North East Fisheries Science Center Research Activities and Concerns regarding Right Whales

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Northeast Fisheries Science Center

Peter Corkeron, Richard Pace & Tim Cole

7th April 2017

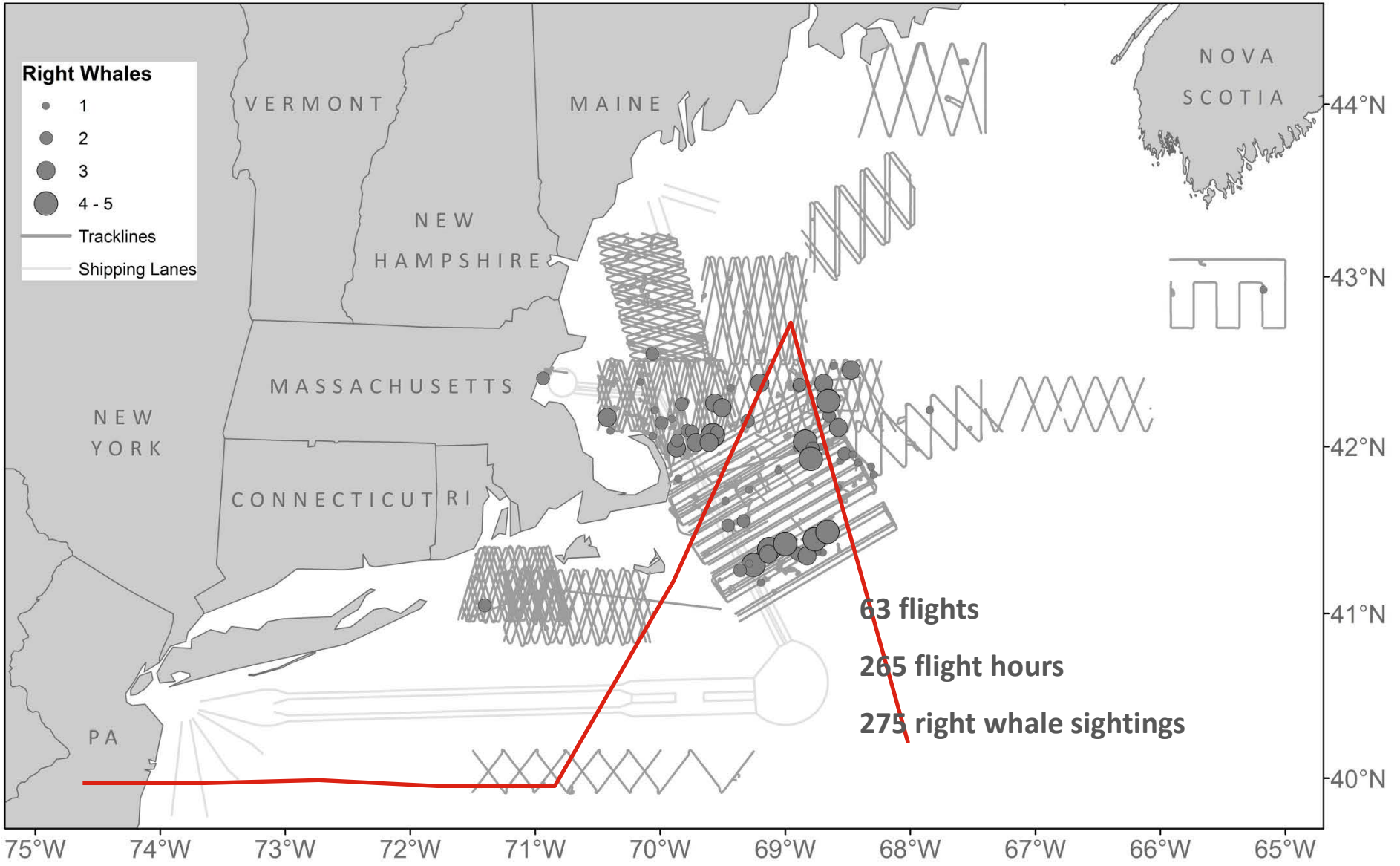
Research activities

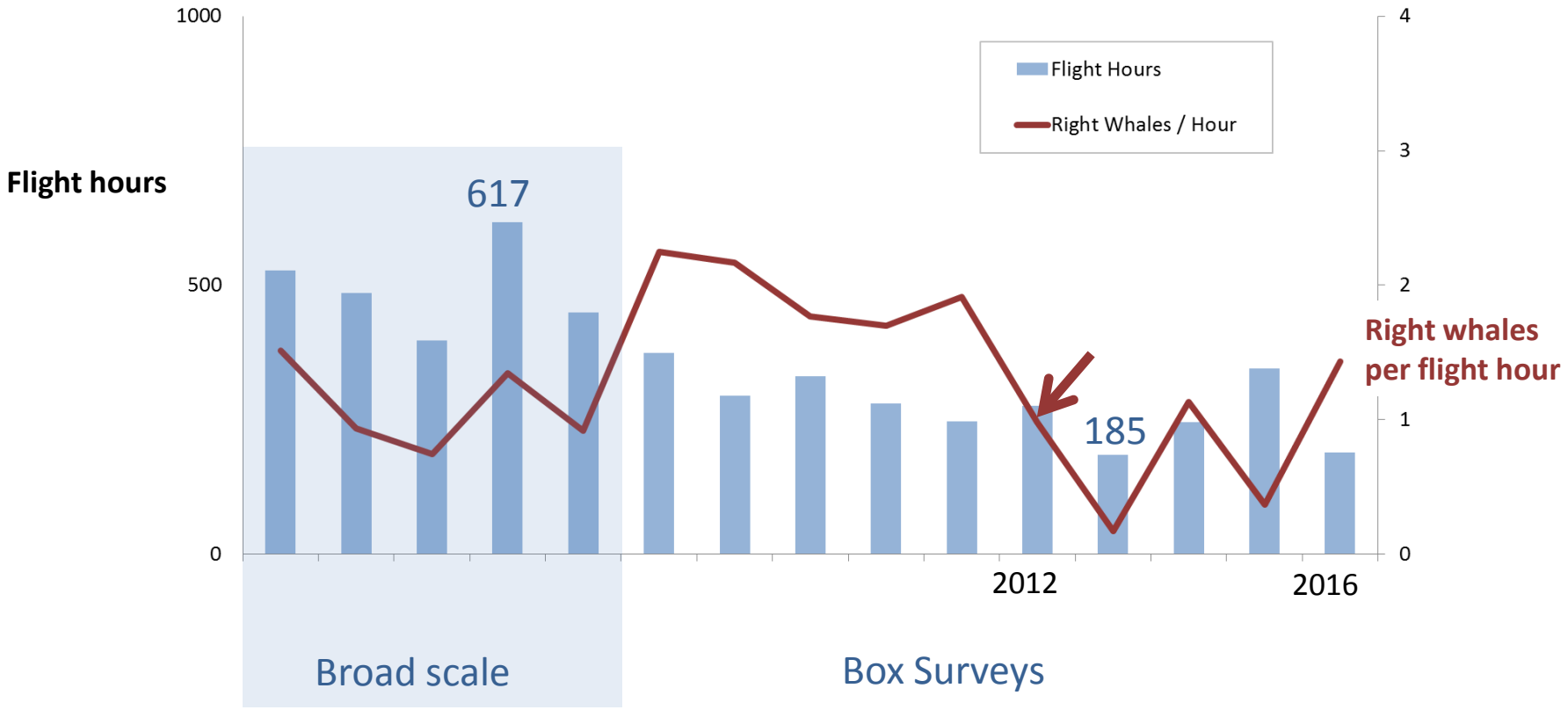
- Visual surveys
- Acoustic survey
- Drone work
- Analyses

Visual surveys

- Focus on NERW aerial survey series
- Work from NOAA ships:
  - May cruises offshore over past years
  - Little data last year, no cruise this year
- Small boat work
  - Southeast calving – collaboration with Syracuse University
  - Cape Cod Bay
  - This year, also off Rhode Island Sound

NOAA right whale aerial surveys Nov 2015 – Jun 2016 (FY16)




Flight hours
1000
500
0
4
3
2
1
0
Flight Hours
Right Whales / Hour
617
185
2012
2016
Right whales per flight hour
Broad scale
Box Surveys

