

Results of the 2014 Underwater Camera Survey of the Eastern Bering Sea Outer Shelf and Slope

Chris Rooper, Mike Sigler, Pam Goddard and Pat Malecha

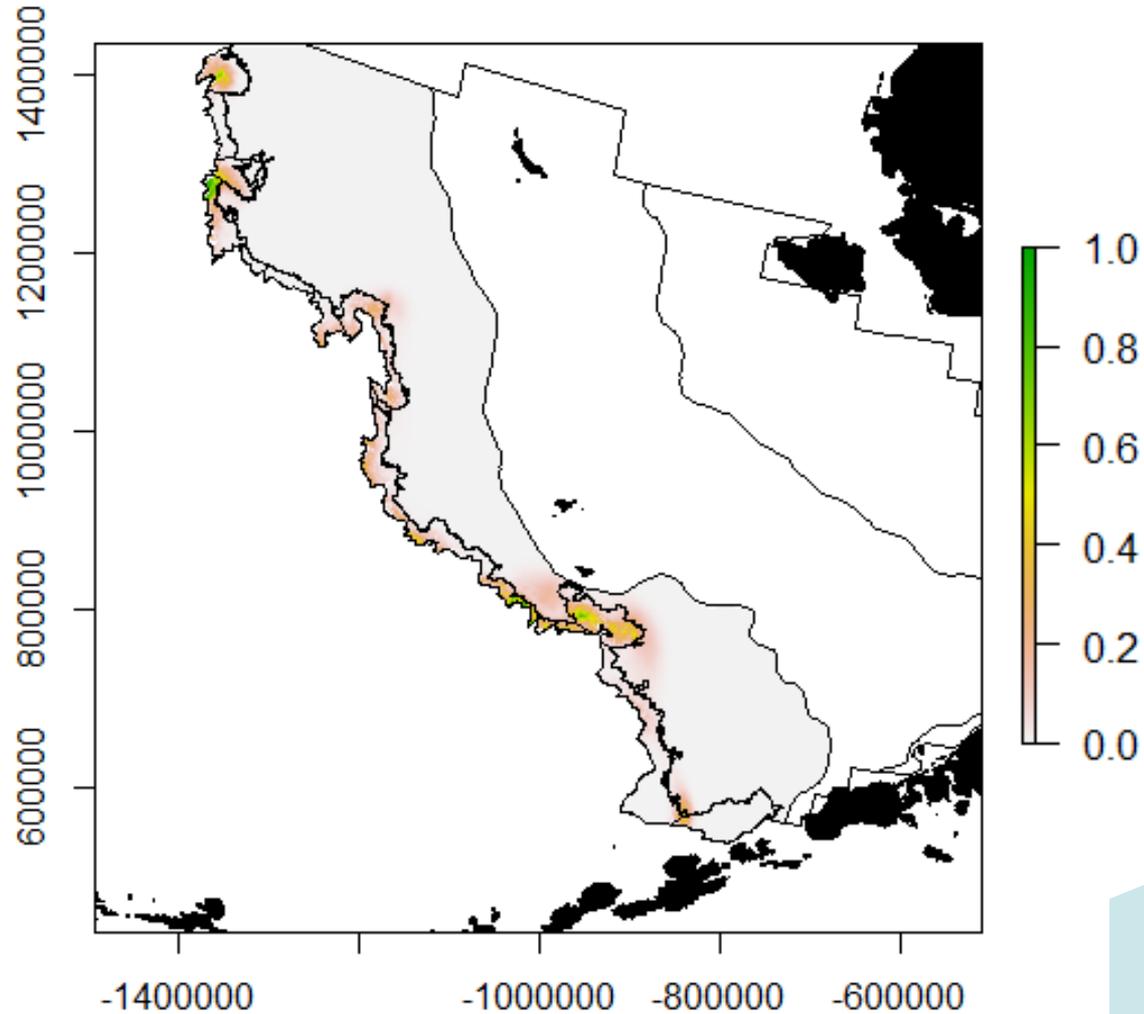
Alaska Fisheries Science Center

NPFMC Meeting
Anchorage, AK
October 5-9, 2015

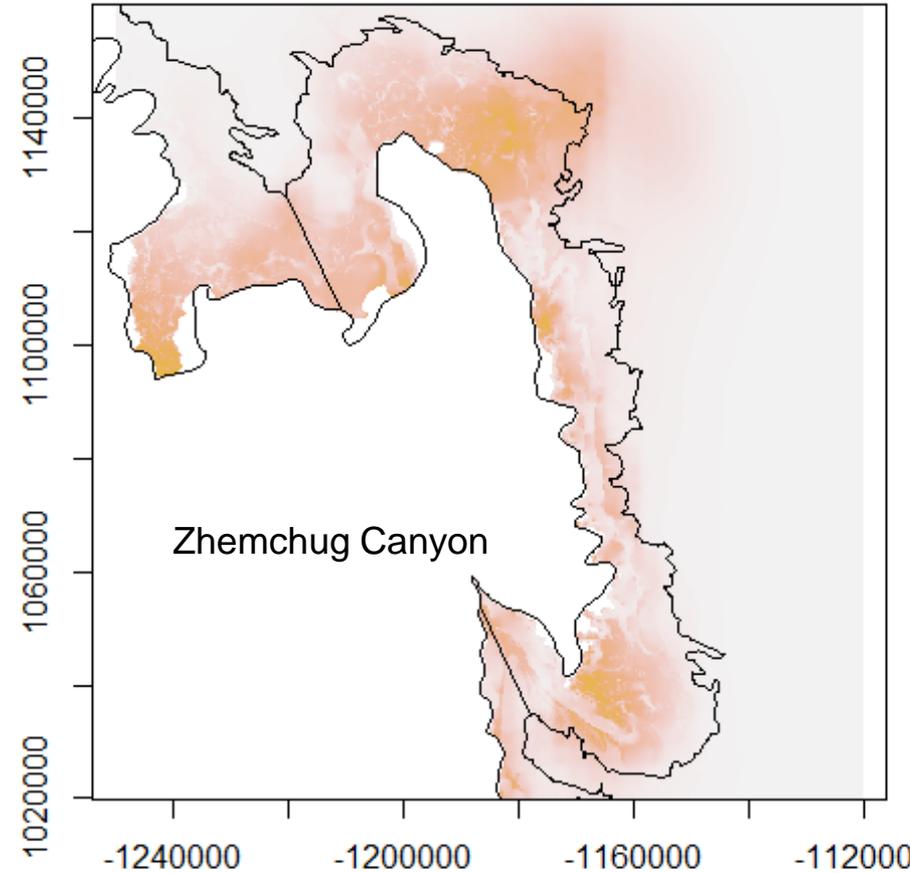
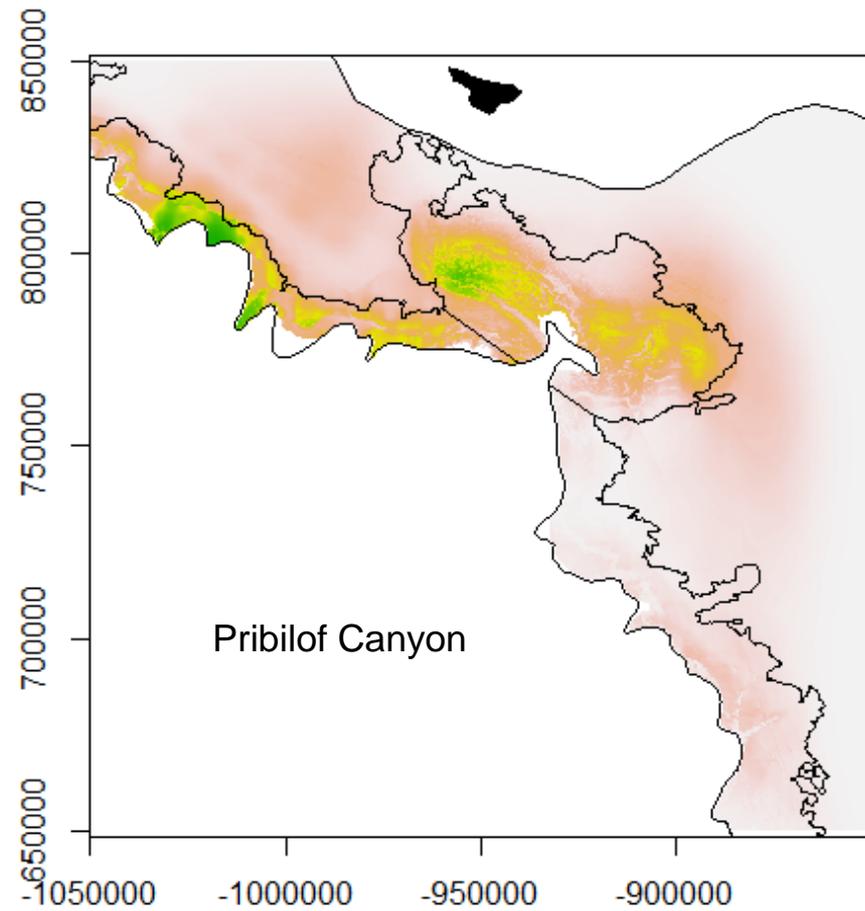
Background and Timeline

- April 2012
 - NPFMC requested analysis of existing data on the eastern Bering Sea slope and canyons
- June 2013
 - AFSC presented results of the analysis
 - ***Included predictive coral model***
- June 2013
 - NPFMC requests further analysis
 - ***NPFMC requests “groundtruthing” of coral model***
- October 2013
 - Further analysis presented
 - ***Plans for summer 2014 fieldwork presented***
- February 2014
 - EBS Canyons workshop – ***discuss upcoming 2014 survey***
- August-September 2014
 - ***Camera survey conducted***
 - Preliminary results to NPFMC (October)
- March 2015
 - Image analysis completed
 - Preliminary results presented
- June 2015
 - ***Final Results and Report to public***
- October 2015
 - ***Presentation to NPFMC***

Probability coral present based on bottom trawl survey data

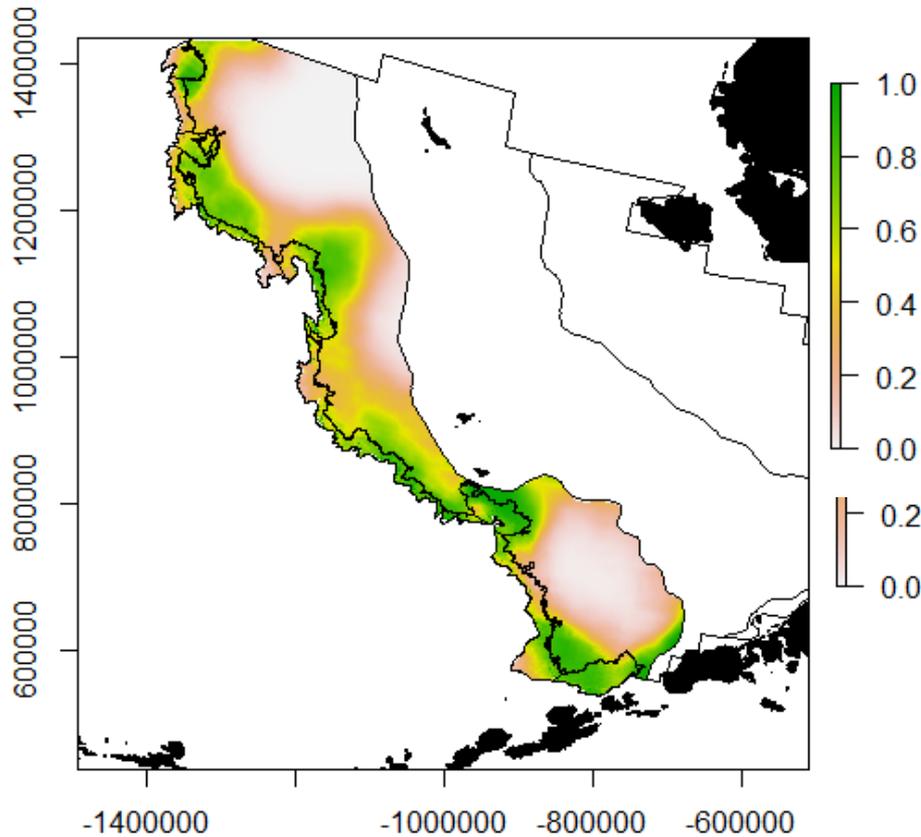


Probability coral present based on bottom trawl survey data

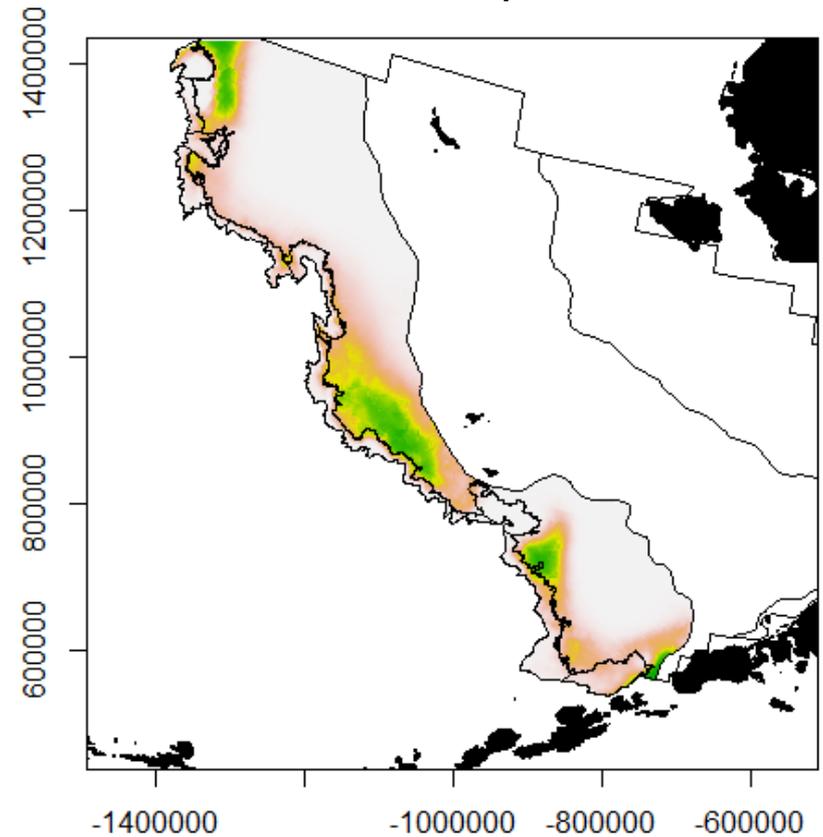


Probability sponge or sea whips present based on bottom trawl survey data

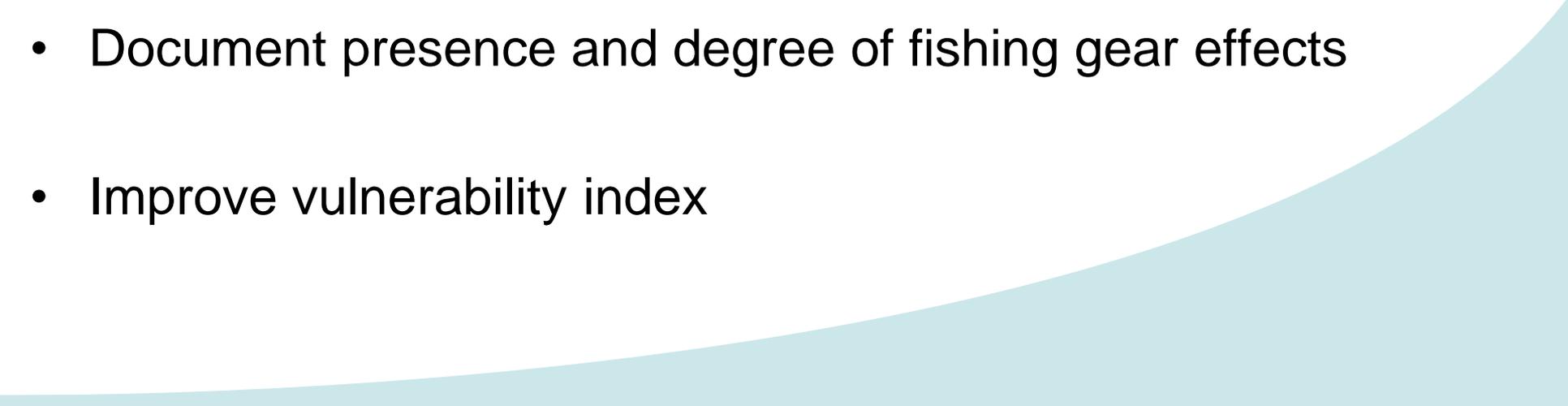
Sponge



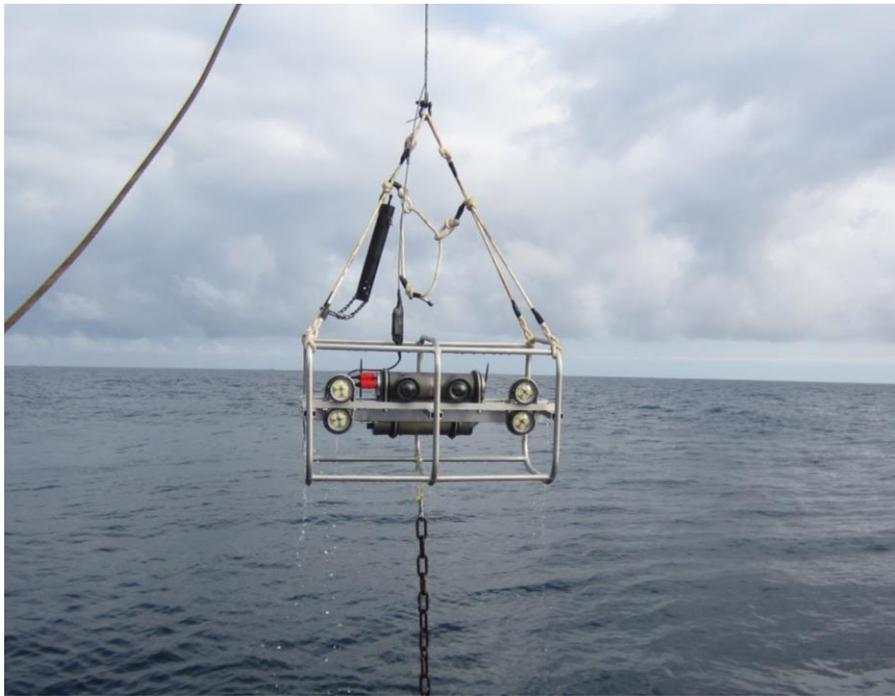
Sea whips



Fieldwork objectives (NPFMC Motion)

