Insights into entanglements from whale population monitoring

John Calambokidis, Kiirsten Flynn, Annabelle Wall, Jenn Tackaberry, and Doug Sandilands

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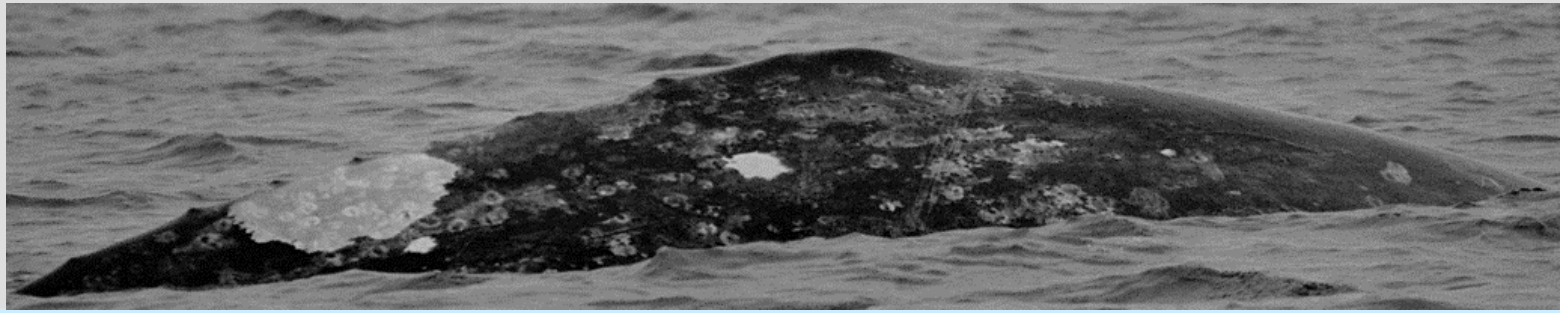
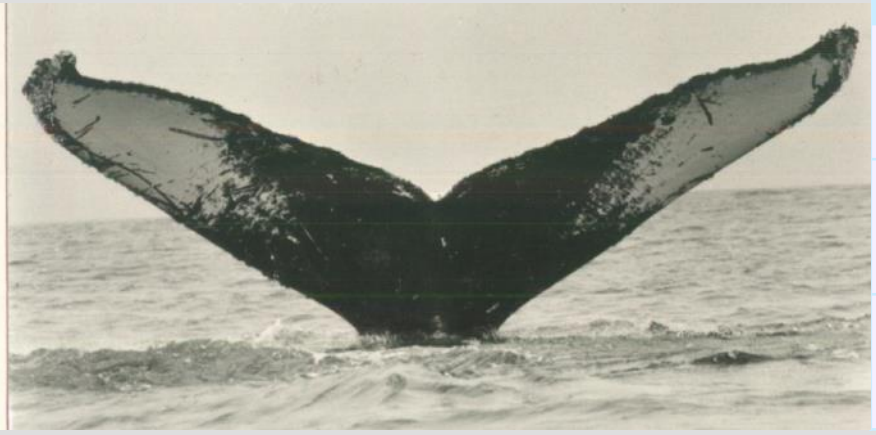
SEALIFE RESPONSE + REHAB + RESEARCH

Overall presentation points

- 1. Updated population estimates and trends of humpback, blue, and gray whales along the US West Coast and how these interact with entanglement risk
- 2. Studies of entanglement scars on humpback whales along the US West Coast and how scaring rates compare to known areas of documented entanglements
- 3. Insights into the population units of whales in different region and DPS status (for humpback whales) and insight into the risk of entanglements
- 4. Identify planned research effort to better address key needs and integrate short and long-term monitoring with entanglement documentation and response
- 5. Whale diving and feeding behavior from observations and tag deployments and insights into dynamics of entanglement

Cascadia Photo-ID catalogs and encounters for E N Pacific





Species	Start of primary effort	Photo-ID catalog (unique IDs)	Sightings/IDs
Humpback whales	1986	5,538	49,824
Gray whales	1998	2,067	28,441
Blue whales	1986	2,144	16,764