Acoustic surveys

see Sofie’s talk this afternoon

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Drone work

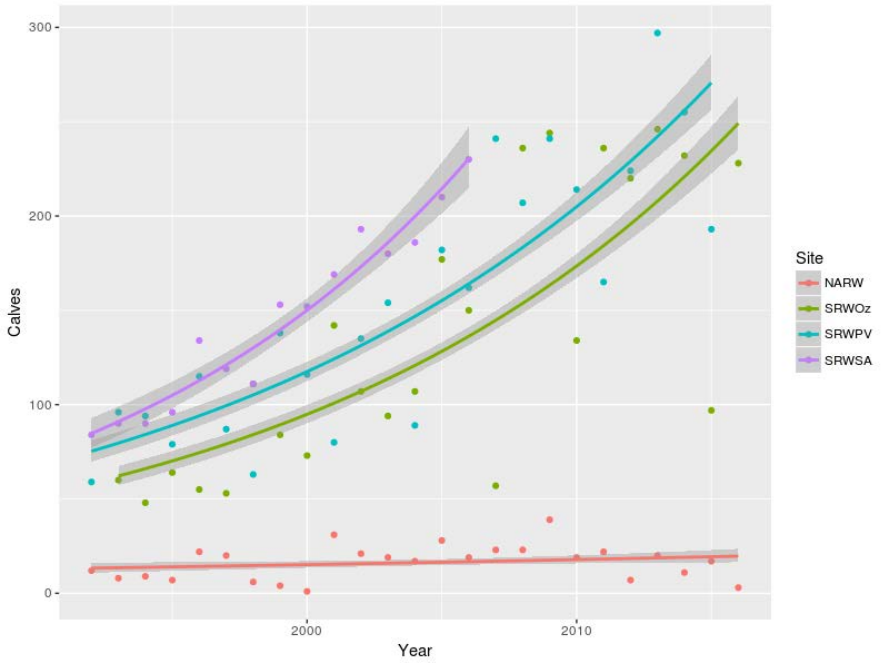
See Michael’s talk this afternoon

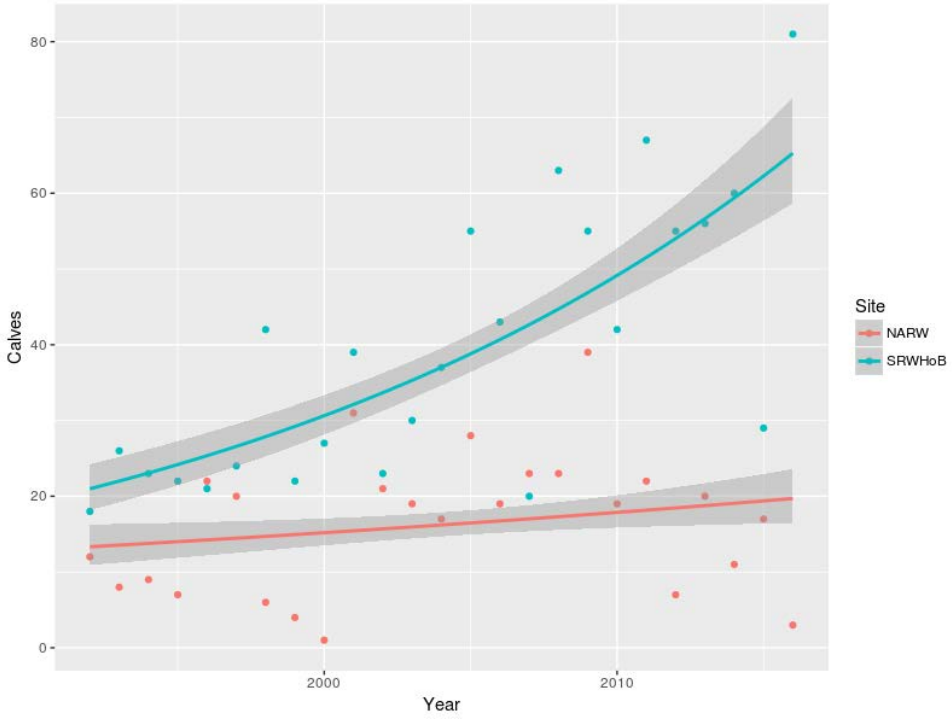
Analyses

- Comparative studies (starting)
- Mark-recapture models:
  - Abundance
  - Survival
- Modeling sublethal effects of entanglement
- PVA-type approaches
  - CMR time series
  - Matrix models