- Validate model predictions
 - Improve/refine predictions of coral presence
 - Acquire height and density data for coral
 - Identify the role of these coral as fish habitat
 - Document presence and degree of fishing gear effects
 - Improve vulnerability index
- 

2014 fieldwork

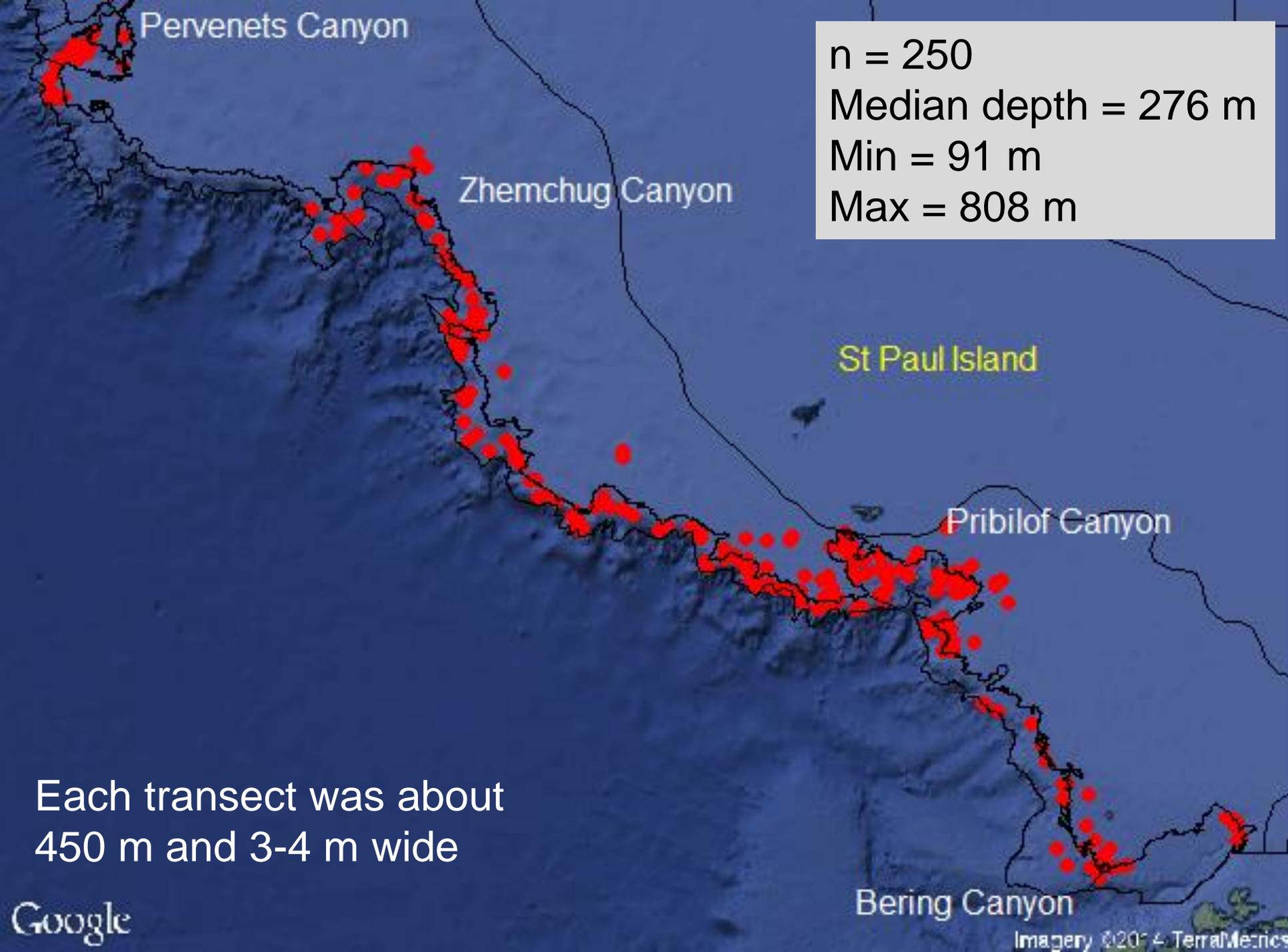


Stereo drop camera

15 minute tows

300 Randomly selected stations
more effort in areas of higher
probability (realized $n = 250$)

~225,000 paired seafloor images



Pervenets Canyon

n = 250

Median depth = 276 m

Min = 91 m

Max = 808 m

Zhemchug Canyon

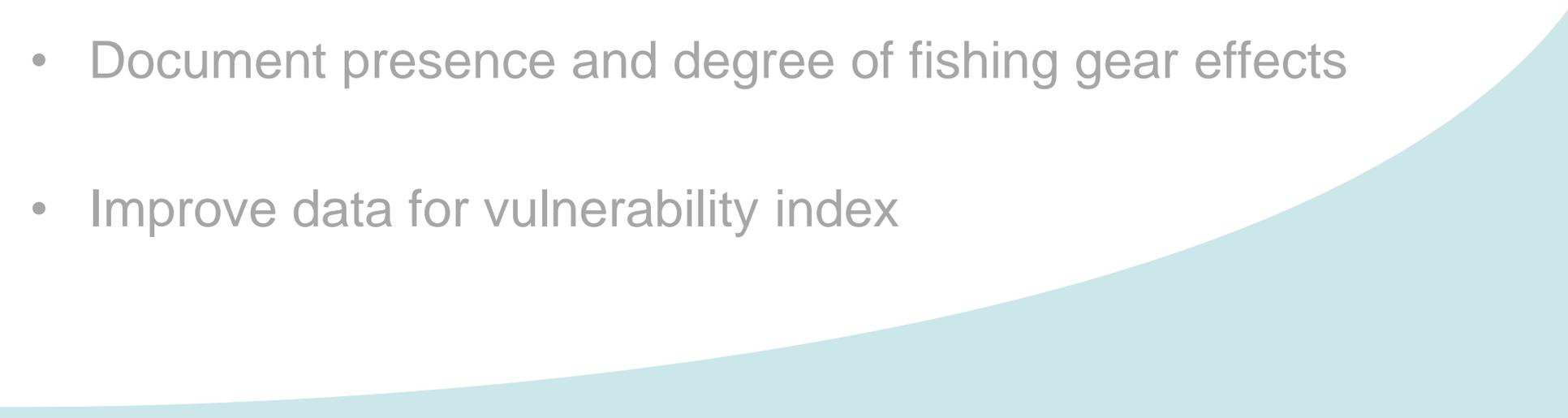
St Paul Island

Pribilof Canyon

Each transect was about
450 m and 3-4 m wide

Bering Canyon

Fieldwork results

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- 

Swiftia sp.
Total number = 537



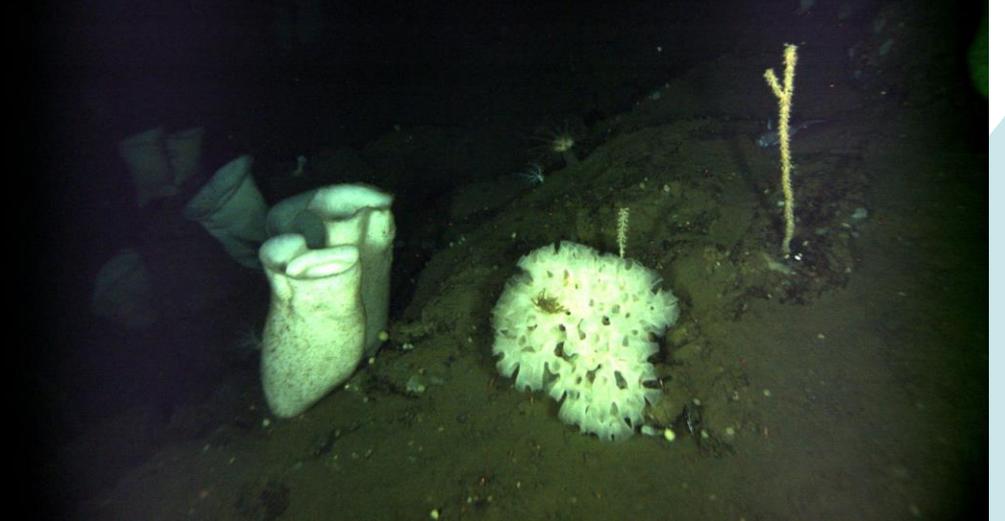
Primnoidae
Total number = 40



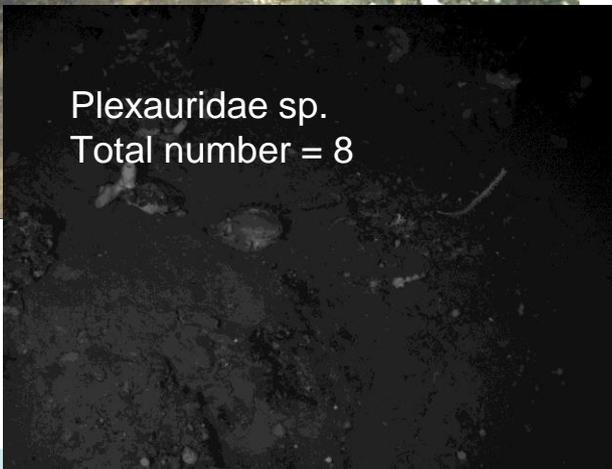
Plumarella sp.
Total number = 811



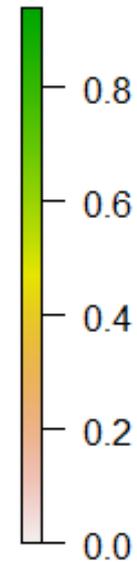
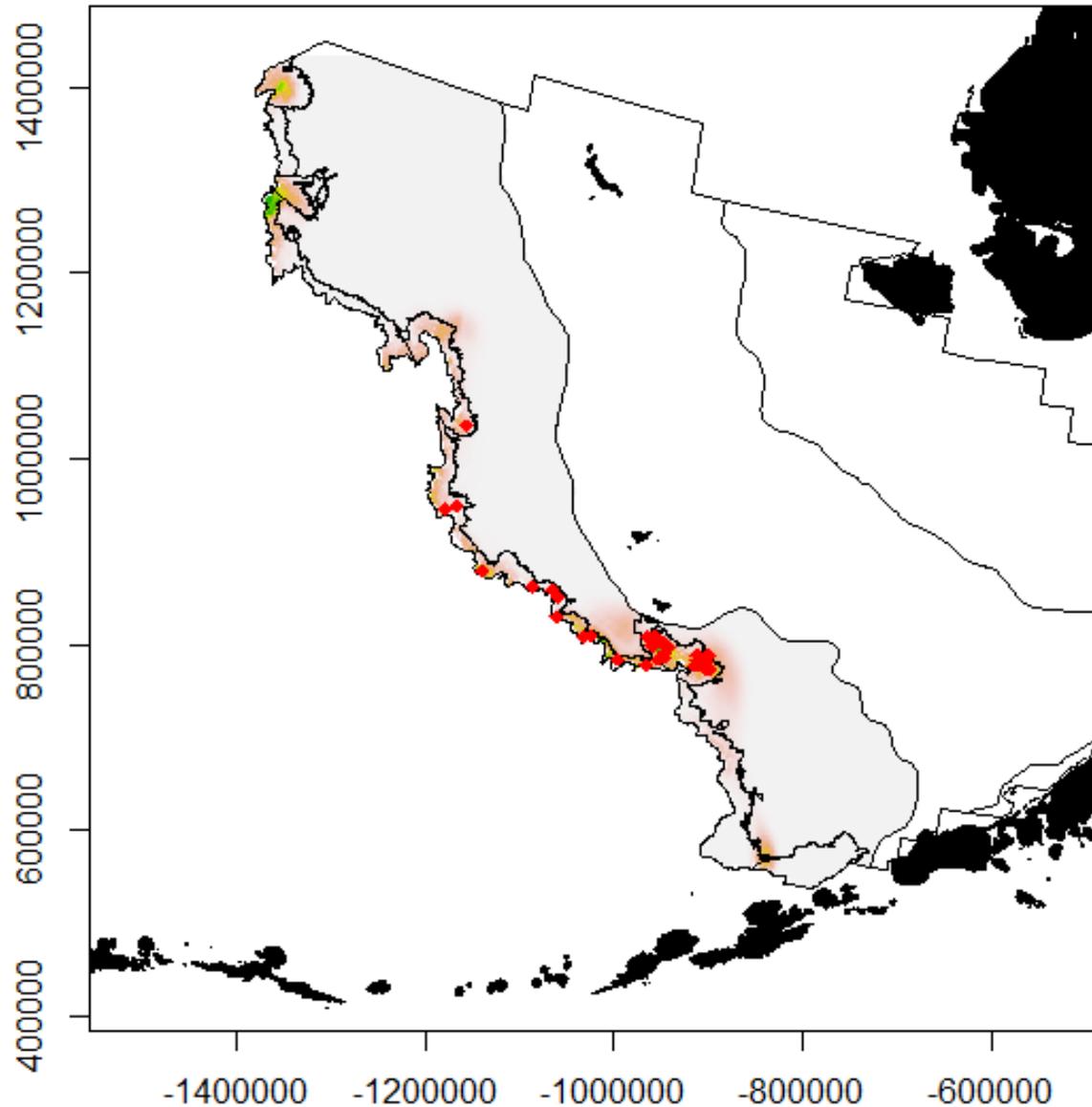
Isididae sp.
Total number = 69



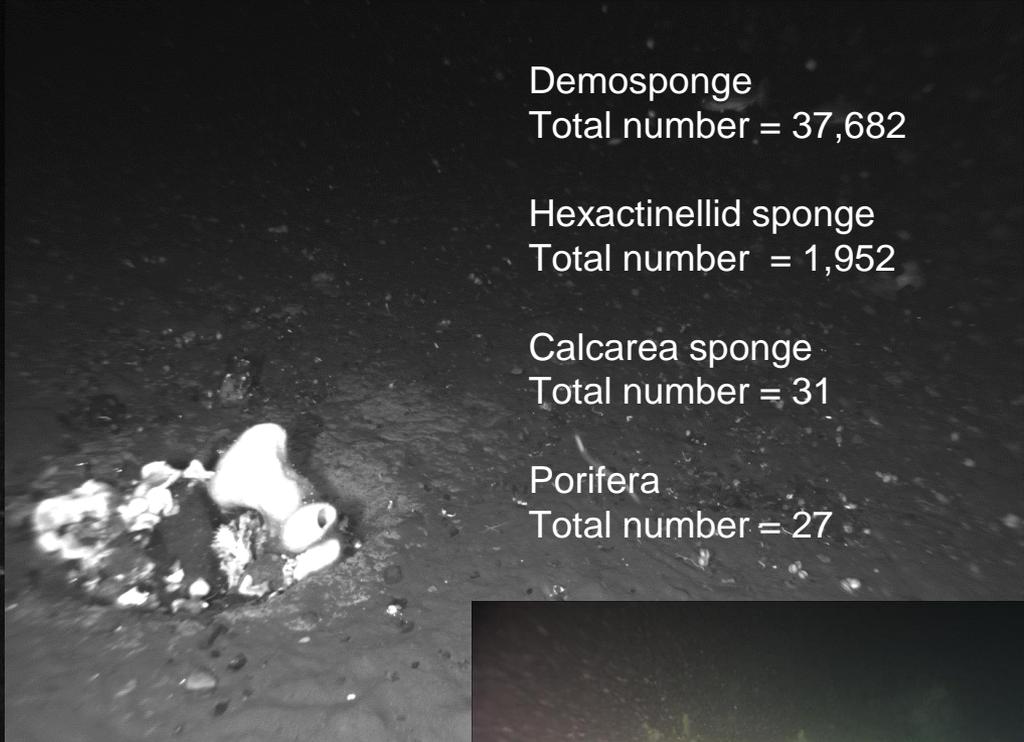
Plexauridae sp.
Total number = 8



Coral Results



n = 32(13%)
Median depth = 451 m
Min = 201 m
Max = 770 m

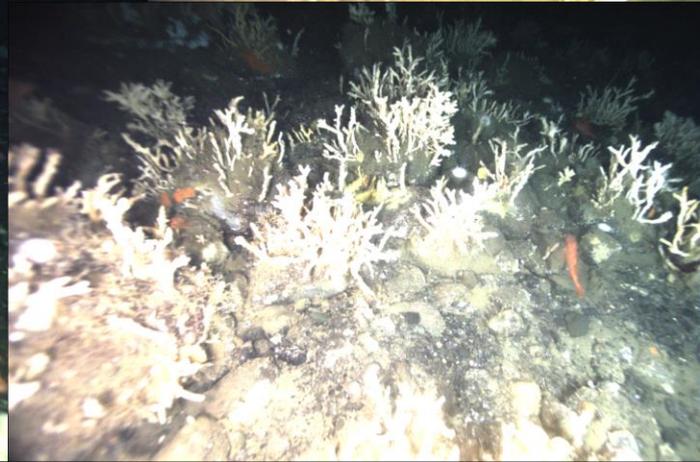
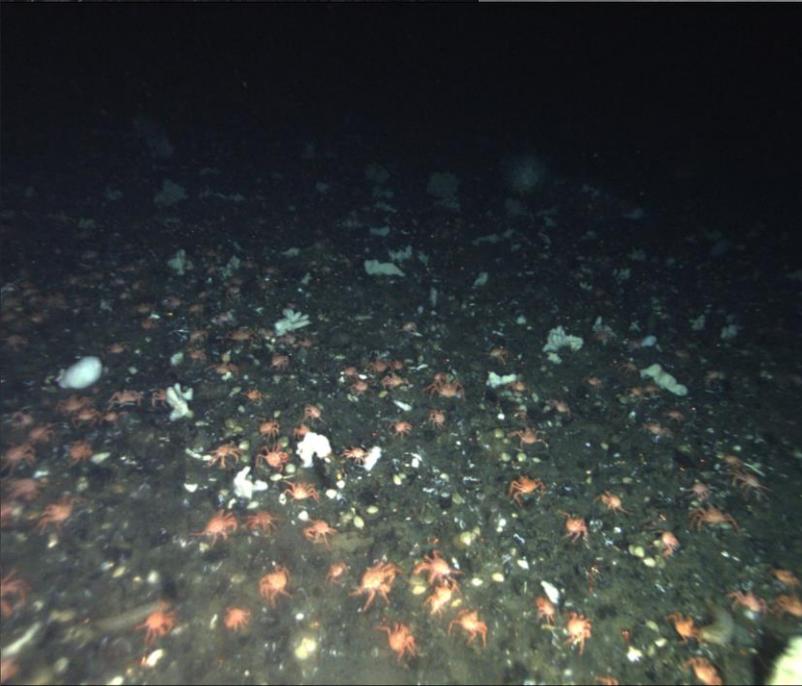


