

Science, Service, Stewardship



Potential Population Level Impacts of West Coast Large Whale Entanglements

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Primary Species Impacted by Entanglements:

- Gray whales
- Blue whales
- Humpback whales

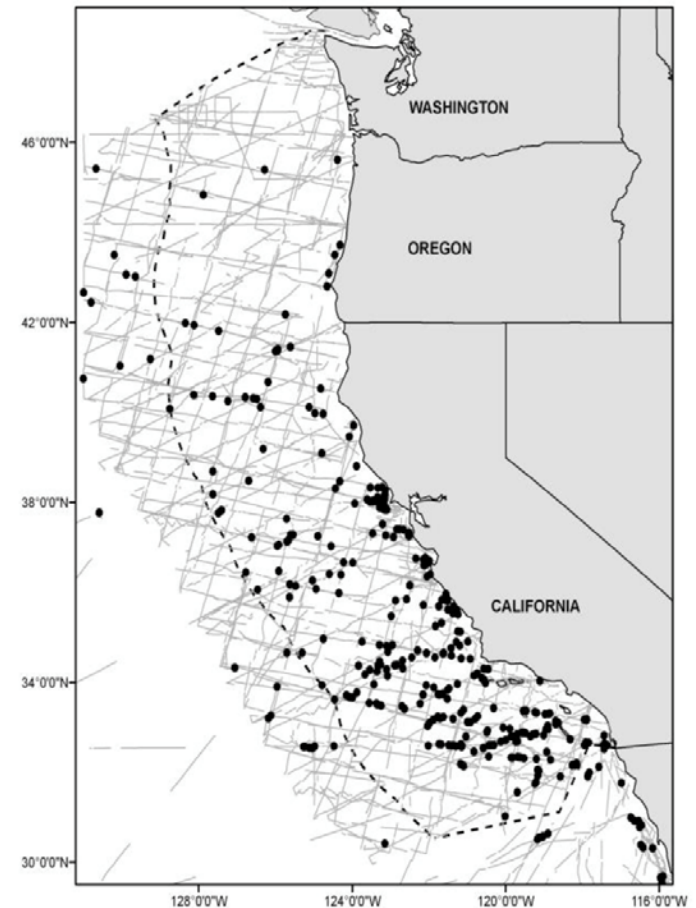
Blue Whales: Current Management under the MMPA (2016 SAR)

Eastern North Pacific Stock

- Range: Northern Gulf of Alaska to Eastern Tropical Pacific
- Abundance: 1,647
- PBR: 2.3 whales per year
- Total commercial fishery Serious Injury or Mortality (SI/M) for 2001-2013: 0 whales – BUT – this doesn't account for recent increase in entanglements