Small boat effort, sightings, and samples from humpback whales in 2018

Humpback whale Biologically Important Feeding Areas

Aquatic Mammals 2015, *41*(1), 39-53, DOI 10.1578/AM.41.1.2015.39

4. Biologically Important Areas for Selected Cetaceans Within U.S. Waters – West Coast Region

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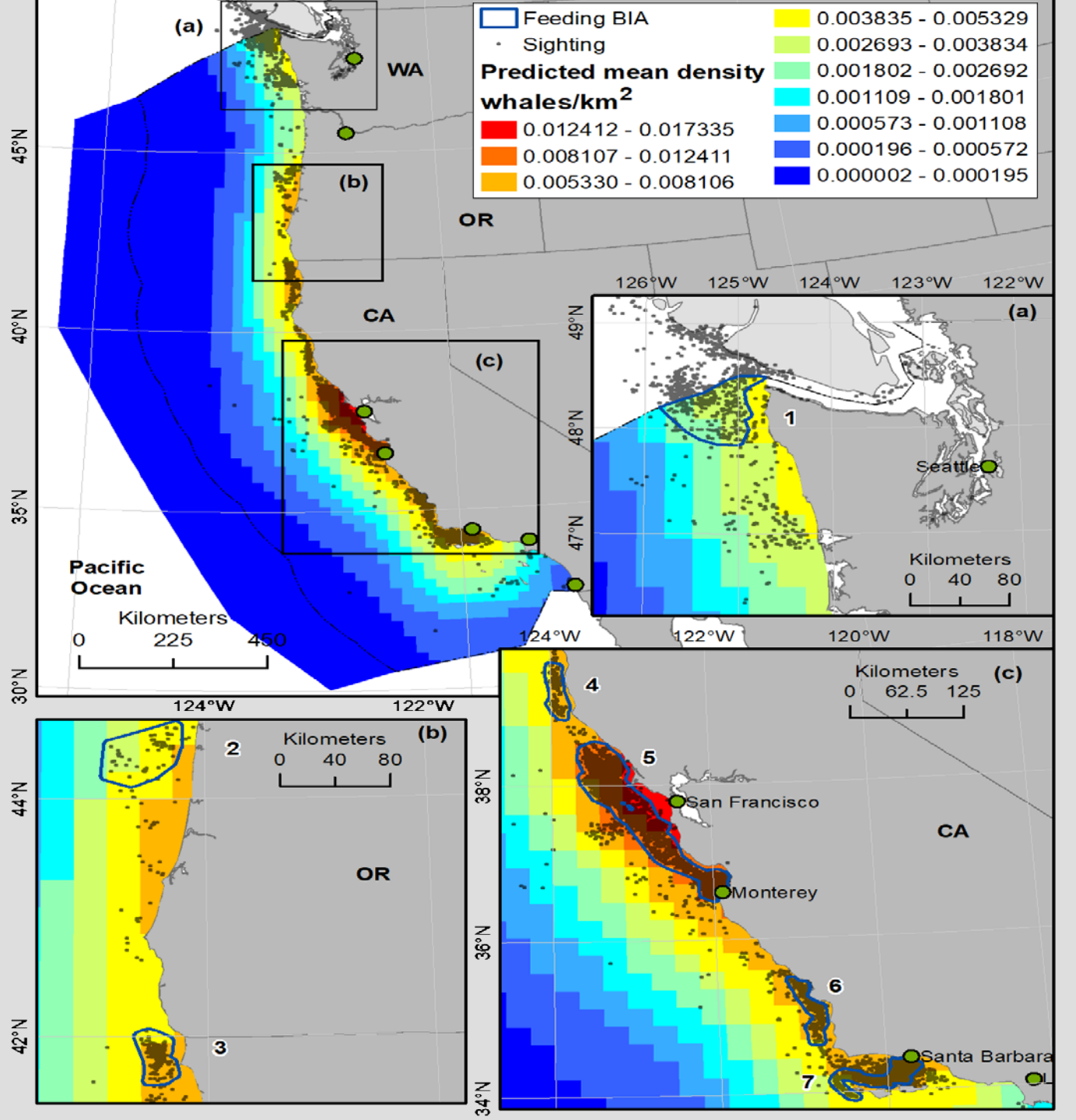
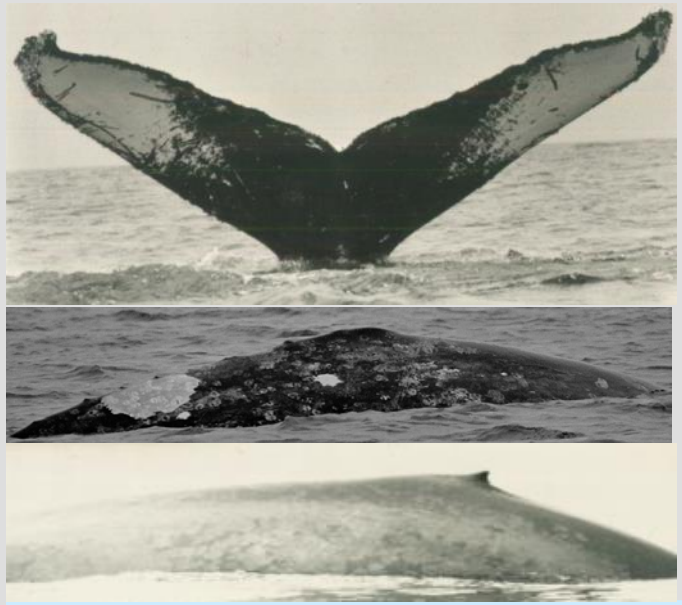