Demosponge
Total number = 37,682

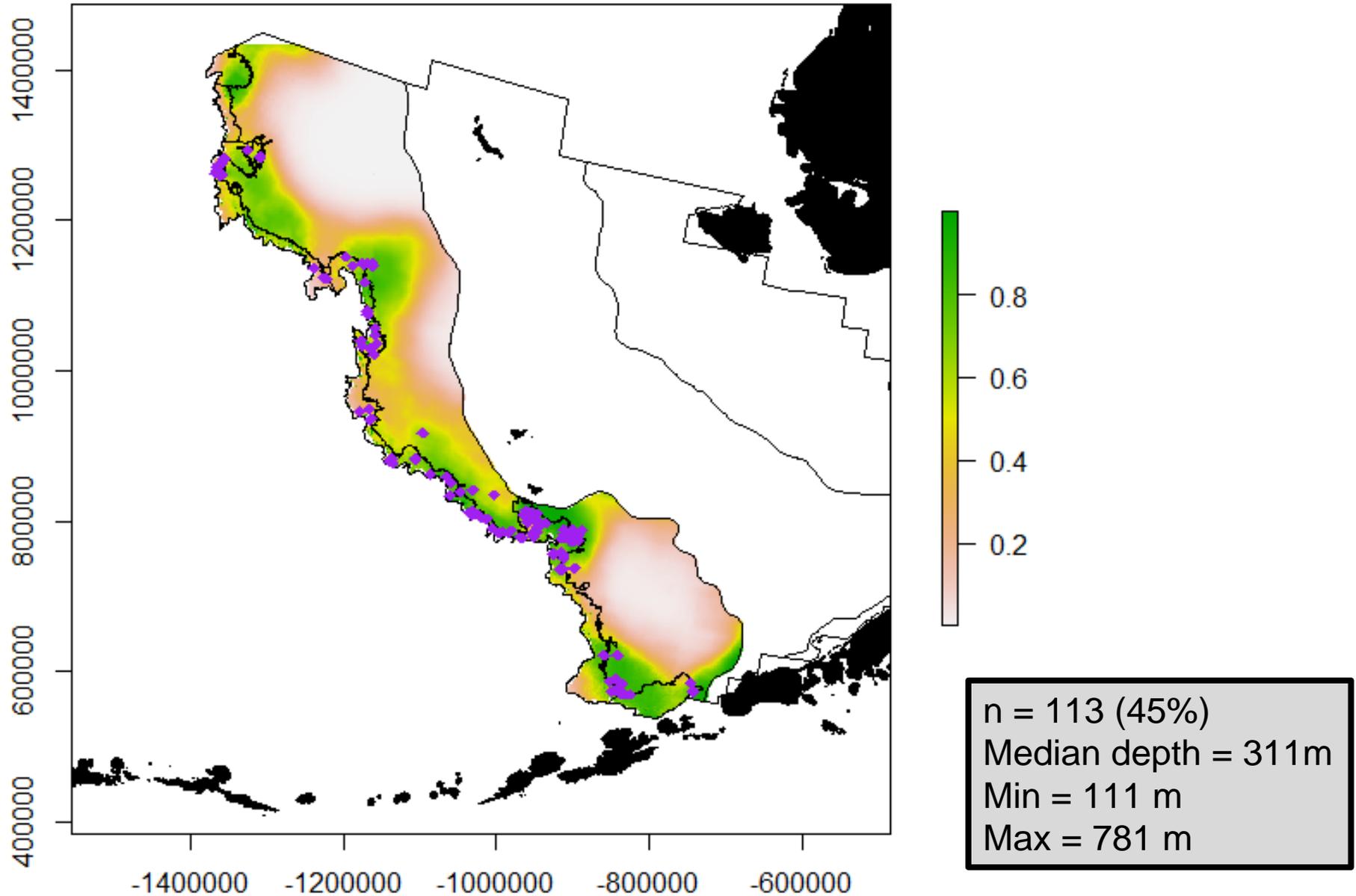
Hexactinellid sponge
Total number = 1,952

Calcarea sponge
Total number = 31

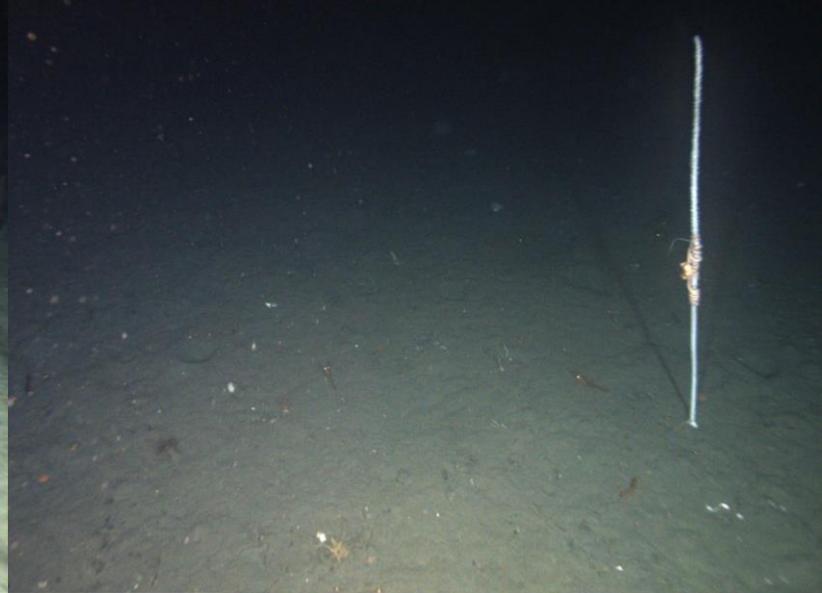
Porifera
Total number = 27



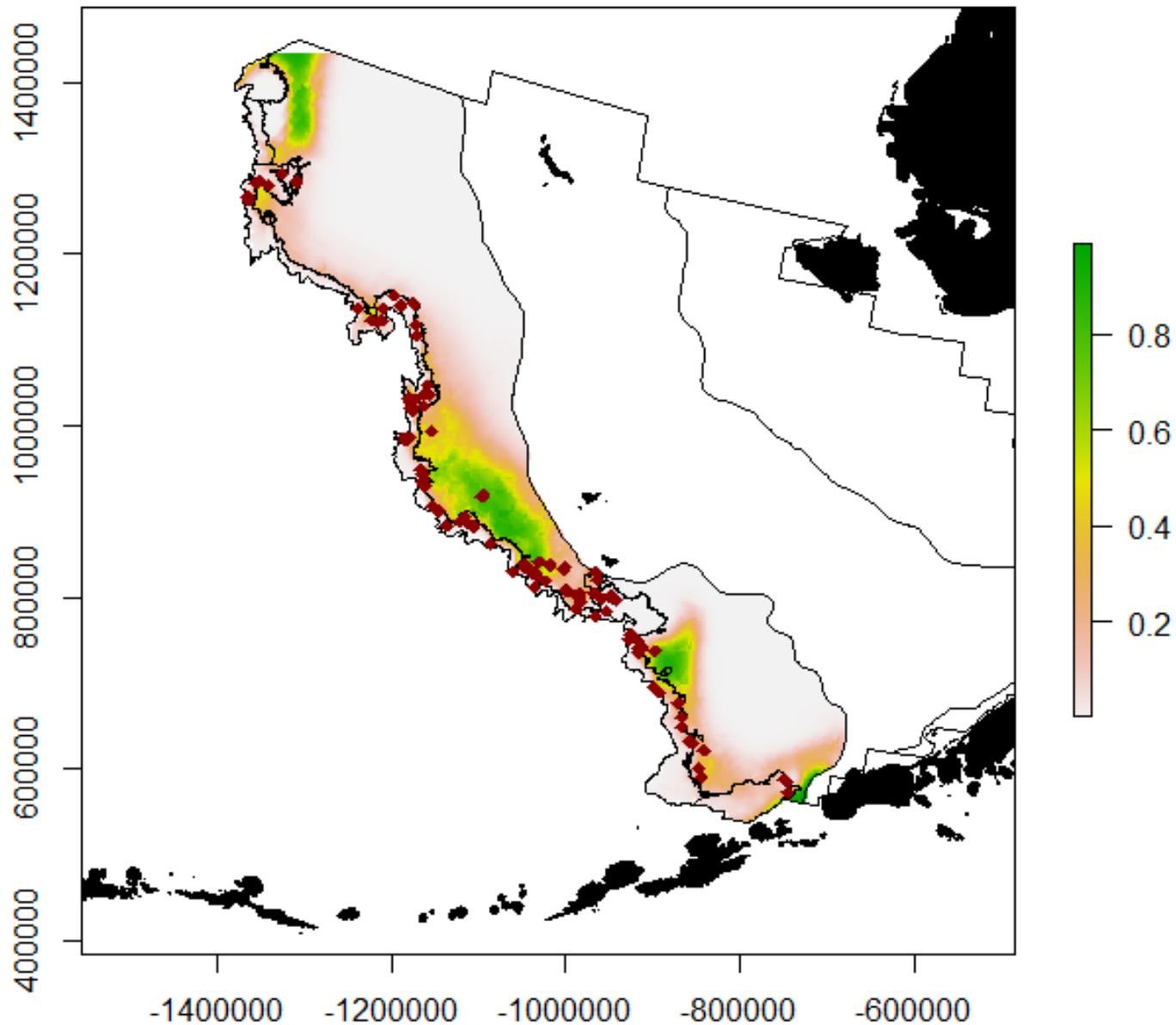
Sponge Results



Halipteris
Total number = 29,435



Sea Whips Results

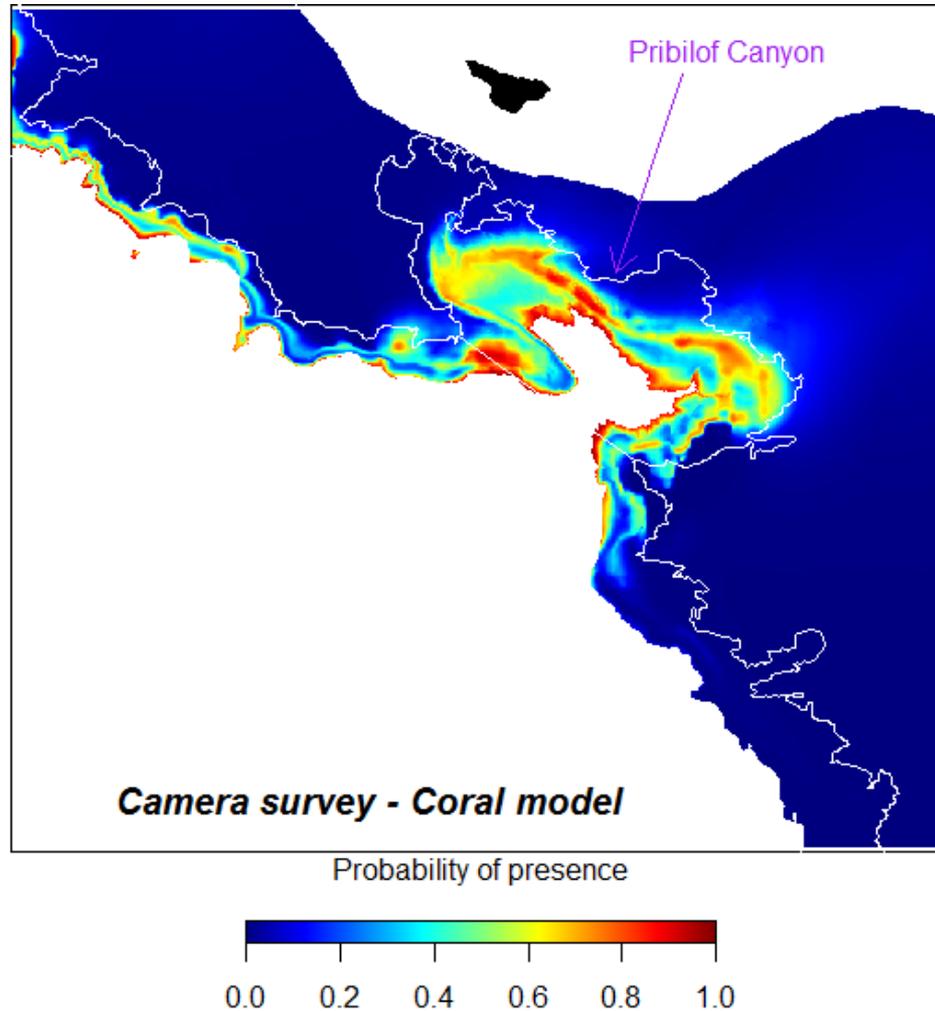


n = 105 (42%)
Median depth = 266 m
Min = 91 m
Max = 760 m

Fieldwork results

- Validate model predictions
 - **Improve/refine predictions of coral presence**
 - Acquire height and density data for coral
 - Identify the role of these coral as fish habitat
 - Document presence and degree of fishing gear effects
 - Improve data for vulnerability index
- 

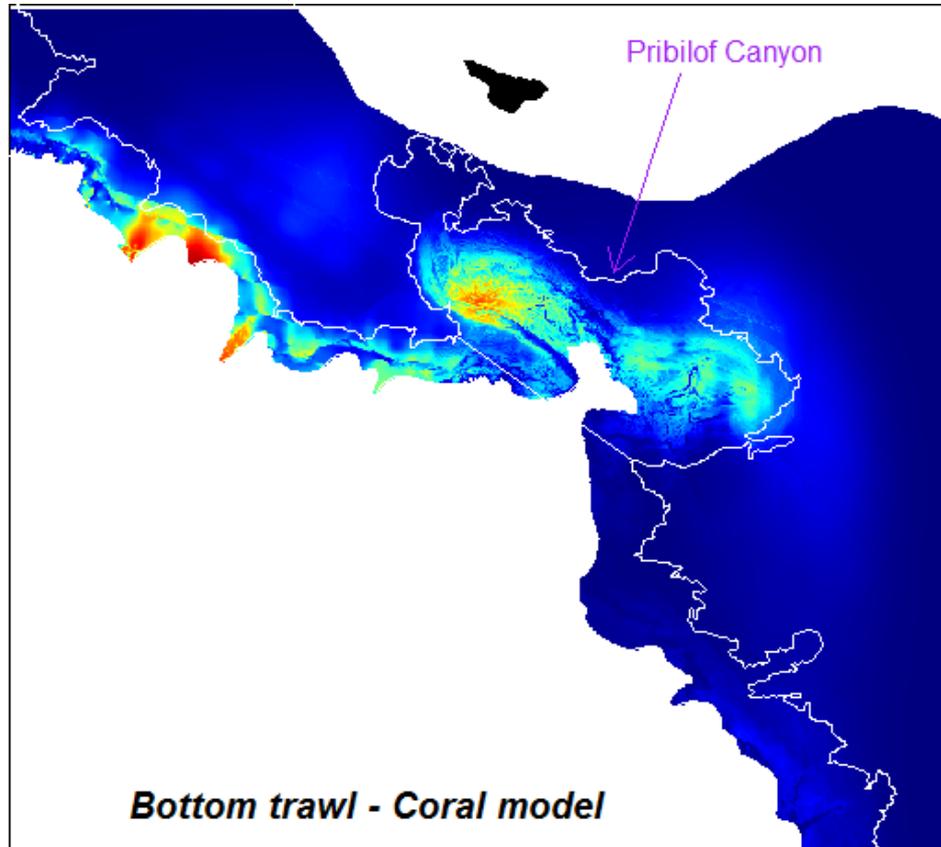
Probability coral present based on camera survey



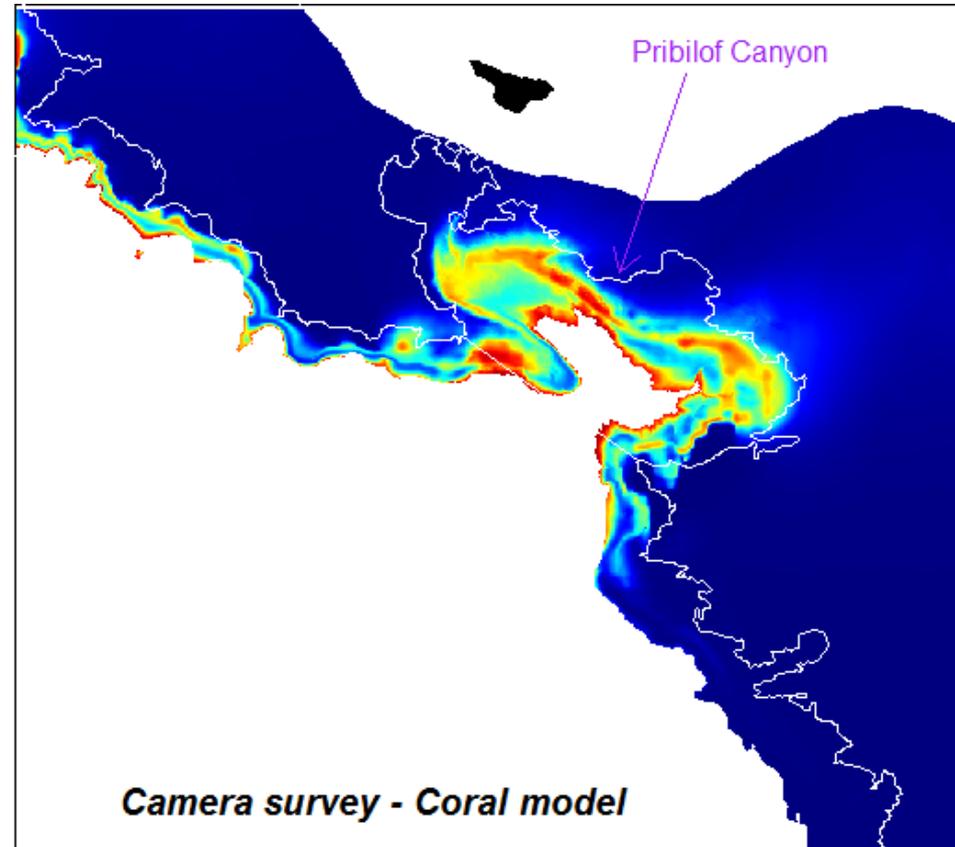
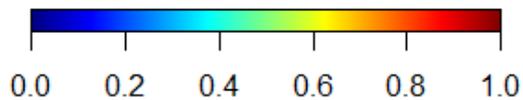
Combine models