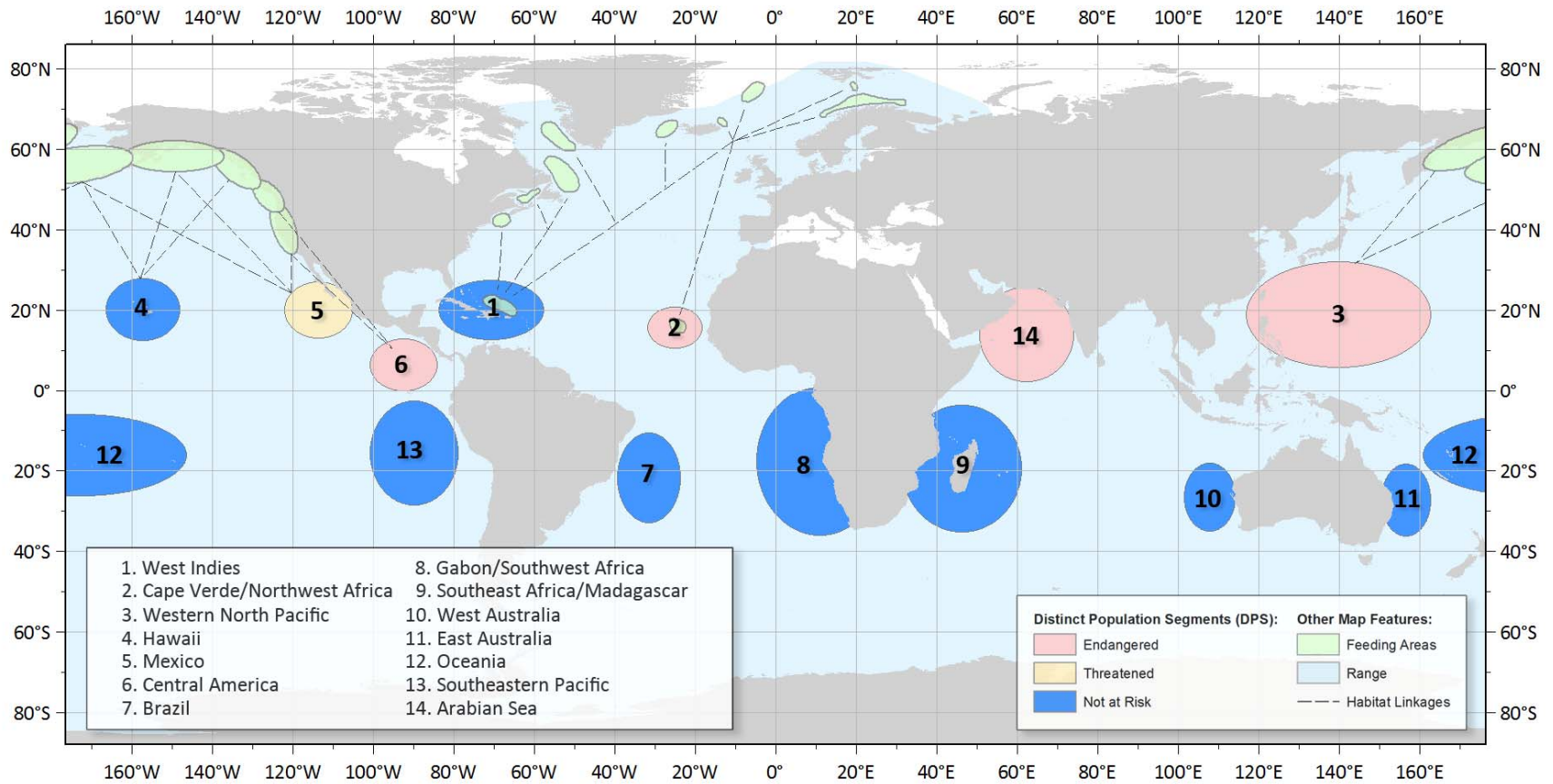
OBSERVED entanglement in 2017 (n=3) exceeded PBR, though outcome of those entanglements is unknown

