Science, Service, Stewardship

NMFS Science and Outreach – Whales, Entanglements, and Information Sharing

NOAA FISHERIES SERVICE

General Info on Humpback Whales

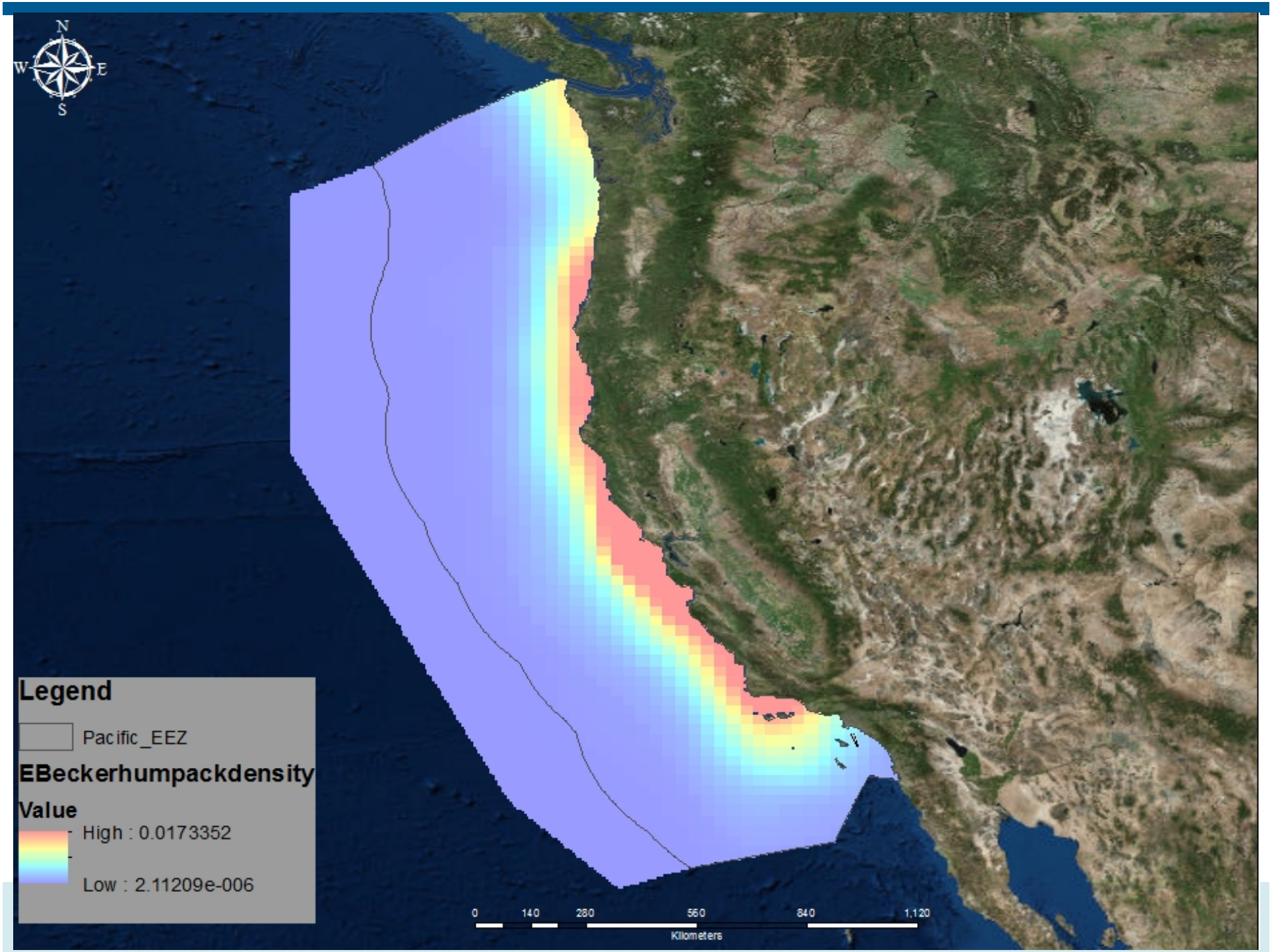
North Pacific

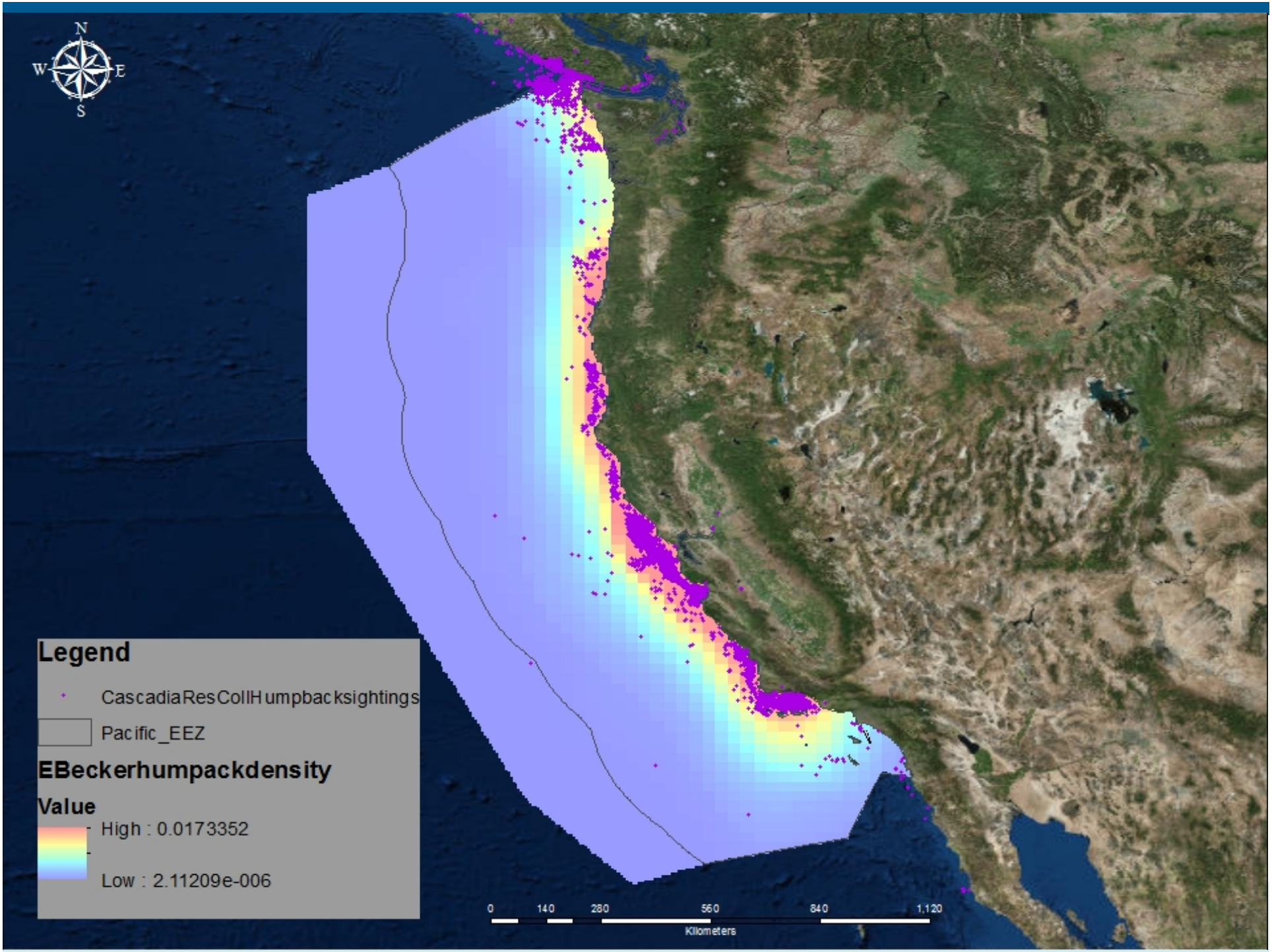
- Feed in the summer along the coast from California to Alaska
  - Prey switching and duration of their presence greatly influenced by what they are feeding on
  - Krill and fish (e.g. anchovies)
  - Feed cooperatively
- Winter: migrate to breeding grounds off of Hawaii, Mexico, Costa Rica, and Japan
  - California animals typical migrate to Mexico and Costa Rica
  - Alaska population migrates to Hawaii
  - There is overlap

Humpback whale SAR

California/Oregon/Washington Stock

- Humpback whale (SARs from 6/4/2014)
  - Population estimate - 1918
  - Increasing – 7%
  - PBR is 11.0
  - Mean annual take based on 2007-2011 data is:
  - Fishery= ≥4.4 [stranding reports and observer reports]
  - Collisions=1.1 [stranding reports]
  - Other HC SI/M =0
  - Total 5.5 is less than PBR (11.0)


N
W
E
S
Legend
Pacific_EEZ
EBeckerhumpackdensity
Value
High : 0.0173352
Low : 2.11209e-006
0
140
280
560
840
1,120
Kilometers


N
W
E
S
Legend
CascadiaResCollHumpbacksightings
Pacific_EEZ
EBeckerhumpackdensity
Value
High : 0.0173352
Low : 2.11209e-006
0
140
280
560
840
1,120
Kilometers