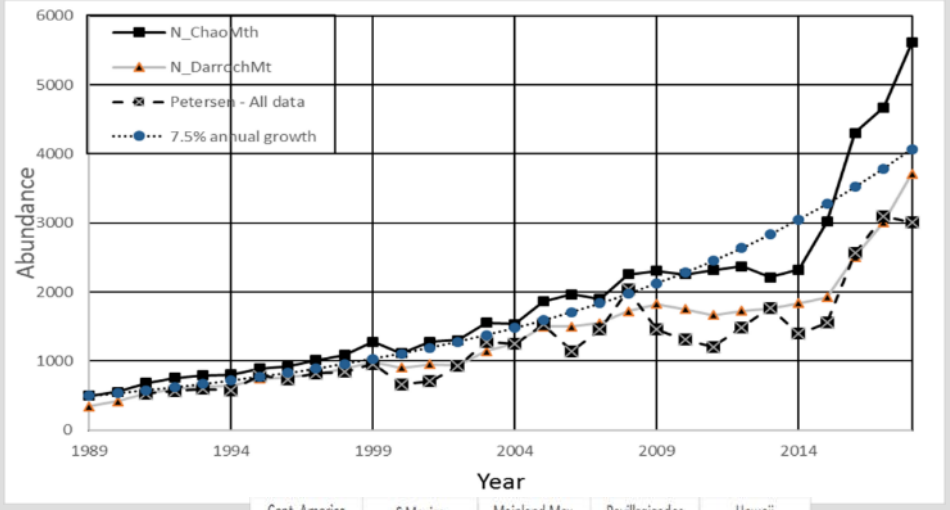
Photo-identification



Abundance and trend/PBR

Migrations/movements/DPS

Entanglement ID & Survival



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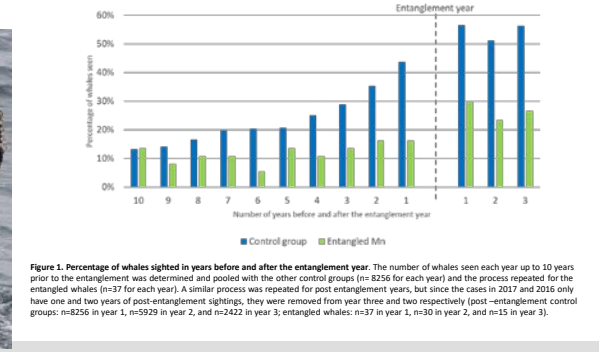
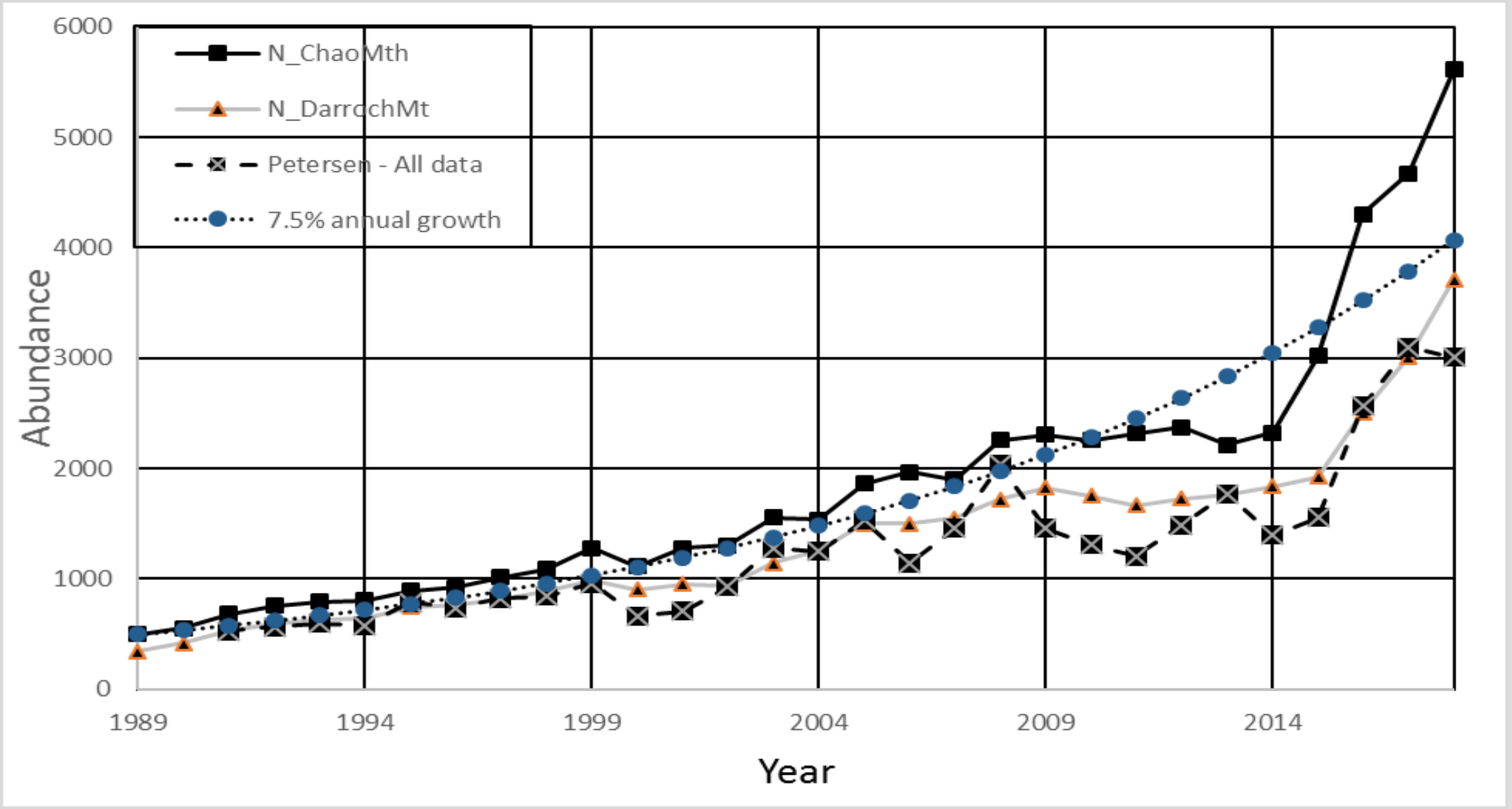
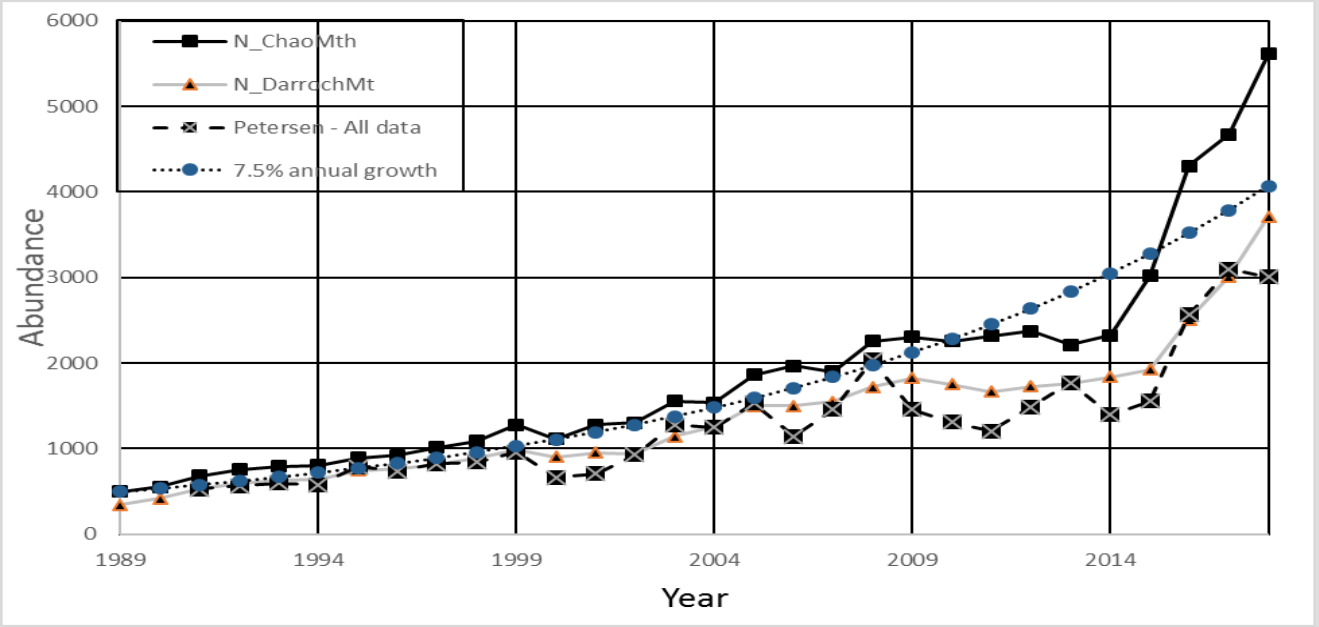


