Humpback whale distribution patterns off California relative to fixed gear

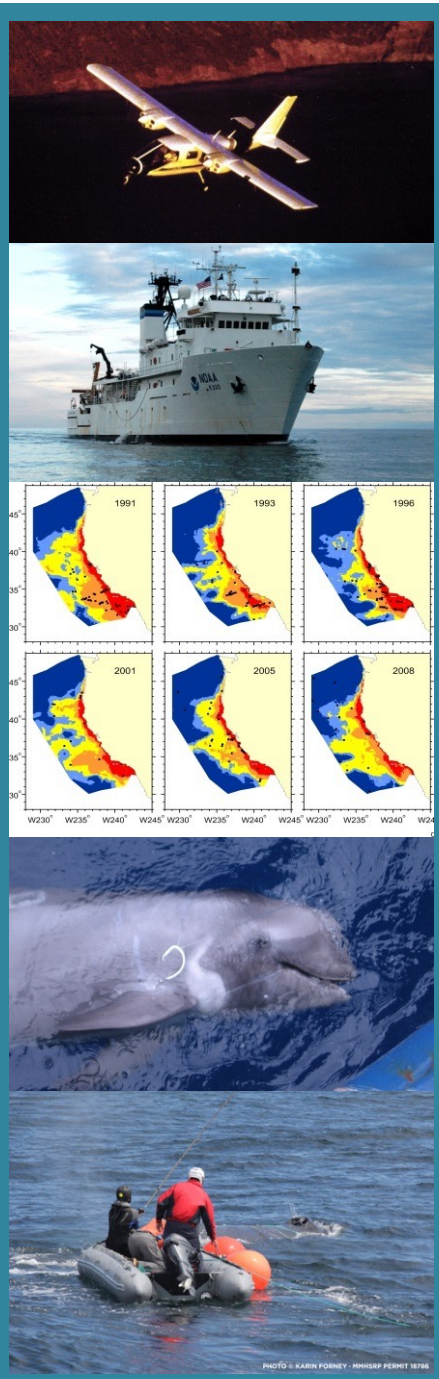
Karin Forney, PhD
Research Biologist, Marine Mammal and Turtle Division
Southwest Fisheries Science Center, NOAA Fisheries, Santa Cruz, CA
Karin.Forney@noaa.gov

My background and expertise:

- Shipboard and aerial surveys:
  - Estimate abundance and population trends for marine mammals and sea turtles
  - Develop habitat-based models of marine mammal distribution

- Assess and reduce bycatch of marine mammals in fisheries
  - Analyze fishery data
  - Provide analytical support for NOAA Take Reduction Teams
  - Evaluate injury severity for animals injured by human activities (as required under the Marine Mammal Protection Act)

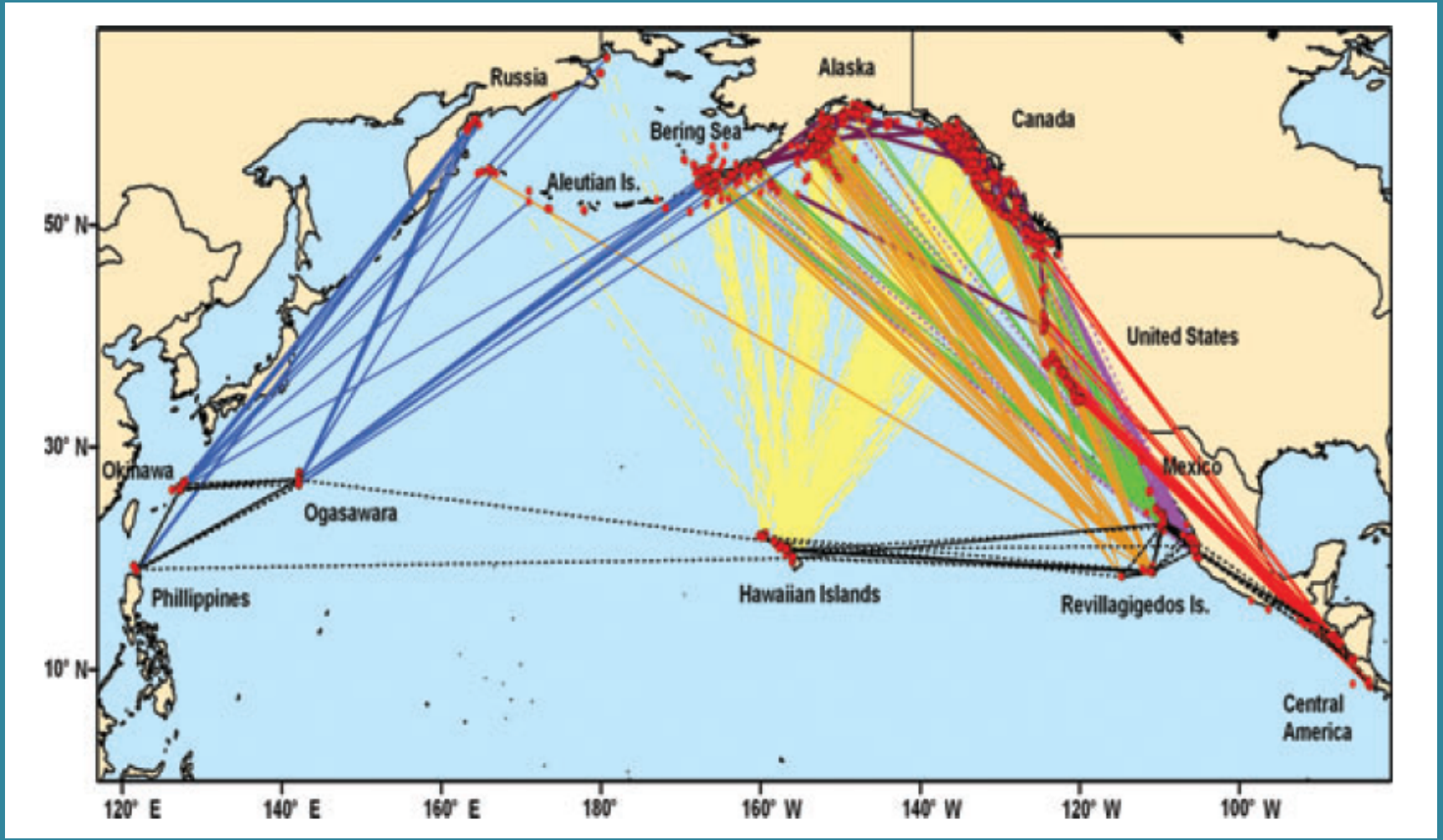
- Central California whale disentanglement network member