General Info on Gray Whales

- Eastern North Pacific (ENP)
  - Feed in the Chukchi, Beaufort, nw Bering Seas
  - Small group summer/feed along Pacific Coast "Pacific Coast Feeding Group" (PCFG)
  - Migrate to winter breeding grounds off Mexico
  - Predictable migration timing
  - Delisted after recovery 1994
- Western North Pacific (WNP)
  - Feed in the Okhotsk Sea
- ENP and WNP are genetically distinct, but overlap

Gray Whale SAR
Eastern North Pacific

- Gray whale (SARs from 6/4/2014)
  - Population estimate – 19,126
  - Increasing – over 3 % annual
  - PBR is 558
  - Mean annual take based on 2007-2011 data is:
  - Fishery= 2.4 [stranding reports and observer reports]
  - Collisions=2.2 [stranding reports]
  - Other HC SI/M =123 (Russian whaling)
  - Total less than PBR


N
W
E
S
Vancouver
Seattle
WASHINGTON
Portland
OREGON
IDAHO
Salt Lake C
UTAH
NEVADA
Sacramento
San Francisco
CALIFORNIA
Las Vegas
Los Angeles
ARIZONA
Phoenix
San Diego
Legend
Pacific_EEZ
GW_Total_Density_DeAngelisetal
0
140
280
560
840
1,120
Kilometers

Photo identification of whales

- Fluke identification is most common
- Each whale can be identified by the unique black and white pattern on the underside of the flukes (humpbacks and grays)
- Allows researchers to monitoring of the movements, health, and behavior of individual humpbacks and gray whales

