Science, Service, Stewardship

Distribution and abundance of rockfish species determined using a combination acoustic-optic-trawl survey of trawlable and untrawlable substrates

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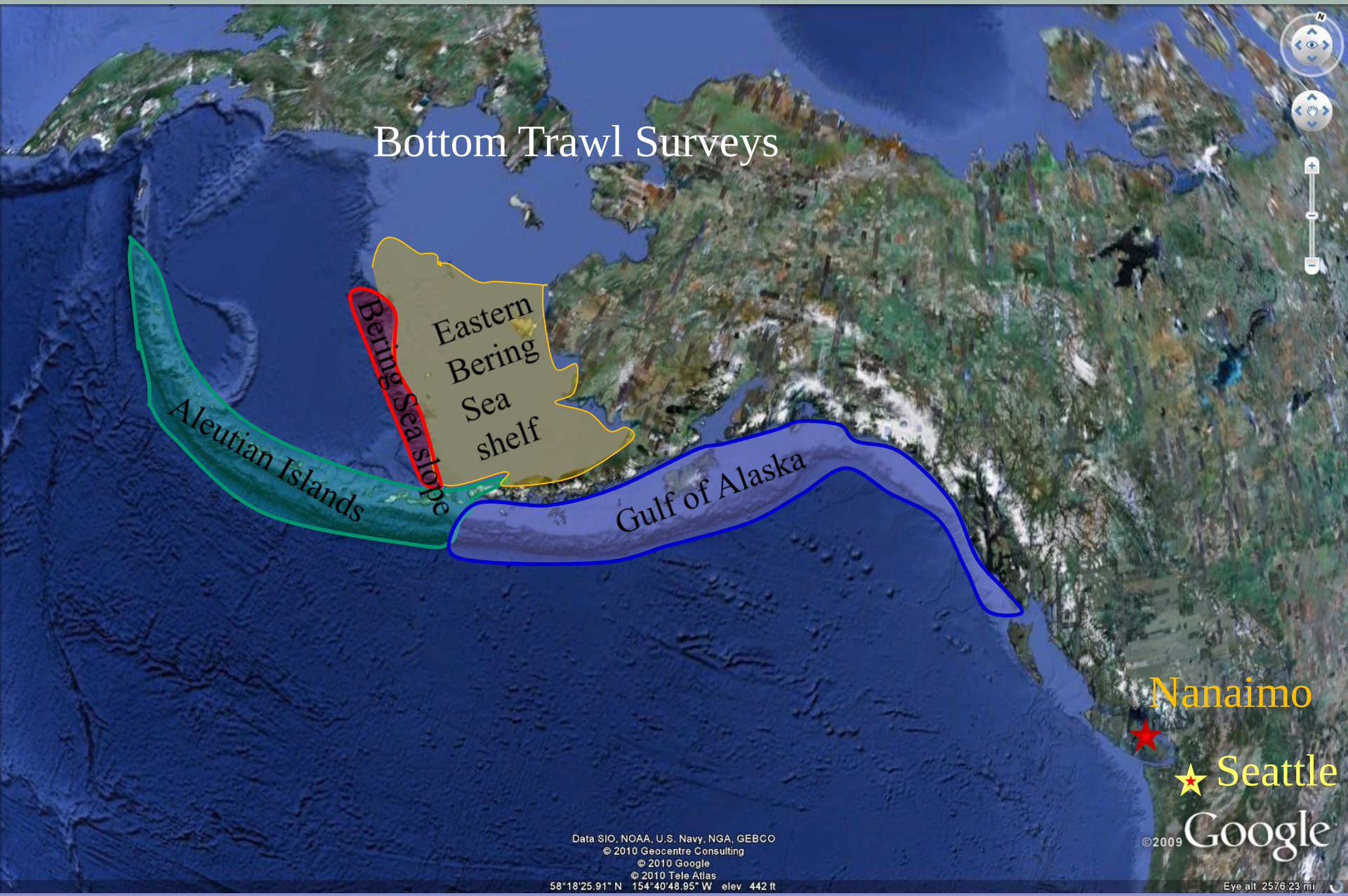
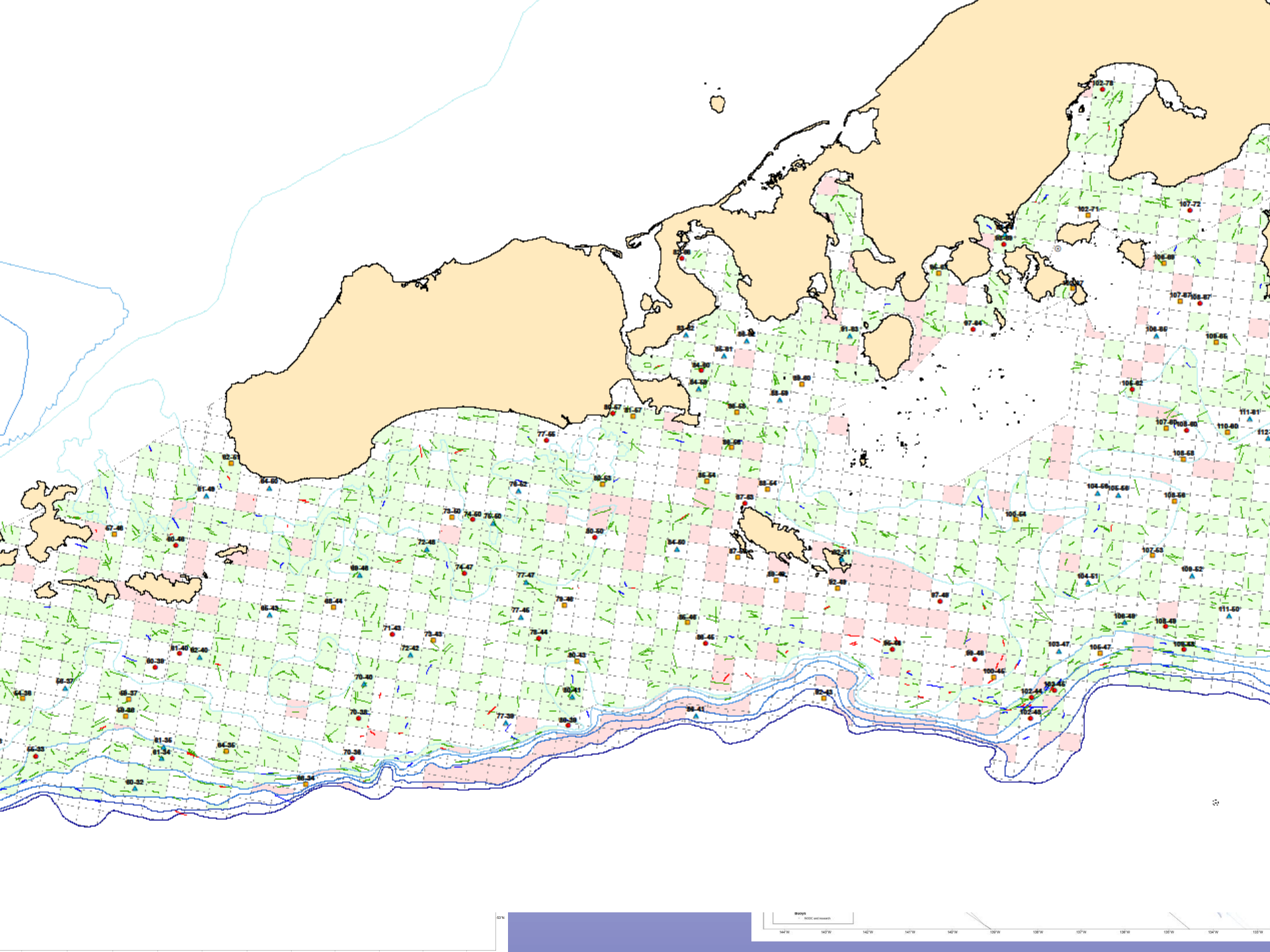
NOAA FISHERIES SERVICE