Trawl survey data

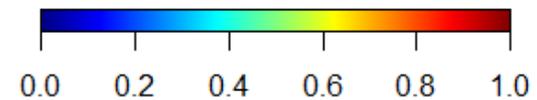
Camera survey data



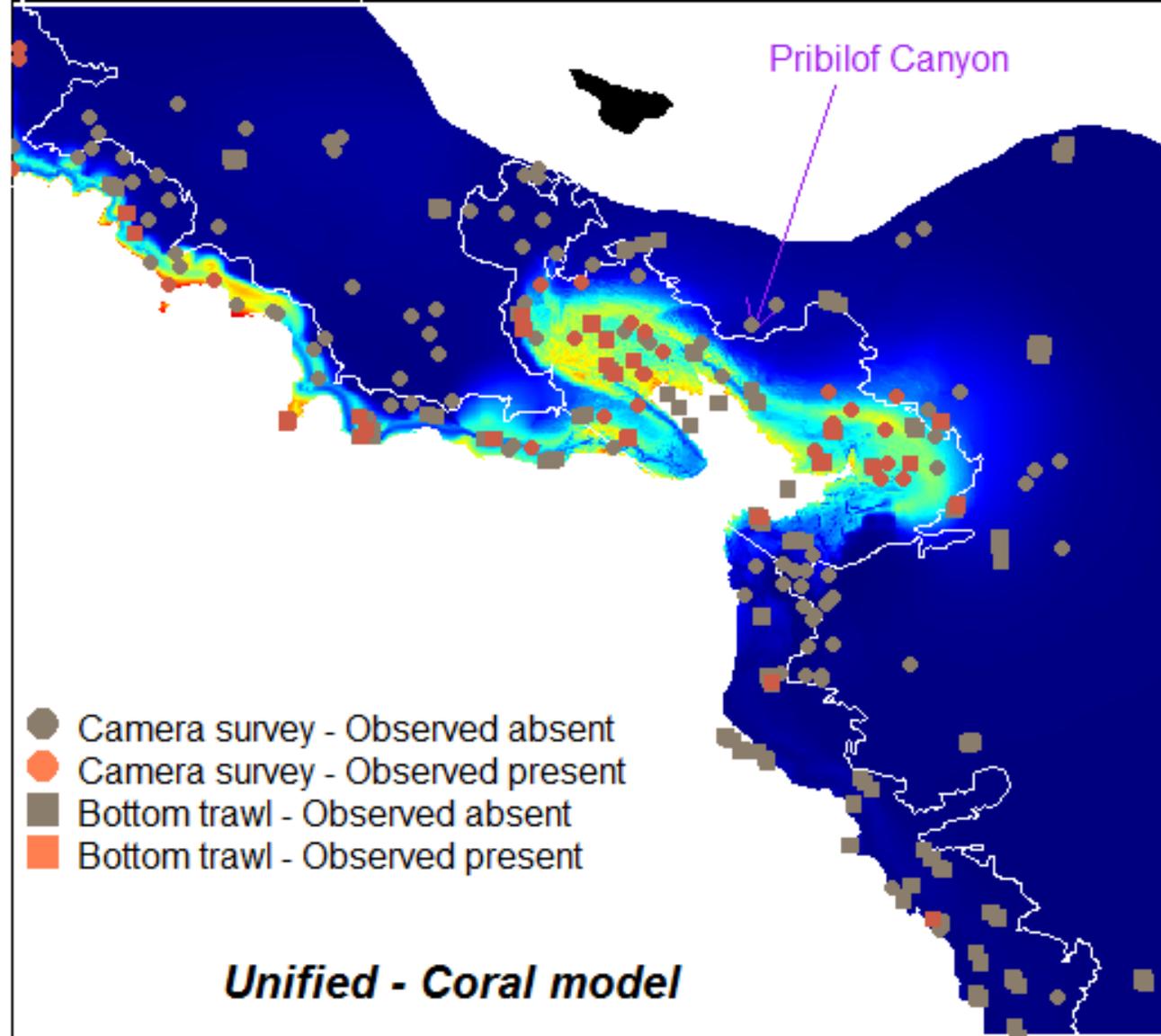
Probability of presence



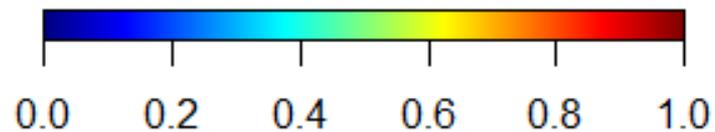
Probability of presence



Probability
coral present,
unified coral
model,
Pribilof
Canyon



Probability of presence

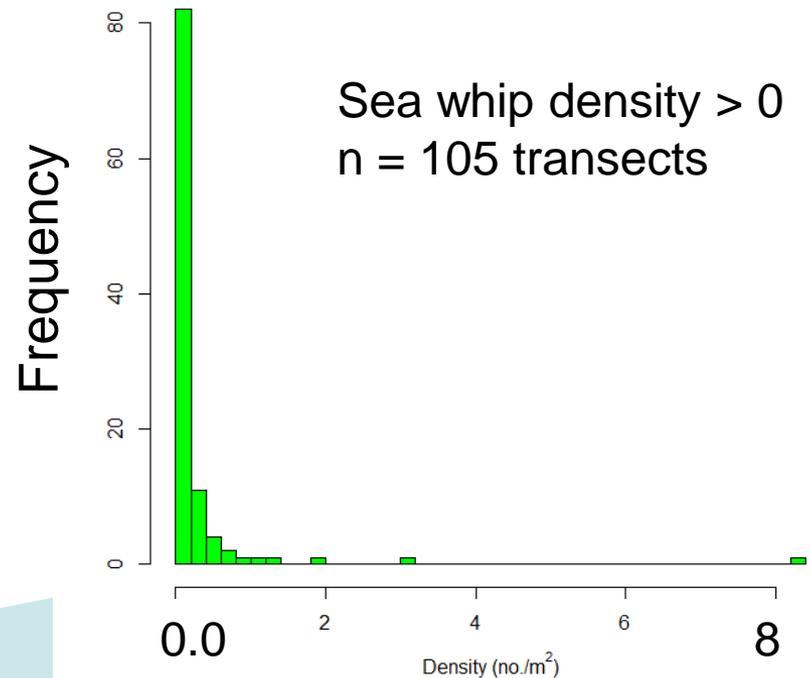
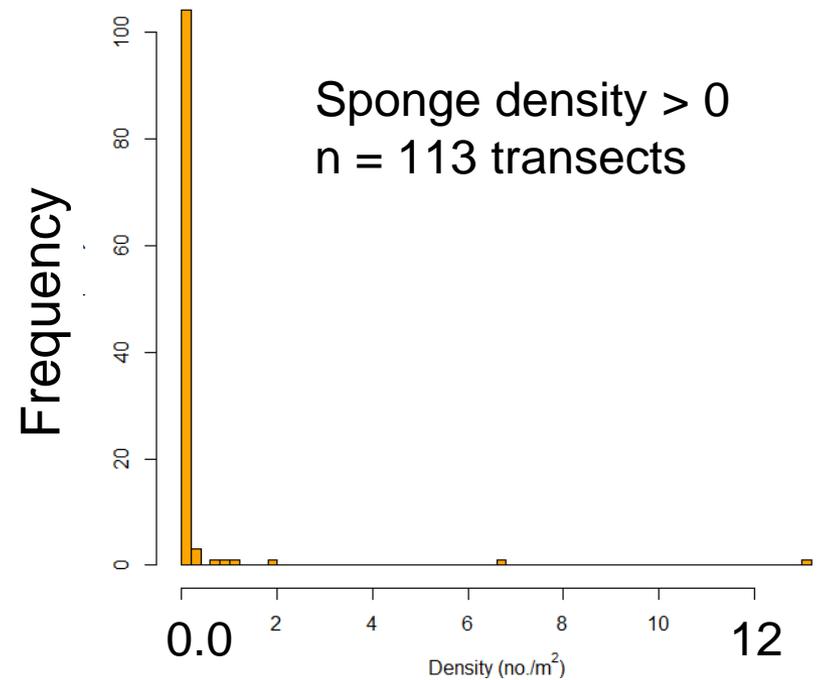
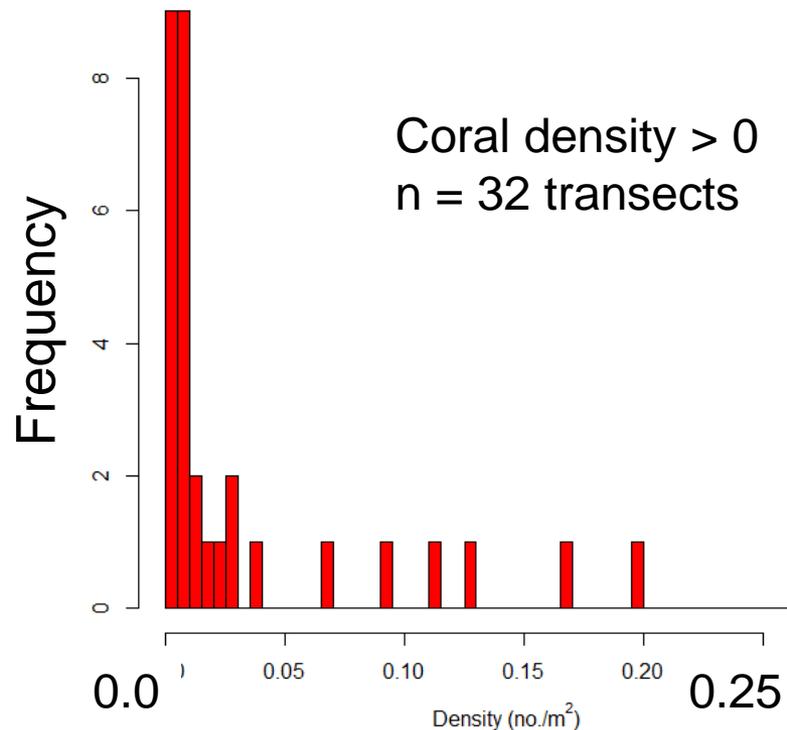


Fieldwork results

- Validate model predictions
 - Improve/refine predictions of coral presence
 - **Acquire height and density data for coral**
 - Identify the role of these coral as fish habitat
 - Document presence and degree of fishing gear effects
 - Improve data for vulnerability index
- 

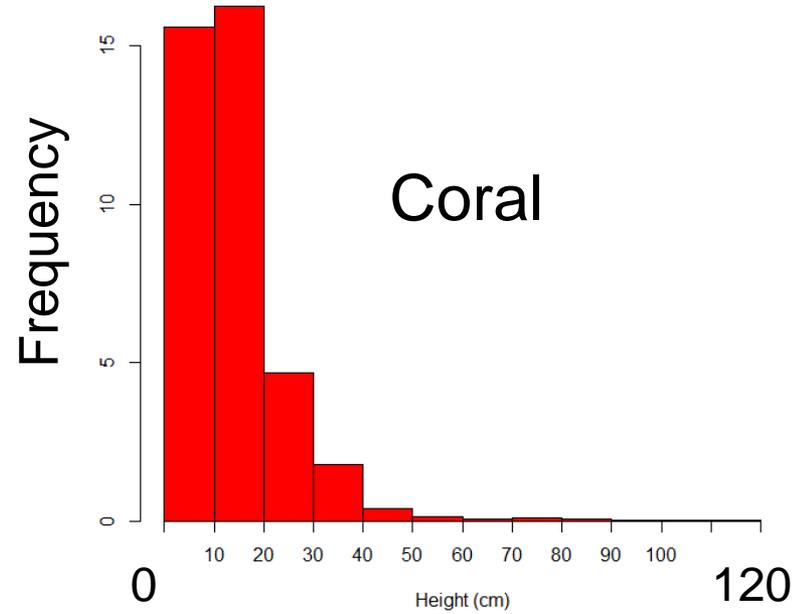
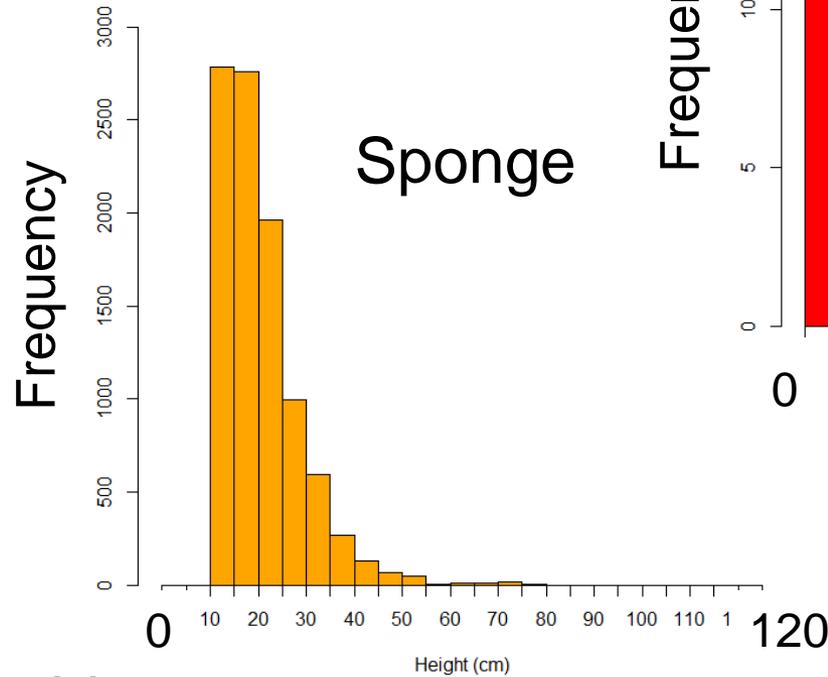
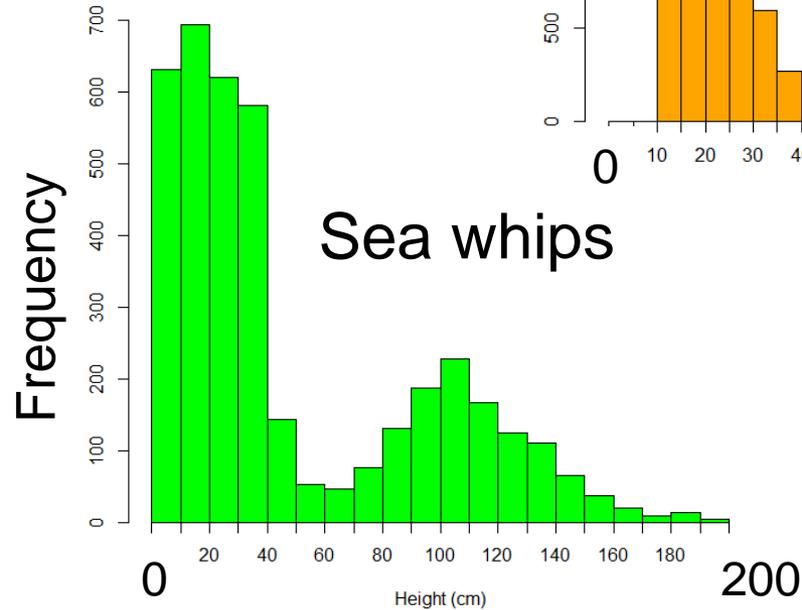
Observed densities

Camera survey

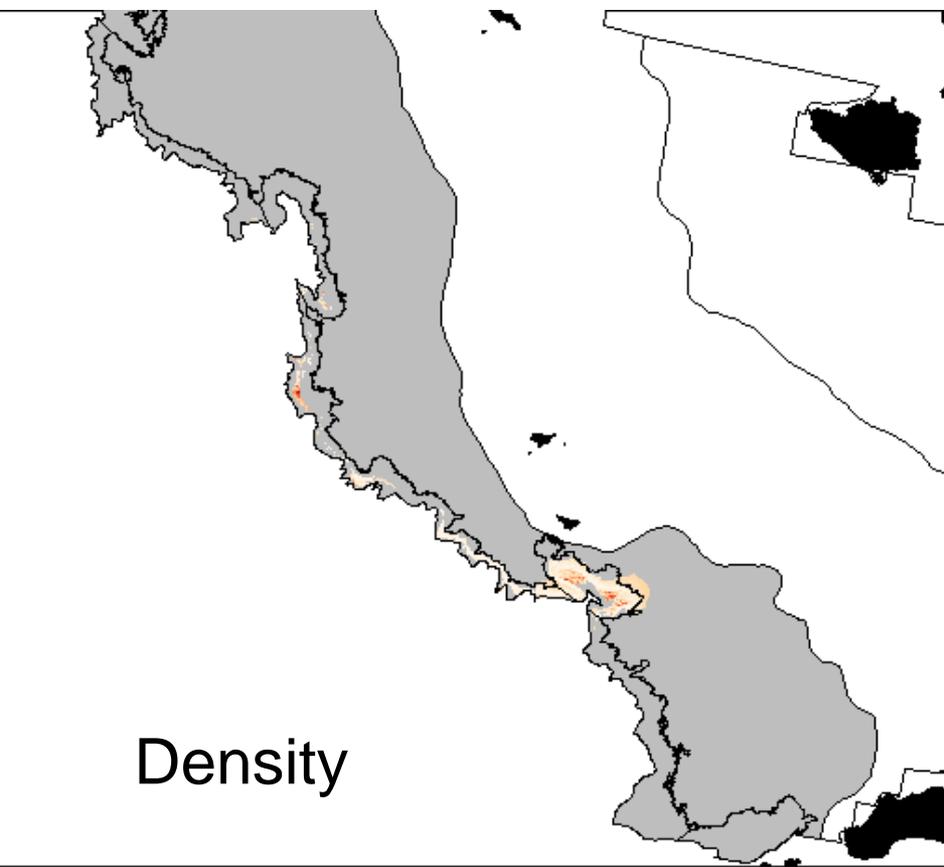


Observed heights

Camera survey

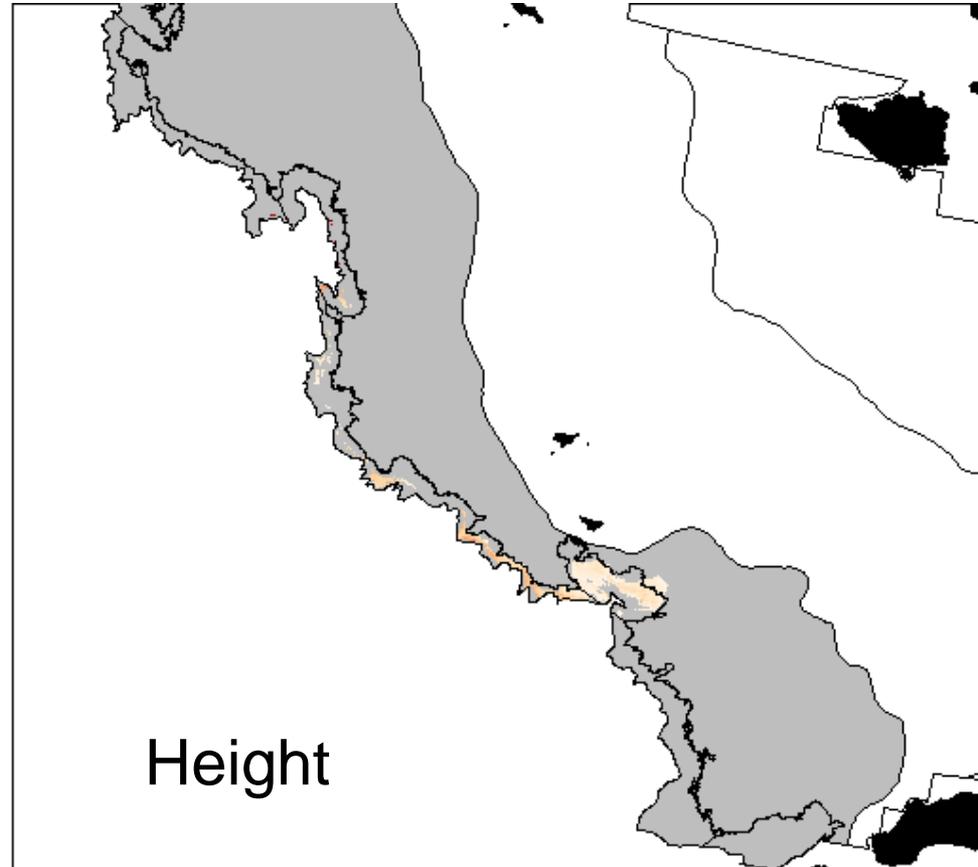
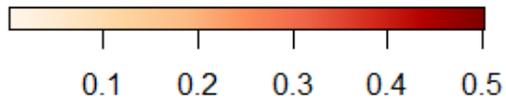