Calf production over time

- Thanks to Claire Charleton for HoB; John Bannister for SW Aust, Vicky Rowntree for PV data





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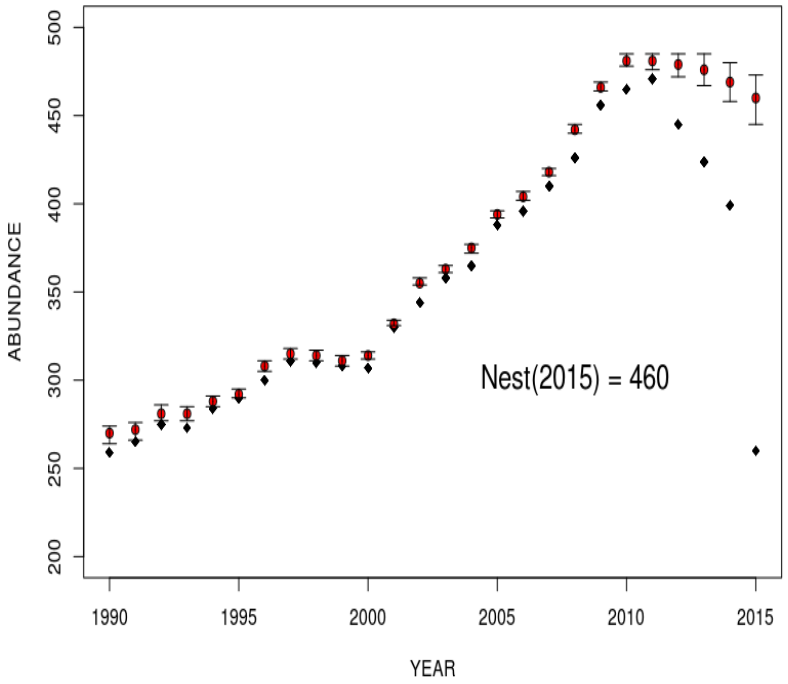
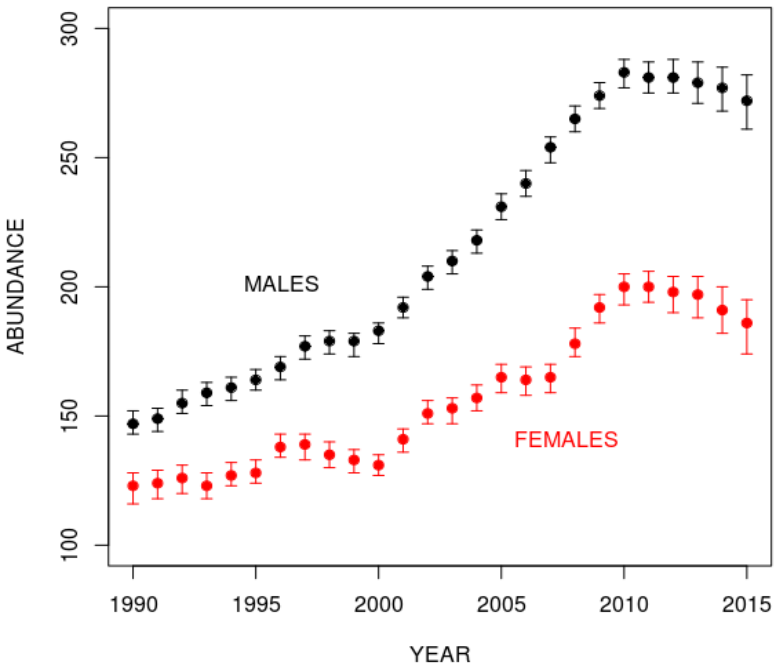
Abundance based on mark recapture