North Pacific Humpback whale populations

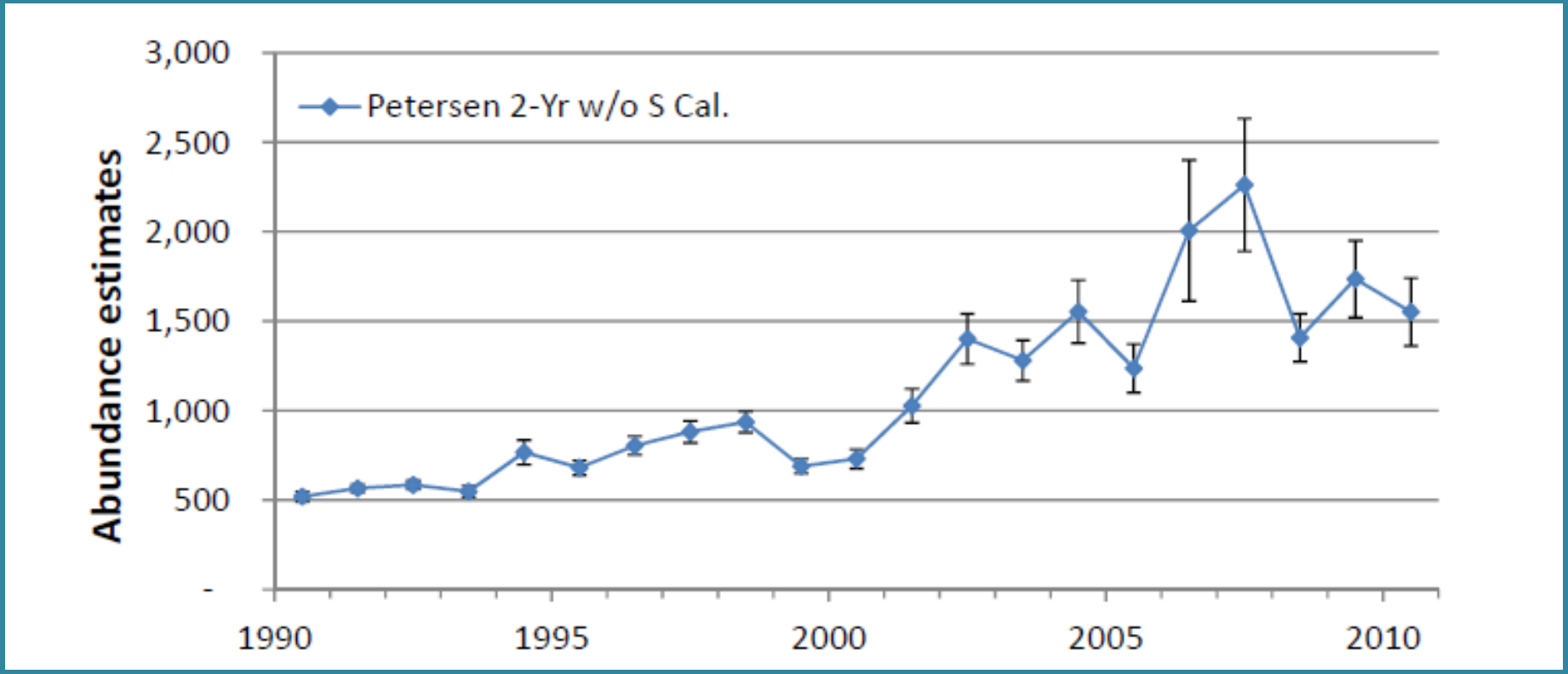
(Barlow et al. 2011, Marine Mammal Science)

Whales that feed off California and Oregon (March-November) migrate to breeding areas off Central America and Mexico during winter



CA/OR Humpback whale population trends

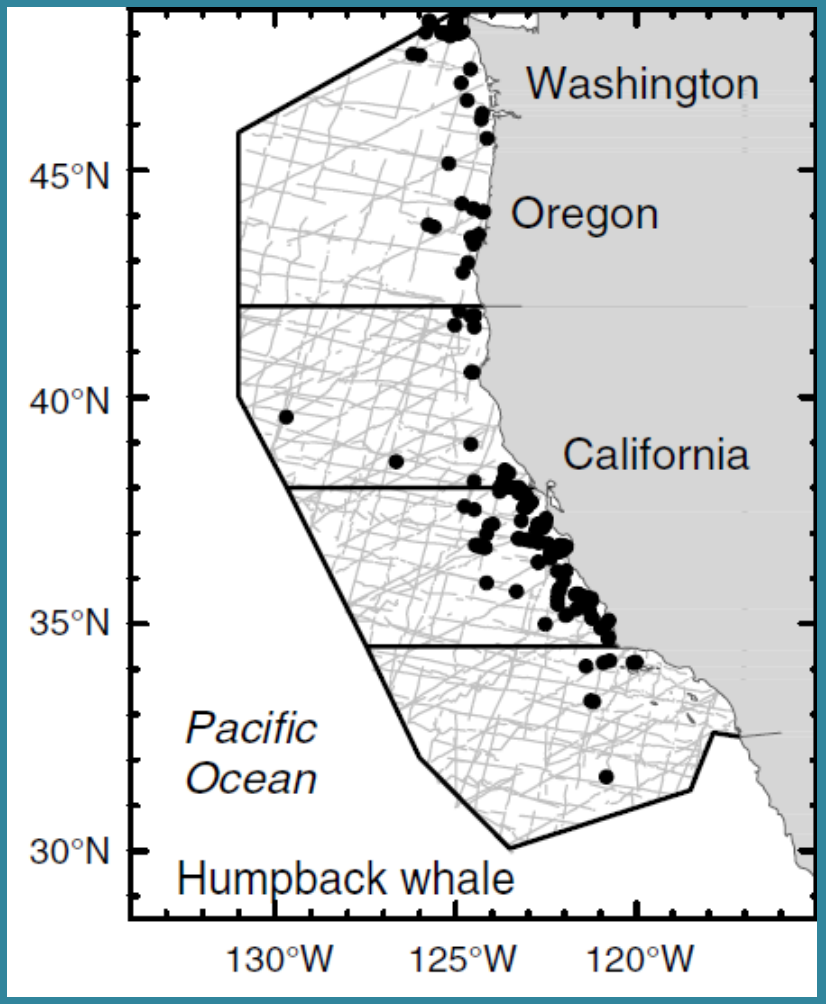
(Calambokidis and Barlow 2013, Contract Report)