Coral density and height models (preferred)



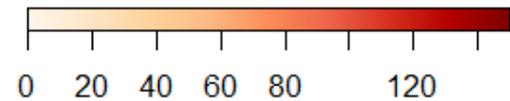
Density

Density (no./m²)

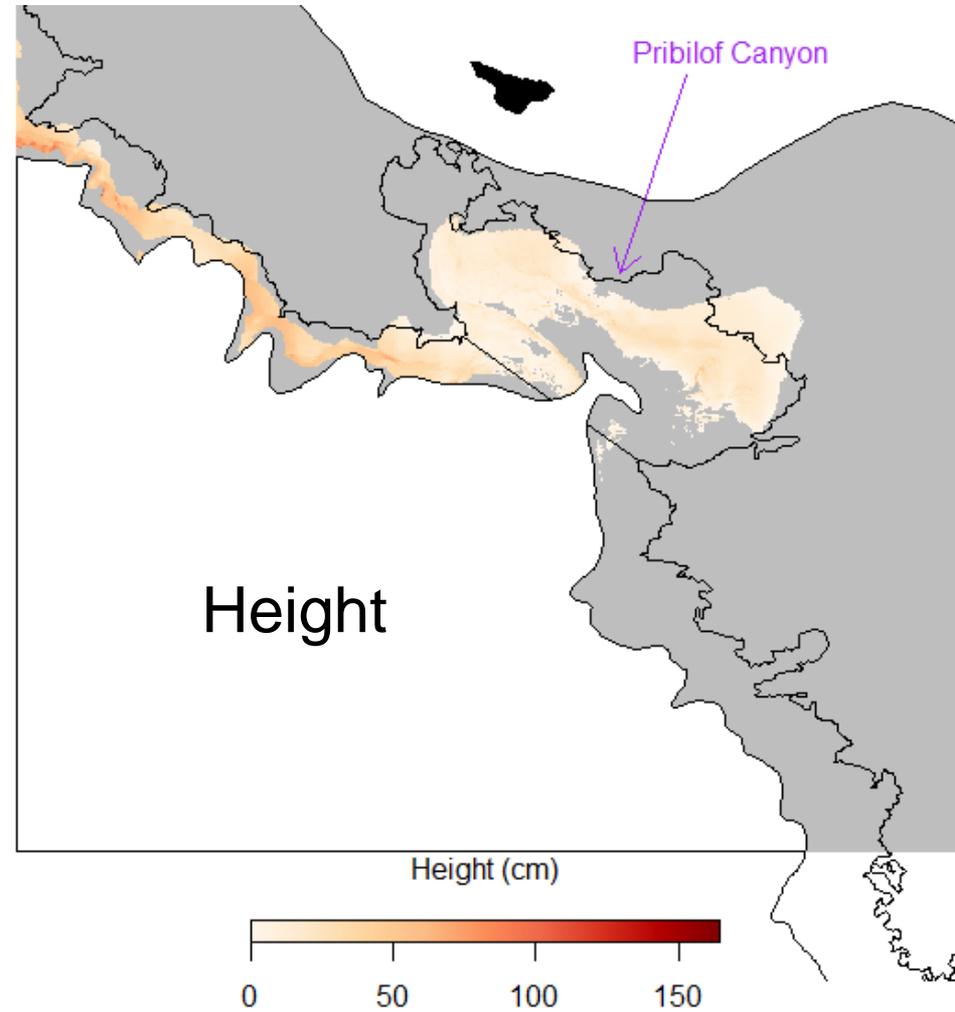
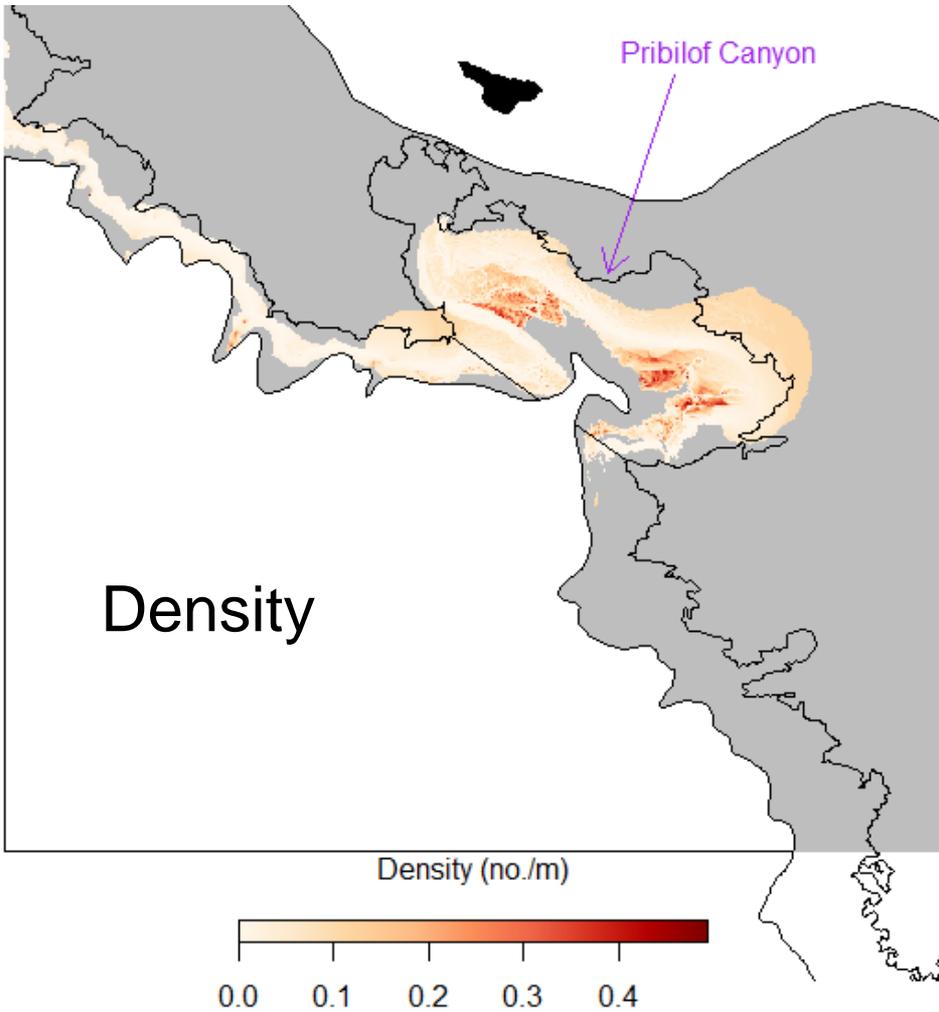


Height

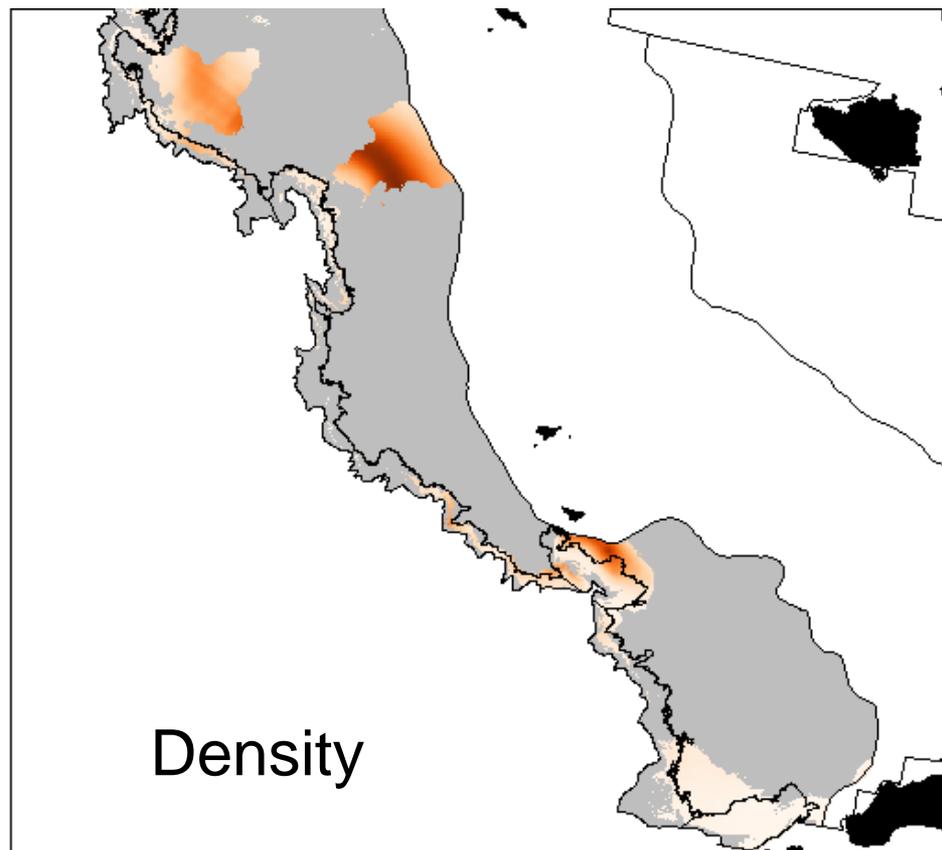
Height (cm)



Coral density and height models (preferred)

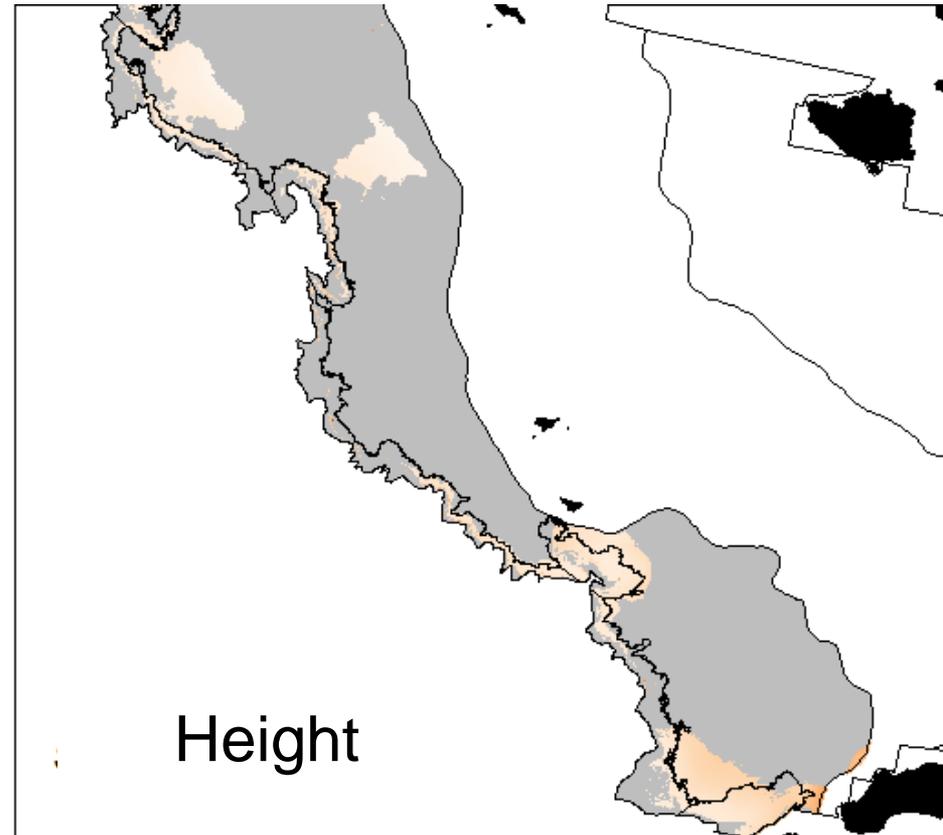
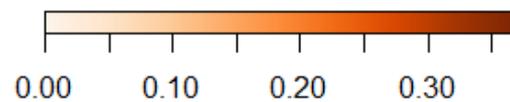


Sponge density and height models (preferred)



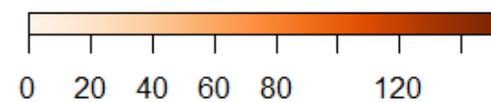
Density

Density (no./m²)

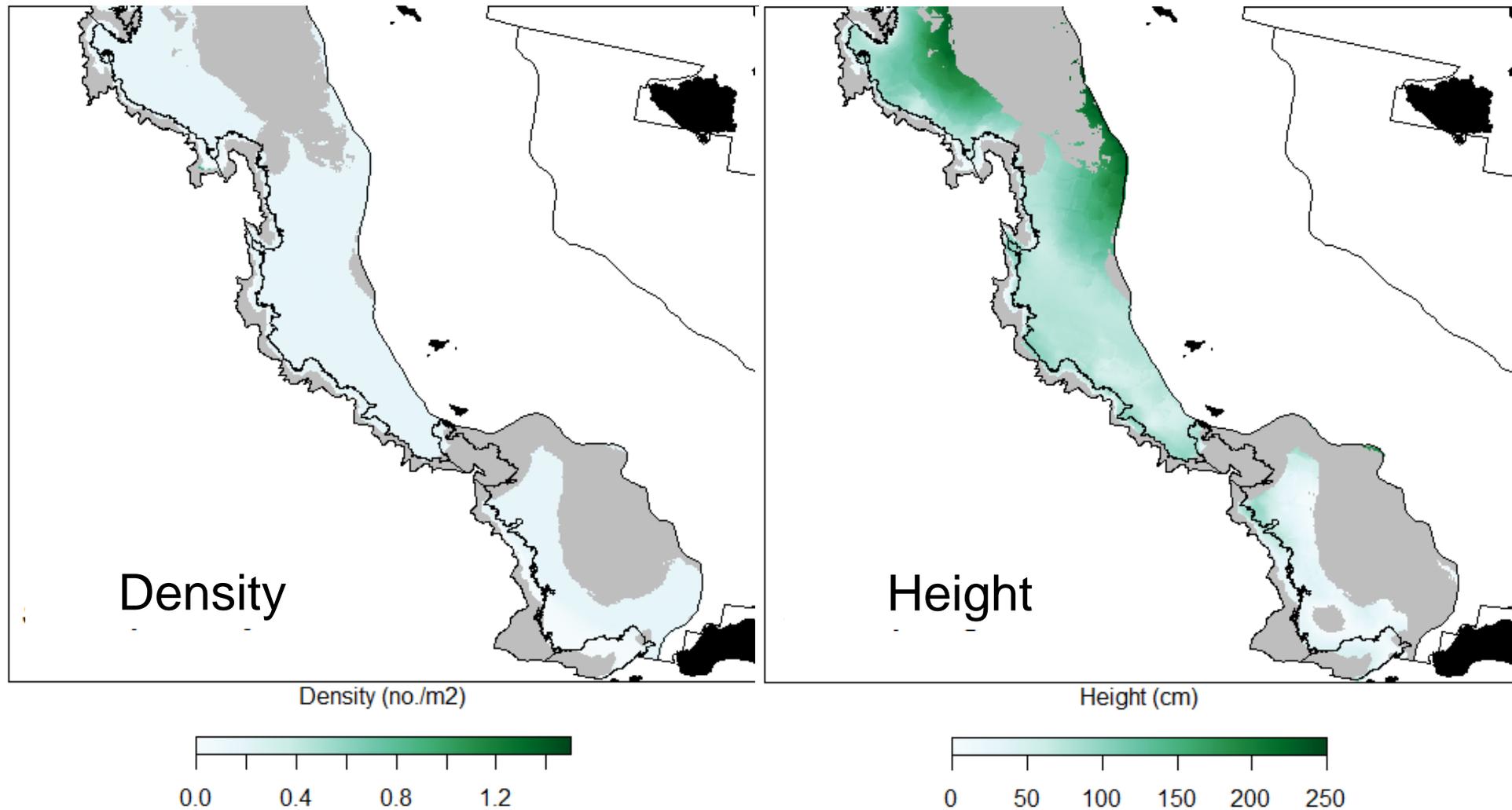


Height

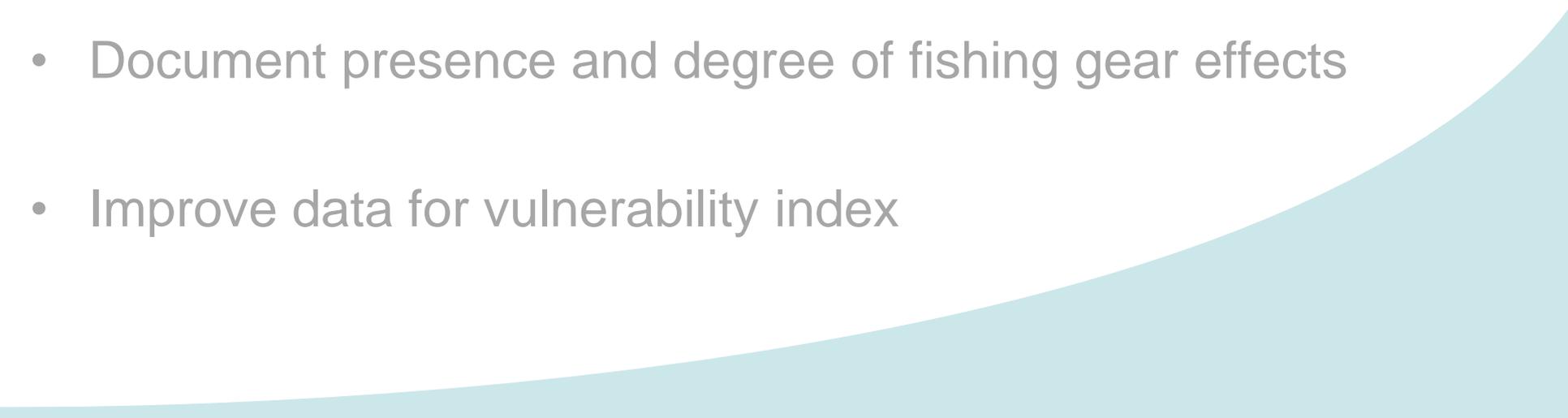
Height (cm)

