ALWTRT Informational Webinar: Population Viability Analysis

The meeting will begin at 4:30

For technical support:
Use the "Raise hand" function

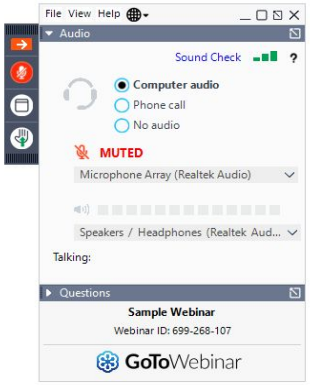
Unmuted (green) **Muted (red)**

This is the control panel

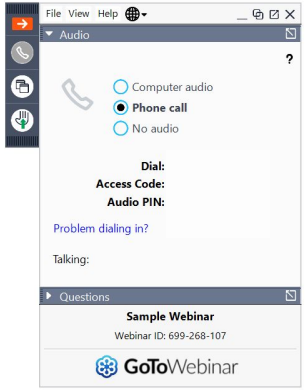
Find the **Control Panel** and open it by clicking the orange arrow. You can usually find this on the right hand side of your screen. You can expand the grey option bars by clicking the triangle on the left hand side of "Audio" and "Questions".

The **Control Panel** also allows you to mute/unmute by clicking the microphone symbol.

Computer Audio (Preferred)



Cell phone for audio (limited internet)

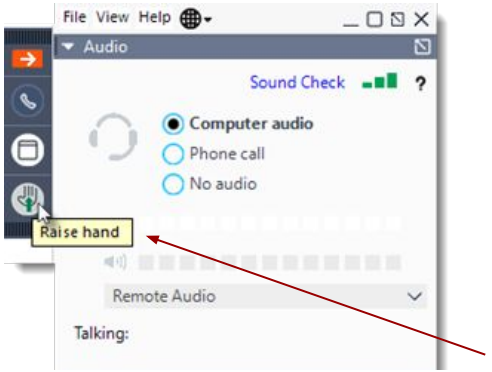


Make sure you can see a red microphone symbol next to your name in attendees. If you cannot, you will not be able to speak.

Select your **audio settings**. Computer audio is recommended. If you dialed in on your phone and did not enter your audio pin, please redial and enter your audio pin.

Access the audio options by clicking on the grey bar that says "Audio".

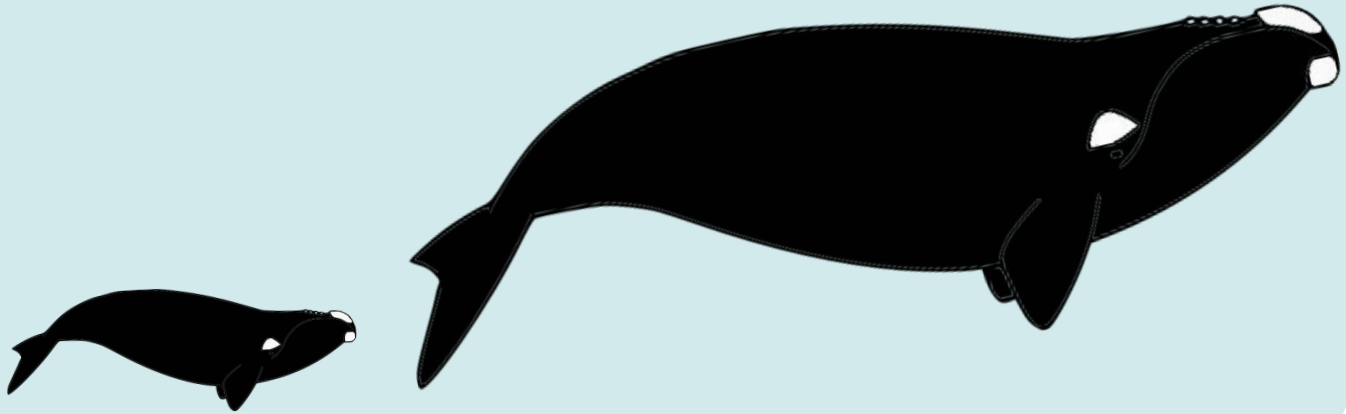
This is the Raise hand function



This is the **Raise Hand** function, you will use this to 'get in line' for the Q&A. You can also use it to let us know if you are experiencing technical difficulties.

Please Note: Today's webinar is being recorded.

ALWTRT Informational Webinar:
Population Viability Analysis



November 6, 2023

NOAA FISHERIES

TRT Members: Participating in Today's Webinar

Please Note: *Today's event is being recorded*

Reminders for Team Members:

- Please hold questions until the end
- Include the slide number or topic of your question
- Use the RAISE HAND function to ask a question
- When you are called on, we will un-mute you, and then you will need to un-mute yourself to ask your question
- The recording will be available on the Team's web page following today's presentation

Non-Team Members: You are welcome, but Q&A time is reserved for Team members.

Recordings of past webinars are available on Atlantic Large Whale Take Reduction Team web page under "Team Meetings." Follow the registration link of the under the recent team meeting and the recording will begin.

NOAA FISHERIES

A management-focused population viability analysis for North Atlantic right whales

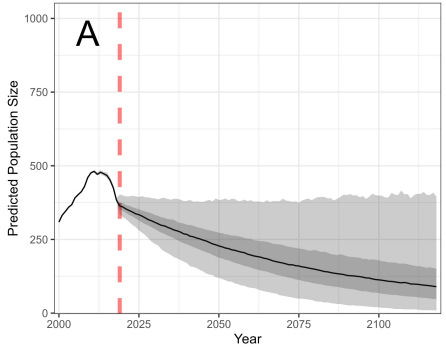
Michael C. Runge[1], Daniel W. Linden[2,3], Jeffrey A. Hostetler[1,4], Diane L. Borggaard[3], Lance P. Garrison[5], Amy R. Knowlton[6], Véronique Lesage[7], Rob Williams[8], Richard M. Pace III[2]

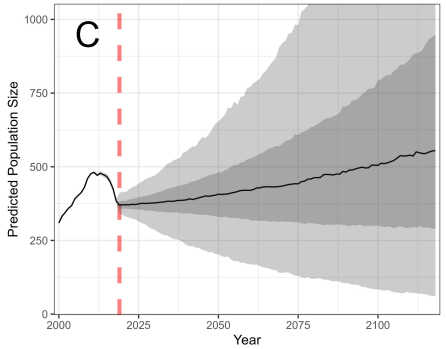
[1]U.S. Geological Survey, Eastern Ecological Science Center
[2]NOAA Fisheries, Northeast Fisheries Science Center
[3]NOAA Fisheries, Greater Atlantic Regional Fisheries Office
[4]U.S. Fish and Wildlife Service, Division of Migratory Bird Management
[5]NOAA Fisheries, Southeast Fisheries Science Center
[6]Anderson Cabot Center for Ocean Life, New England Aquarium
[7]Fisheries and Oceans Canada, Maurice Lamontagne Institute
[8]Oceans Initiative

Fisheries and Oceans Canada | Pêches et Océans Canada

Take home messages

- Current status of NARW depends on effectiveness of post-2020 regulations
  - Under 2013–2019 demographic rates, we project continued long-term decline, with quasi-extinction risk >90% in 100 yr
  - If both the U.S. and Canadian efforts are as effective as intended, the risk drops to ~35%
- Entanglement threat > vessel strike threat
  - Both are substantial
  - Threat due to *observed* decreases in prey appears small





NOAA Technical Memorandum NMFS-NE-307

OUTLINE

- Background
- Methods
  - Model framework and structure
  - Retrospective analyses
- Results
  - Rates of mortality and reproduction
  - Forward projections
- Discussion

BACKGROUND

- Several guidance documents call for evaluation of future trends
  - 2005 US Recovery Plan
    - "…no more than a 1% chance of quasi-extinction in 100 yr"
  - 2014 Canadian Recovery Strategy
    - "…an increasing trend in abundance over three generations"
  - 2017 US 5-year Review
- Population Evaluation Tool (PET) Subgroup
  - Established under, and reports to, NE and SE Implementation Teams
  - Charge (7/2018): *Develop a tool* that will allow us to *characterize extinction risk* and examine what is needed to improve population trajectories
  - A living tool for management

BACKGROUND: Objectives for **P**opulation **E**valuation **T**ool

1. Estimate extinction risk under current and projected threats
2. ~~Explore demographically based recovery criteria~~
3. Conduct a quantitative threats analysis
4. Evaluate a series of relevant management alternatives
5. Conduct a full sensitivity analysis
6. Facilitate communication, outreach, and education

BACKGROUND: Desired output metrics

- Extinction (or quasi-extinction) risk over time
- Minimum expected population size
- IUCN metrics
  - e.g., risk of 50-percent decline in 3 generations
- Population growth rate
- Other demographic metrics
  - Calving probabilities
  - Cause-specific mortality rates