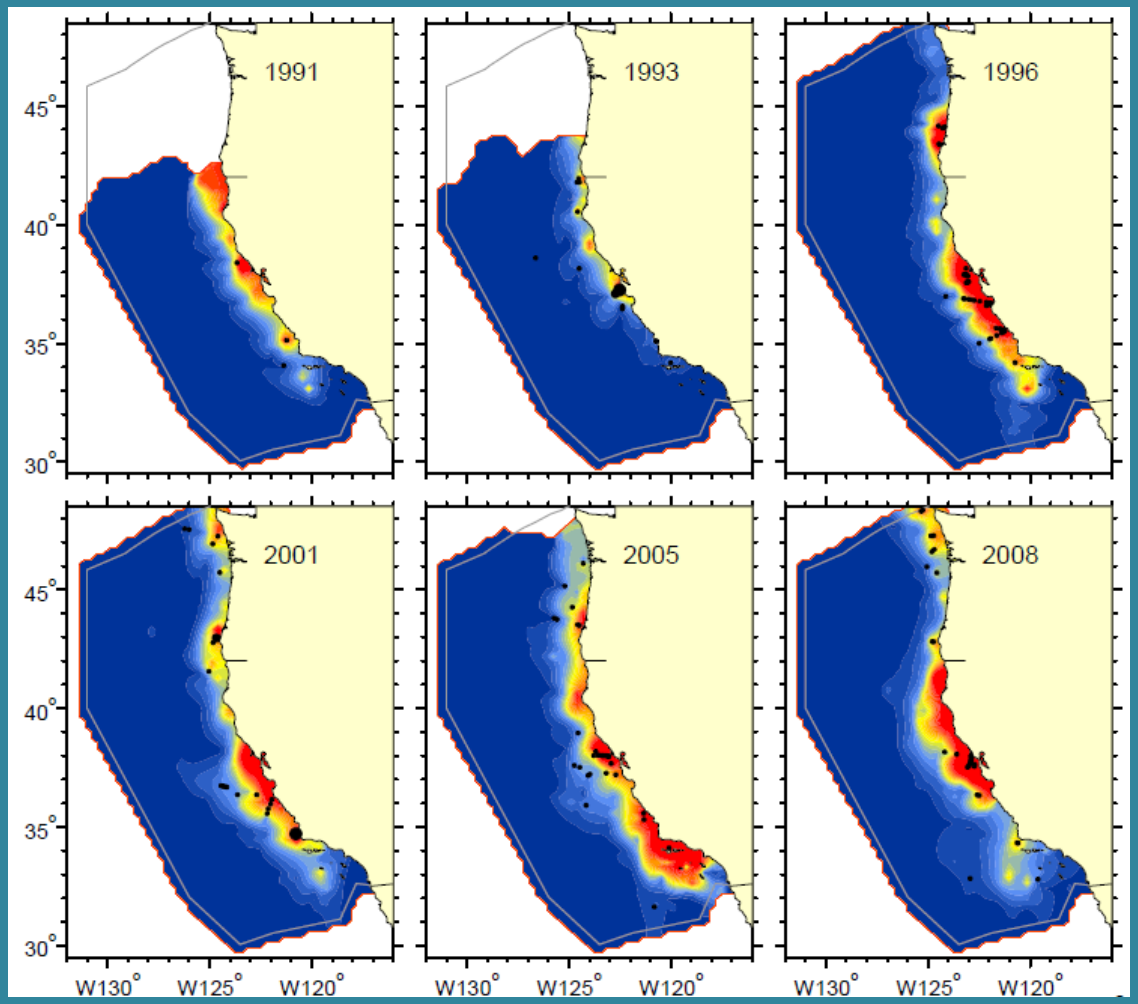


Population recovered from past whaling through about 2008, followed by leveling off or slight decline

CA/OR Humpback whale distribution, 1991-2008

(Barlow and Forney 2007, Becker et al. 2012,2016)