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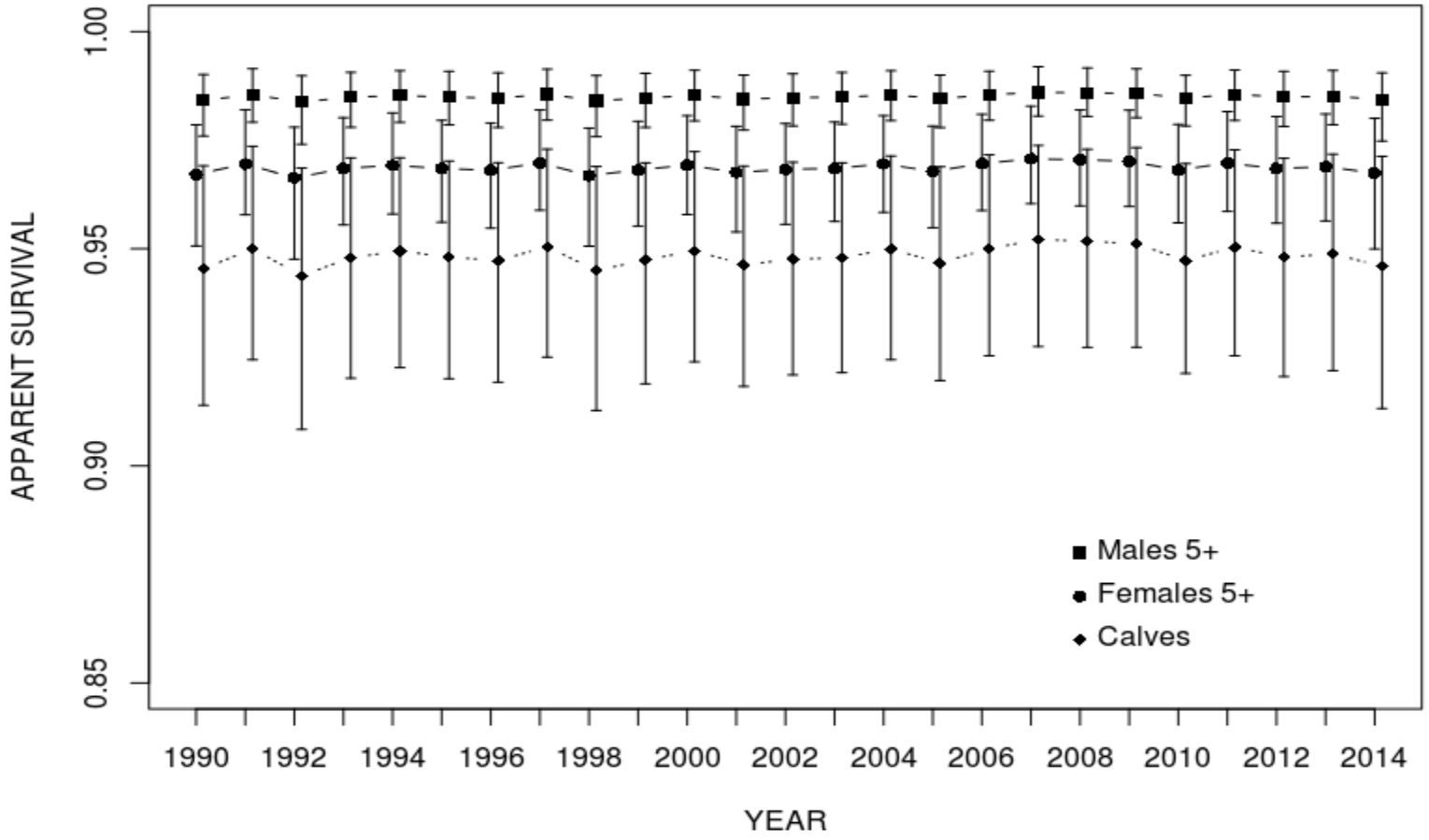
Estimates of annual survival