BACKGROUND: NARW threats represented

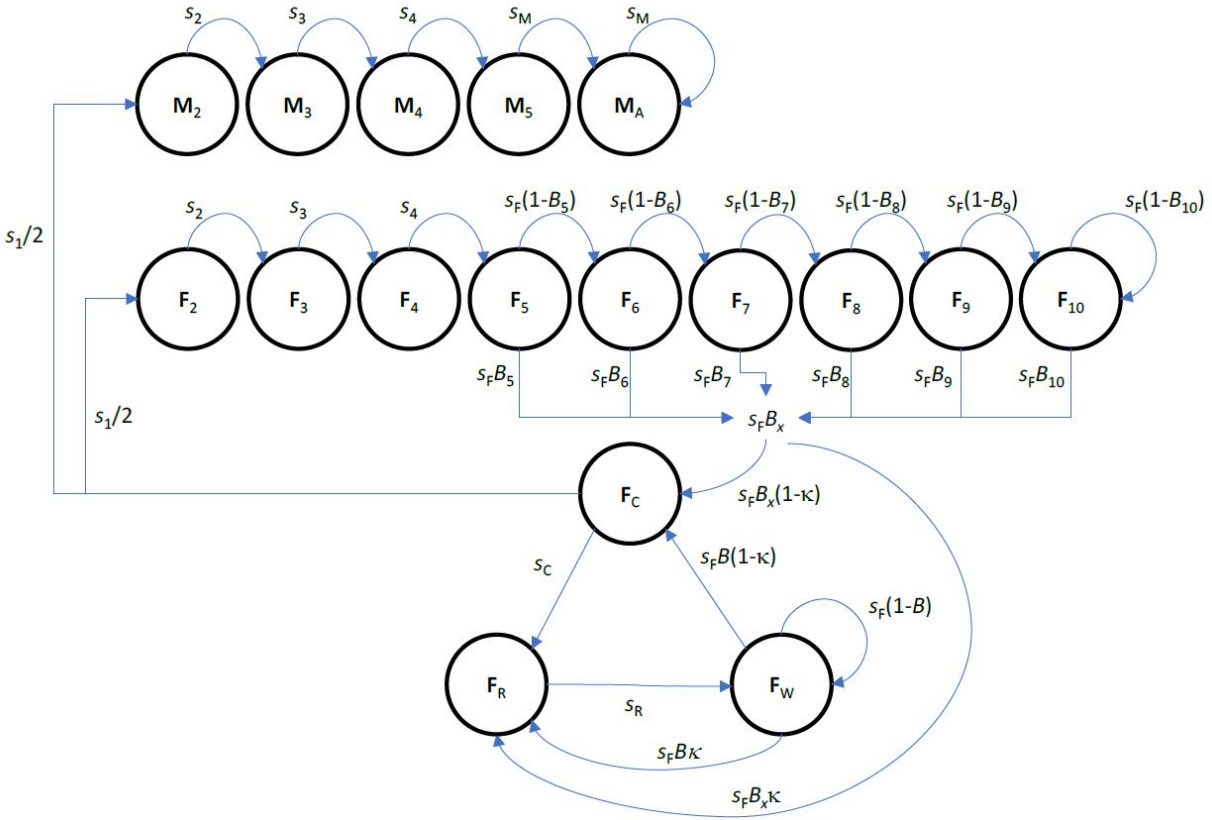
- Entanglement
- Vessel strikes
- Changes in prey availability
- Changes in prey accessibility (anthropogenic noise)

METHODS: Projection model

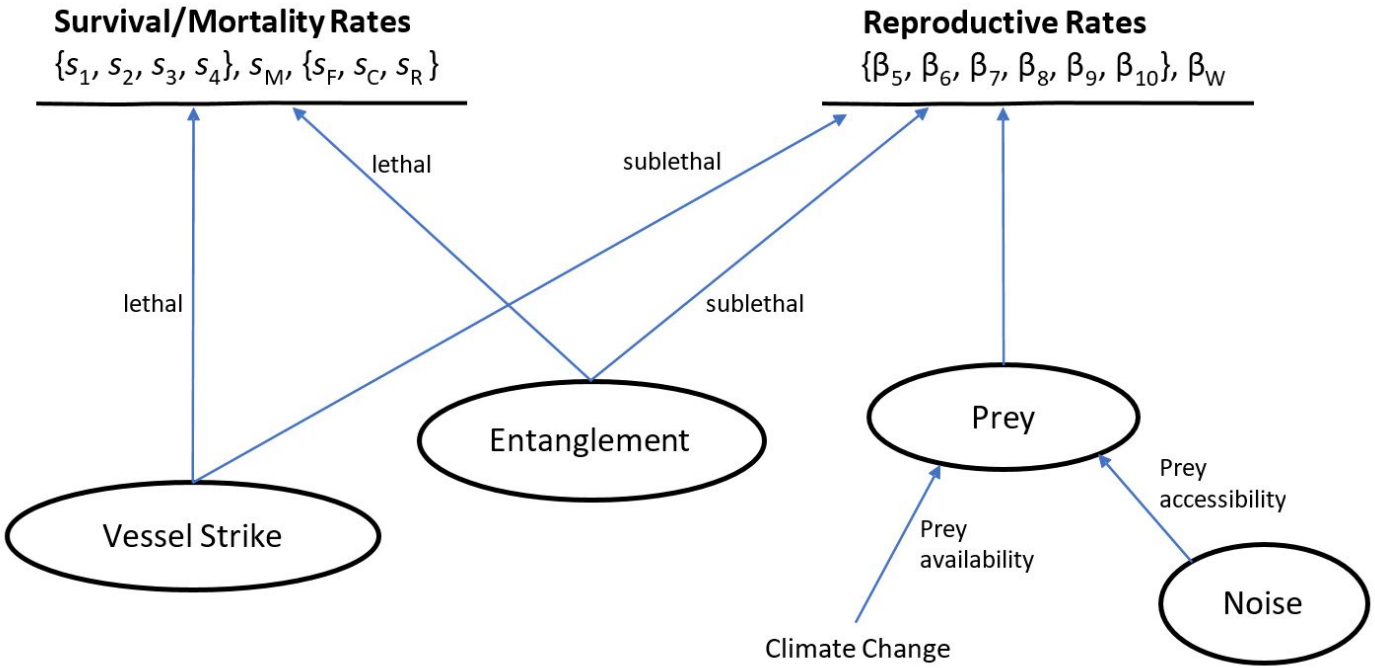
- Single (rangewide) population, annual timeframe
- Individually-based model (IBM)
  - Age- and state-based structure
  - Injury state (entanglement, vessel-strike)
- Threats-based submodels
- Accounts for uncertainty
  - Temporal variance, parametric uncertainty, demographic stochasticity
- Population dynamics
  - Density dependence
  - *No* Allee effects; *no* genetic mechanisms (e.g., inbreeding depression)

`NEFSC/PSD-NARW_PET_PVA`

METHODS: Age and stage structure

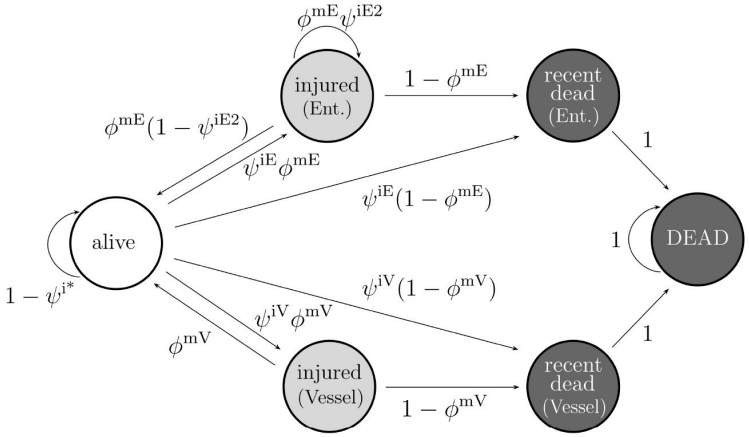


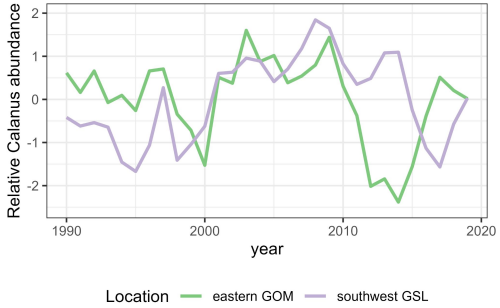
METHODS: Threats submodels



METHODS: Retrospective analyses

- Multistate capture-recapture models
  - Mortality (cause-specific)
  - Reproduction
- Time series of prey indices
- Effect of prey indices on reproduction
- Initial population size