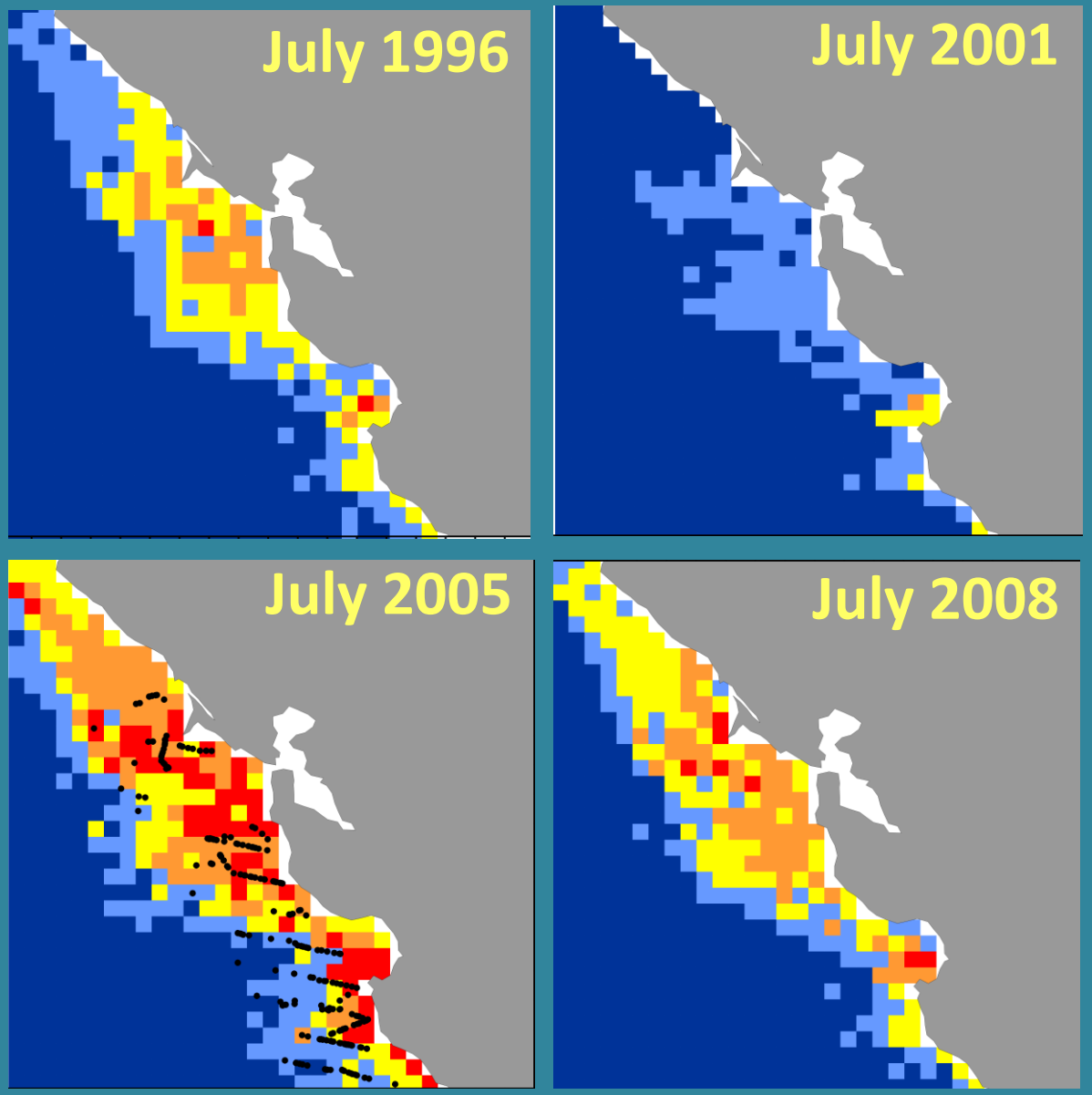




Central CA humpback whale distribution models

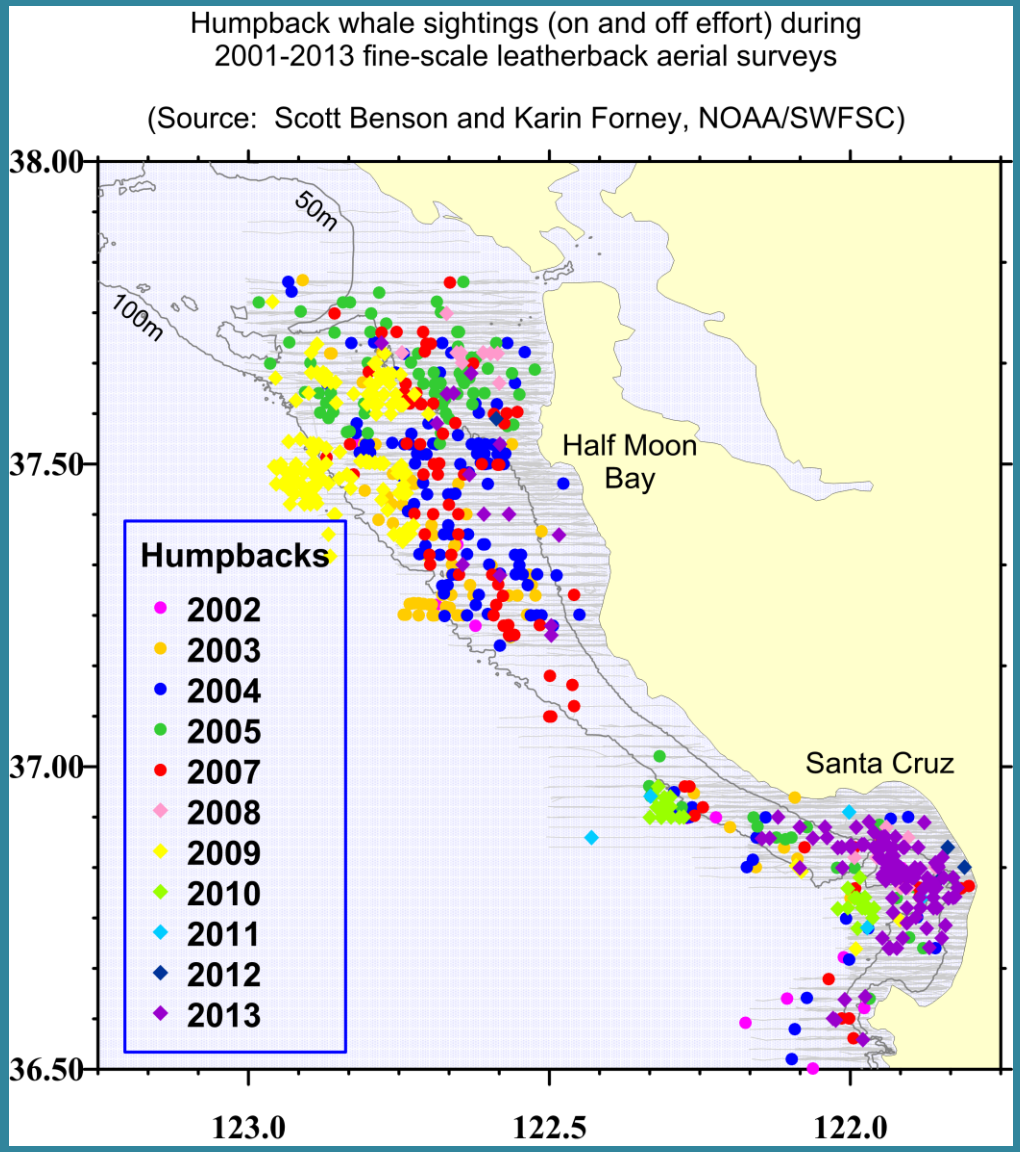
July 1996, 2001, 2005, 2008

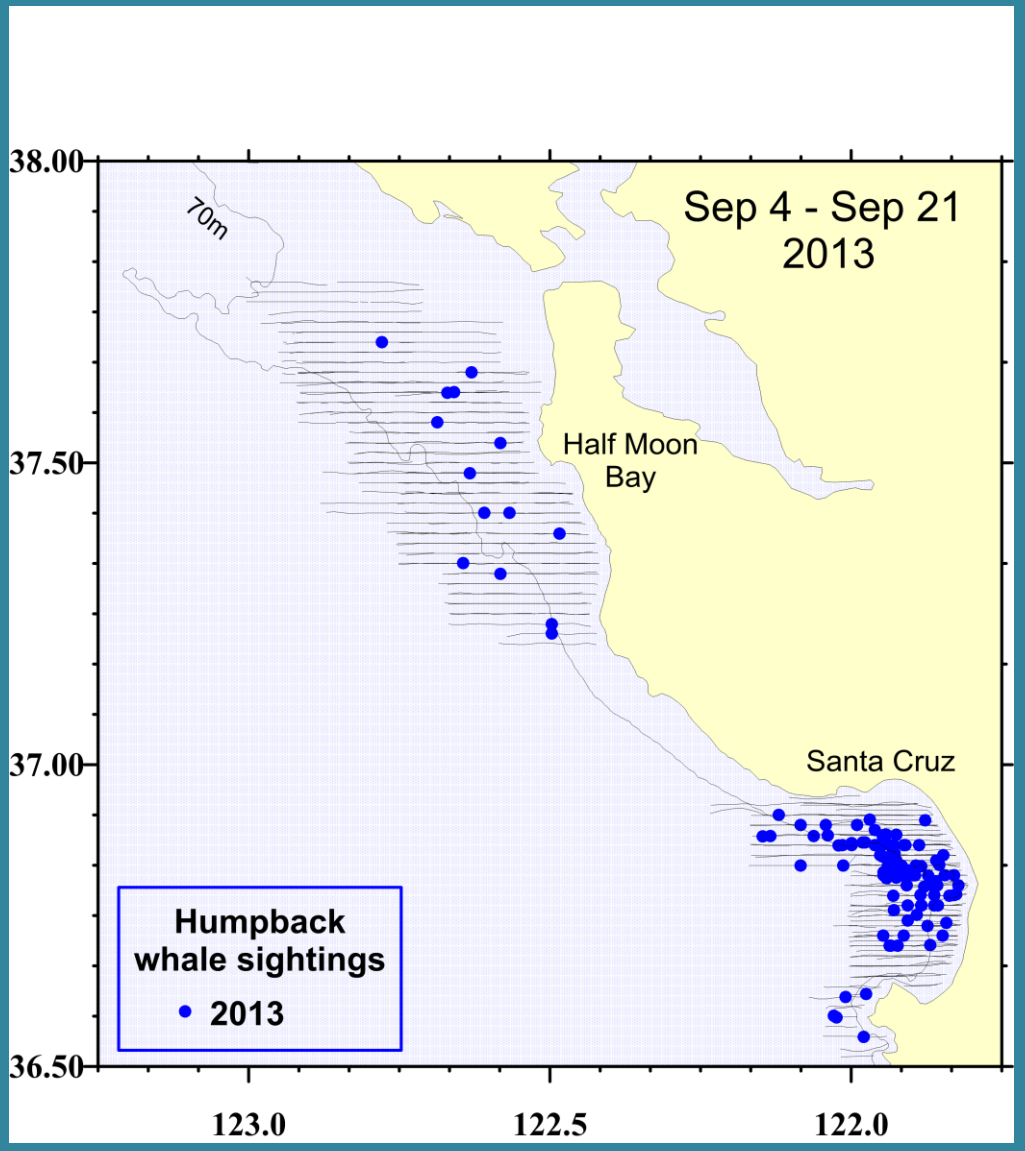
(Becker et al. 2016)