Eastern North Pacific Stock CA/OR/WA Range

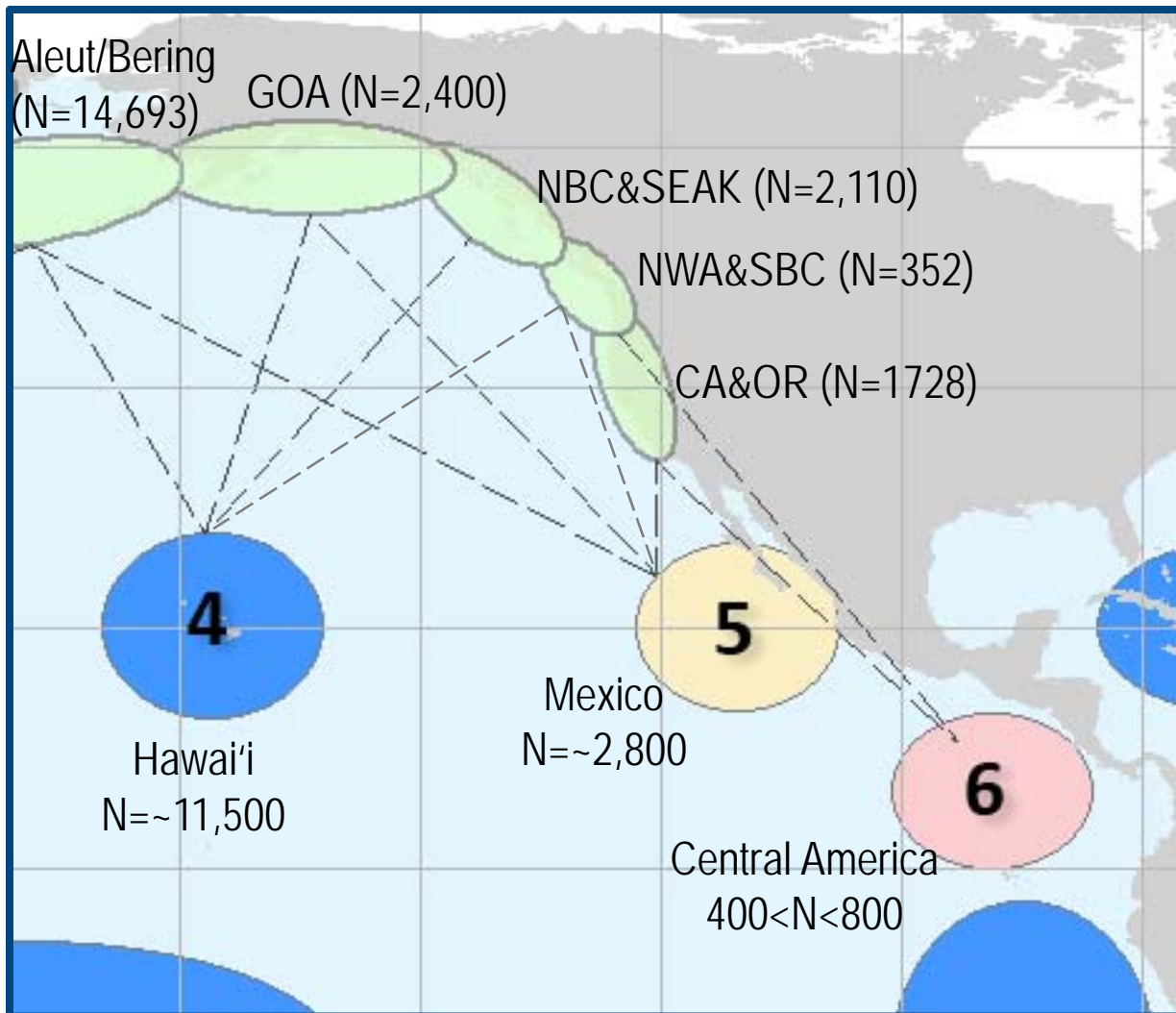


Carretta et al. 2017. US Pacific Marine Mammal Stock Assessments: 2016

Humpback Whale Breeding and Feeding Grounds



Humpback Whale Breeding and Feeding Grounds



ESA Status:

- Endangered
- Threatened
- Not at risk

Other Map Features:

- Feeding Areas
- Migratory linkages

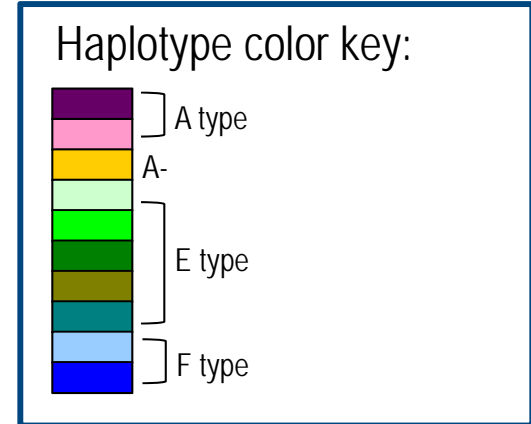
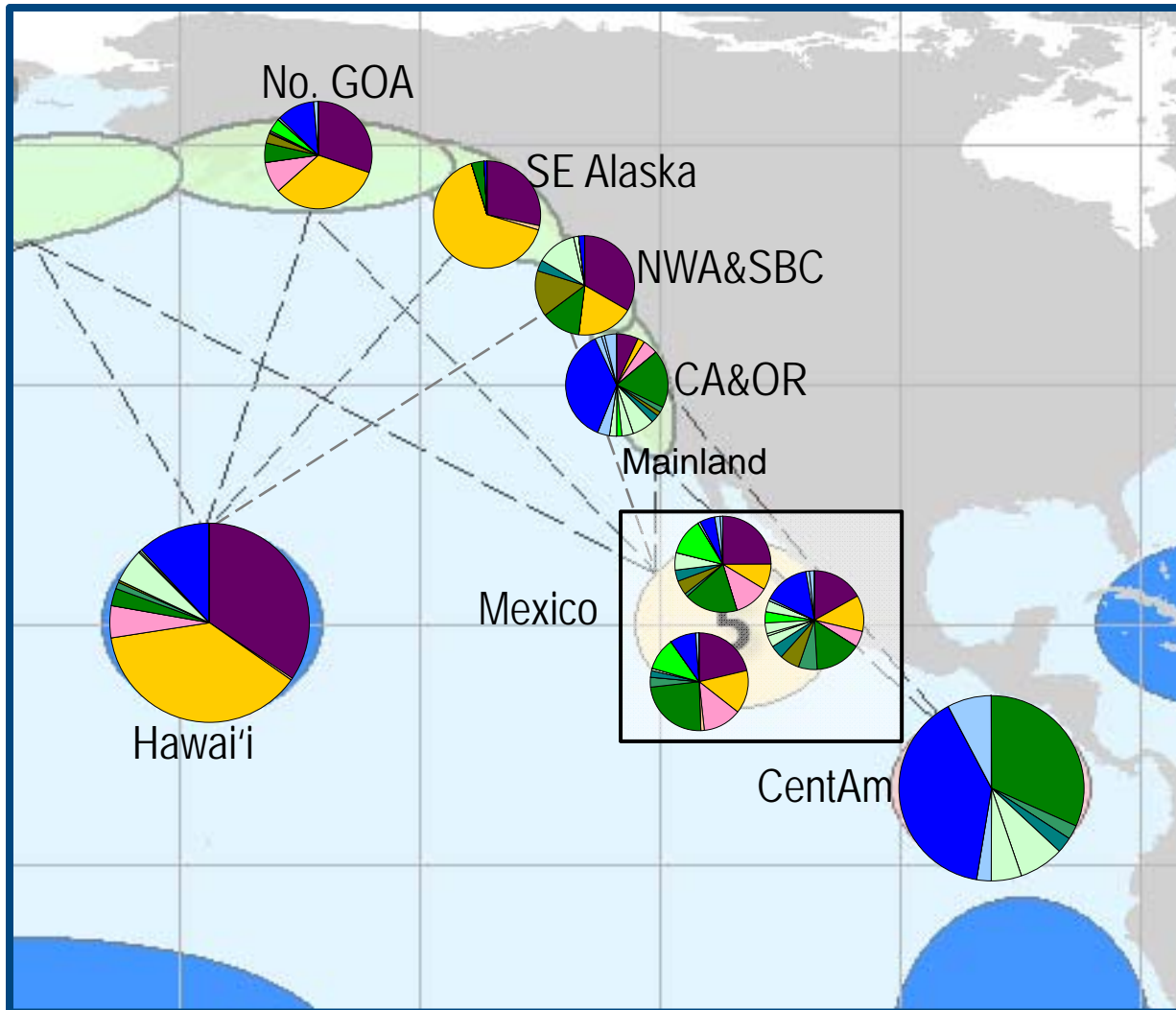
Abundance estimates from Wade et al., in prep.