METHODS: Baseline scenarios

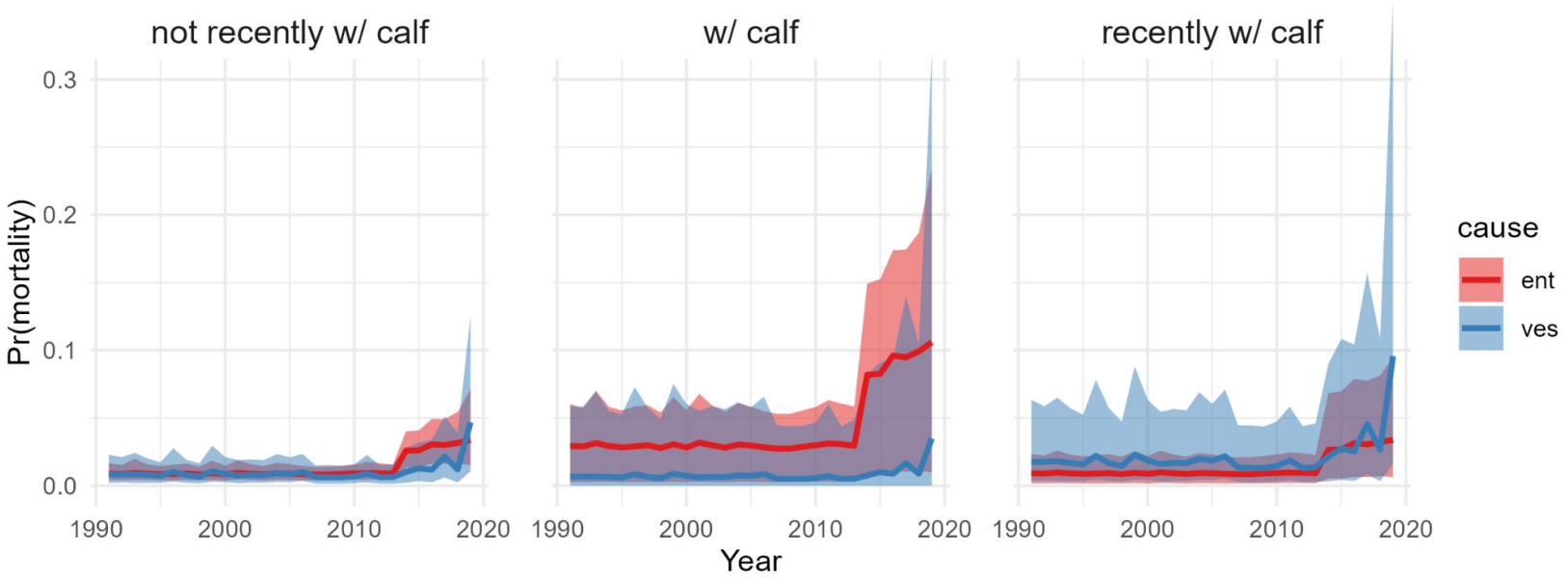
- The intent is to best represent the current status
- Demographic rates from 2013–2019
- Three versions, relative to entanglement severe injury:
  - **0%** reduction in entanglement severe injury rate (pre-2021 levels)
  - **25%** reduction in entanglement rate (e.g., assuming successful mitigation measures by the ALWTRP*)
  - **50%** reduction in entanglement rate (e.g., assuming successful mitigation measures in both countries)

* ALWTRP: Atlantic Large Whale Take Reduction Plan (2021 rule)

METHODS: Baseline scenarios

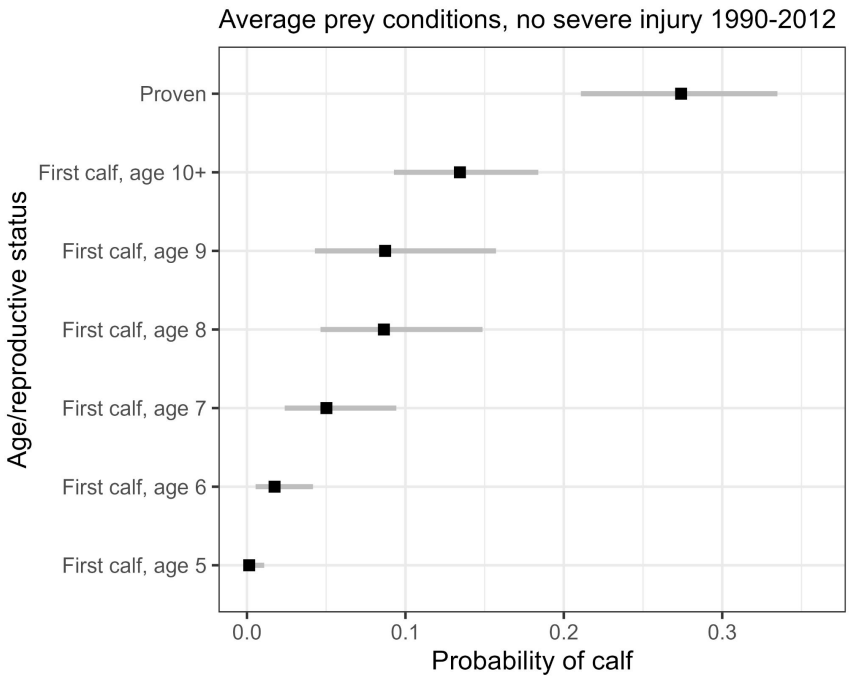
- Vessel strike assumptions:
  - Observed increases in shipping volume correspond with increases in container ship size during 2000–2020
  - Resulting vessel traffic remains constant (e.g., 0% change)
- Prey assumptions:
  - Post-2010 prey conditions continue indefinitely
  - Reflects climate-induced ecosystem change in western Atlantic
- Natural mortality negligible (beyond calf stage)

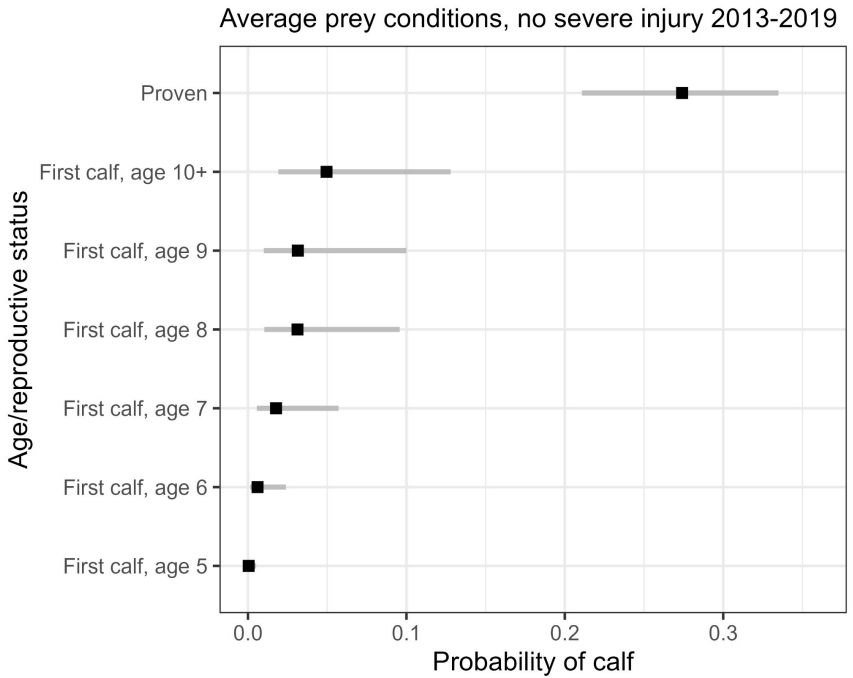
RESULTS: Mortality rates (1990–2019)



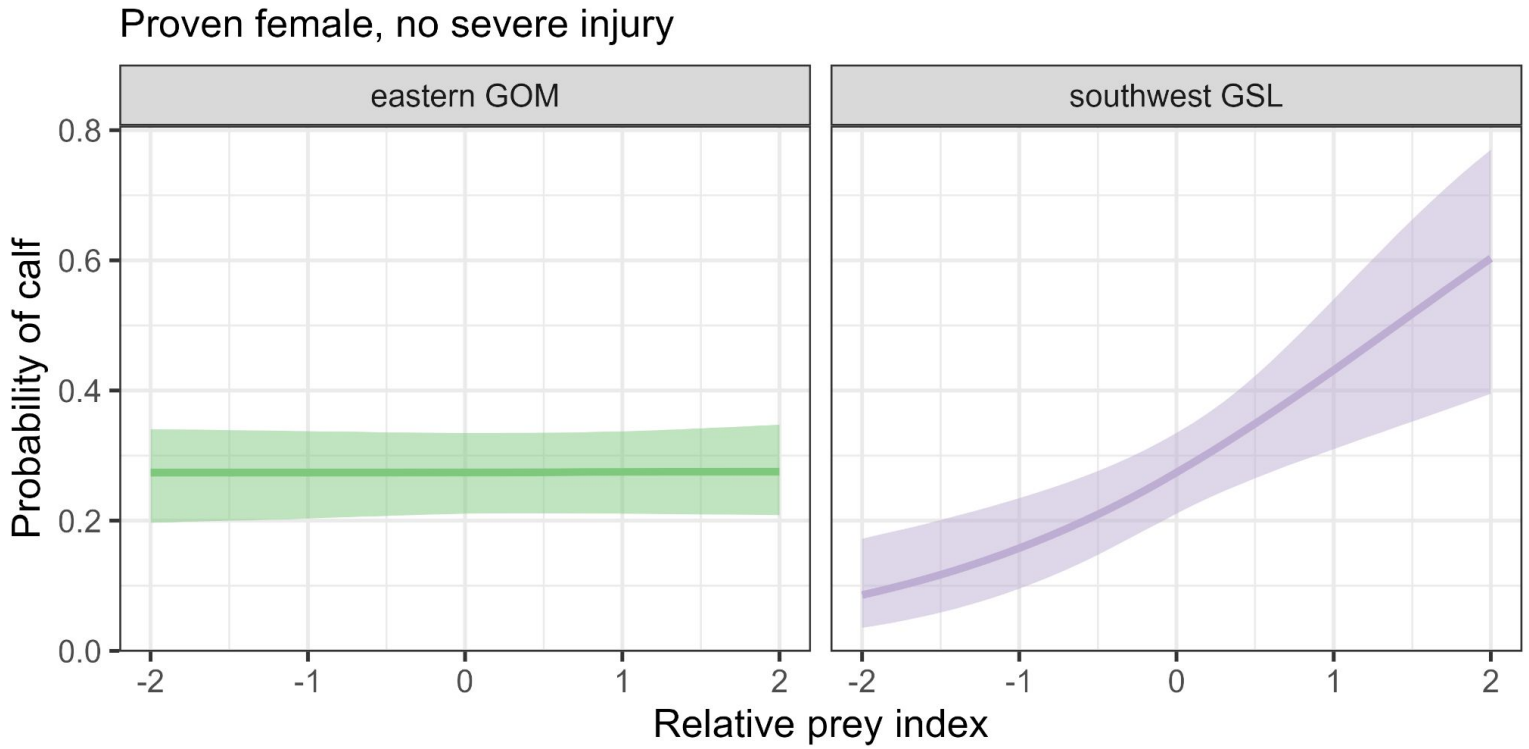
- Females w/ calf had significantly higher rates of mortality
- Injury rates elevated after 2013