Central California Humpback Whale Distribution

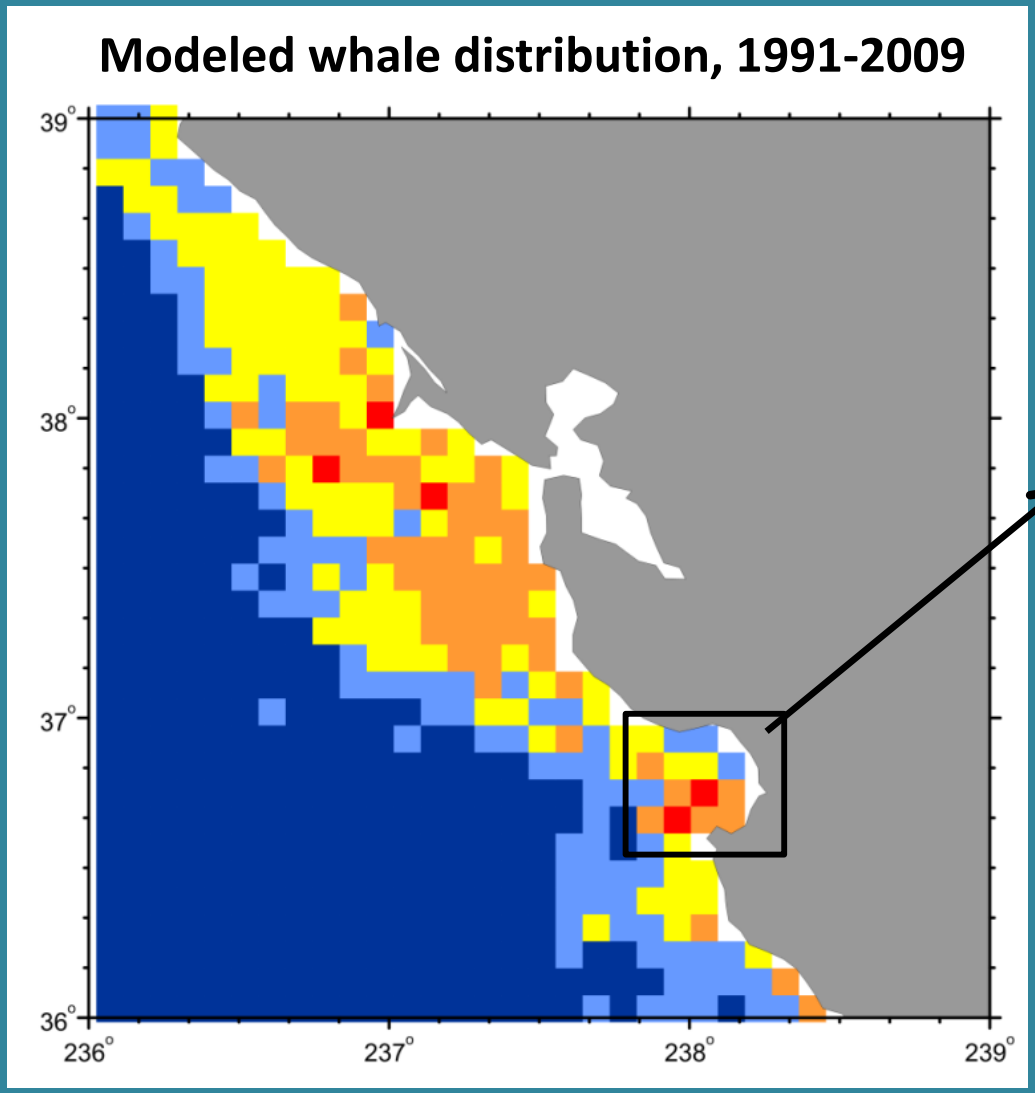
From 2002-2013 leatherback turtle aerial surveys (Scott Benson, NOAA/SWFSC)

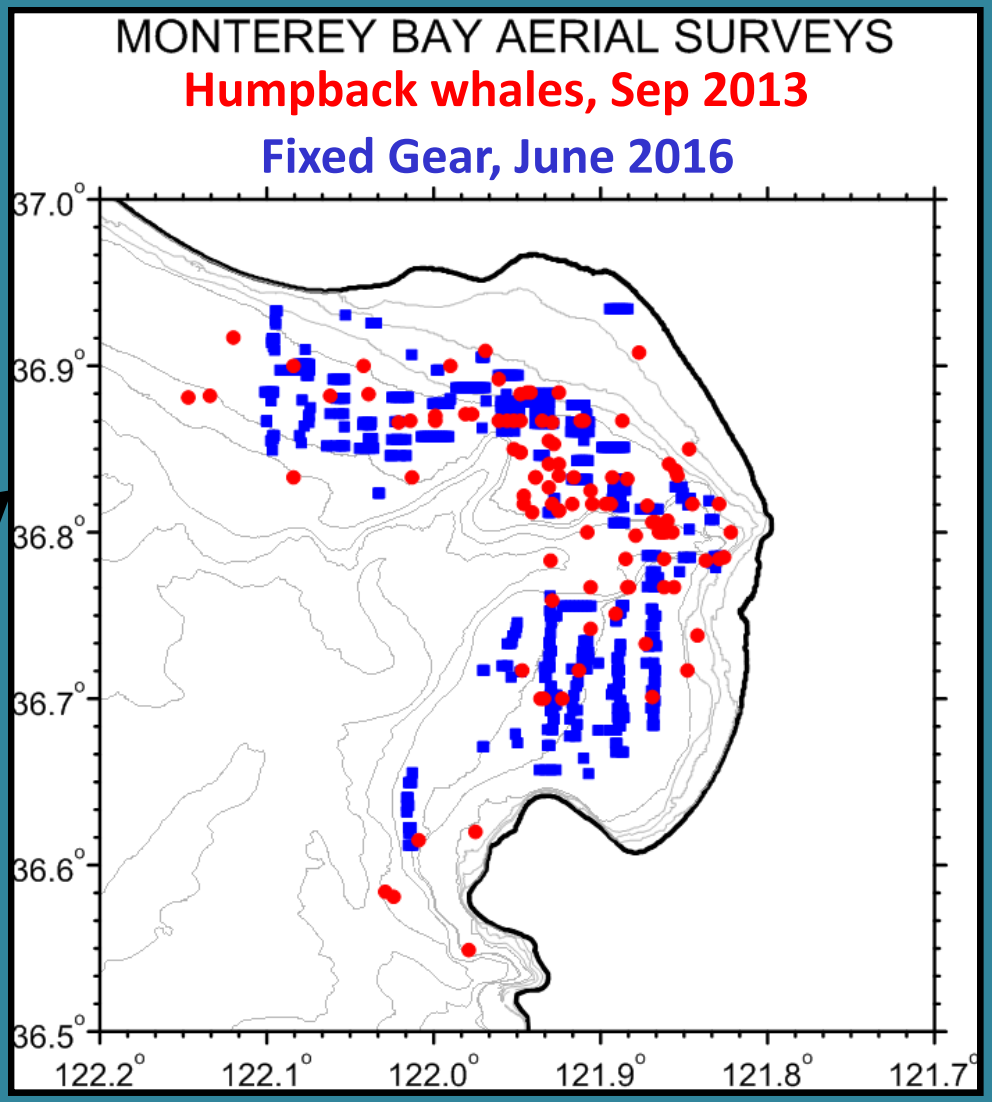




Persistent hotspots: Monterey Bay, Gulf of the Farallones

(see also Calambokidis et al. 2015)