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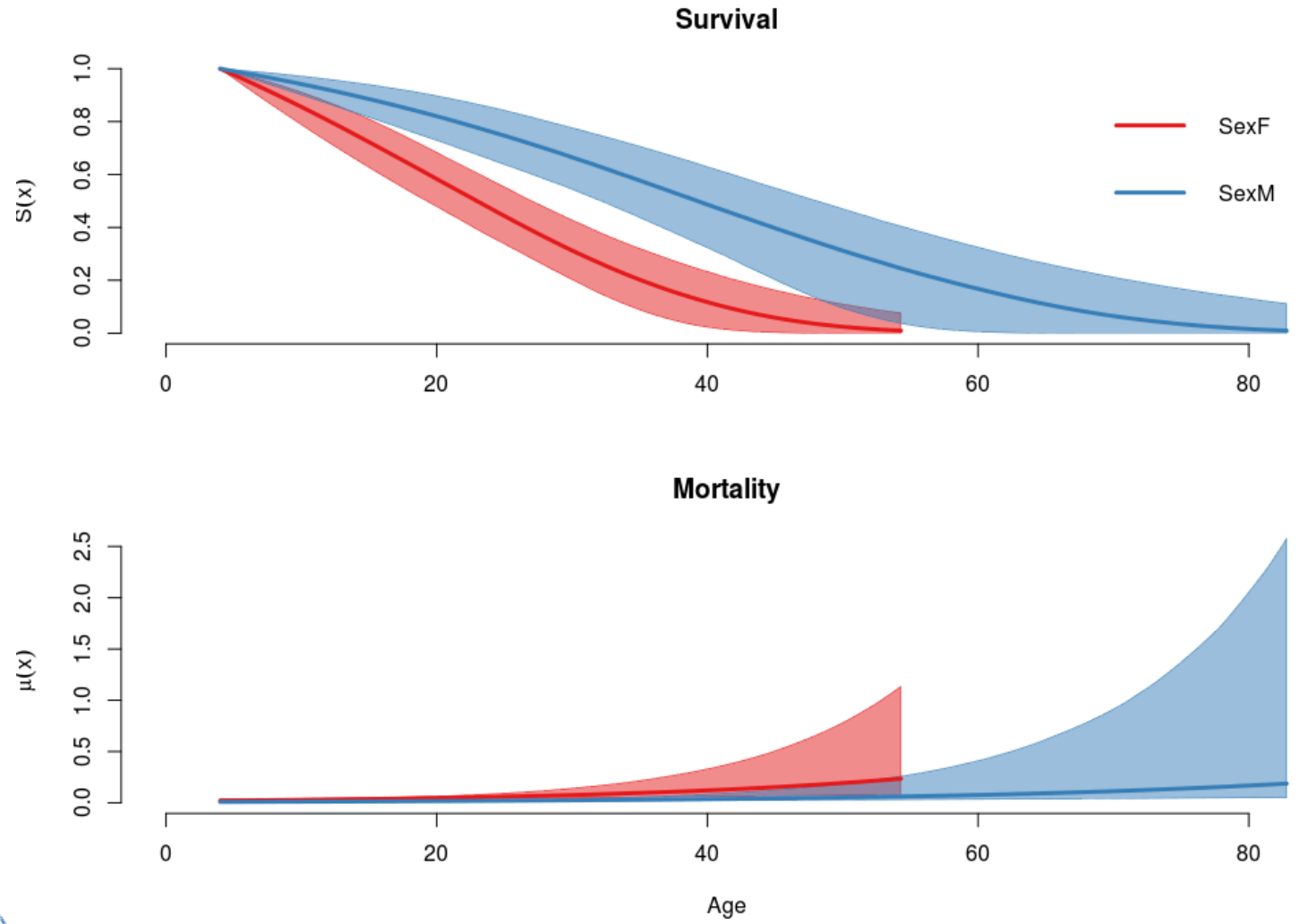
Actuarial senescence

Actuarial senescence: a decline in the probability of survival with aging

- Different from *Reproductive Senescence*: a decline in reproductive success with aging
- (which is, in turn, different from *menopause*)

Another CMR model – different view of survival



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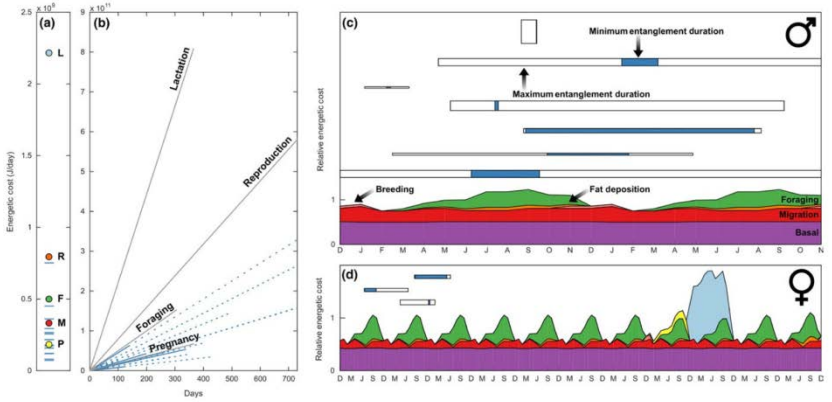
Life history: sublethal effects of drag