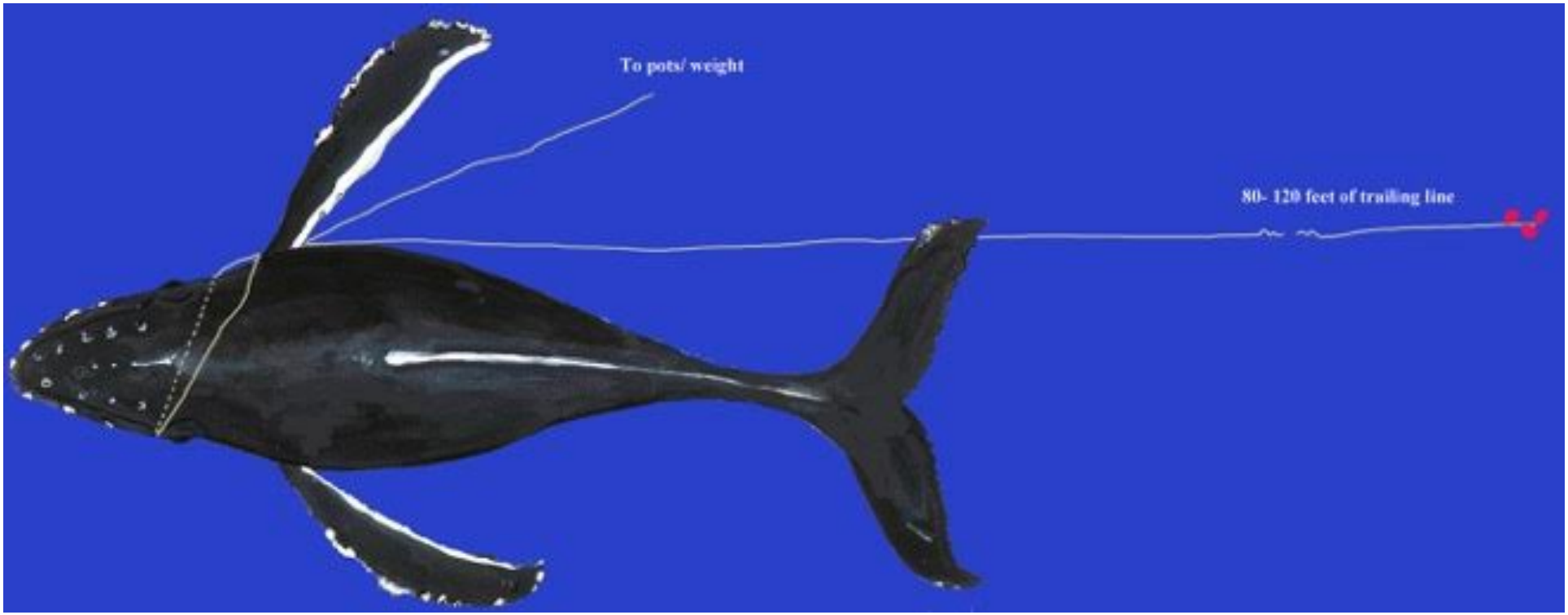
Photo credit: NOAA

How are whale getting entangled?

- Difficult to pinpoint exactly
  - Slack line
  - Night/poor visibility?
  - Caught on fins, tail, mouth while feeding?
  - Anecdotal whales have been observed “playing” with kelp
  - Response to early sensation of line is roll/throw gear?

- Better documentation and increased response can help recreate/understand entanglement


G-4


To pots/ weight
80- 120 feet of trailing line

NOAA FISHERIES SERVICE

East Coast Approach to Minimizing Entanglements

- East Coast – struggling for several decades to understand the mechanics of entanglement and design effective solutions
  - Some time/area closures where risks known/appear high
  - Sinking line - Most trap fisheries involve strings
  - Weak links – required on surface buoys and anchors
  - Minimizing vertical lines – assumption that number of entanglements related to number of vertical lines (minimum trap # per string)
  - Dynamic area management – makes sense, implemented, but ultimately challenging to operate
  - Evolving gear marking – trying to pinpoint sources