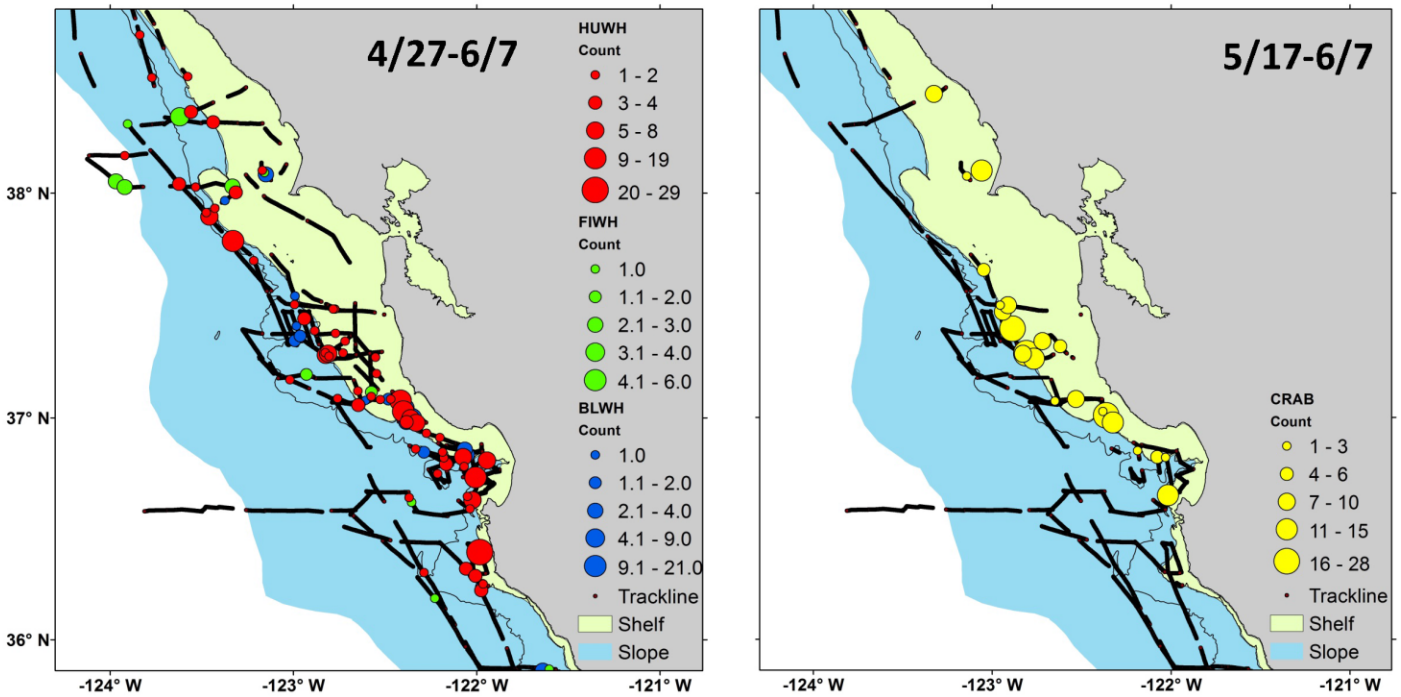




Caveat: Year & month mismatch

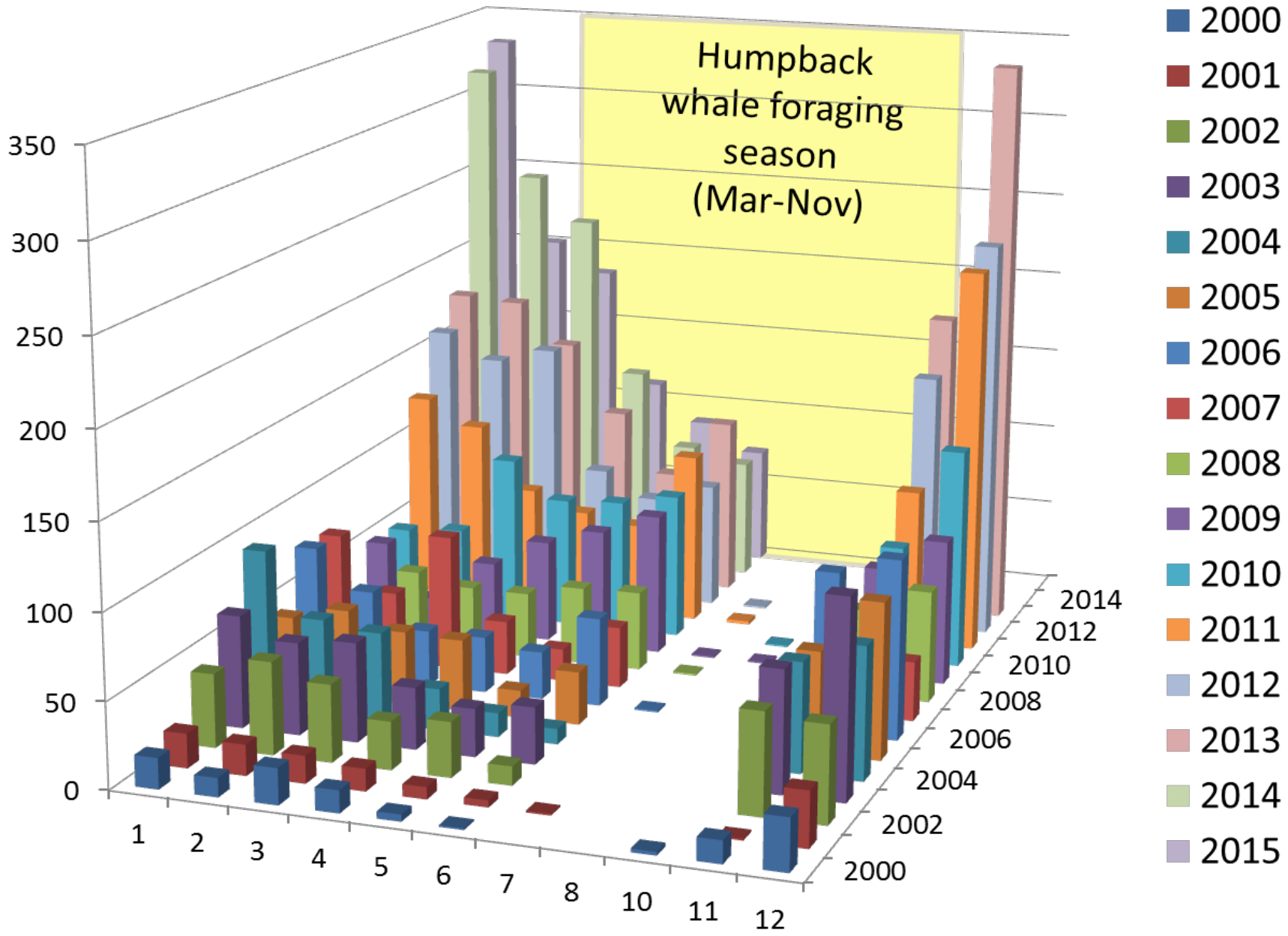
Whale / fixed gear overlap areas, April/May 2016

Distribution and abundance (counts per hour) of baleen whales (left), and counts of crab pot fishing gear (right) derived from observations collected during the 2016 *Rockfish Recruitment Ecosystem Assessment Survey* (RREAS)