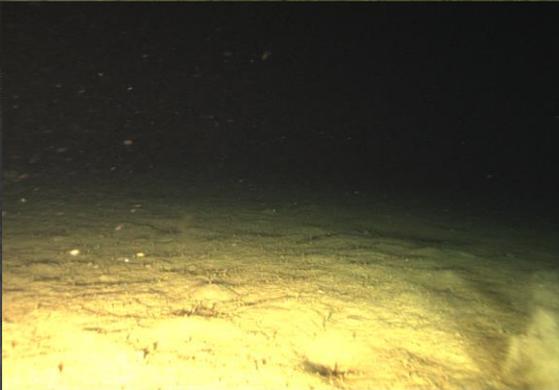
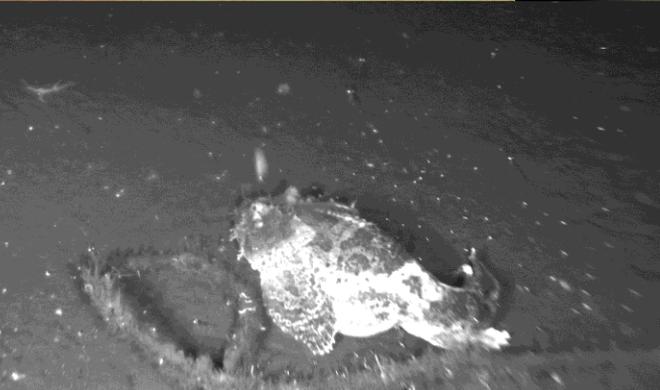


Sea whip density and height models (preferred)



Fieldwork results

- Validate model predictions
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 - **Identify the role of these coral as fish habitat**
 - Document presence and degree of fishing gear effects
 - Improve data for vulnerability index
- 



- 
- An underwater scene with several fish swimming in a dark, slightly hazy environment. A crab is visible on the left side. The bottom right corner of the image is a light blue gradient.
- Observed fishes and crabs = 7,362
 - Dominated by
 - Crabs
 - Eelpouts
 - Sculpins
 - Poachers
 - Snailfish
 - Flatfish
 - Grenadiers
 - Skates
 - Shortspine thornyhead
 - Pacific ocean perch

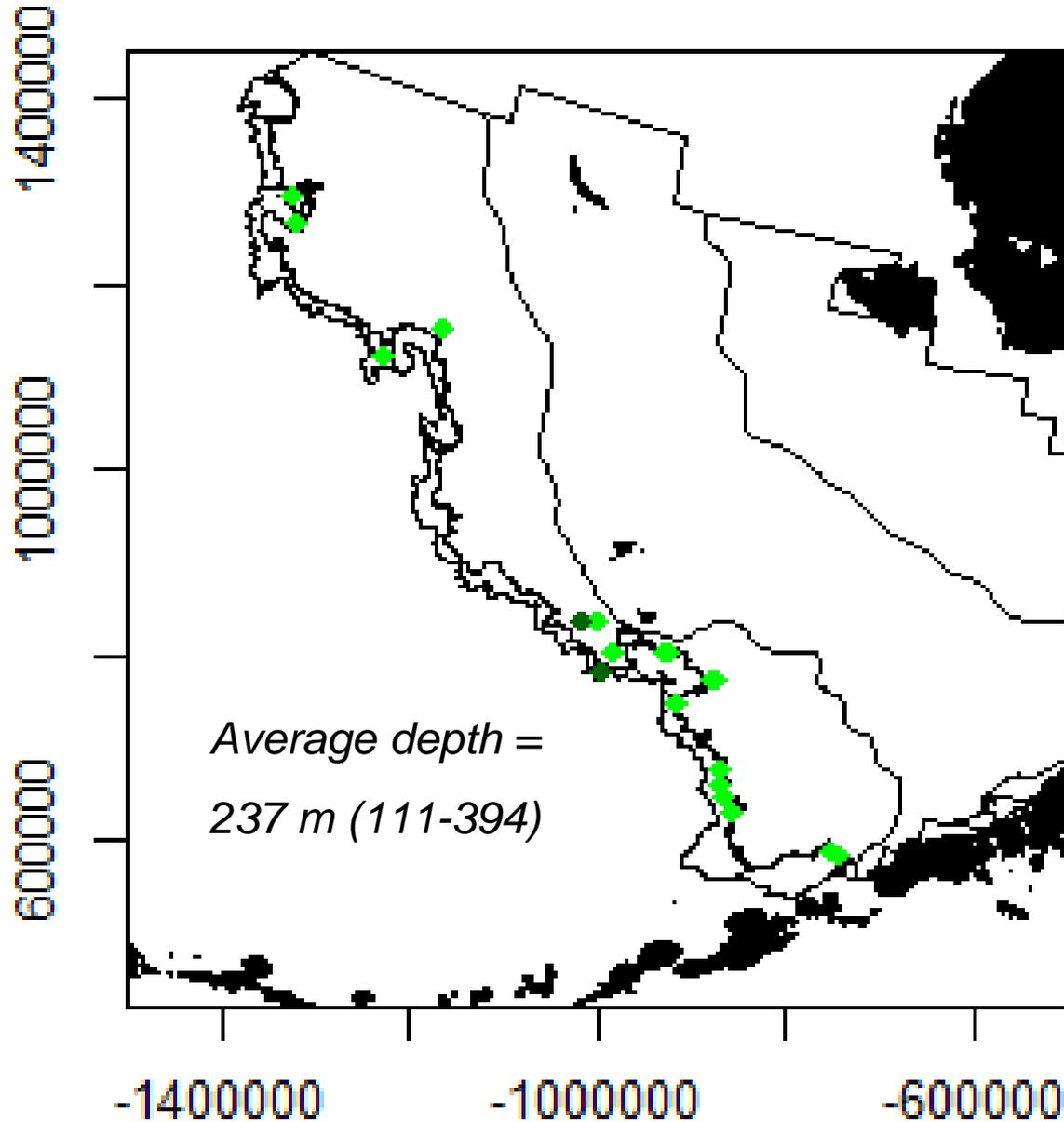
Effect of presence of invertebrates on fish density

Species/group	Main			
	Sponge	Coral	Whips	Depth
Rockfish (all Sebastes)	sig +	sig -	ns	sig
POP	sig +	ns	ns	sig
Shortraker	ns	sig +	ns	ns
SST	ns	ns	sig -	sig
Cod	ns	ns	sig -	sig
Sculpins	ns	ns	ns	sig
Grenadier	sig -	sig -	sig -	sig
Flatfish	ns	ns	sig +	sig
Pollock	ns	ns	ns	sig
Chionoecetes	sig -	sig -	ns	sig
King crabs	sig +	sig +	ns	sig
Skates	ns	ns	ns	sig
Northern rockfish	ns	ns	ns	ns
Rougheye/blackspotted	ns	sig +	ns	ns
Sablefish	ns	ns	ns	ns

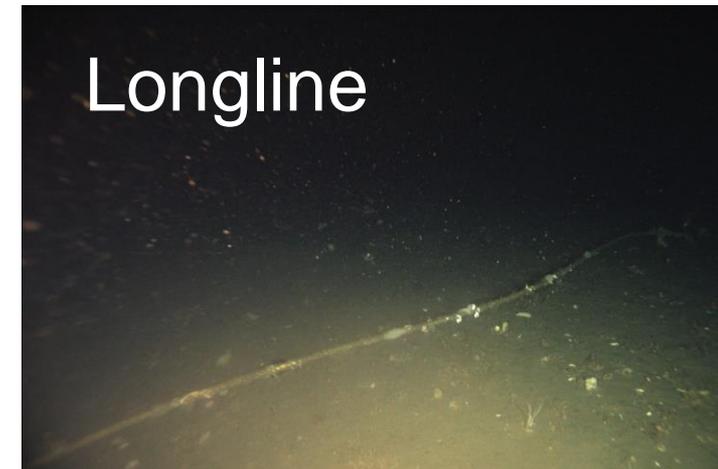
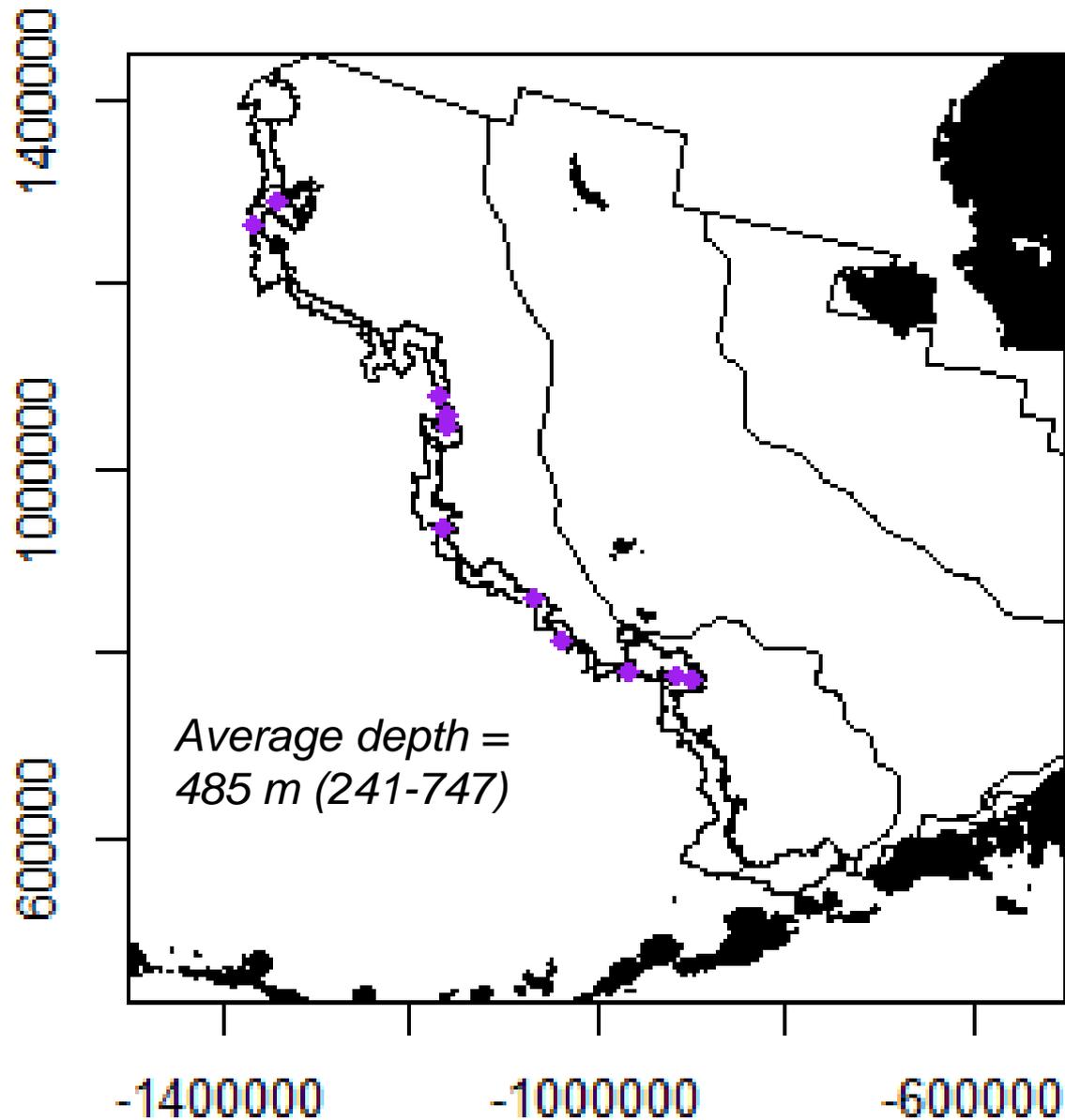
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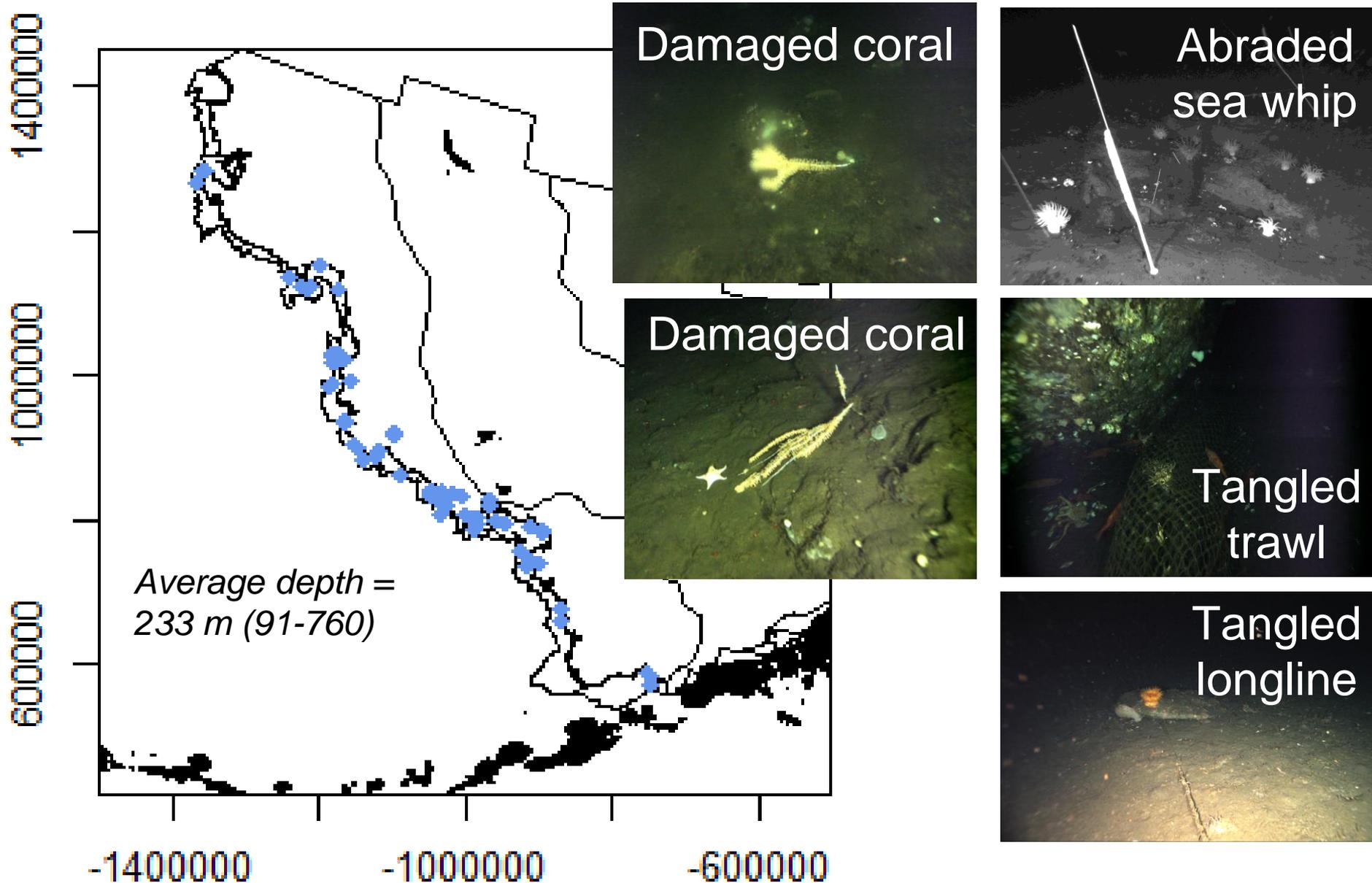
Trawl net or tracks (n = 21 transects)



Longline or crab gear (n = 11 transects)



Damaged invertebrates (n = 68 transects)



Summary

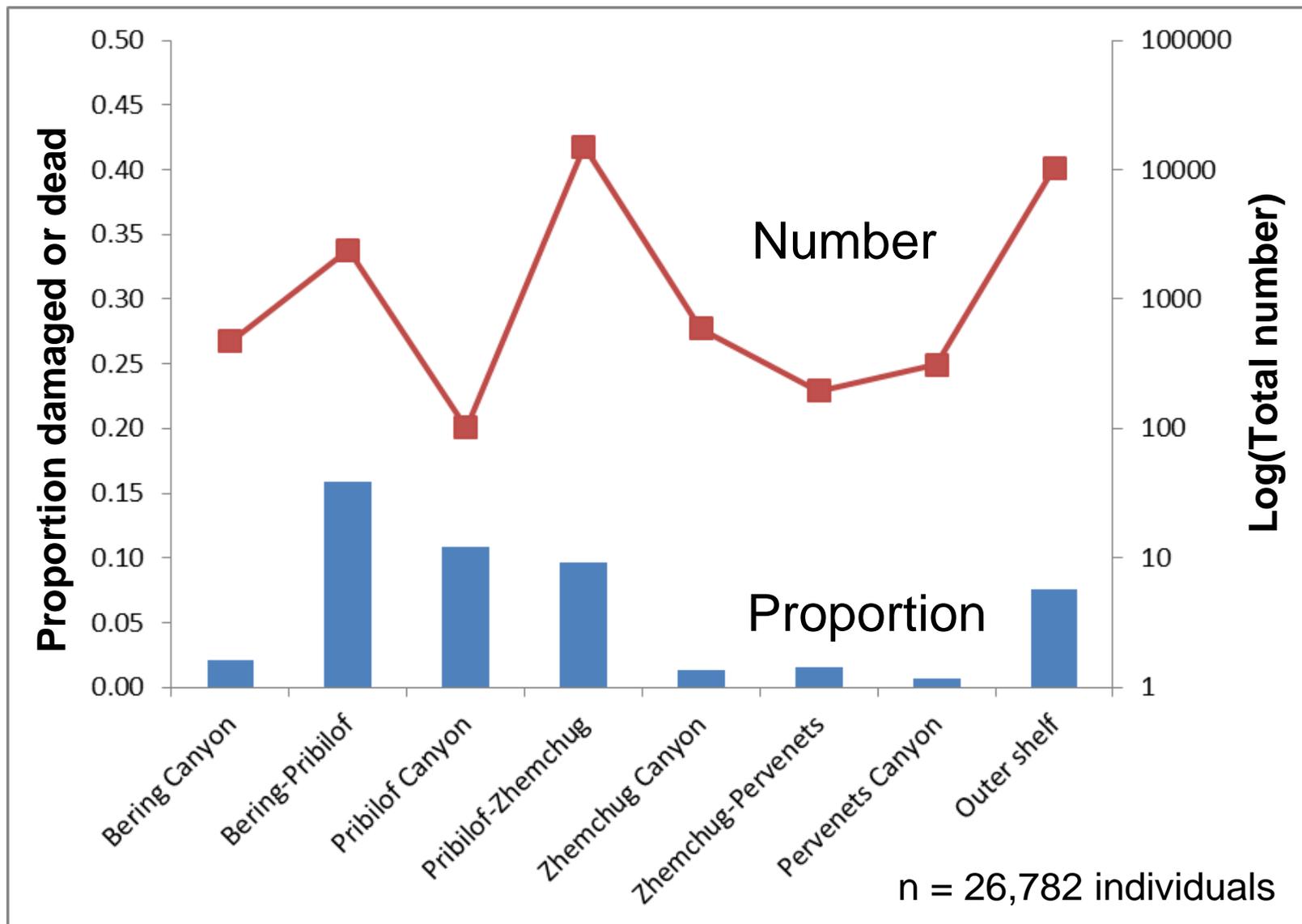
Classification	Number of transects	Percent of transects
Longline or crab gear	11	4%
Trawl net	2	1%
Trawl tracks	19	8%
Evidence of fishing subtotal 	32	13%
Damaged Isididae	2	1%
Damaged Demosponge	7	3%
Damaged Halipteris	60	24%
Damaged taxa subtotal 	68	27%
Damaged taxa <u>or</u> evidence of fishing total	92	37%
Damaged taxa <u>and</u> evidence of fishing total	8	3%