ATTACHING BUOY LINES TO OFF-THE-SHELF WEAK LINKS

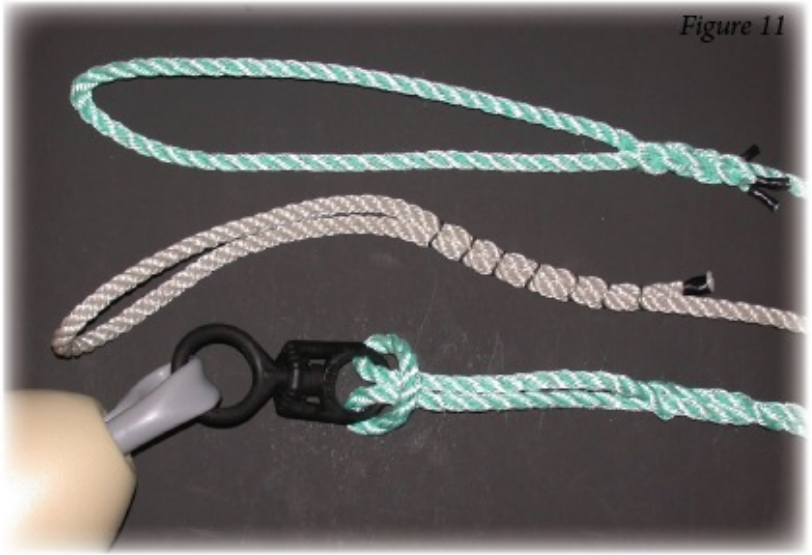


Figure 11

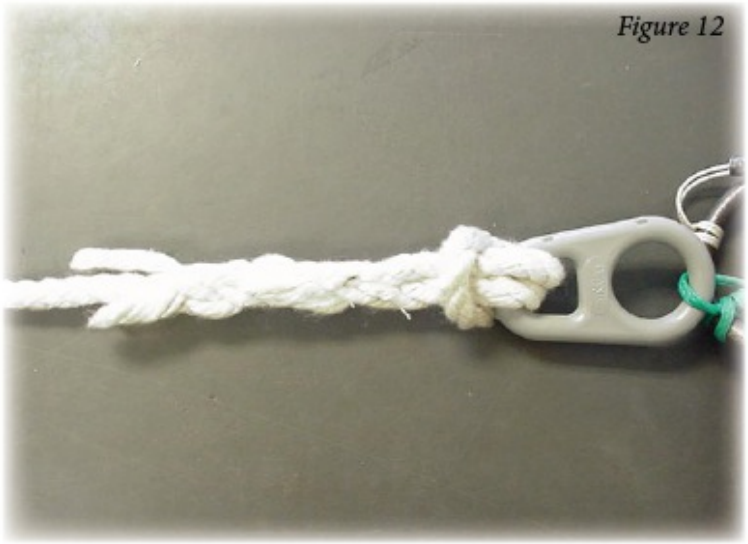


Figure 12

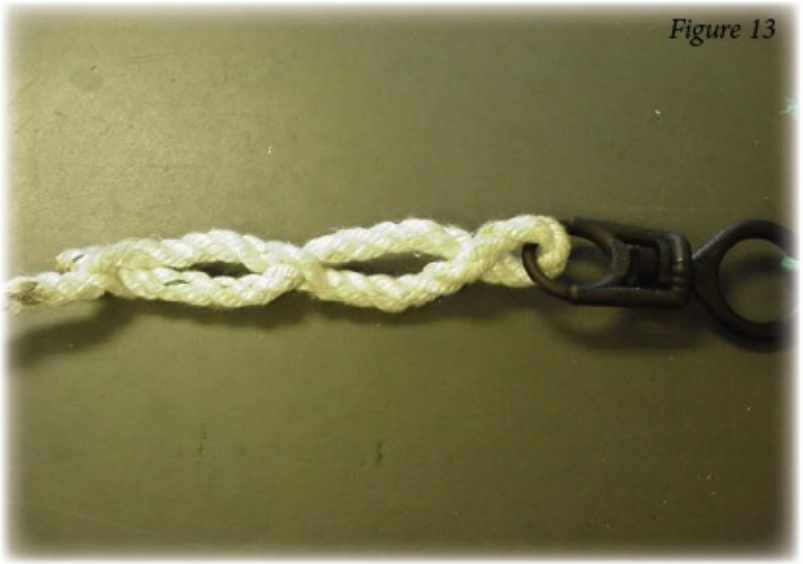


Figure 13

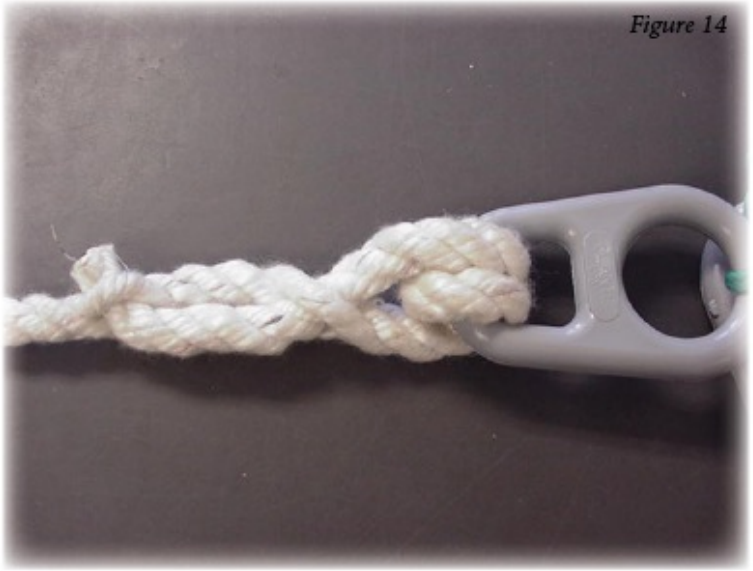


Figure 14

Surface Buoy Marking

SURFACE BUOYS ARE TO BE MARKED WITH:

Markings to help identify the associated vessel or fishery by including one of the following:

- the owner's boat registration number and/or US vessel documentation number;
- Federeal commercial fishing permit number; or
- Whatever positive identification is required by the vessel's home-port state.

When marking is not already required by state or federal regulations, the letters and numbers must meet the following requirements:

- At least 1-inch (2.5cm) in height;
- Block letters or Arabic numbers; and
- In a color that contrasts with the color of the buoy.

Buoy Line Marking:

BUOY LINES ARE TO BE MARKED WITH:

THREE 12 inch (30.48 cm) colored marks:

- one at the top of the buoy line,
- one midway along the buoy line, and
- one at the bottom of the buoy line.

If the mark consists of two colors, EACH COLOR mark may be 6-inches for a TOTAL MARK of 12-inches.

Each color code must be permanently affixed on or along the line and each color code must be clearly visible when the gear is hauled or removed from the water.