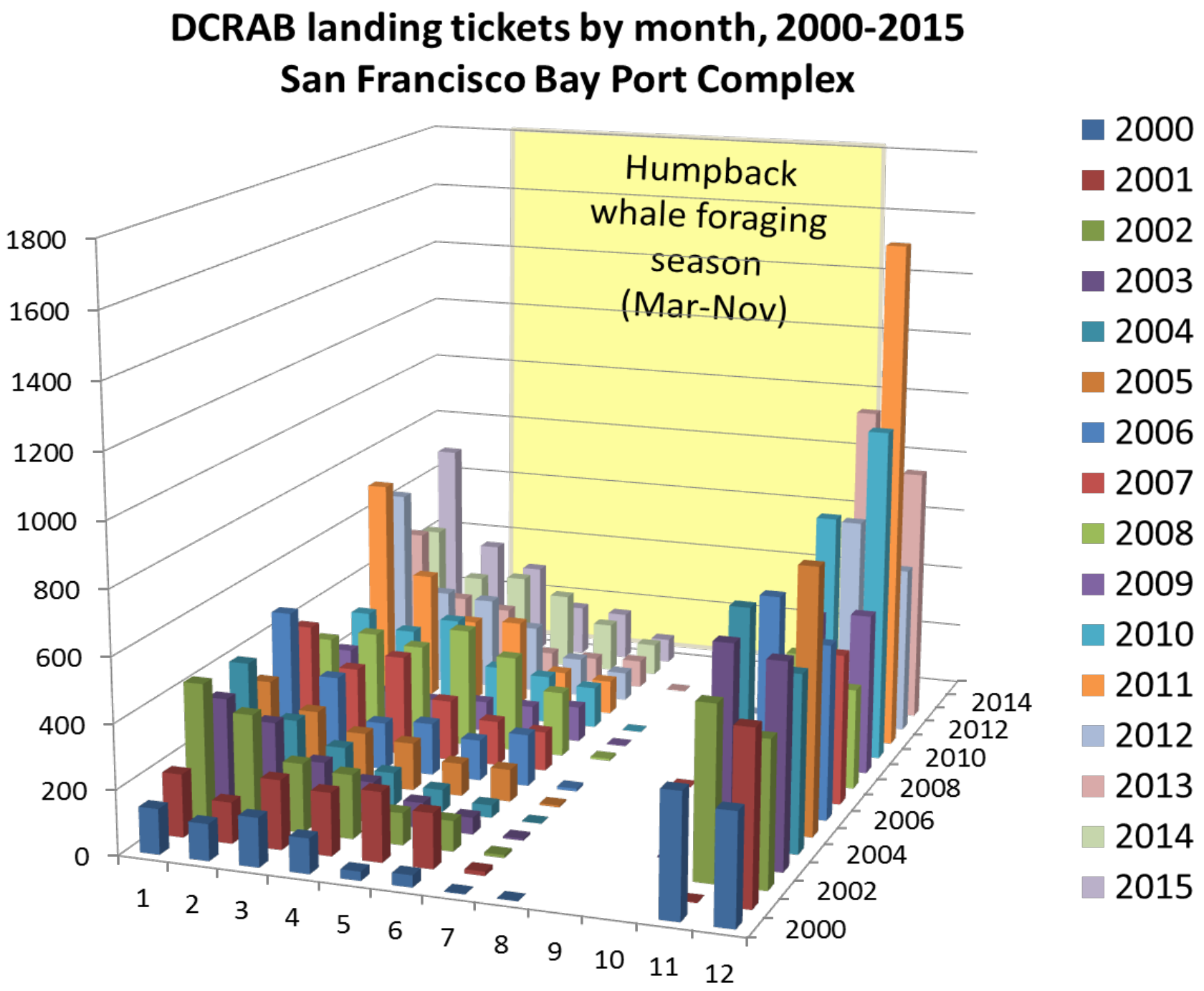


HUWH is humpback whale, FIWH is fin whale, BLWH is Blue Whale
Data derived from JA Santora, WJ Sydeman (Farallon Institute/UC Santa Cruz) and NOAA-NMFS Fisheries Ecology Division

DCRAB landing tickets by month, 2000-2015
Monterey Bay Port Complex



Landing data provided by Don Pearson, NOAA/SWFSC, Santa Cruz, CA



Landing data provided by Don Pearson, NOAA/SWFSC, Santa Cruz, CA

Key observations

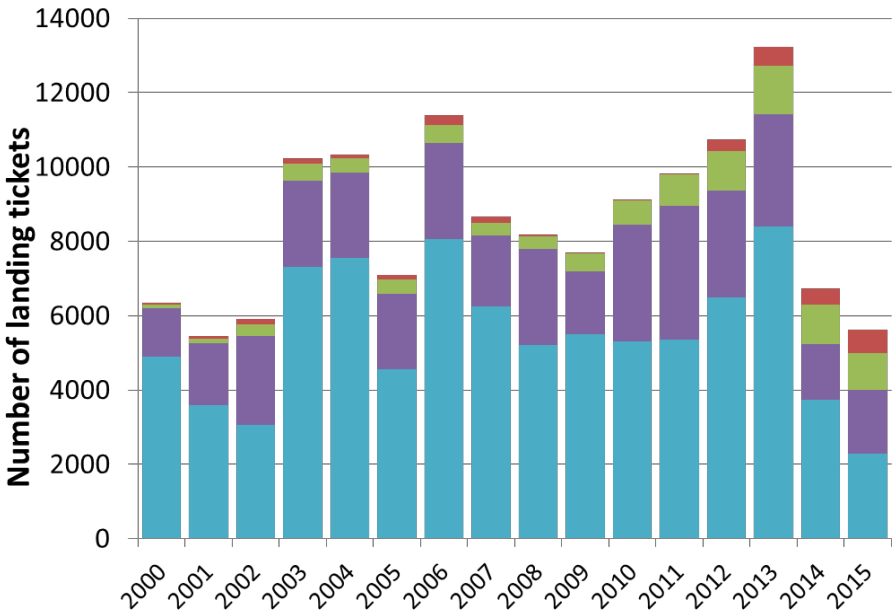
- Humpback whale distribution varies from year to year as prey availability changes
- Whales may feed on schooling fish (mostly nearshore) or krill (in slope-edge waters).
- Since 2013, humpback whales have spent more time inside Monterey Bay (hundreds of whales).
- Nonetheless, there are persistent ‘whale hotspots’ that include areas where crab pot gear is commonly set, especially in Monterey Bay and parts of the Gulf of the Farallones.

Two general approaches for reducing entanglement risk

1. Modify gear to reduce potential for whales to get tangled (e.g. less slack, 'whale links', fewer vertical lines…). *Must find solutions that maintain safe and efficient fishing operations.*
2. Reduce temporal and spatial overlap between whales and fixed gear, for example…
   - …when/if we know whales are in a given area (dynamic)?
   - …if we can predict hotspots from winter/spring oceanographic and fishery data (requires further study)?
   - …in persistent hotspots during times of greatest overlap (e.g. April-June along shelf-edge in Monterey Bay)?

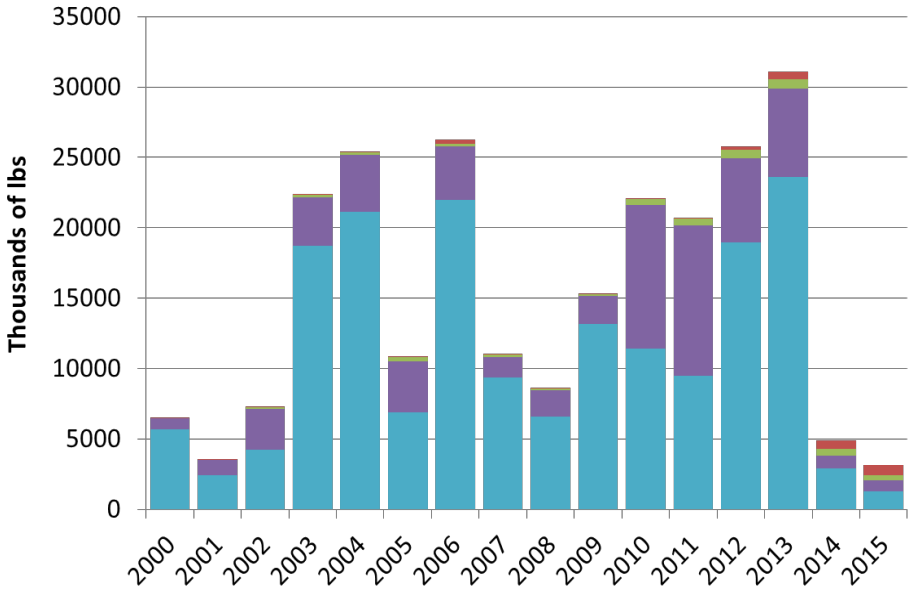
Dungeness Crab, Central and Northern California, 2000-2015 (Calendar Year*)

EFFORT (Number of landing tickets)