RESULTS: Age-specific calving probability (1990–2019)

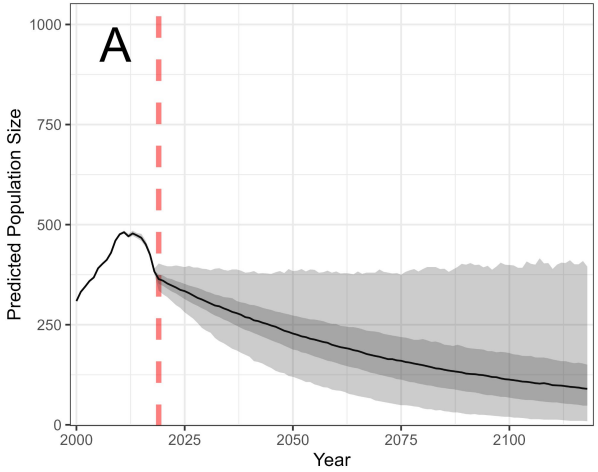




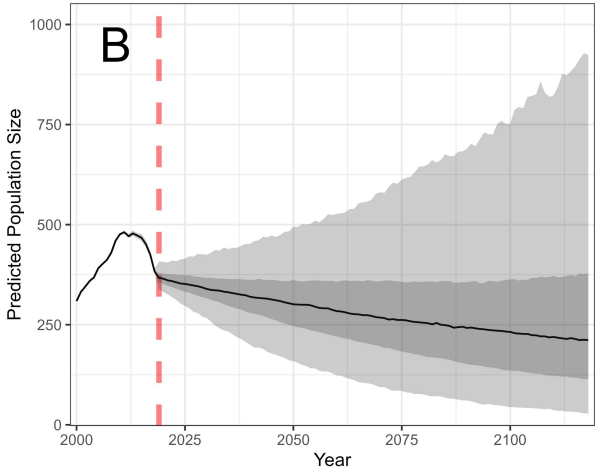
RESULTS: Calving relationship with prey



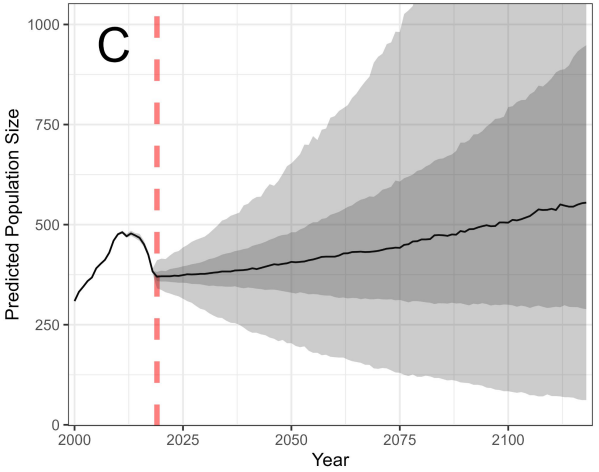
RESULTS: Baseline projections



Status quo entanglement



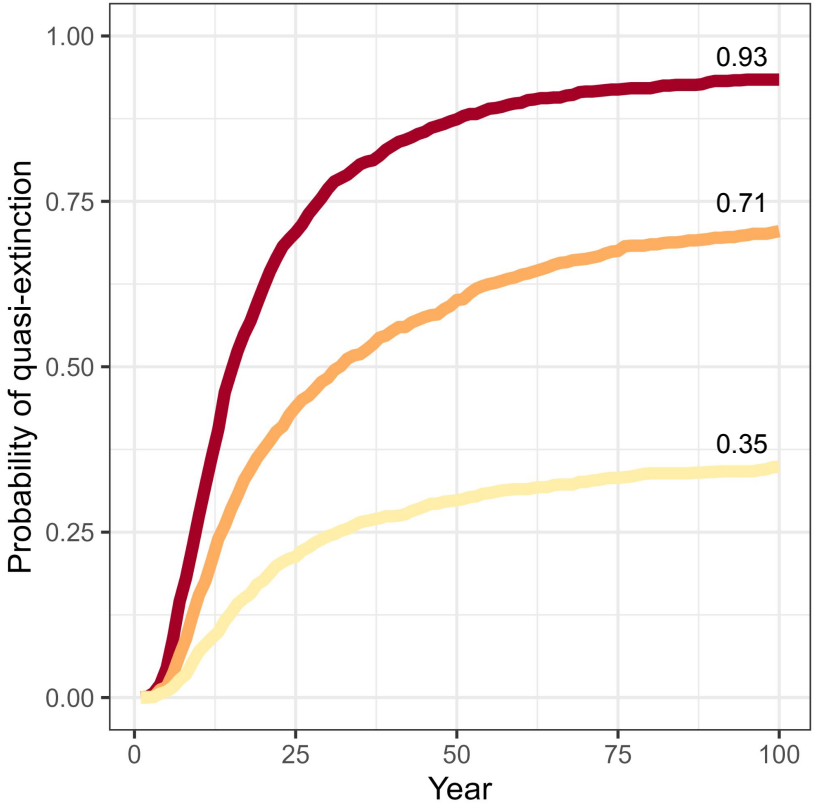
25% entanglement reduction



50% entanglement reduction

RESULTS: Baseline projections

Quasi-extinction: dropping below 50 proven females



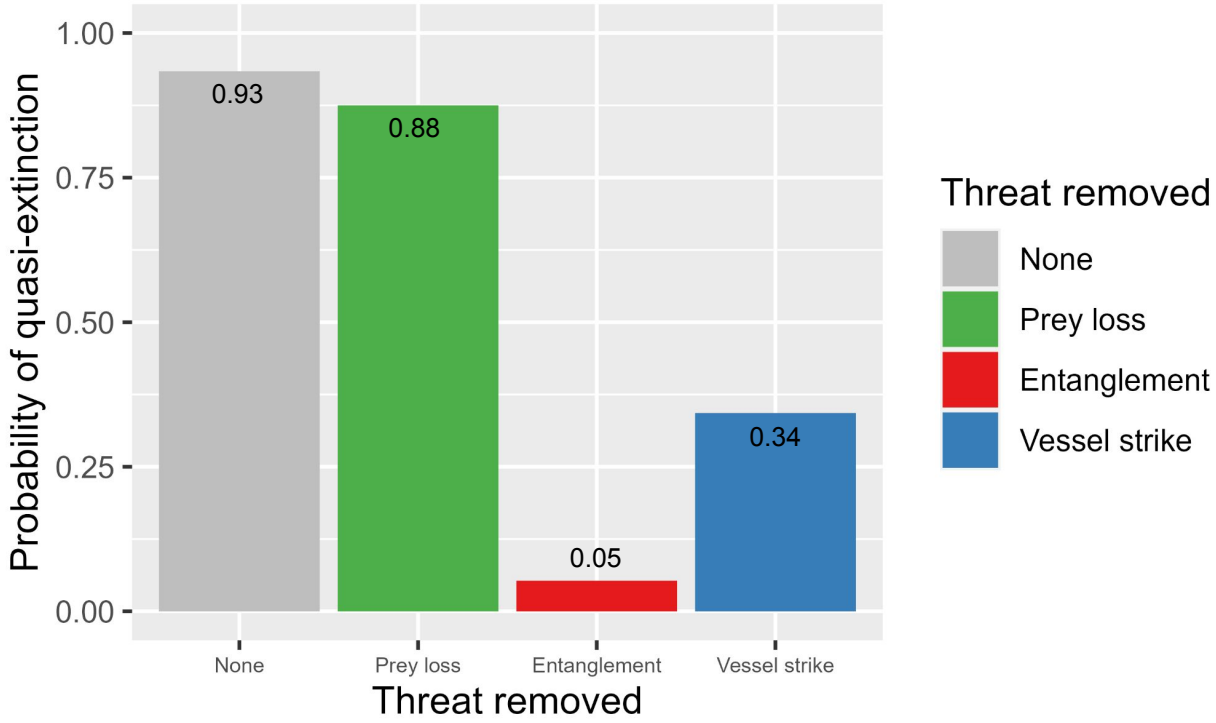