Interchange Between Feeding and Breeding Areas Based on Photo-ID Matches in SPLASH Data

Feeding Area	Breeding Area					
	1	2	3	4	5	6
	Central Am	Mx Mainld	Mx Baja	Mx Islands	Hawaii	West Pac
1 CA&OR	26	89	16			
2 NWA&SBC	3	18	7	2	18	
3 NBC&SEAK		11	8	16	291	
4 GOA		25	22	50	150	2
5 Aleut.&Bering		9	7	11	50	9
6 Kamchatka						21

Data courtesy of John Calambokidis, Cascadia Research Collective

Mitochondrial Control Region Haplotype Frequencies



Baker et al., 2013

Latitudinal Gradients within Feeding Areas

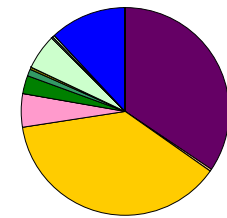
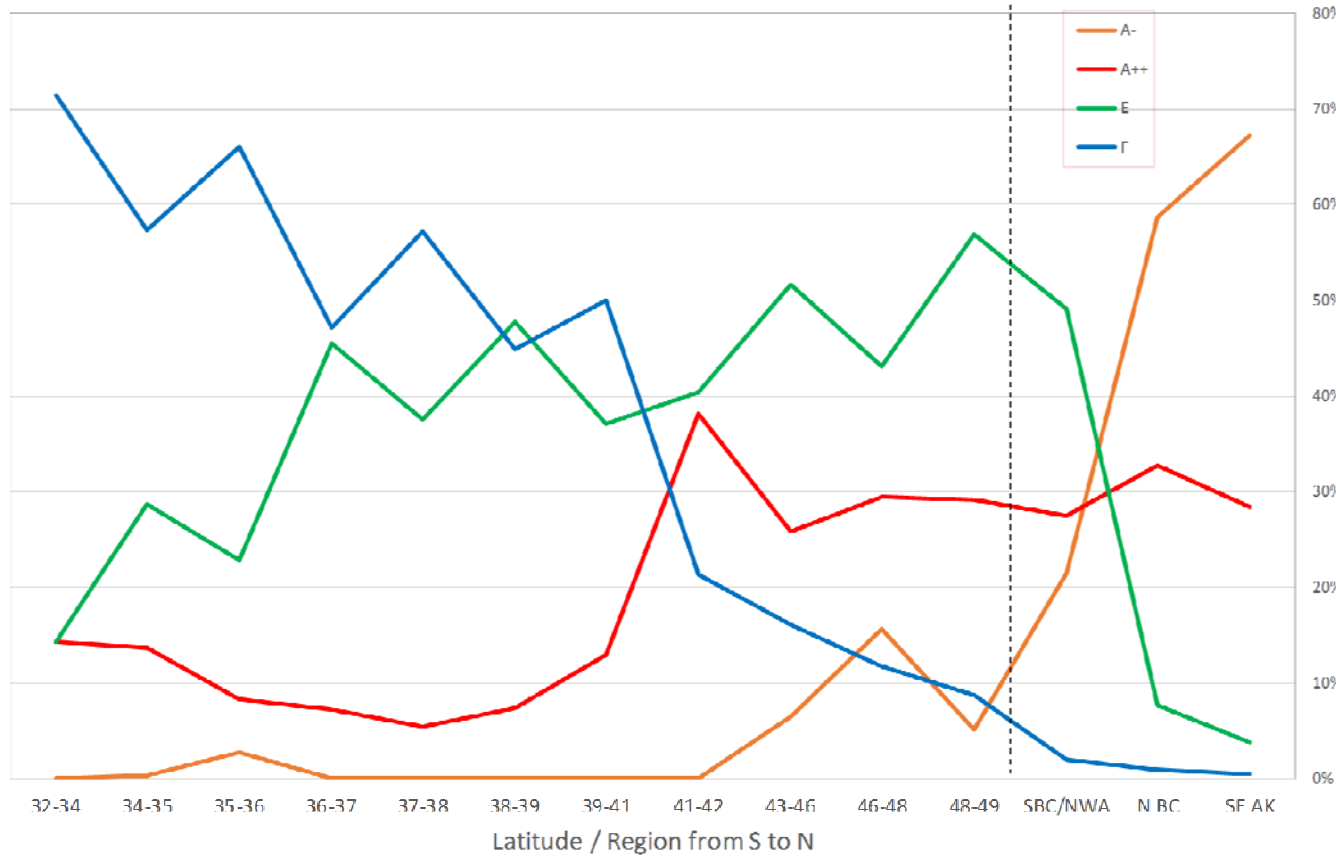
Photo-ID matches using data through 2014