January 18, 2011


Bottom Trawl Surveys
Eastern Bering Sea shelf
Bering Sea slope
Aleutian Islands
Gulf of Alaska
Nanaimo
Seattle
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
© 2010 Geocentre Consulting
© 2010 Google
© 2010 Tele Atlas
58°18'25.91" N 154°40'48.95" W elev 442 ft
©2009 Google
Eye alt 2576.23 mi


SEA STORM


Buoys
NODC and research
144°W
143°W
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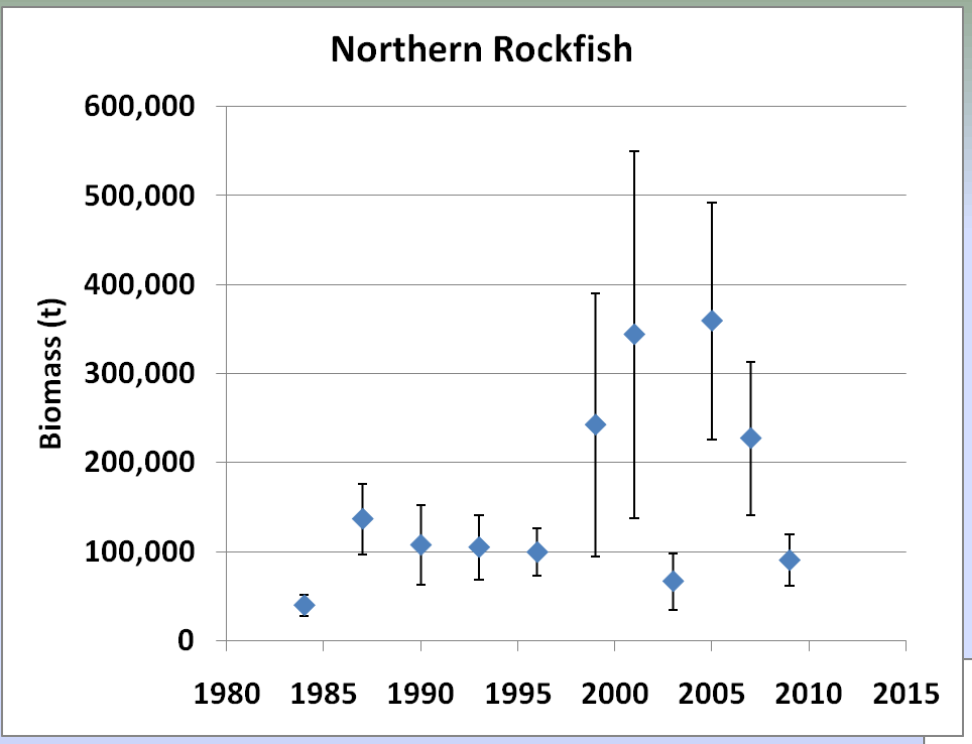
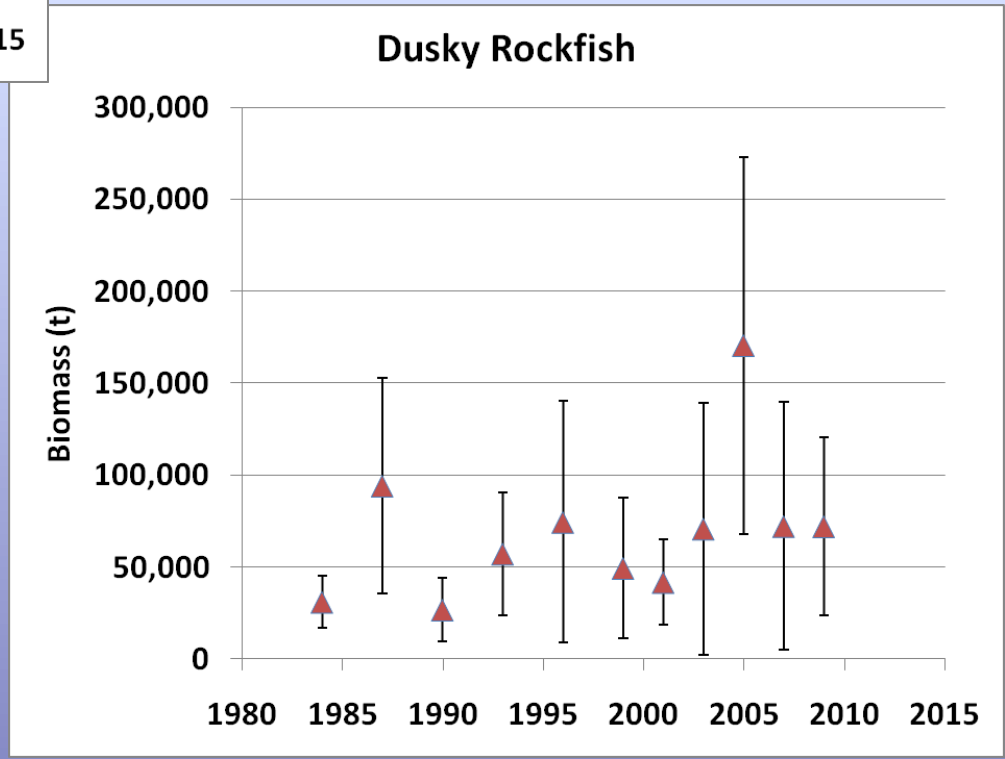
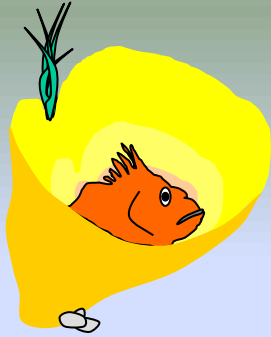
134°W
133°W