Status quo entanglement

25% entanglement reduction

50% entanglement reduction

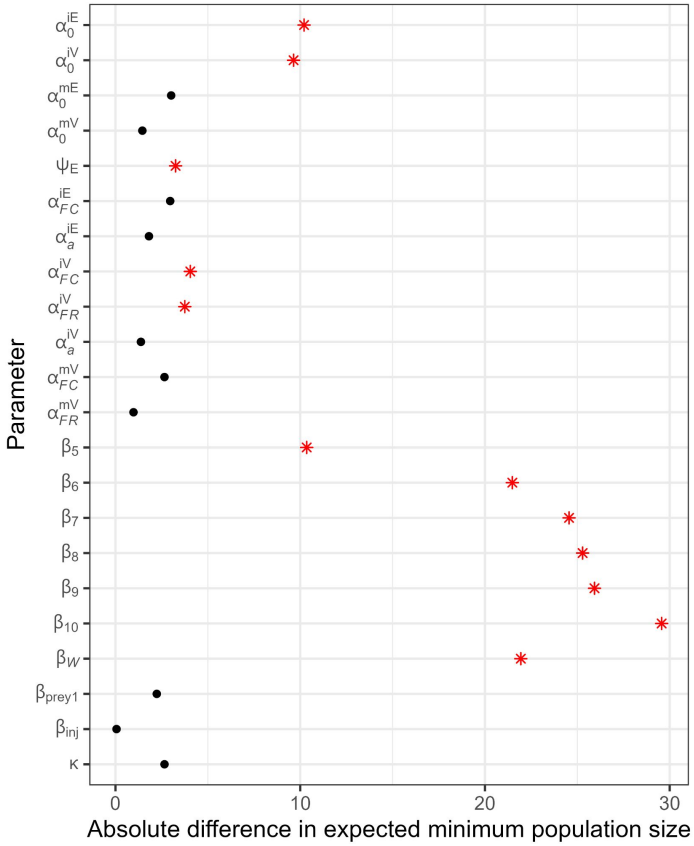
RESULTS: Threats analysis

Quasi-extinction: dropping below 50 proven females

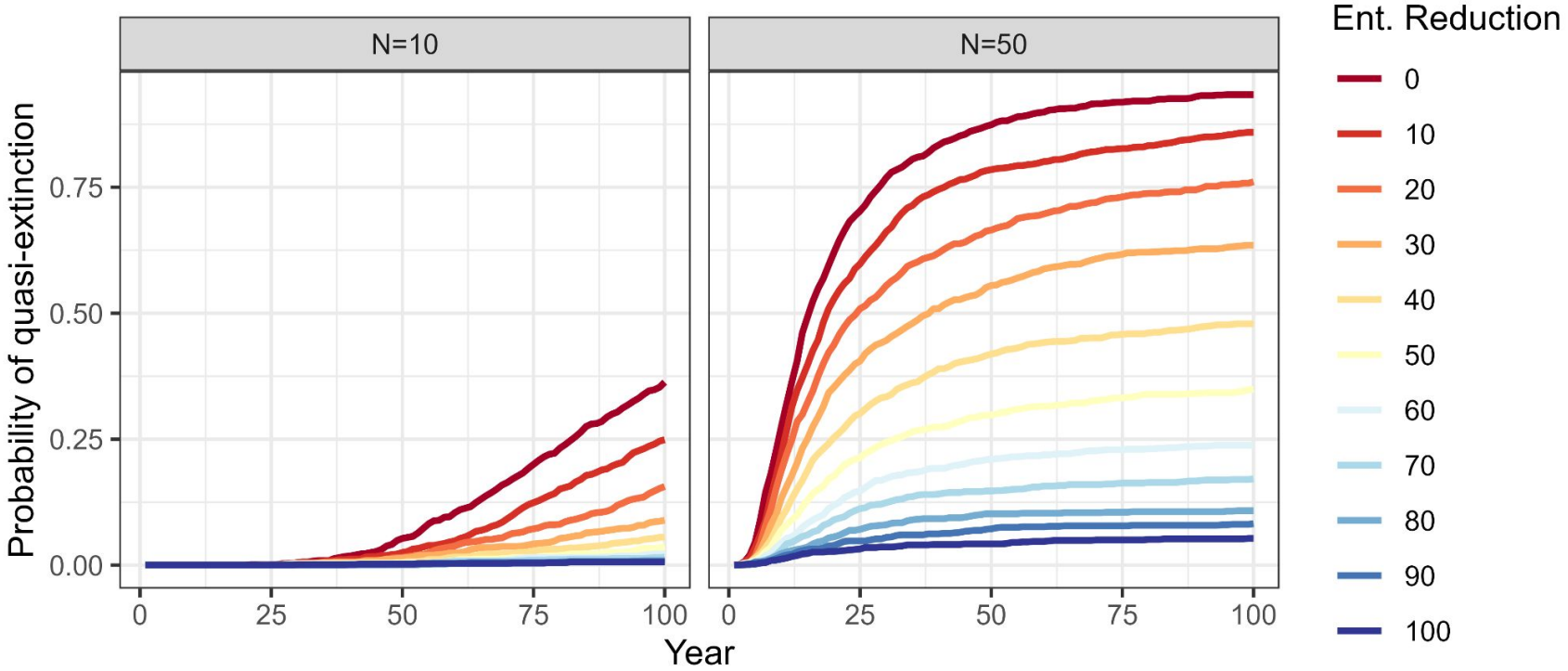


RESULTS: Sensitivity analysis

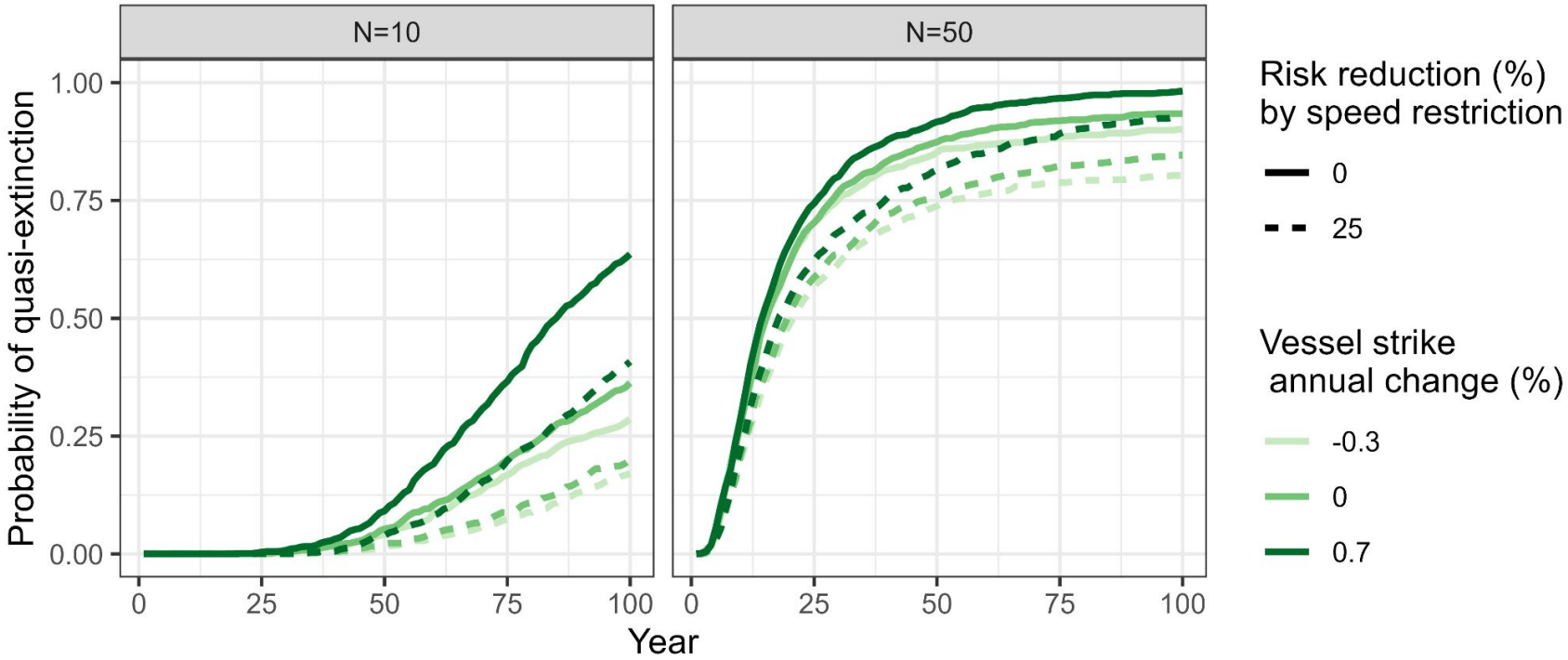
- Effect of parameter uncertainty on expected minimum population size
- Several parameters stood out related to injury and calving:
  - Average injury rates
  - Age-specific calving rates