Feeding Region	# Encounters	Unique IDs	BREEDING GROUND				
			HI	Revilla Arch. MX	MainId MX	Southern MX	Cent Am.
Southern BC	580	293	13	6	21	4	3
Inland WA	329	125	6	2	8	-	1
WA Outer Coast	893	464	17	11	43	4	8
Oregon	188	138	-	4	36	2	8
N California	1,296	620	2	2	134	14	46
Gulf of Farallones	7,010	1,589	3	4	261	43	166
Monterey Bay	7,083	1,445	1	2	165	51	158
Southern/Central CA	1,193	479	1	3	77	14	100
S Calif Bight	3,864	760	1	2	85	20	109

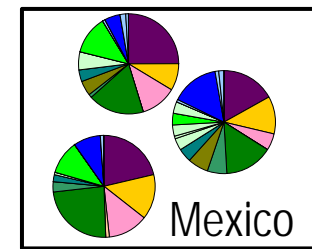
Data courtesy of John Calambokidis, Cascadia Research Collective

Latitudinal Gradients within Feeding Areas

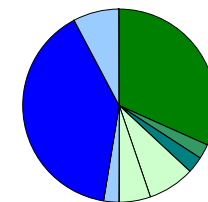
Haplotype frequency by latitude along the US West Coast