- van der Hoop et al 2016.
- Based on observed entanglements:
- Energetic costs comparable to 1-way migration / pregnancy + lactation



- Entanglements so prevalent in NARW that they can be thought of as another – anthropogenic – life history stage

ORIGINAL RESEARCH

WILEY Ecology and Evolution Open Access

Entanglement is a costly life-history stage in large whales

Julie van der Hoop[1,2] | Peter Corkeron[3] | Michael Moore[2]

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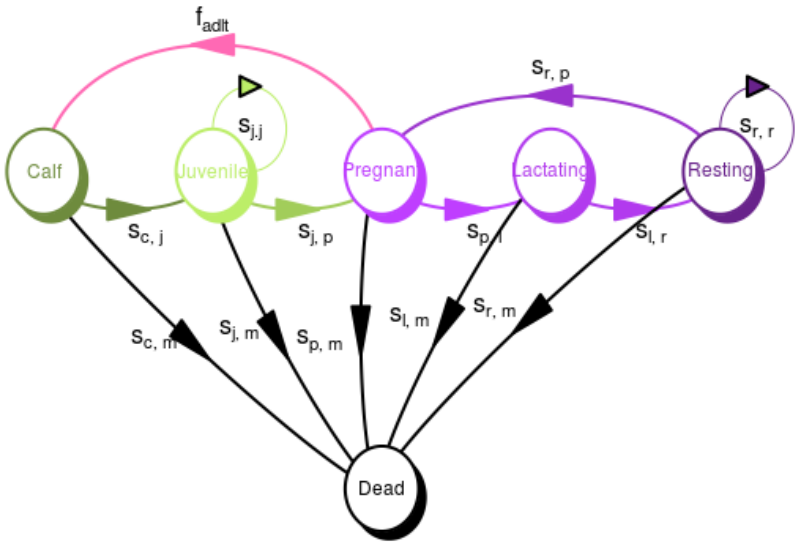
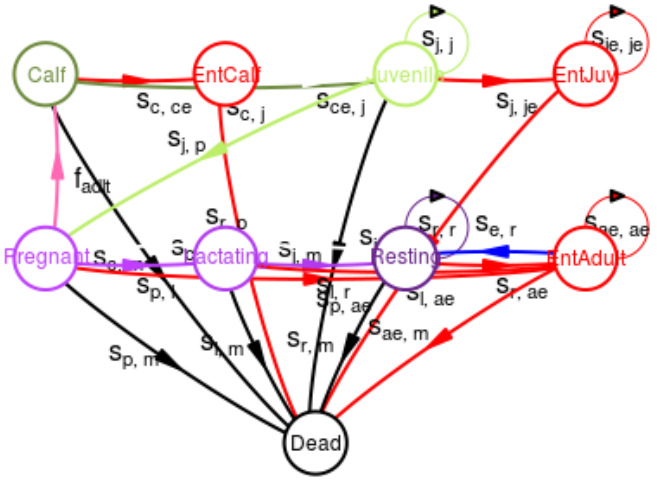
Matrix model with entanglements

Stage-structured NARW individual model with death



Stage-structured NARW individual model with entanglement and death



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Obvious concerns

- Chronically high adult mortality
  - Not high enough to drive decline, but enough to prevent potential increase
  - Causes well understood
- Chronically poor (& variable) calving rate
  - When extremely poor, enough to cause decline
  - Proximate cause clear (condition)
  - Ultimate driver(s) poorly understood, multiple options
  - Current decline correlates with poor calving

Less obvious concerns

- Prior lack of emphasis comparing NARW with SRW
  - Understand state variables for population biology but lack perspective of that understanding
- Requirement for further understanding of processes driving states prior to further action?
  - Inference on process the most difficult in ecology: design / comparative approaches
- Prior view of NARW as a success

With thanks

- Collaborative effort
- Large whale team at NEFSC: Lisa Conger, Pete Duley, Allison Henry, Christin Khan, Fred Wenzel
- Others at NEFSC, especially PA group
  - And special thanks to Gen Davis for turning my scruffy ppts into something legible
- External partners, especially those @ NEAq & WHOI