Fixed Gear Guide

Rock Crab

Line
Material: Poly-blend or nylon line
Width: 5/16th or 3/8th inch
Color: Various colors

Buoys
Bullet buoy or polyballs marked with license number; some fishermen use double bullet buoys for added floatation

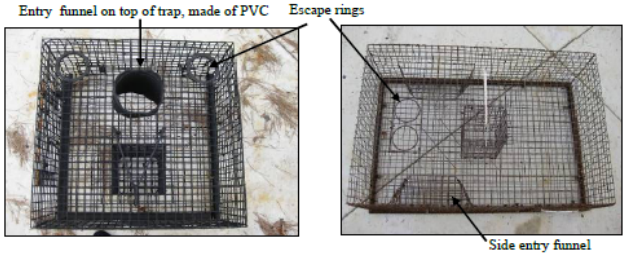
Trap Description
- Trap dimensions: 24"x 24" x 12"
- Mesh: 1"x 1" 2"x 2", 2"x 4" mesh
  - CA: 1 7/8 x 3 7/8 inch minimum mesh size (FGC § 9011)
- Most traps have entry funnel on the top made of 6" diameter pipe, some have entry funnels on side made of wire mesh
- Must have two rings for escapement (3 ¼" diameter) (FGC § 9011)
- Destructive device required by law (FGC § 9003)

Configuration
- Most fish single traps with a single buoy
- Some fish 5 to 25 traps connected to a common ground line

Trap limit
- No limit, 200 traps is common

Wire mesh trap with entry funnels and escape rings on top

Fathoms Plus brand plastic traps are sometimes used



Rock Crab

Fishery distribution
Common depths fished: 10-35 fm

Geographic Range of Effort
- Entire California coastline, including offshore islands
- Main port is Santa Barbara, with lower effort in Morro Bay, Los Angeles, and San Diego, and very little effort above Morro Bay

General Fishing Season/Structure

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
California												

	Net	
		Mono-filament
California Near Live Fish (p 18)		
Coonstripe Shr (p 20)		
Dungeness Cra (p 22)		
Hagfish (p 24)		
Rock Crab (p 2		
Pacific Halibut		
Sablefish (p 28		
Spiny Lobster		
Spot Prawn (p		
California Halib White Seabass Gillnet (p 38)		X
Small Mesh Dri Gillnet (p 15)		X
Large Mesh Dri Gillnet (p 15)		

Trap Key

1

1a. Trap made of mainly metal **2**
1b. Trap made of mainly plastic..... **7**

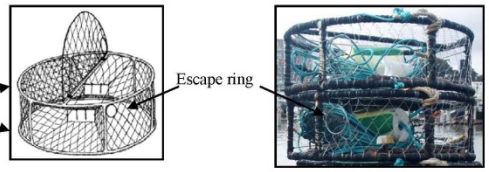
2

2a. Round frame..... **3**
2b. Rectangular frame..... **5**

3

3a. Outer rings equal diameter, approximately three foot ring diameter:

Dungeness crab p. 22



3b. Outer rings not equal diameter, tapered shaped..... **4**

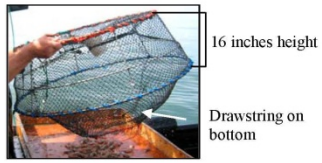
4

4a. 0.5 inch cord mesh, bottom ring diameter ≥ 3 feet:

Coonstripe shrimp p. 20

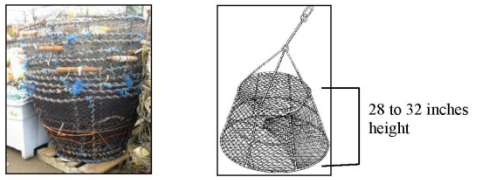
4b. 0.8 - 1.5 inch cord mesh, bottom ring diameter ≥ 3 feet:

Spot prawn p. 32



4c. ≥2 inch cord mesh, bottom ring diameter 3 or 6 feet, trap height between 28 and 32 inches:

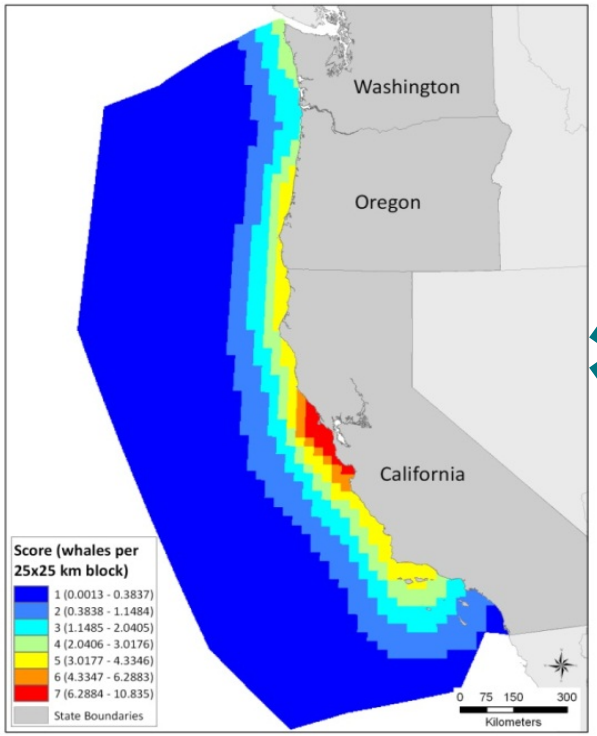
Sablefish p. 28



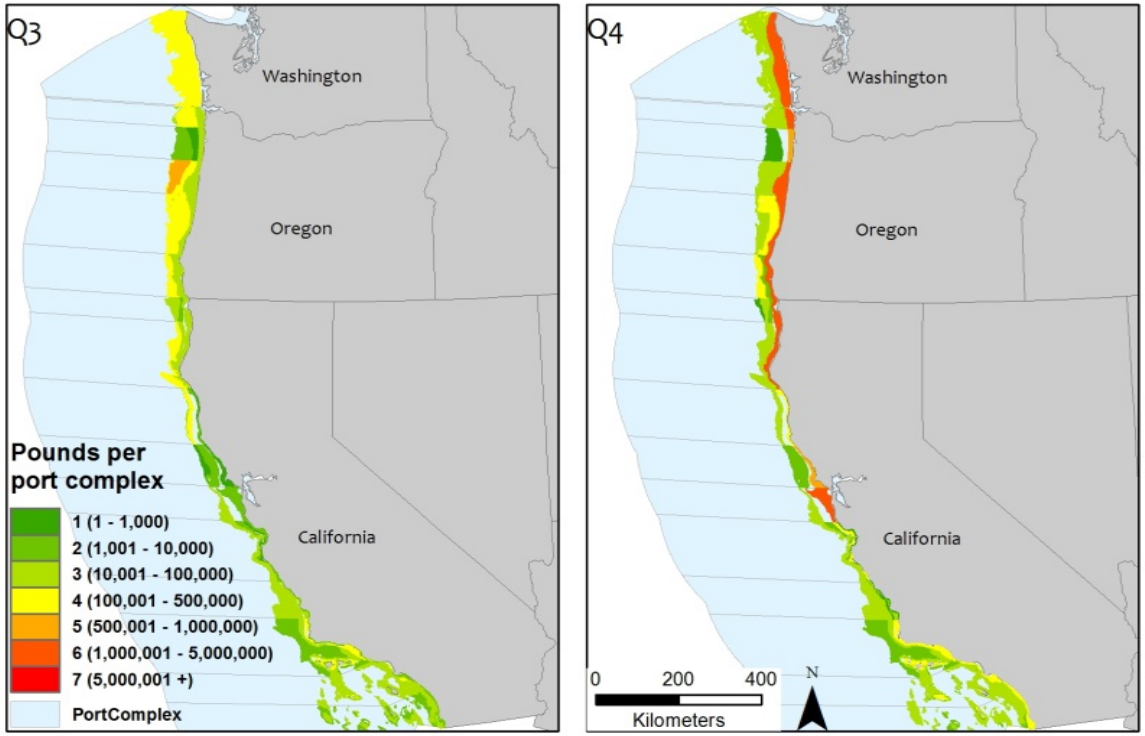
9

Co-occurrence model walk-through

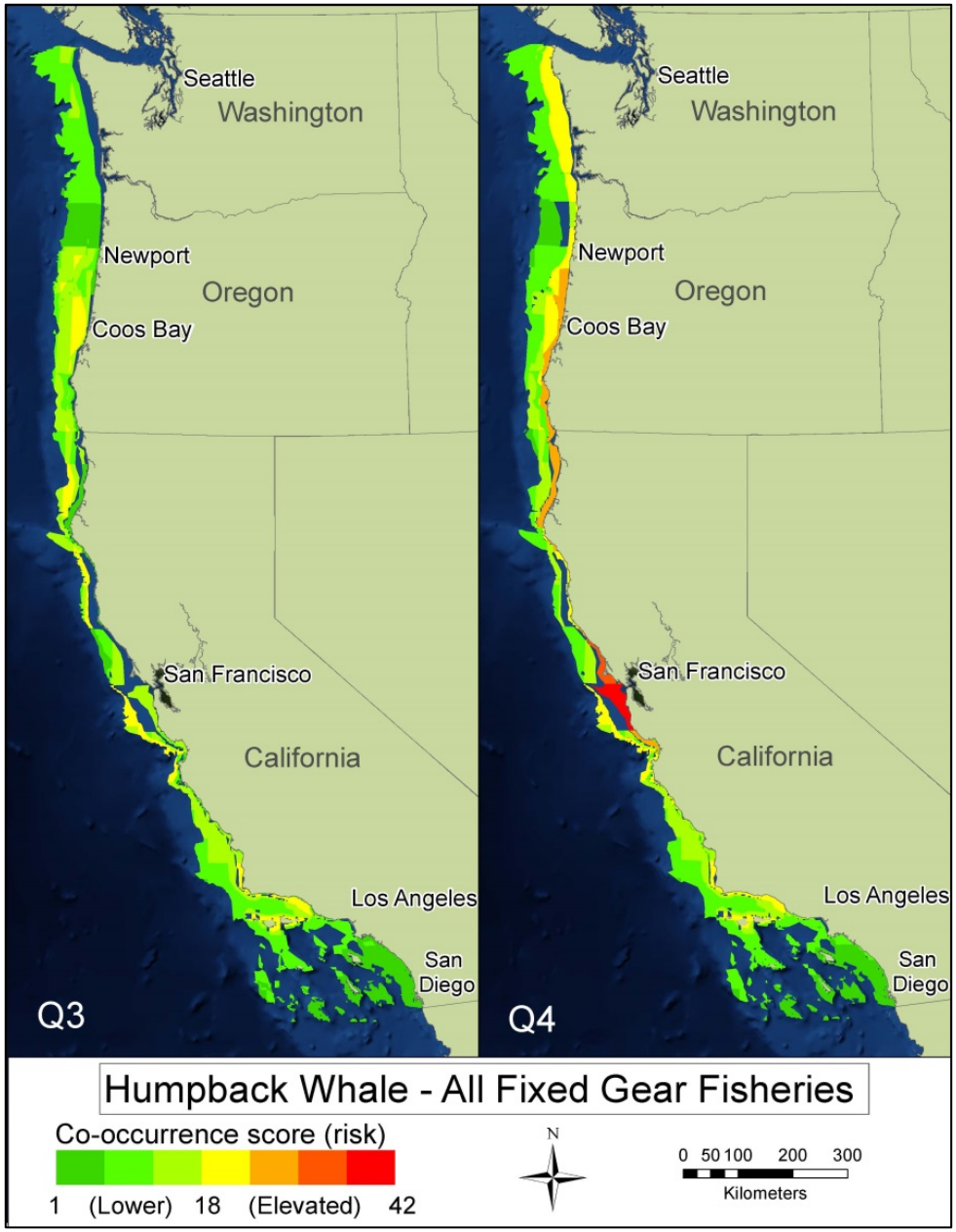
Humpback whale