Hawai'i



Mexico



Central America

Baker et al., 2013

MMPA Stocks are Incorrectly Delineated

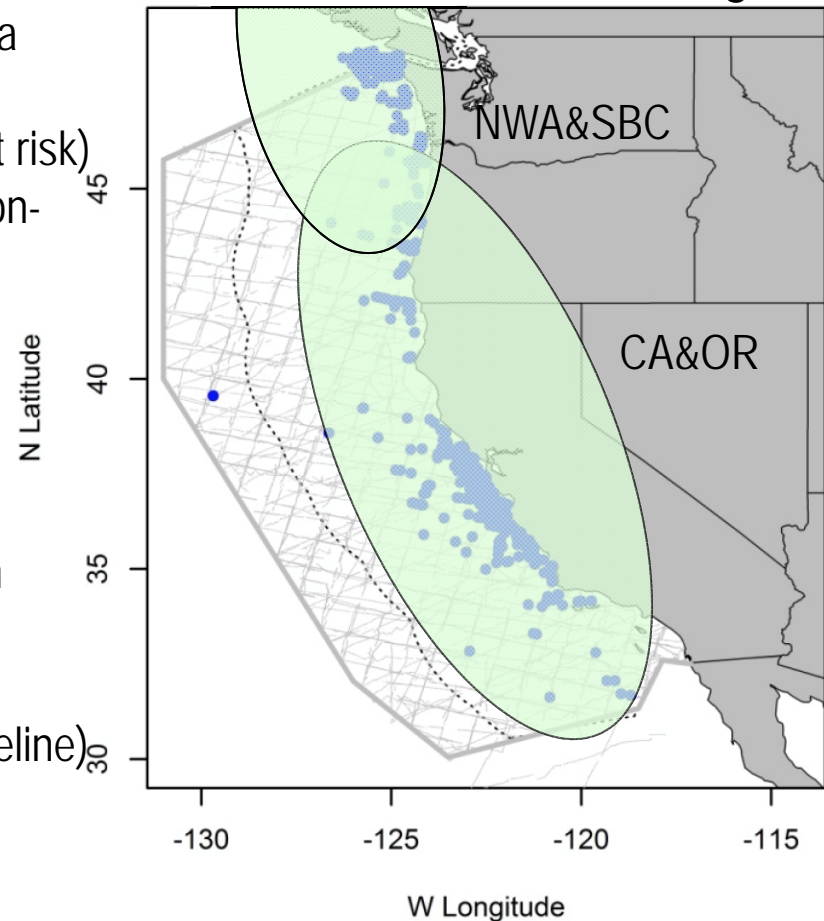
Currently managed as one stock

- Current stock is a mix of a mix of 1) Central America (Endangered), 2) Mexico Mainland, Baja, and Revillagigedos (Threatened), 3) and Hawai'i (Not at risk)
- Cannot monitor or manage impacts at the population-level until they are separated into different stocks

We're working on it...

- Working Group has convened to correct stock delineation
- Effort is on hold due to Agency-wide moratorium on stock delineation revisions
- Moratorium will be lifted once NMFS Headquarters finalizes revised policy on stock delineation (no timeline)

CA/OR/WA Stock Range



Current Management under the MMPA (2016 SAR)

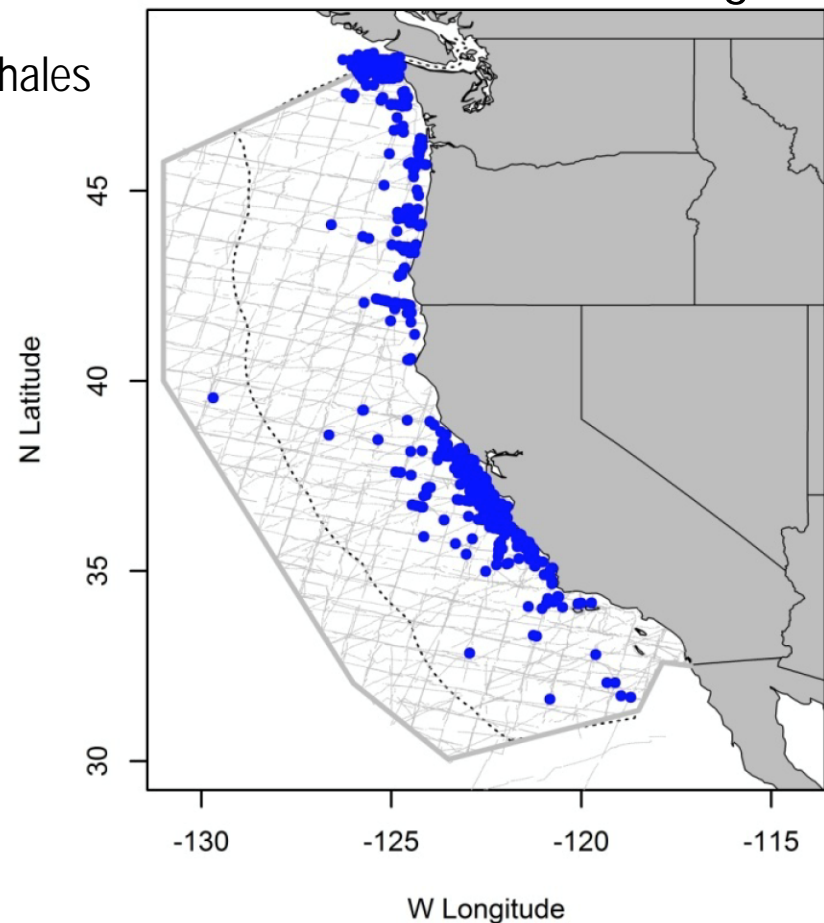
- Abundance: 1,918
- PBR: 11 whales per year
- Total commercial fishery S/I/M for 2010-2014: 5.3 whales
– BUT – this doesn't account for recent increase in entanglements