Damaged taxa

Classification	Number of transects	Percent of transects
Damaged Isididae (coral)	2	1%
Damaged Demosponge	7	3%
Damaged Halipteris (whip)	60	24%
Damaged taxa subtotal	68	27%

- No other damaged taxa were observed
- Cause of damage (i.e., anthropogenic or natural) is difficult to determine (but literature shows effects of fishing on size and viability)

Overall, 9% of individual sea whips were horizontal, damaged, or dead



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 - **Improve data for vulnerability index**
- 

Vulnerability

Function of:

- **Initial Size**
- **Initial Abundance**
- Recruitment
- Growth
- Impact rate

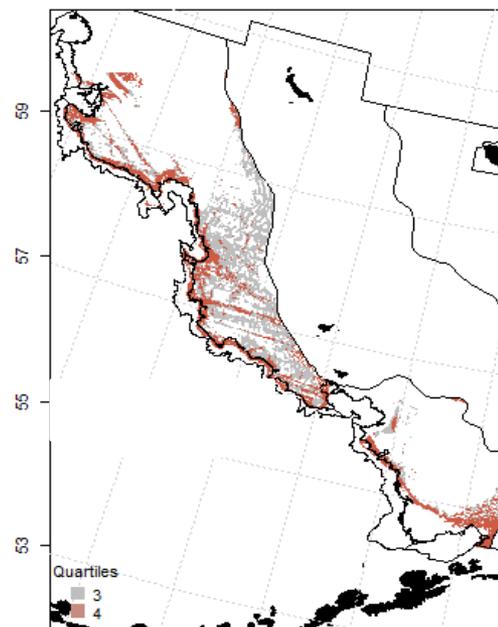
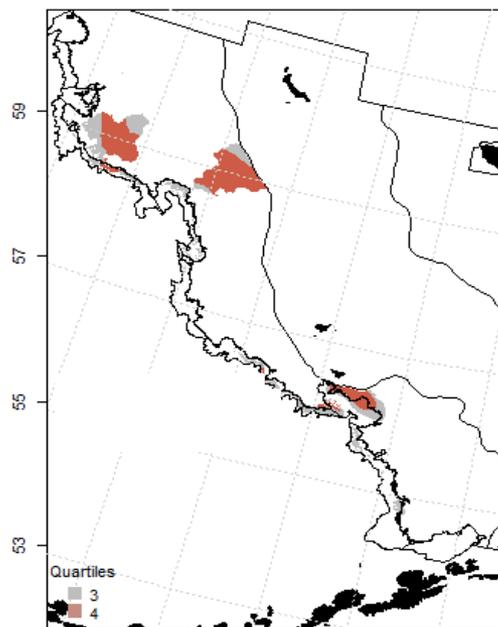
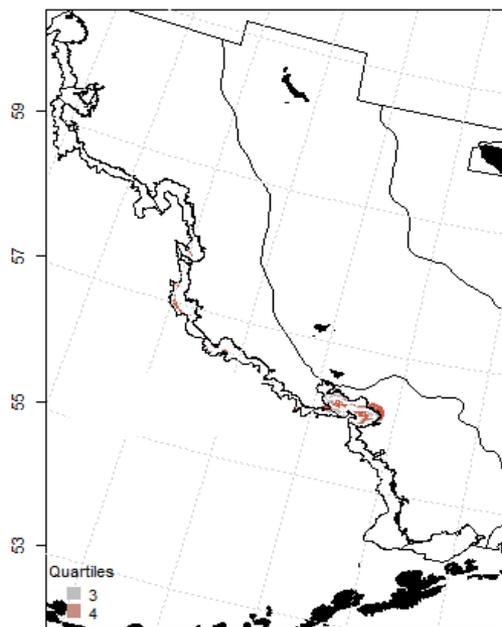


Coral

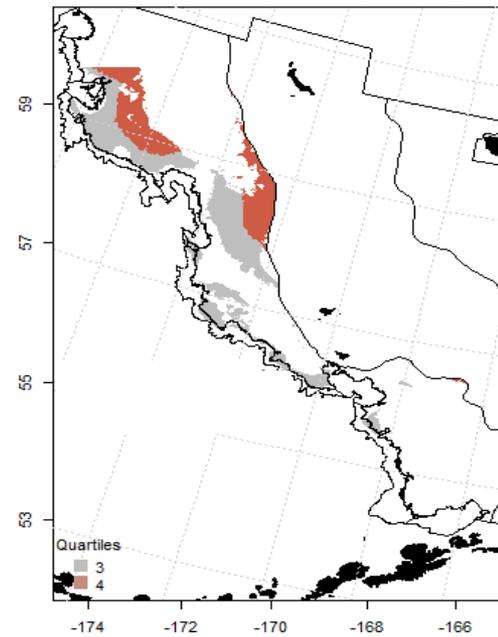
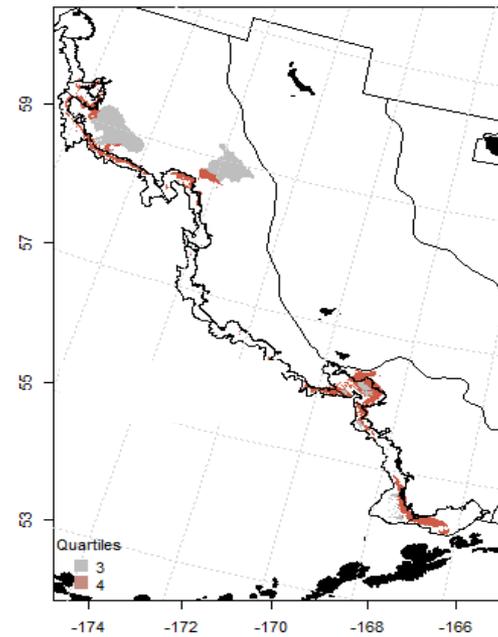
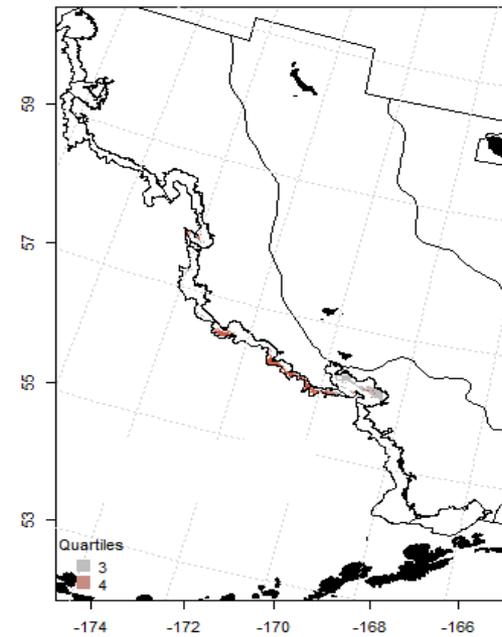
Sponge

Sea whips

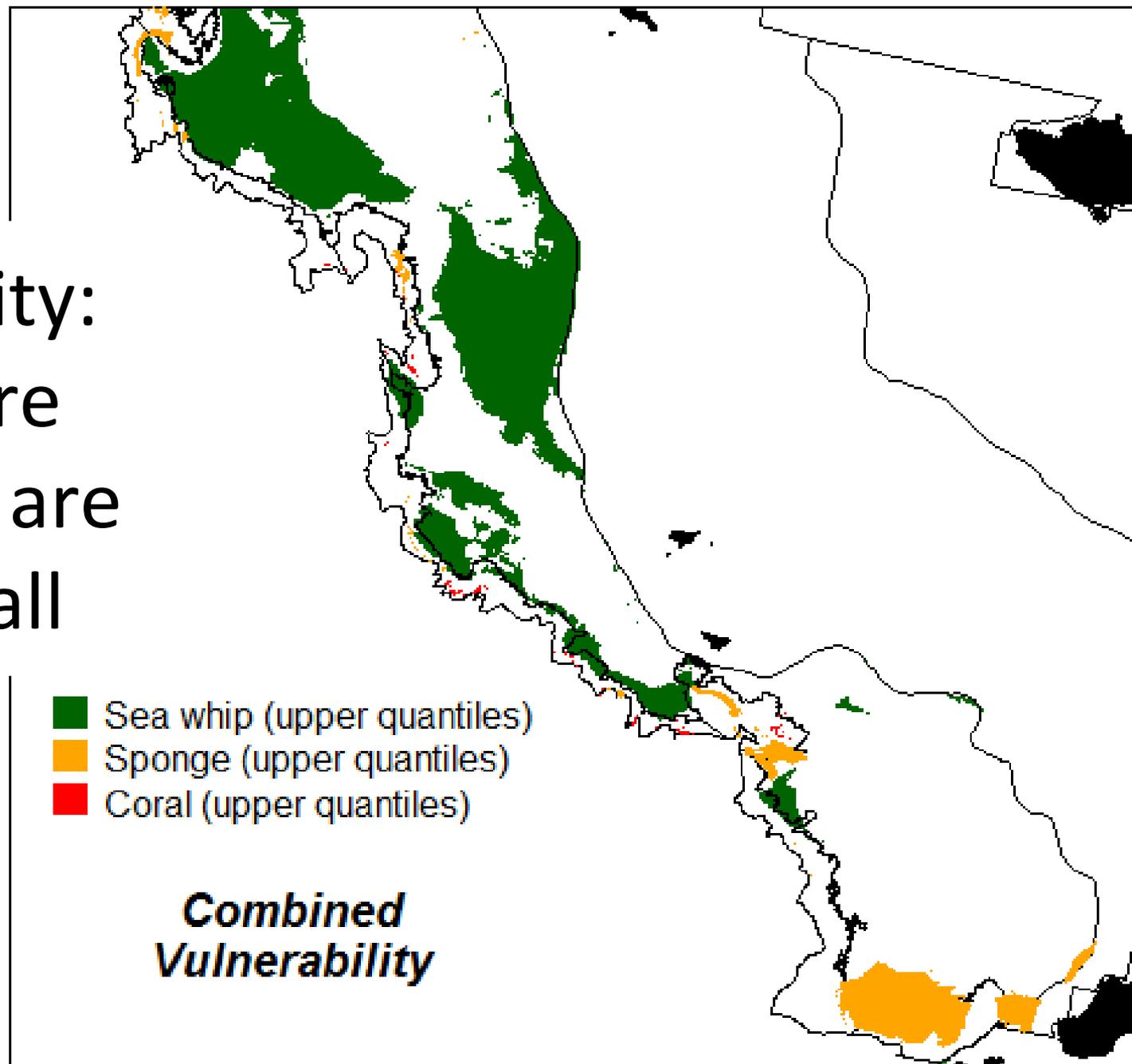
Denser



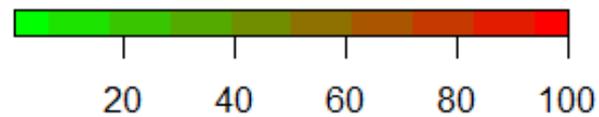
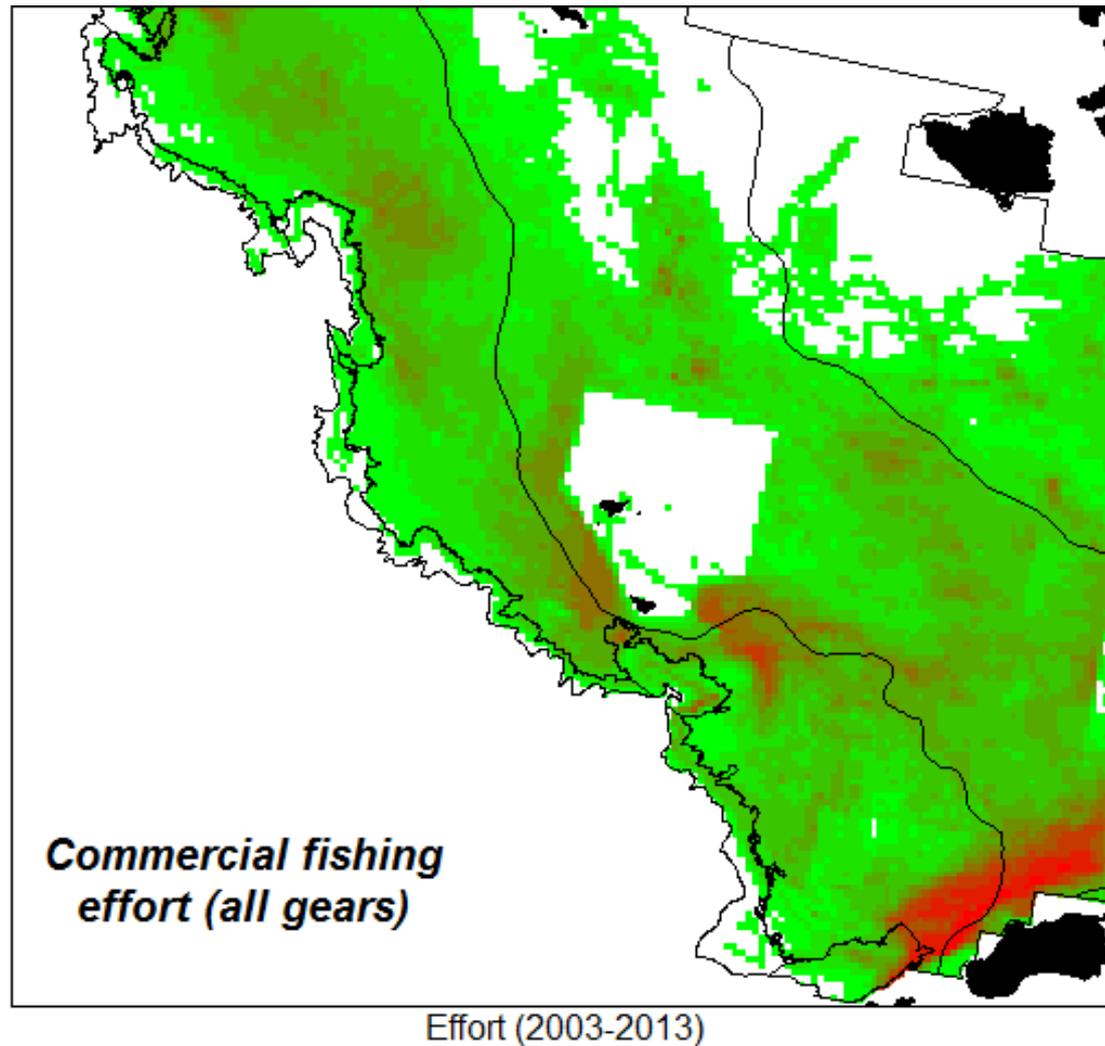
Taller