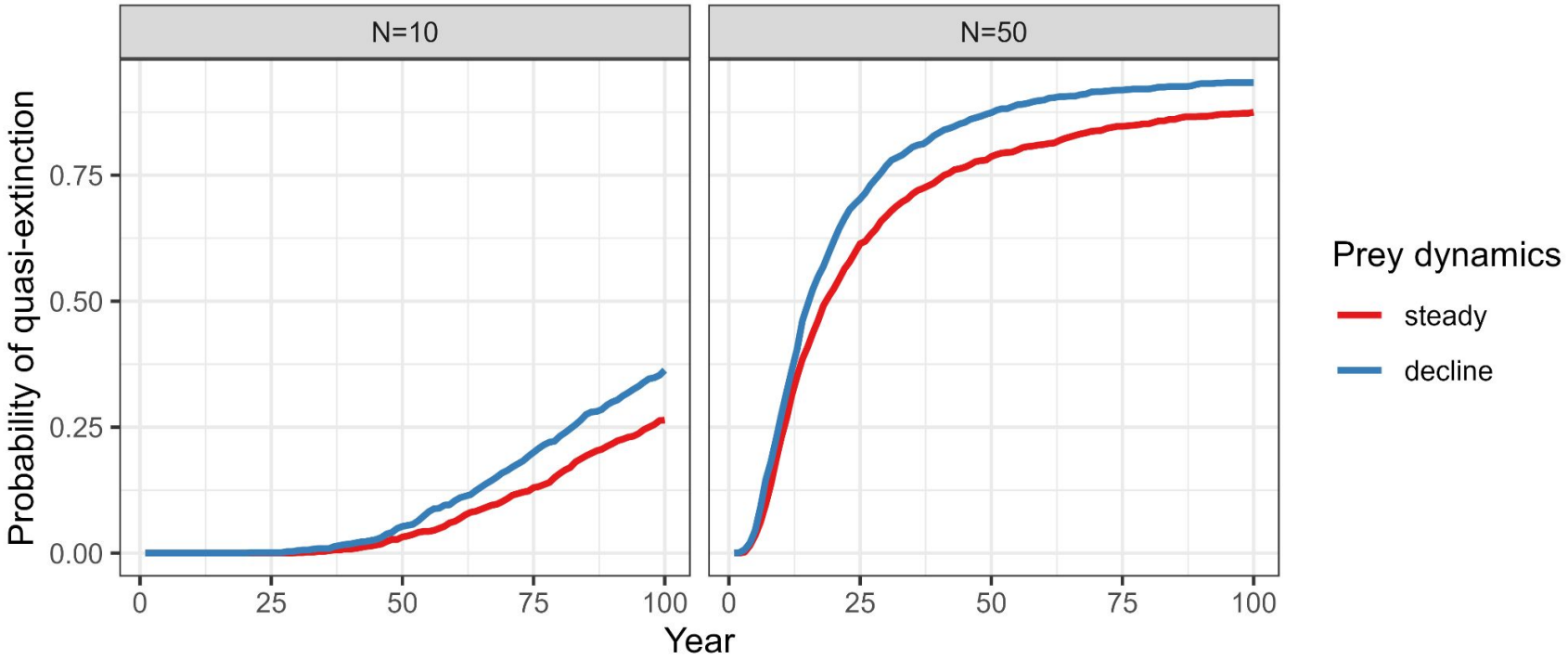
RESULTS: *Scenarios* exploring entanglement reduction



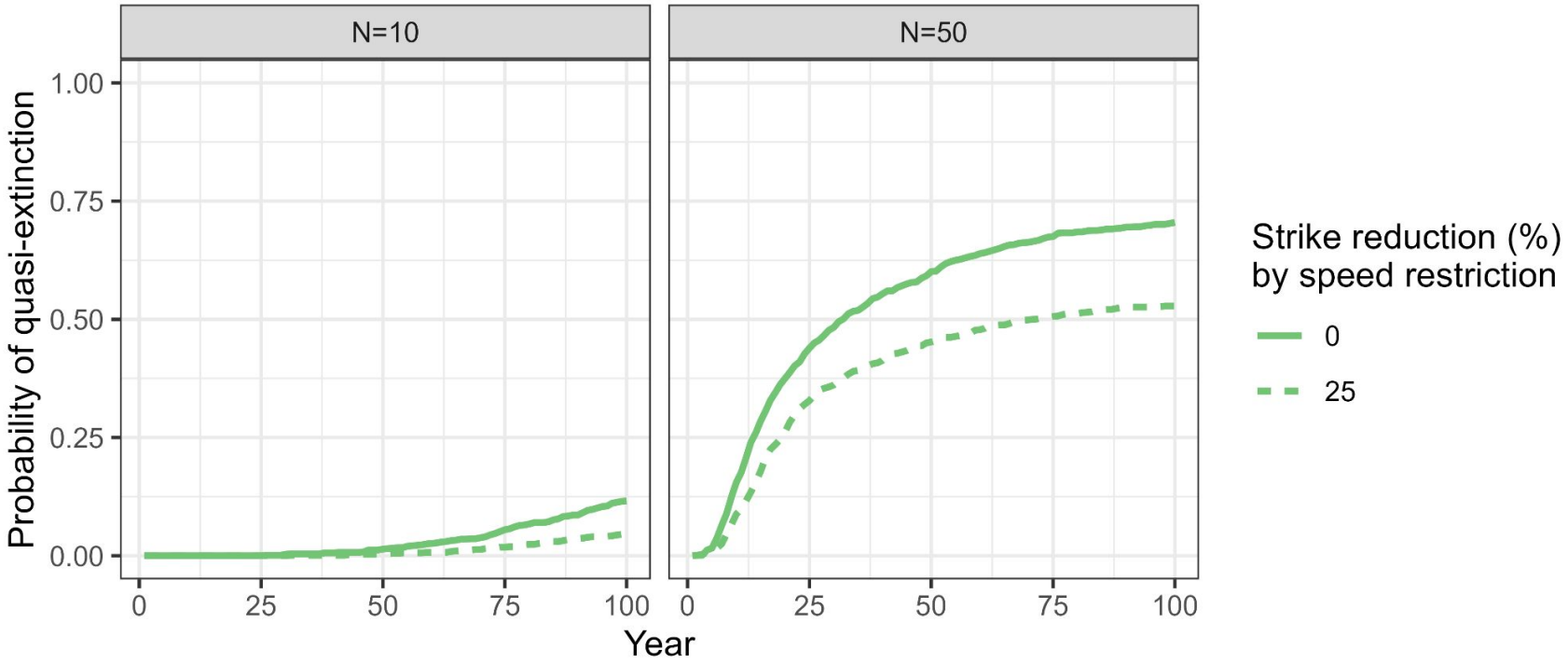
RESULTS: *Scenarios* exploring vessel strike changes



RESULTS: *Scenarios* exploring future prey trends



RESULTS: *Scenario* exploring vessel speed restriction given 25% entanglement reduction



Take home messages

- Current status of NARW depends on effectiveness of post-2020 regulations
  - Under 2013–2019 demographic rates, we project continued long-term decline, with quasi-extinction risk >90% in 100 yr
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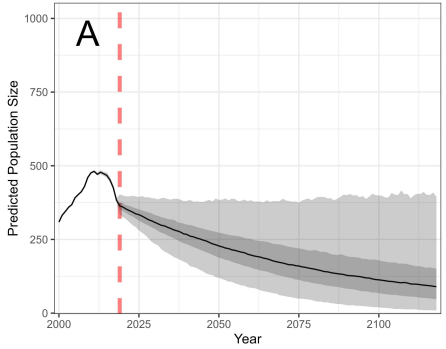

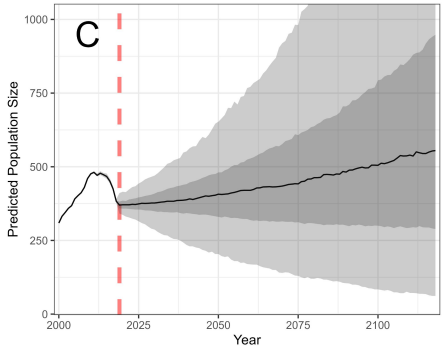

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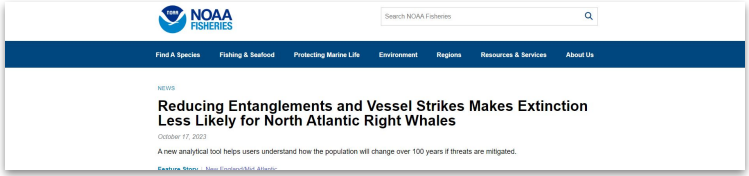
Peer review status

- PVA report external peer-reviewed in fall 2022
  - Center for Independent Experts (CIE)
  - USGS Fundamental Science Practices (FSP)
- Report and peer-reviews publicly available



- Plan for scientific peer-reviewed journal papers
  - Supporting retrospective analyses
  - Early versions reviewed by CIE

Acknowledgements

- This work is only possible due to the contributions of many Consortium members who have shared individual whale sightings data made useful through continuously meticulous curatorial action of the folks at New England Aquarium.