OBSERVED and CONFIRMED entanglements in 2017 (N=16) exceeded PBR, though it is unknown how many resulted in S/I/M

PLUS:

- unobserved entanglements
- ship strikes
- other human-caused mortality

CA/OR/WA Stock Range



Carretta et al. 2017. US Pacific Marine Mammal Stock Assessments: 2016

Humpback Whales

Current impediments to successful management

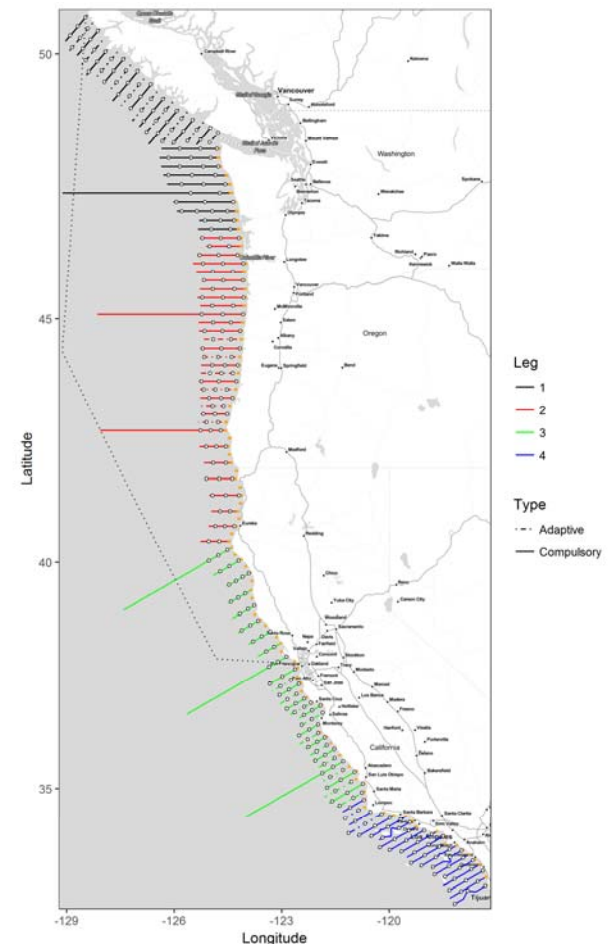
- Current stock delineation is incorrect – AT LEAST two distinct population segments inhabit CA Current, but currently managed as one stock
- Existing population-level abundance estimates are out of date and highly uncertain
- We need better information on relative abundances of populations by latitude
- Currently unable to reliably assign mortalities to population

**Research is underway to address these issues,
but much more work is needed**

Ongoing/Planned Humpback Assessment Work

- 11,000 photo-identifications from the last two years being added to the catalog (ongoing)
 - 50% increase in total number of identifications
 - Includes substantial increase in photo-id sample size from breeding grounds
- Pilot project to improve ability to assign samples to breeding ground based on genetic data (starting in July)
- California Current Ecosystem Survey (CCES)

CCES planned tracklines



California Current Ecosystem Survey (CCES)

June – December, 2018

Research survey lead by SWFSC. Unique aspects include:

- Much greater effort in nearshore habitat than previous surveys
- Focus on obtaining photo-id and biopsy samples from humpbacks
- Cascadia Research Collective contracted to conduct simultaneous shore-based small boat effort
- Photo and biopsy data will both be used to assign individuals to breeding populations
- All resulting data will be used to develop population-level metrics (abundance, distribution, connectivity, entanglement rates, pregnancy rates, jeopardy analyses, etc.)

CCES planned tracklines