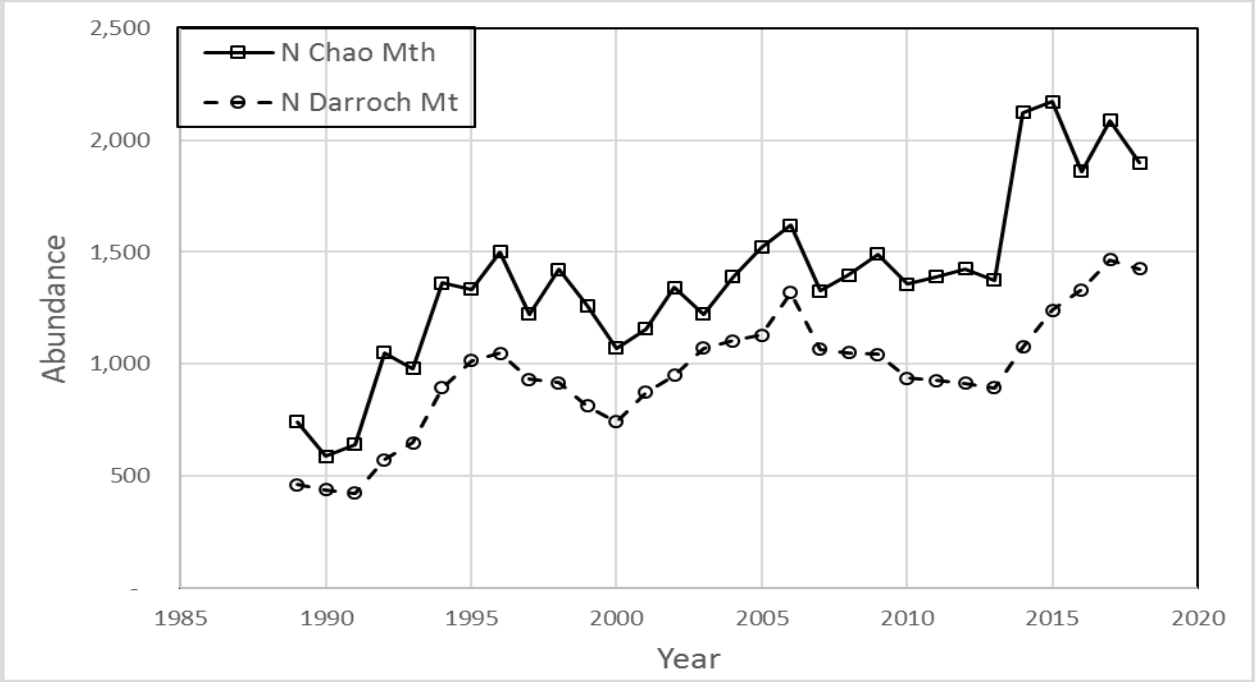
Figure 1. Percentage of whales sighted in years before and after the entanglement year. The number of whales seen each year up to 10 years prior to the entanglement was determined and pooled with the other control groups (n= 8256 for each year) and the process repeated for the entangled whales (n=37 for each year). A similar process was repeated for post entanglement years, but since the cases in 2017 and 2016 only have one and two years of post-entanglement sightings, they were removed from year three and two respectively (post –entanglement control groups: n=8256 in year 1, n=5929 in year 2, and n=2422 in year 3; entangled whales: n=37 in year 1, n=30 in year 2, and n=15 in year 3).