Population size estimation of North Atlantic right whales from 1990-2022

Daniel W. Linden

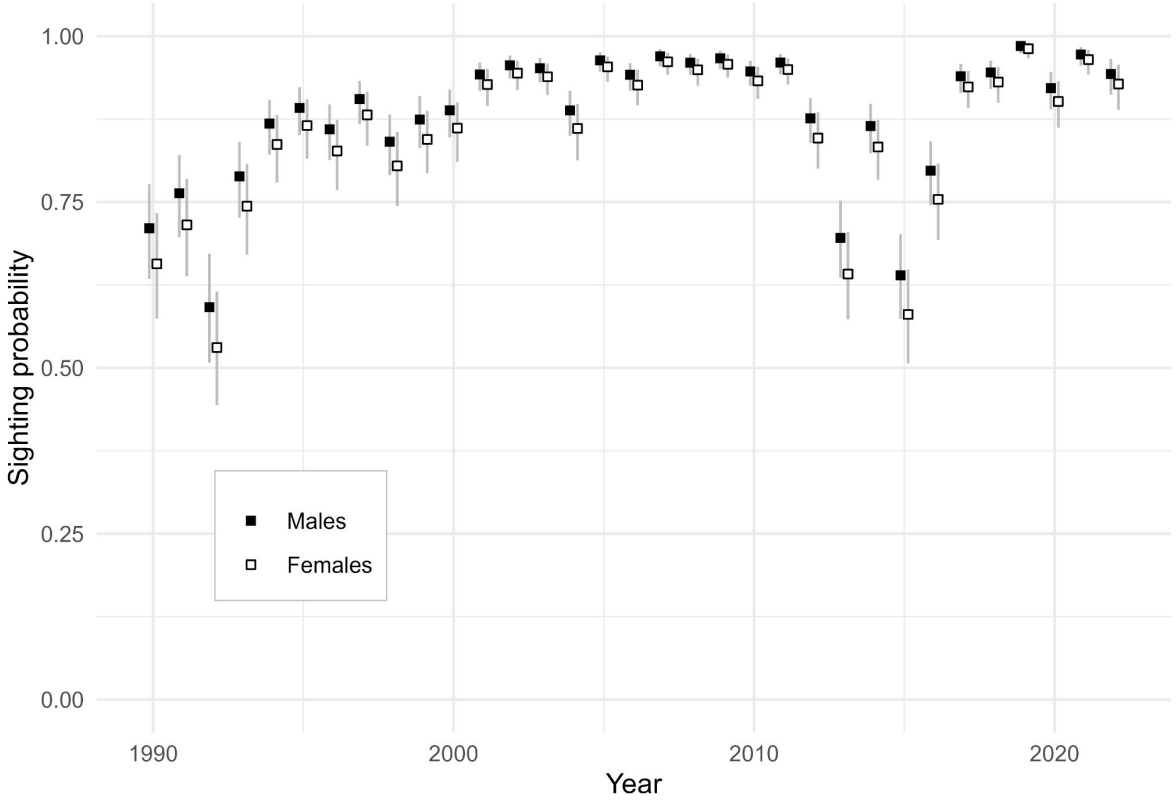
Northeast Fisheries Science Center
NOAA National Marine Fisheries Service

Summary

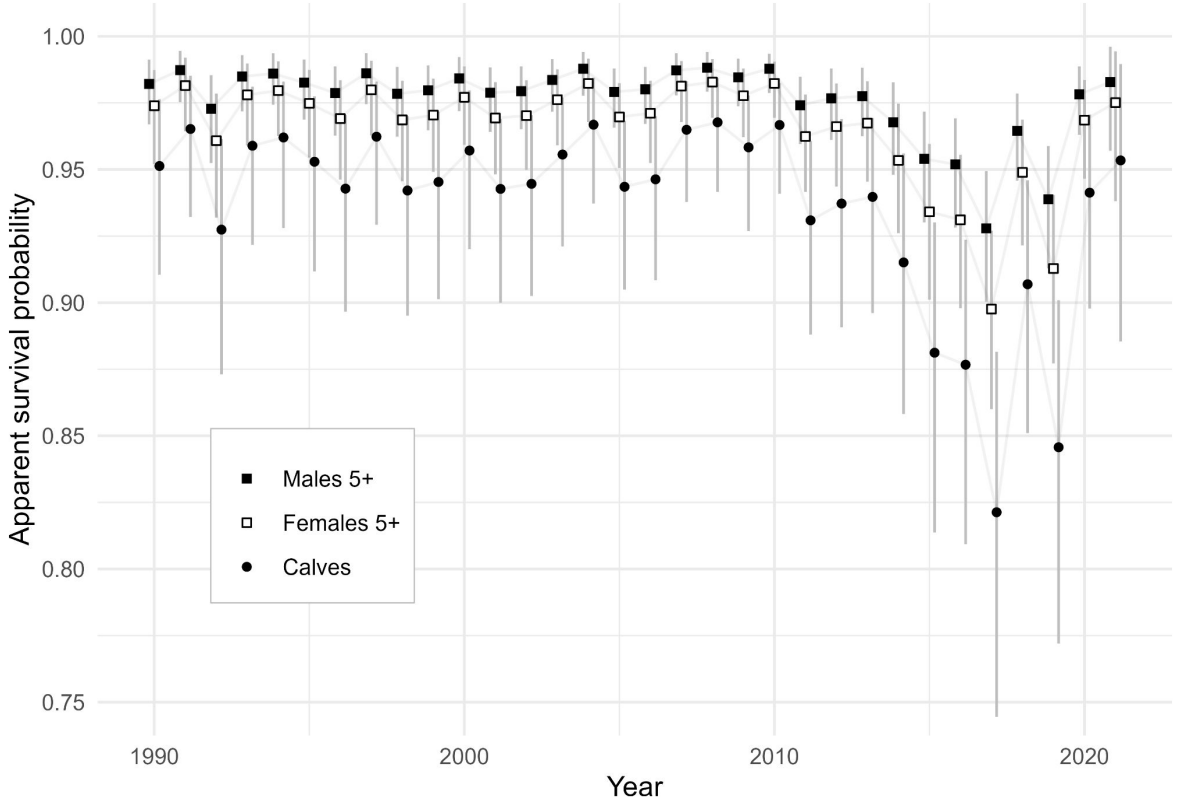
- NARW population estimate in 2022 = **356** [346, 363]
  - Revised estimate for 2021 = 364 [360, 369]
  - Addition of previous year calves to sightings catalog causes upward adjustment
- Rate of decline *appears* to have slowed
  - Too early to tell
  - Annual mortalities > PBR