Fixed gear commercial fisheries

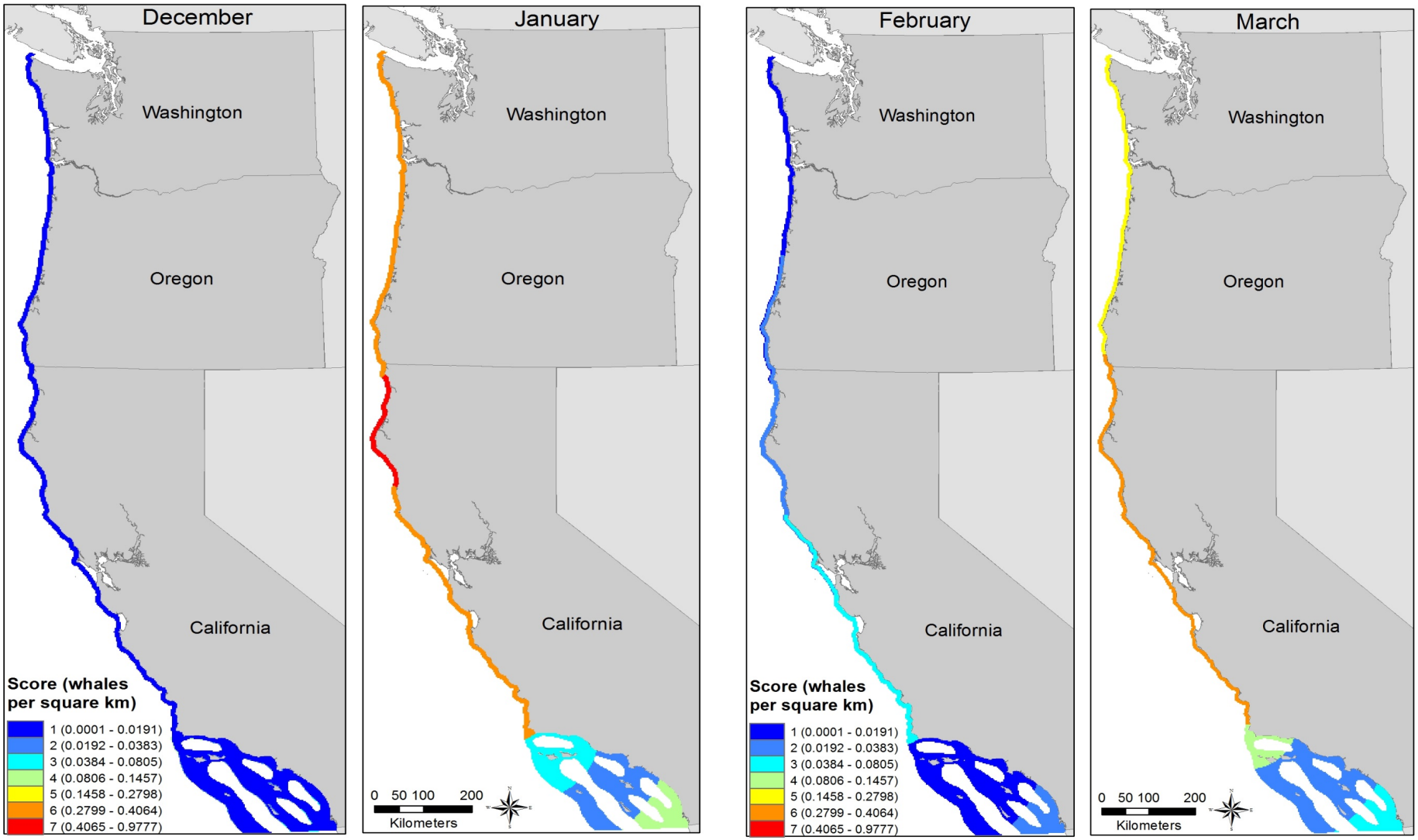


Scaled whale density (1 to 7) multiplied by scaled fixed gear commercial fishing effort (1 to 7) results in a co-occurrence score (1 to 49)