Humpback whale trends – California and Oregon

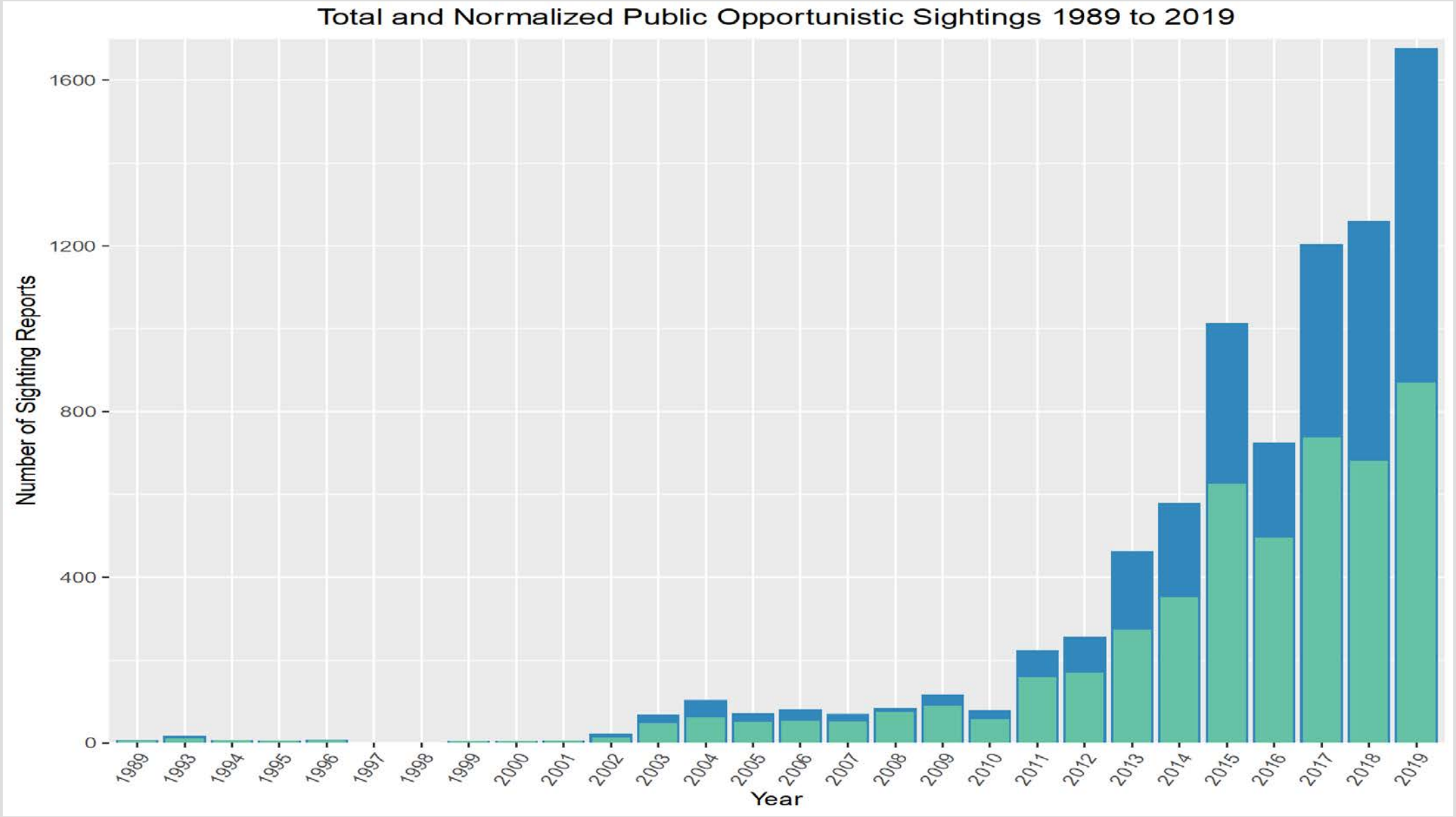


Humpback and blue whale trends - US West Coast

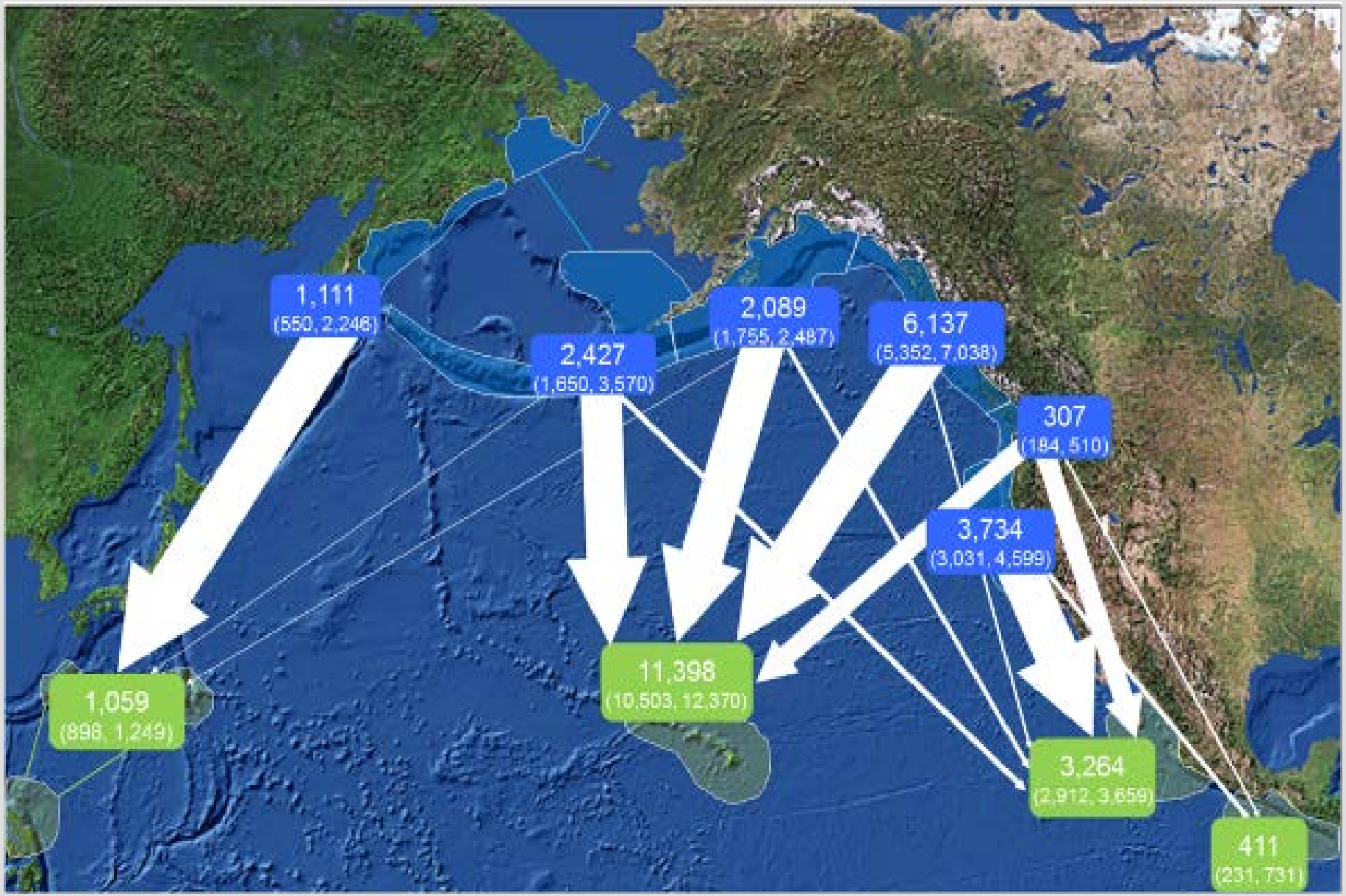




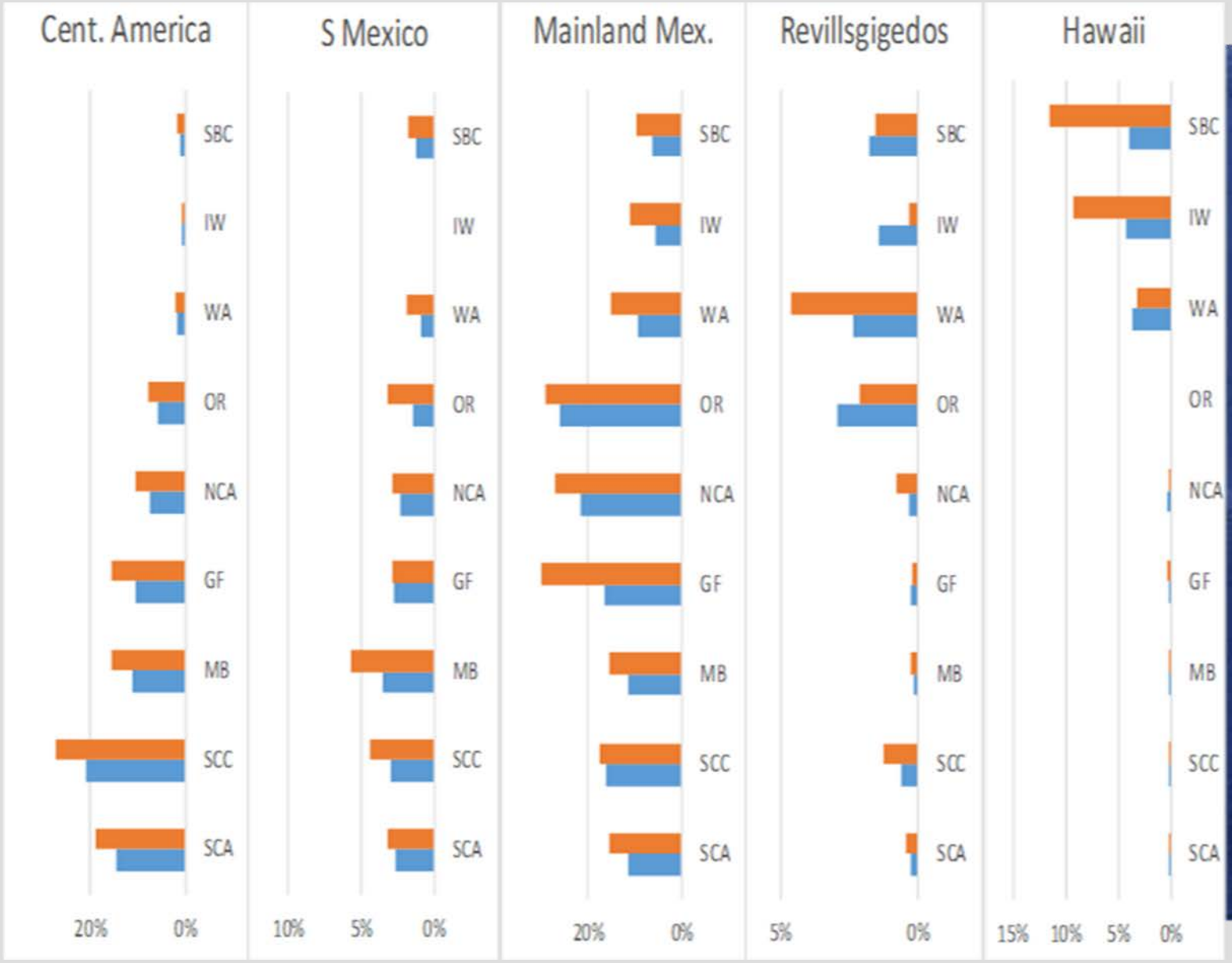
Humpback public sighting reports from the BCCSN, Orca Network, Cascadia Research, and the Whale Museum from 1989 to 2019 (Miller 2020)



SPLASH multi-strata estimates (Wade et al.)