NOAA Technical Memorandum NMFS-NE-314

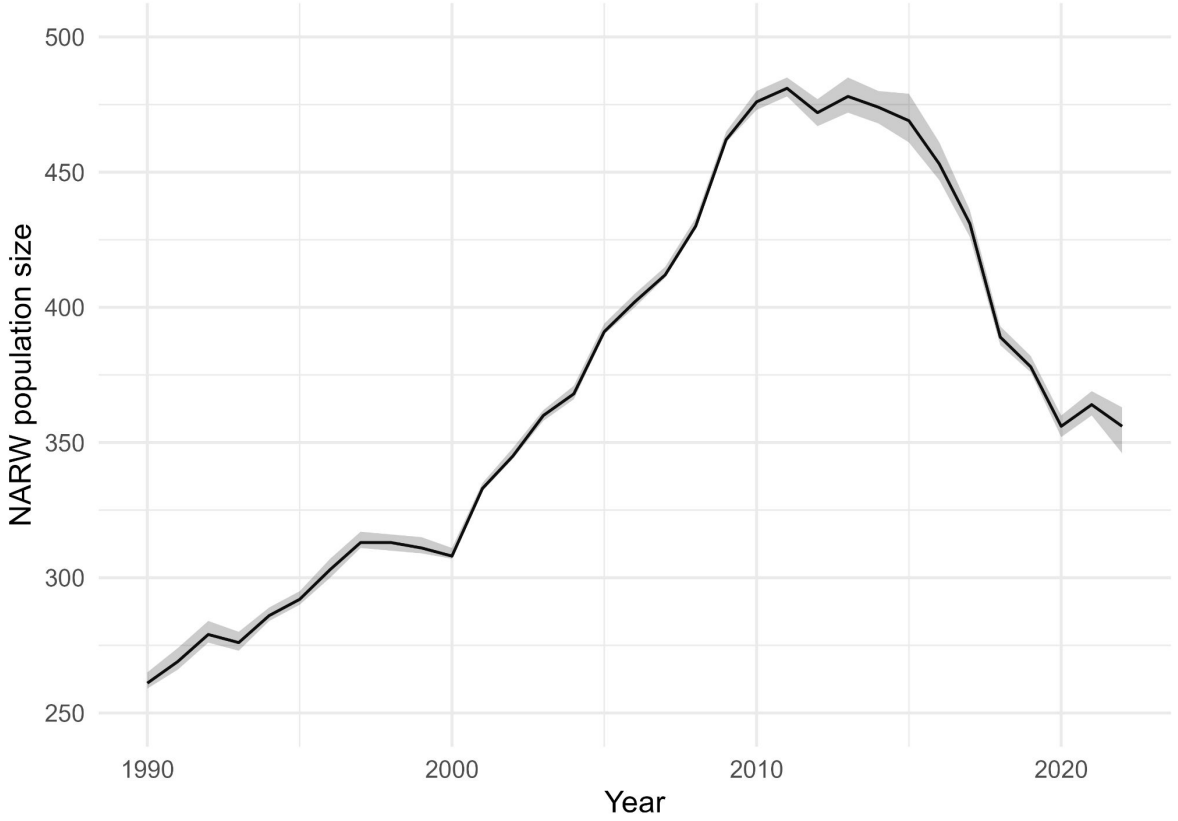
Sighting probabilities



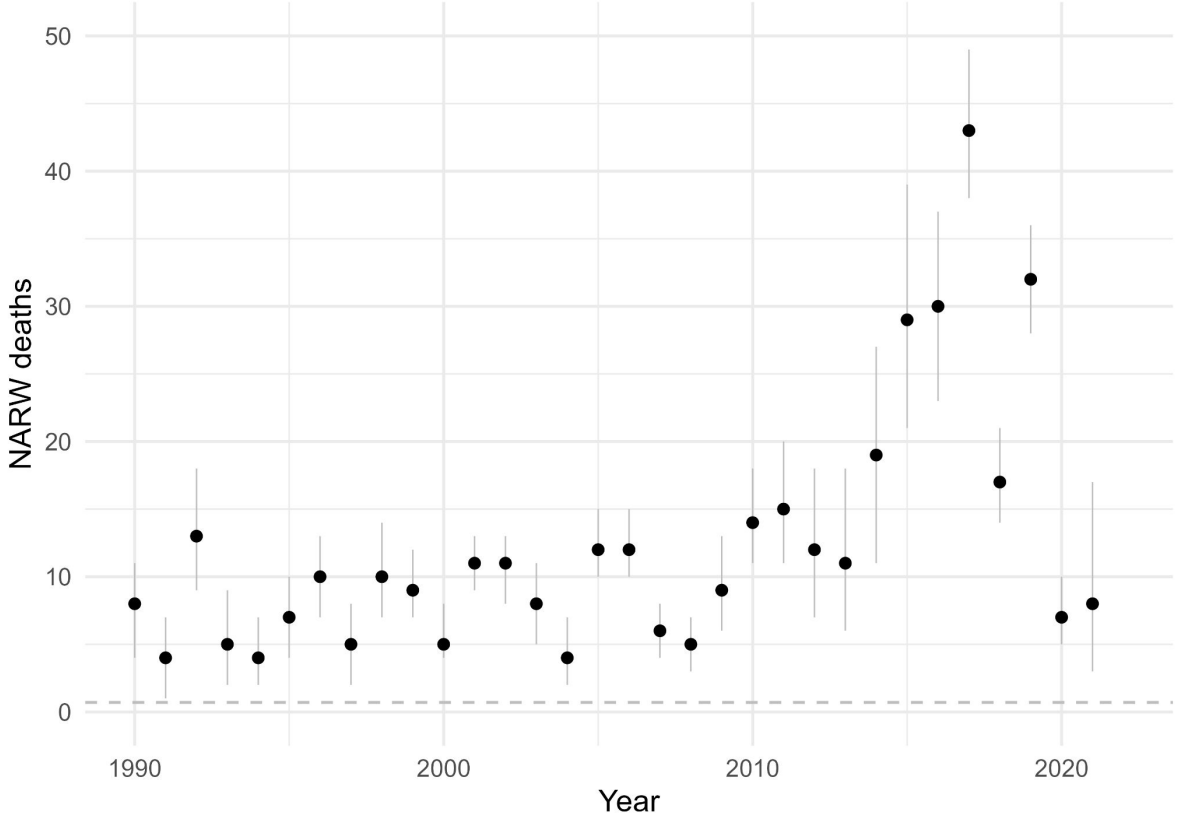
Survival probabilities



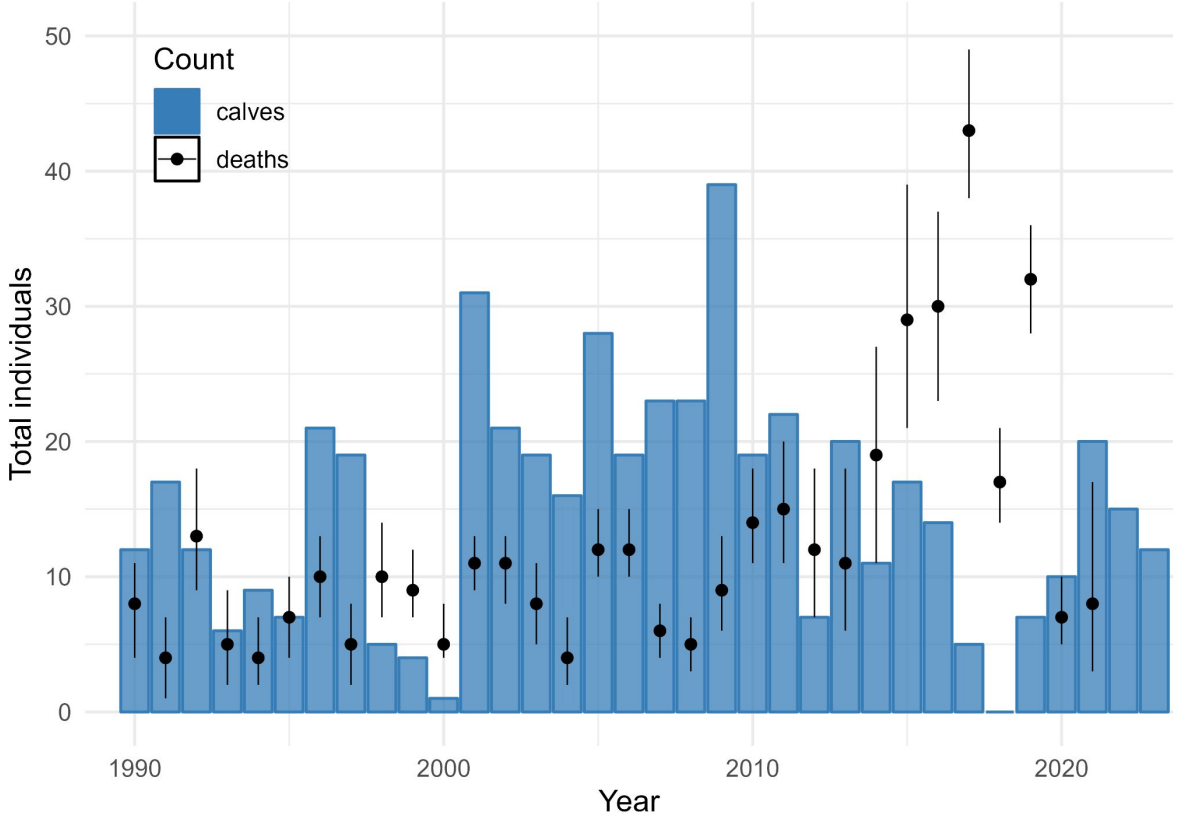
Population size



Annual mortalities



Annual mortalities vs. calves*



*Not formally part of population estimation

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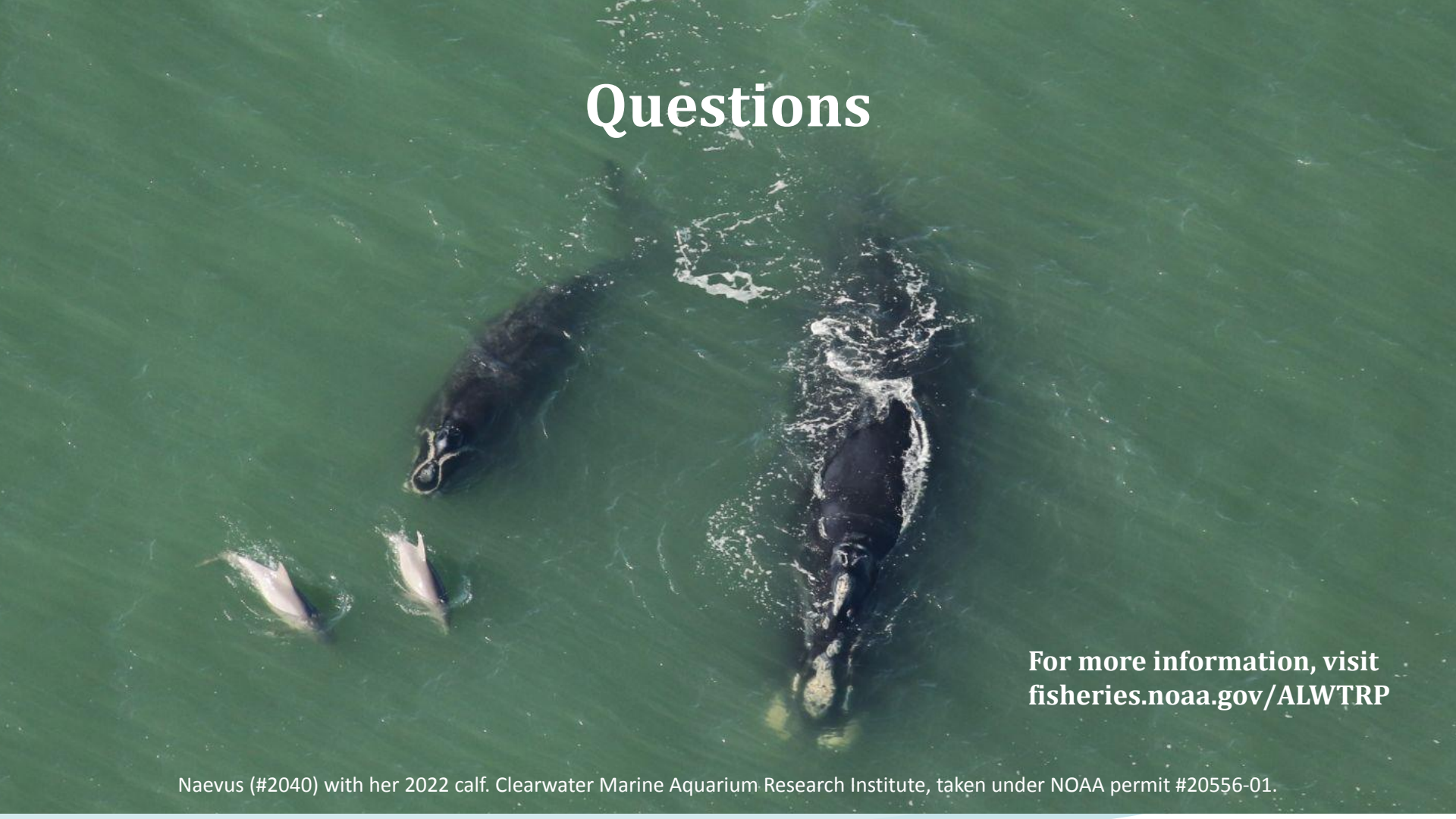
Questions



For more information, visit fisheries.noaa.gov/ALWTRP

Naevus (#2040) with her 2022 calf. Clearwater Marine Aquarium Research Institute, taken under NOAA permit #20556-01.