Vulnerability:
areas where
organisms are
dense or tall



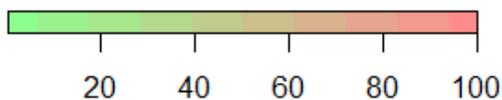
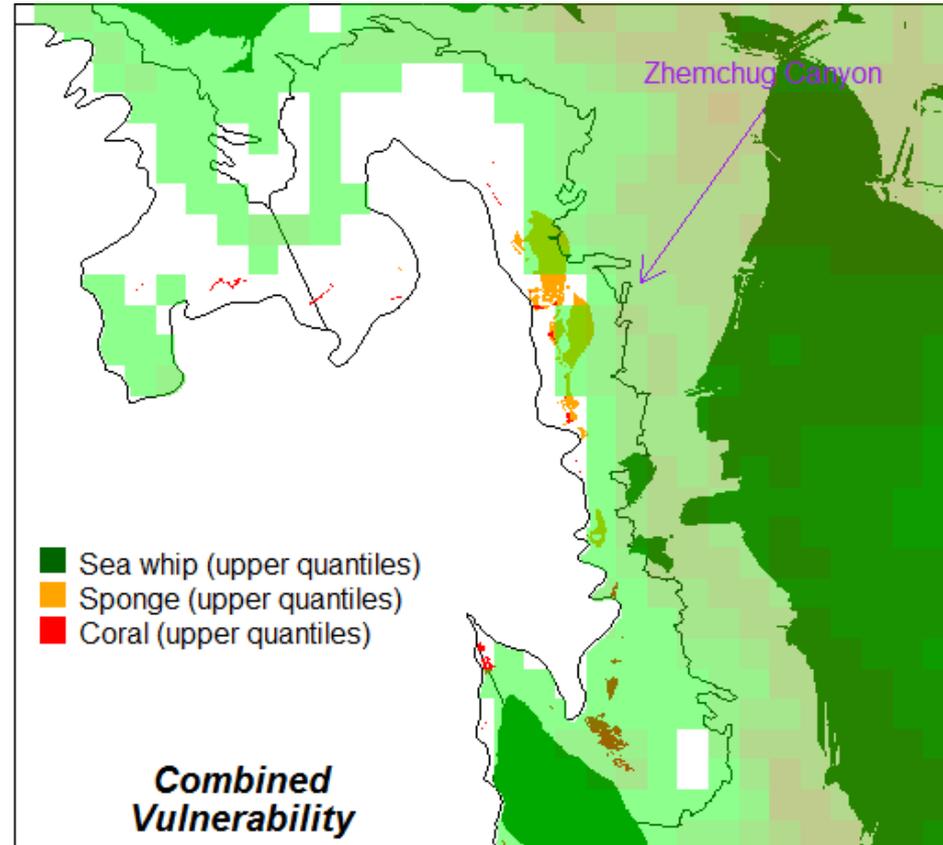
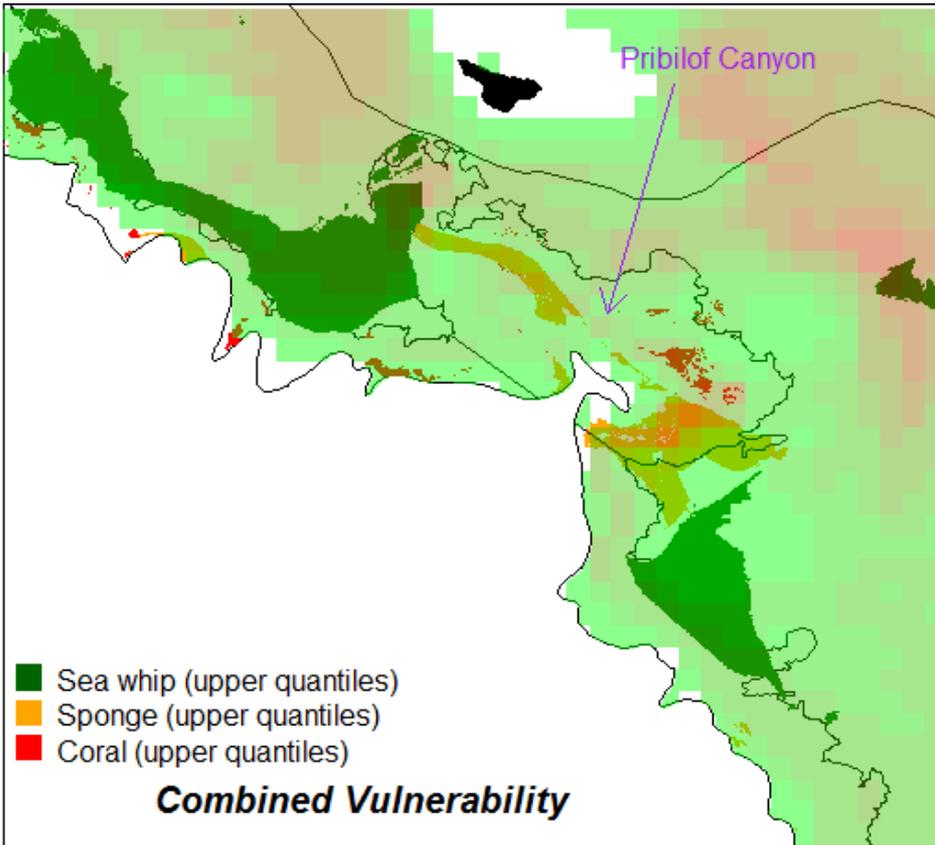
Fishing effort (2003-2013)



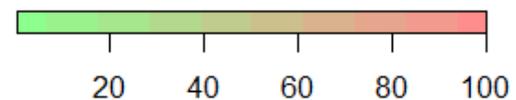
Overlay fishing effort on vulnerability map

Pribilof Canyon

Zhemchug Canyon



Fishing effort (2003-2013)

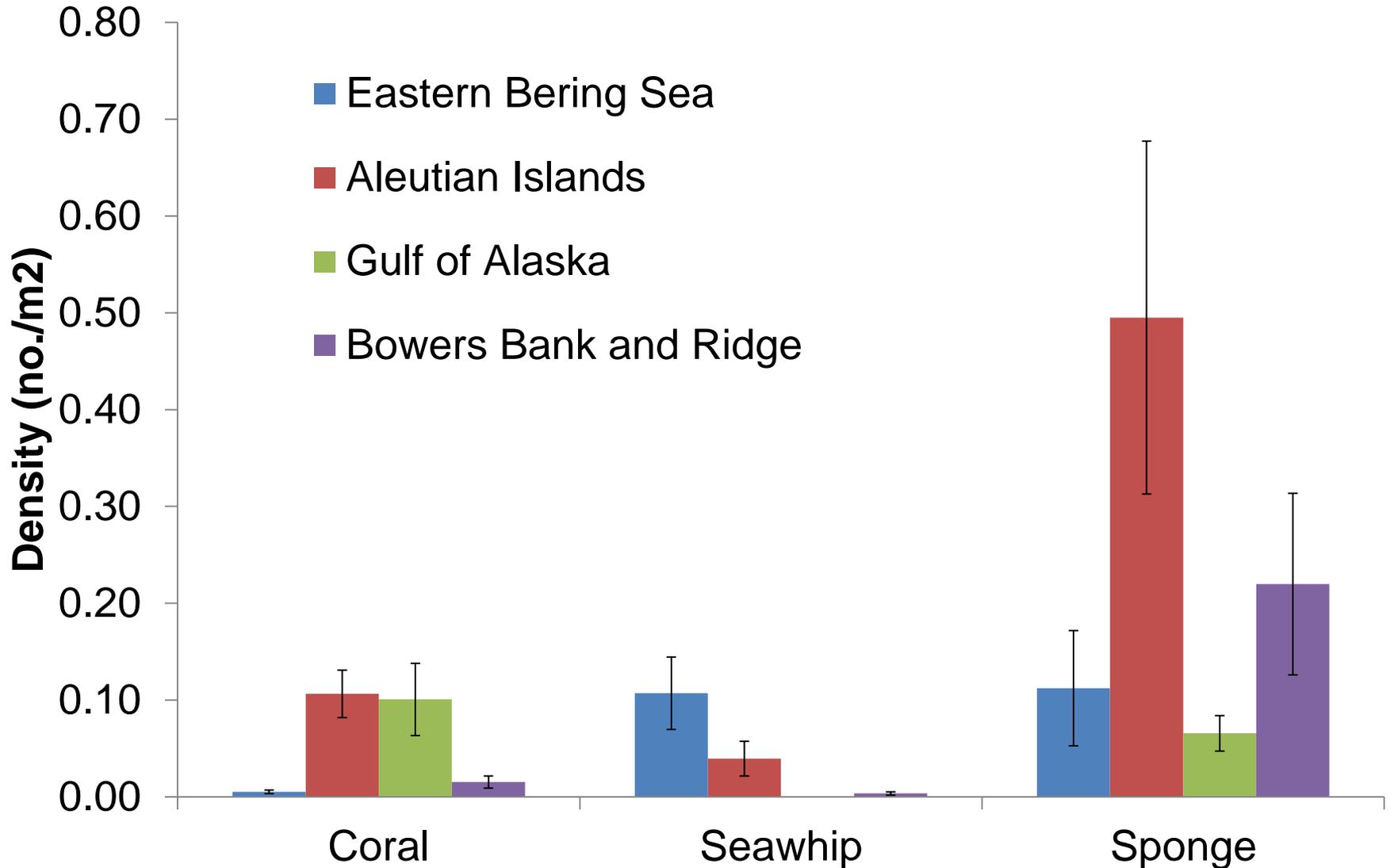


Fishing effort (2003-2013)

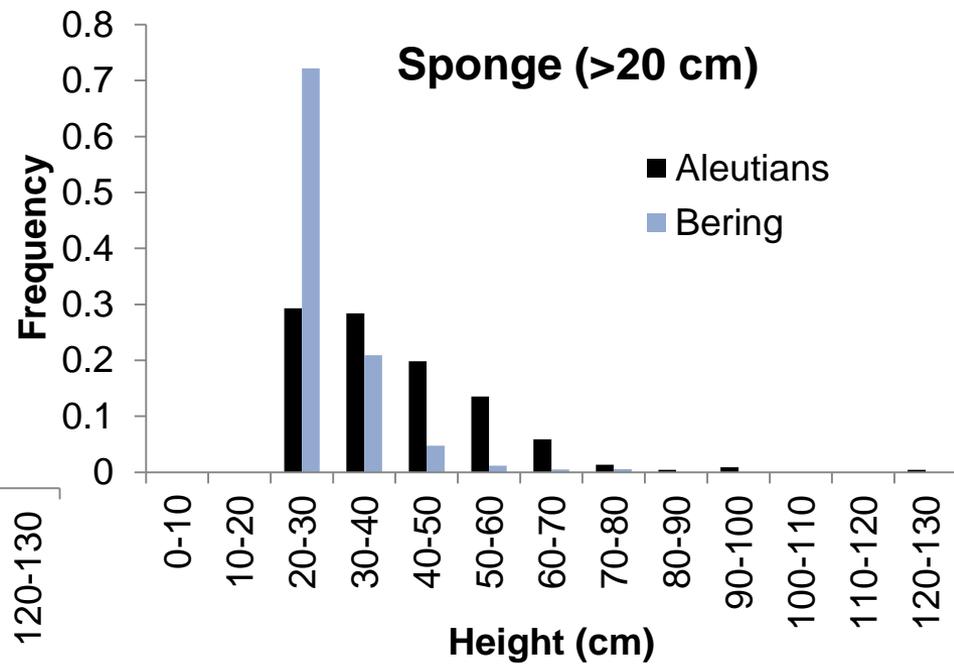
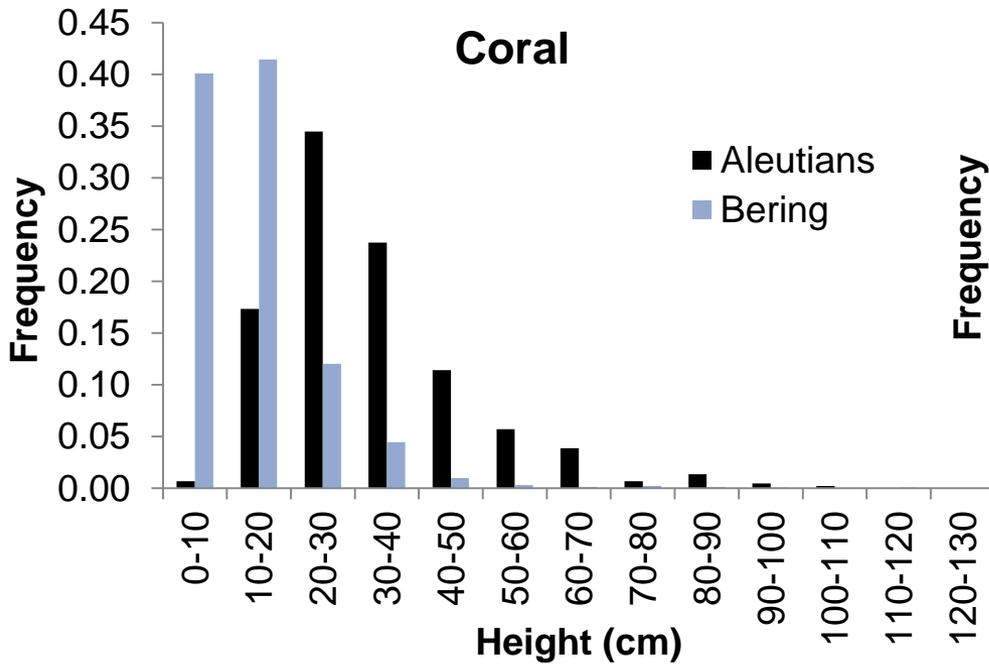
Compare Bering Sea to other regions of U.S.

Location	Depth Range (m)	Coral density	Sponge density	Sea pen density	Investigator
Grays Reef, WA	120-300		0.600		Clarke
Astoria Canyon, OR	148-1358	0.064	0.600	0.100	Bianchi
Heceta Bank, OR	70-341	0.001	0.030		Rooney
Cordell Bank, CA	55-250		0.100		Pirtle
Canyons, Central CA	90-319	0.004-0.03	0.04-0.2		Bianchi
Offshore banks, Southern CA	40-600	0.070			Yoklavich
Offshore banks, Southern CA Bight	32-320	0.0003-0.08	0.010		Tissot et al. 2006
Oceanographer Canyon, Middle Atlantic	100-1400	0.054	0.065	0	Heckler et al. 1980
Lydonia Canyon, Middle Atlantic	400-1800	0.035	0.026	0	Heckler et al. 1980
Baltimore Canyon, Middle Atlantic	100-1100	0	0.004	0.019	Heckler et al. 1980
EBS Canyons	91-808	0.005	0.107	0.112	This study

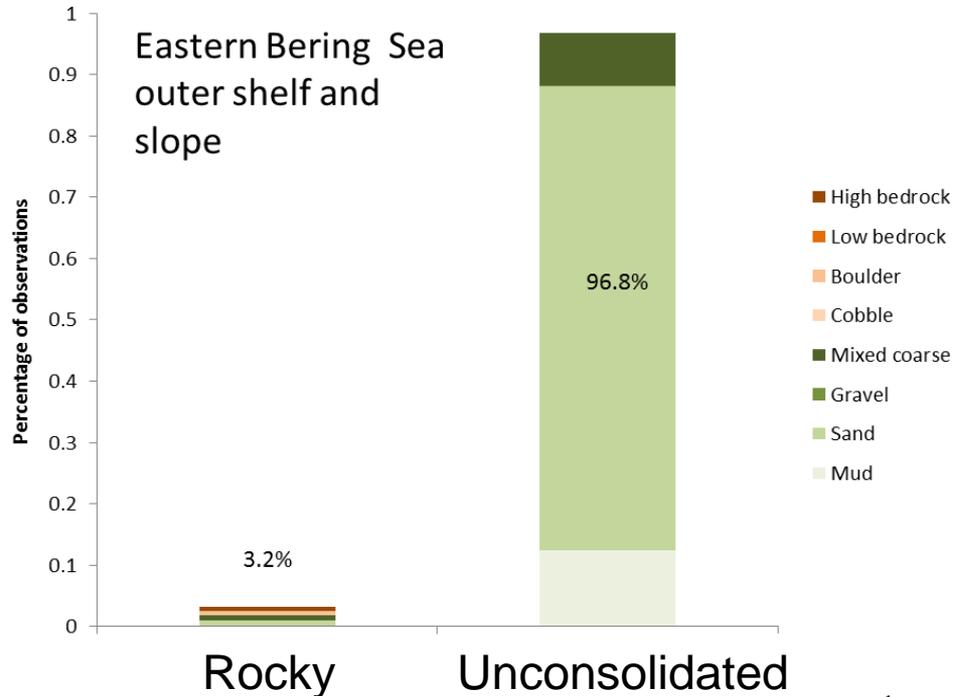
Compare Bering Sea to other regions of Alaska



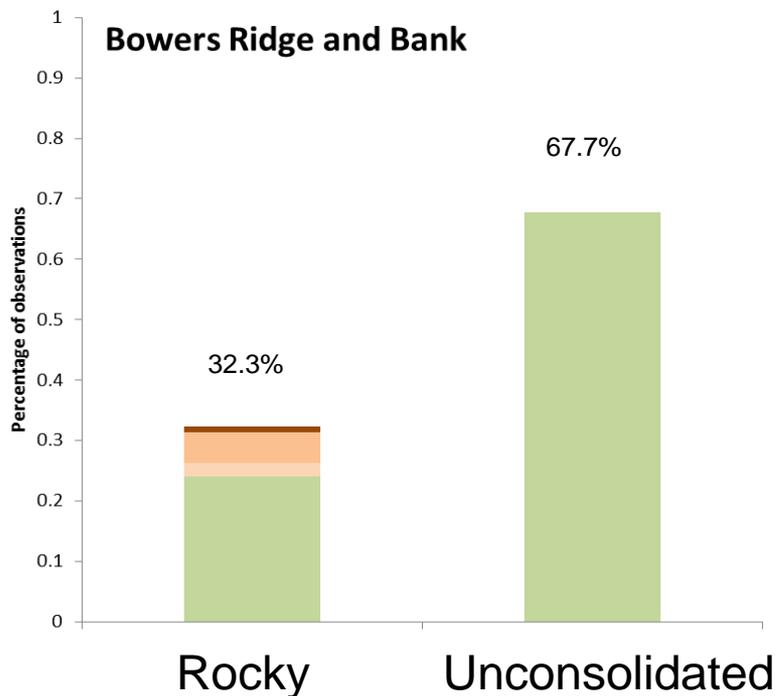
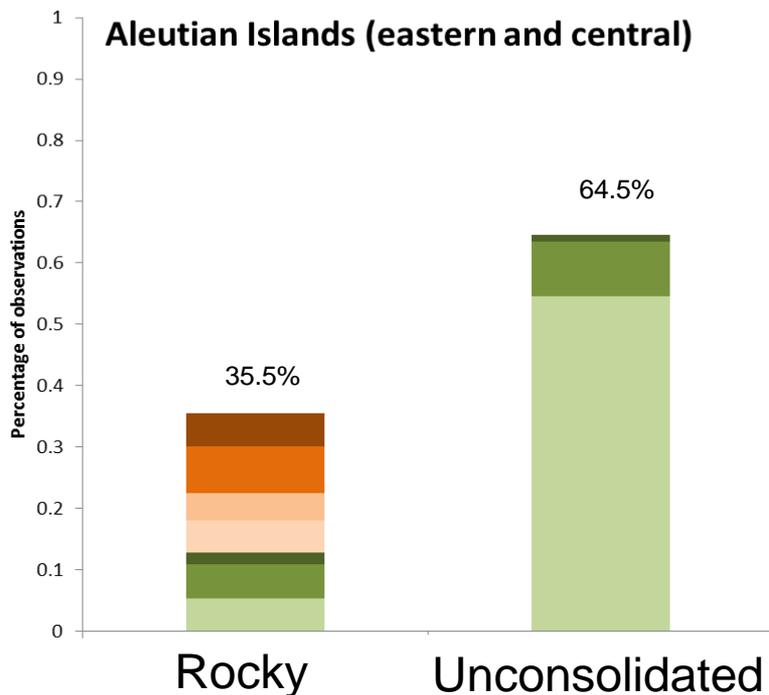
Compare Bering Sea to other regions of Alaska



Why?



Region	Transects with rocky habitat	Transects with coral
Gulf of Alaska	35%	30%
Aleutian Islands	63%	60%
Bowers Bank	42%	47%
Eastern Bering Sea	19%	13%



Conclusions

- Coral occurrence was low throughout
 - Concentrated around Pribilof Canyon and to the northwest
 - Consistent with model results and other data (trawl, observer)
 - Densities were low even where they occurred
- Sponge & Sea Whips distributed more broadly
 - Consistent with model results and other data
 - Sponge and sea whip densities were high in some locations
- Some associations of rockfish and king crab with corals and sponges
- About 9% of sea whips observed were damaged

FV Vesteraalen

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- Rick Towler
- Kresimir Williams
- Rachel Wilborn
- Bob Stone
- Jerry Hoff
- Mark Zimmermann
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