Proportion of humpback whales matching breeding areas



Key research needs

1. Provide information on whale habitat, distribution, migratory timing, & relative density at key locations in spring, summer and fall to inform models and decision making related to fishery

2. Determine and increase the proportion of entangled animals that get reported since goal should be to reduce overall entanglements but increase proportion that are reported
   - Improve reporting of entangled whales especially in areas without high whale watch activity (Monterey Bay)
   - Improve the quantity and quality of information collected during entanglement responses
   - Provide more opportunities to disentangle whales

Overall goal of planned research

Address both short and long term information needs while improving entanglement documentation and number of disentanglements

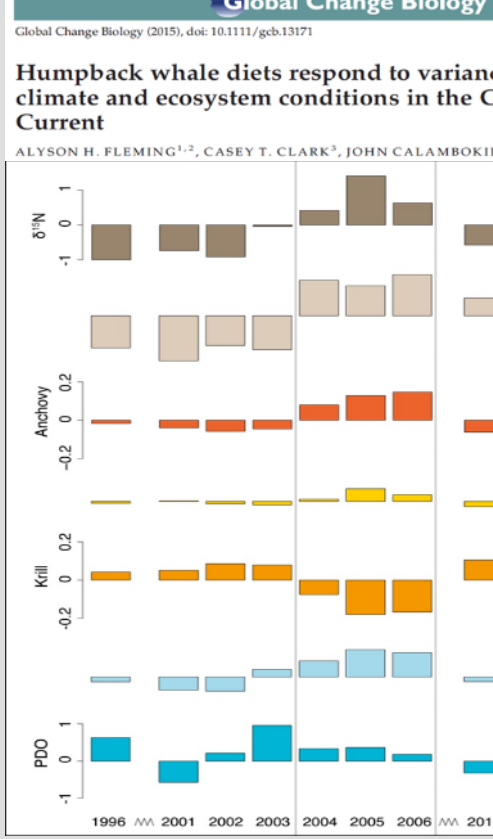
- Short-term information at critical points on whale occurrence/distribution and overlap with fishery
- Long-term information on whale abundance, trends, and stock structure
- Improved reporting and documentation of entanglements
- Active efforts to disentangle whales

Determination of prey of humpback whales

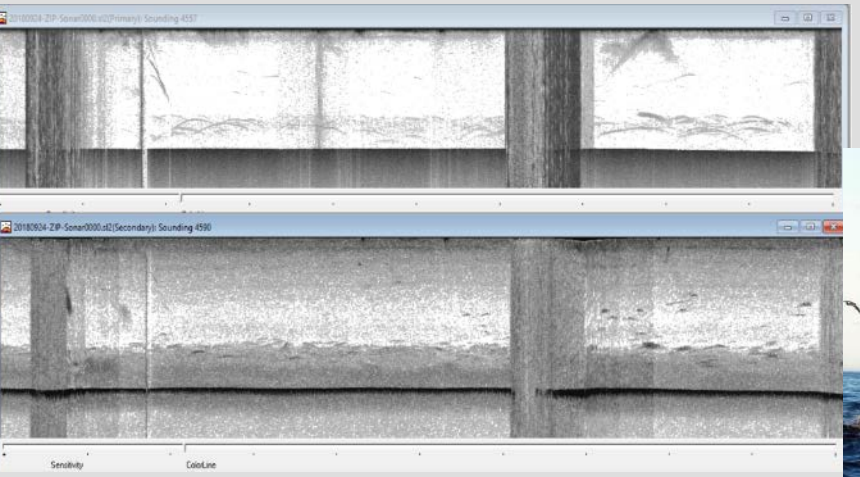
Humpback whale feeding on fish vs krill and insight into distribution/habitat:

1. Dual frequency recording sonar of whale diving and prey
2. Associated species
3. Data from tags where deployed
4. Analysis of samples for stable isotopes