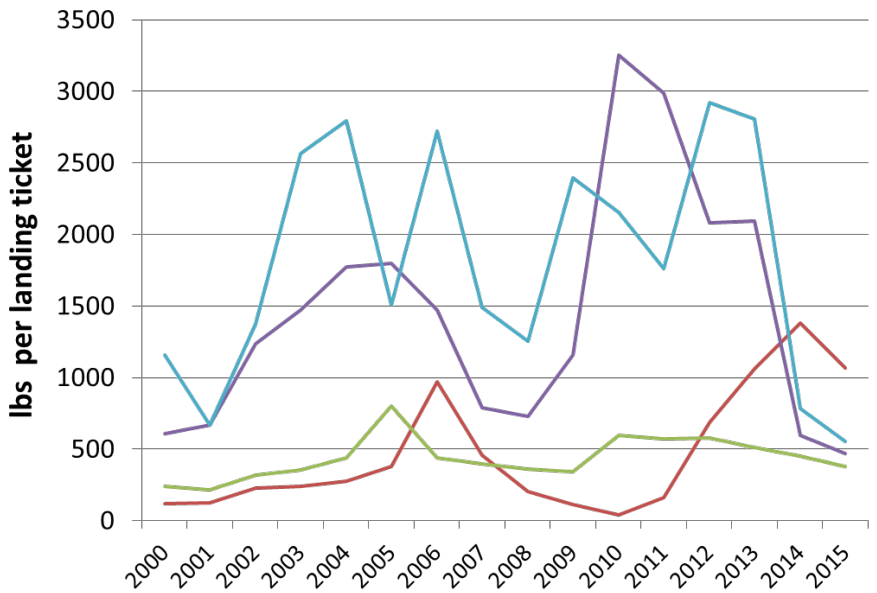


Morro
Monterey
San Fran
NorCal

CATCH (Lbs. landed)



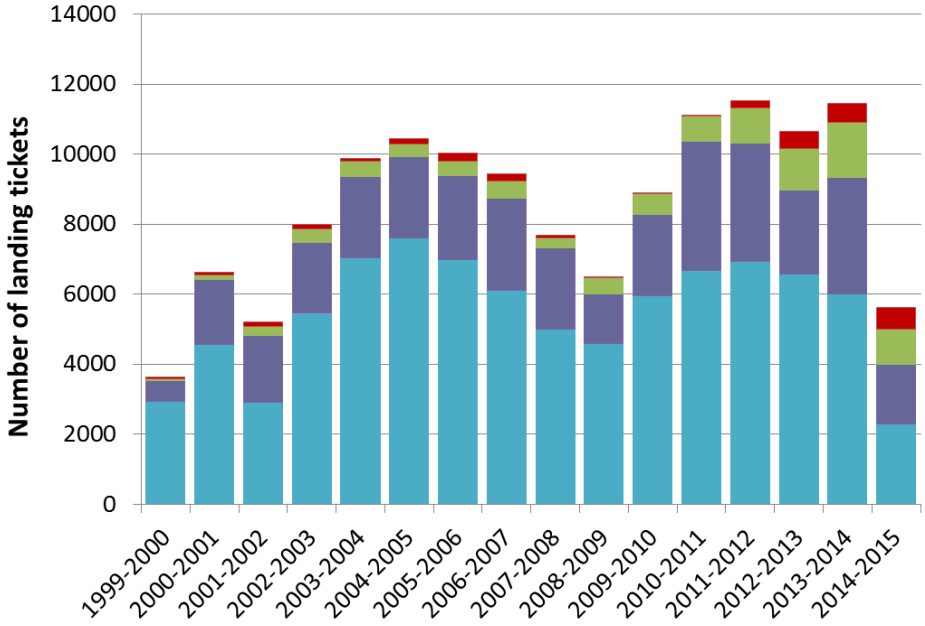
CPUE (Lbs. landed per ticket)



**Note: At the July 13-14, 2016 Working Group meeting, participants requested that these plots be re-done by fishing year, rather than calendar year. The next slide was added following the meeting*

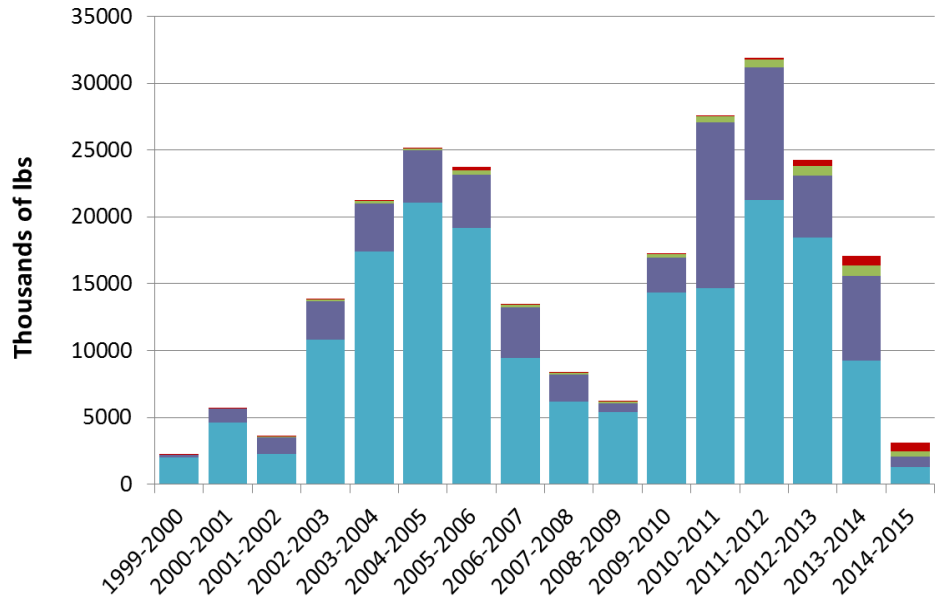
Dungeness Crab, Central and Northern California, 2000-2015 (Fishing Year, Nov-Oct)

EFFORT (Number of landing tickets)

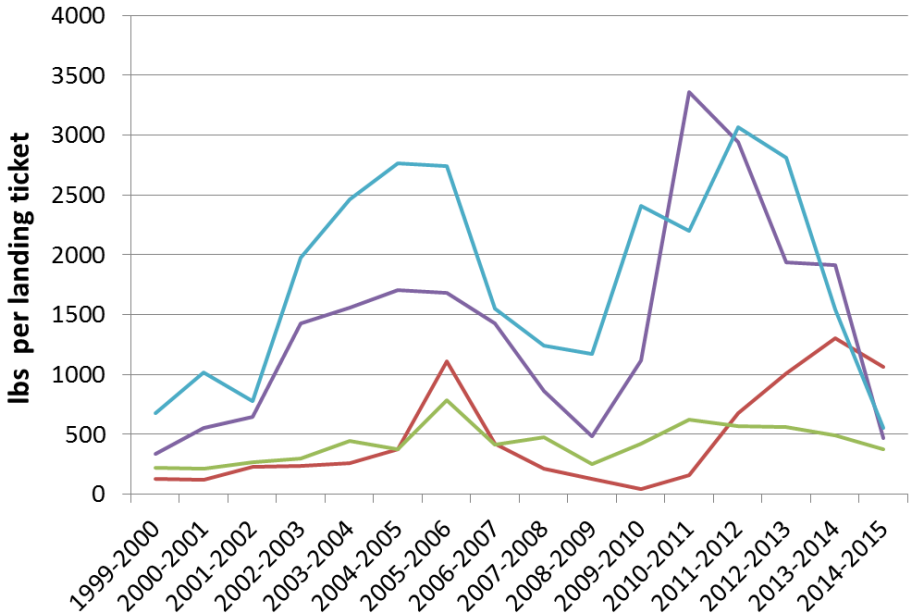


Morro
Monterey
San Fran
NorCal

CATCH (Lbs. landed)



CPUE (Lbs. landed per ticket)



Discussion points and questions

- Can this information help reduce entanglement risk, and if so, how?
- Whale behavior is dynamic and may change again in future.
- Are there any additional analyses/summaries that would be helpful - regarding whales, fishing effort, other data?
- My goal is to provide analytical support to the working group to look at questions of interest and find solutions together.