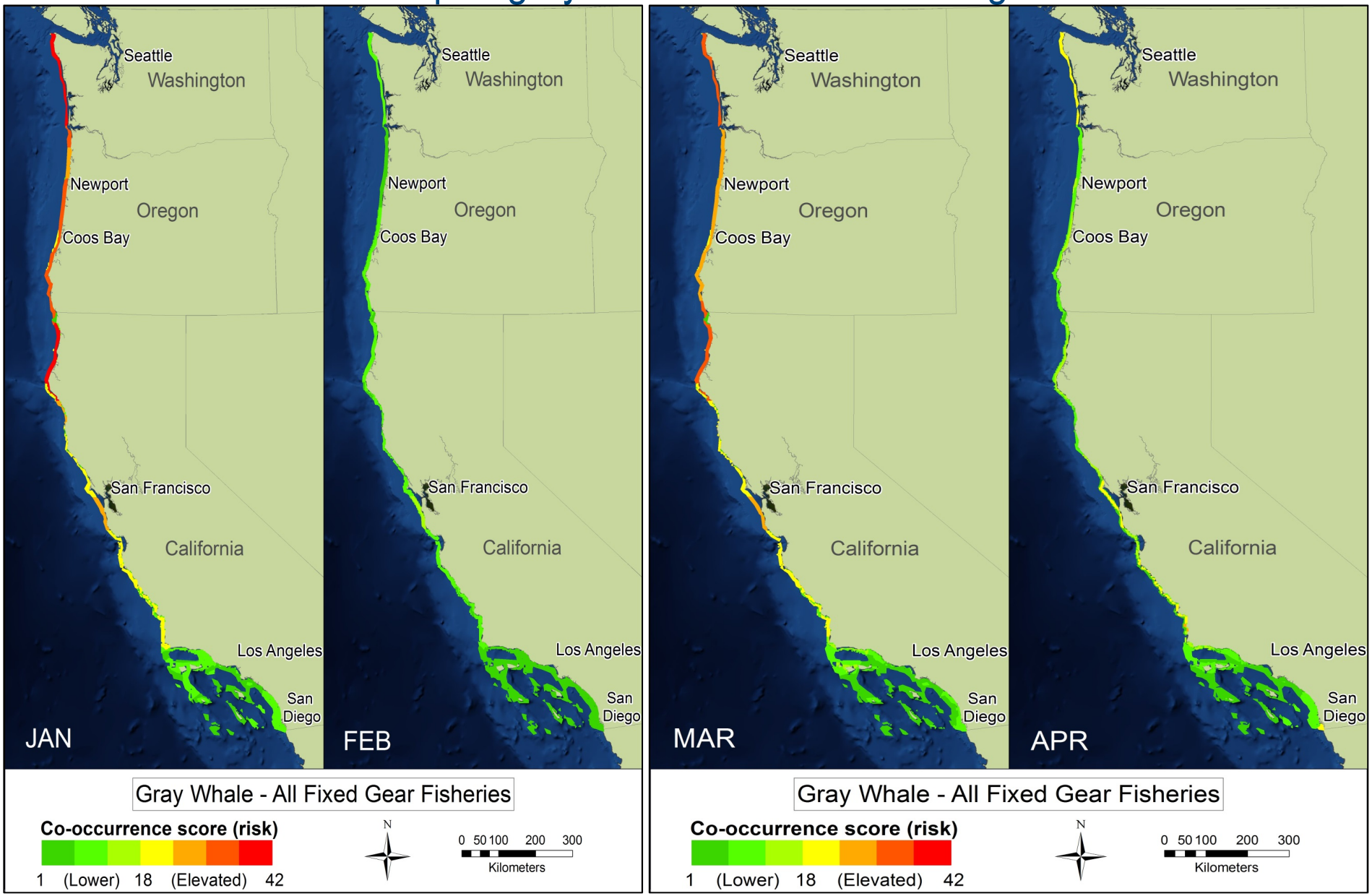
Co-occurrence map of humpback whales with all 11 fixed gear fisheries

Gray whale monthly densities



DeAngelis *et al.*, in prep

Co-occurrence map of gray whales with all 11 fixed gear fisheries



Specific investigations/research (elevated risk areas)

1. **San Francisco:** This time/area study of fishing effort and large whale presence would capture an elevated risk area for all whale species included in this study and would address multiple model limitations.
2. **Santa Barbara:** July to December - this time/area study would capture an elevated risk area for multiple whale species with the California halibut/white seabass set gillnet, hagfish trap, rock crab trap, sablefish, spiny lobster trap, and spot prawn trap fisheries.
3. **Washington, Oregon, and northern California:** Areas that overlap with Dungeness crab trap fishery in December and January - focus on a wide area over a short time frame would capture an elevated risk for blue, fin, and humpback whales and further refine the fishery effort model to target areas of higher gear concentrations.
4. **Central California:** Humpback whales in central California with sablefish/spot prawn based on model results and confirmed entanglement.

Results comparison to entanglement records

- Co-occurrence model results were compared to 15 entanglement reports where fishery and general gear set location are known
- All 15 reports were associated with co-occurrence model medium to high scores
- This supports the use of the co-occurrence model for assessment of whale entanglement risk off the U.S. west coast
- Recent entanglement data does make sense in this framework

NOAA FISHERIES SERVICE

Recent/Current NMFS Outreach and Efforts

- Large whale entanglement workshop - November 2013
  - Key finding to engage with fishing community
- Public meetings in Oregon fishing community - September 2014
- Engagement with CDFW to connect with CA fishing community – now
- Review of entire entanglement record and updating database – July 2015
- Paper detailing record of whale entanglements on US west coast – in prep
- Compiling all available information regarding ideas/key concepts related to minimizing entanglements – in prep
- Engagement with fishermen to improve our data collection and understand the right questions to ask about the gear - now