Stable isotopes as an indicator of fish vs krill feeding



Dual frequency (50/200 KHz) recording echo sounders in areas of whale feeding



Observation of prey or associated species

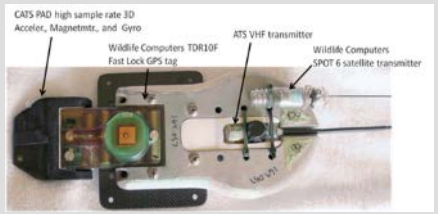
Tag Deployments

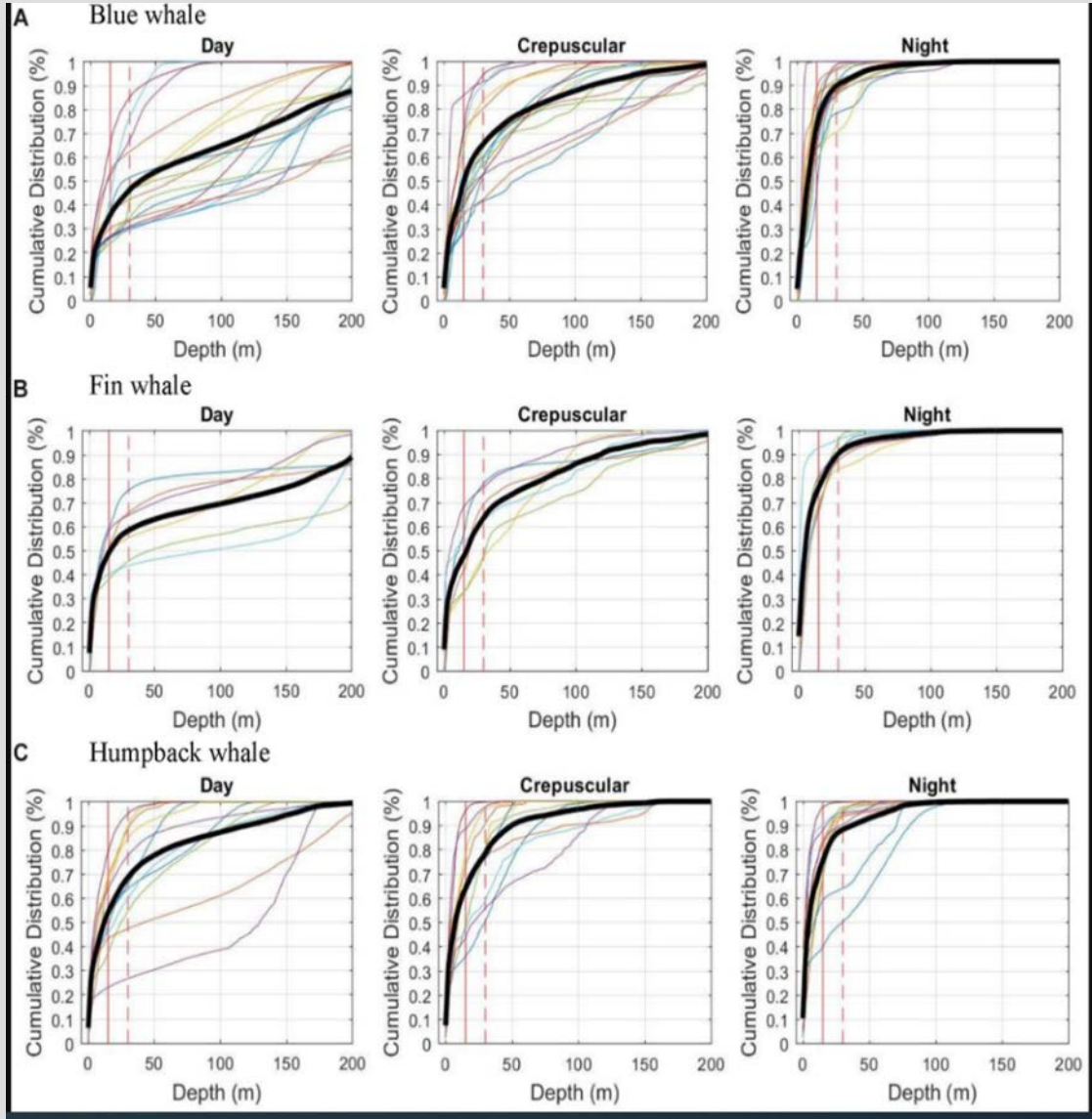
In areas of overlap between whale concentrations and fishing:

1. Examine movements/interactions with gear
2. Depth distribution of use
3. Day-night differences

- Multi-sensor video tags by CATS
  - Video, Depth, GPS, 3D accelerometry, temperature
  - Suction cup attachment

- Wildlife Computers TDR-10 tags
  - Depth, GPS, accelerometry, temp
  - Longer deployments w/ dart attchmt





Entanglement Scar Studies Underway on US West Coast

Two studies of entanglement scaring underway

- First study focused on the regional differences in entanglement scarring (Wall et al. In prep)
  - This will better inform whether the high proportion of reports in MB is real or solely the result of reporting bias
  - Study completed by Annabelle Wall as part of her Master's Thesis and now being written up for publication

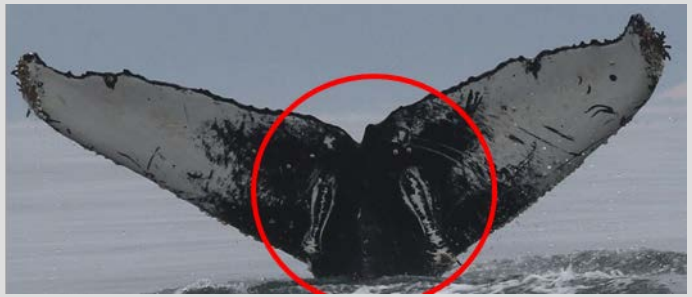
- Second study focuses on annual rate of entanglement using scar acquisition off Central/Northern California
  - Will focus on whales with frequent resightings to look at new scars between encounters
  - Part of Master's work by SFU graduate student Allison Payne

Region	# photo	% scarred	
		All	Tail-stock only
Wash.-S BC	287	15.0	32
Oregon	72	13.9	36
N California	82	11.0	23
C-N California	823	13.6	28
Monterey Bay & HMB	512	16.6	40
Southern California	401	14.5	36

Tailstock insertion point

Dorsal peduncle

Ventral peduncle



Fluke

Problem: Only a small proportion of entangled whales get reported and primarily from areas of high whale watch activity like Monterey Bay

Based on a study of scars we know **only 5% to 10% of entangled whales are reported**


29 Aug: Reported entangled

1 Sept: Disentangled


19 Sept: Wounds healing


1 year later: Entanglement scars still visible

Project Need: Improve proportion of entangled whales documented especially outside Monterey Bay

Research surveys have been effective in both finding entangled whales and getting good documentation. During planned surveys, we will investigate whales to evaluate whether entangled and have documentation gear on board in case encounter one.

Conclusions/Final points

- Importance of getting to metrics that measure true number of entanglements and do no disincentivize reporting.
- Population levels of humpback whales are increasing and are an important factor in understanding entanglement rates
- Need to increase entanglement reporting and integration of monitoring with entanglement documentation and response