Biomass estimates from Gulf of Alaska bottom trawl surveys





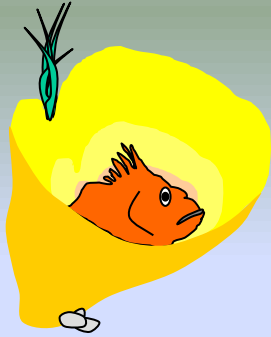
Project Goals



1) Develop methods to determine species and size composition of rockfishes in untrawlable areas

2) Determine distribution and abundance of rockfish species using a combination acoustic-optic-trawl survey of untrawlable substrates

Develop methods to determine species and size composition of rockfishes in untrawlable areas



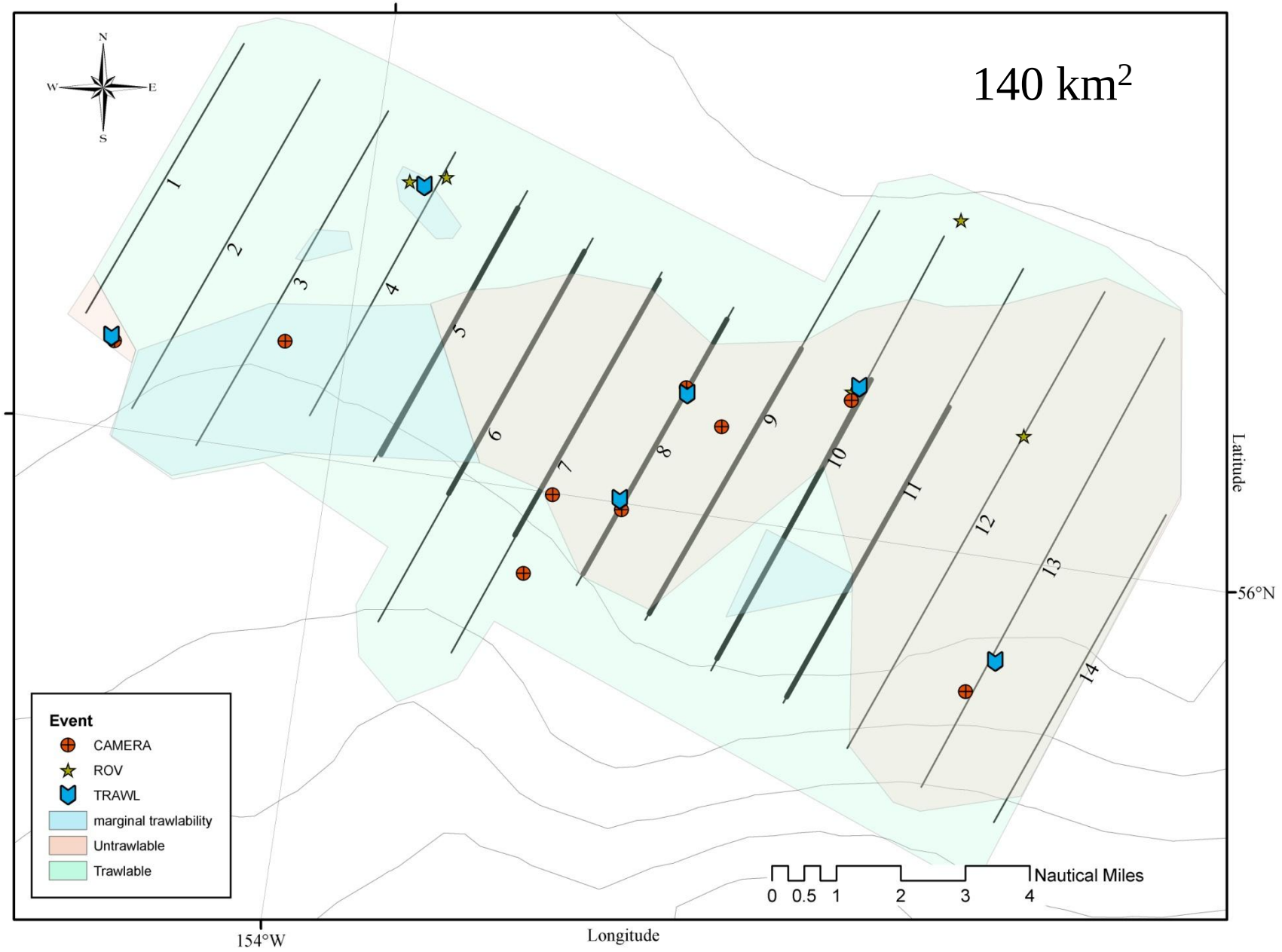
Compare a remotely operated vehicle (ROV), a modified bottom trawl, and a stereo drop camera system (SDC):

1) discriminate rockfish species composition

2) estimate the size of rockfish targets

3) the time necessary to collect and process the samples

4) potential biases in the size and species composition data


140 km2
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12
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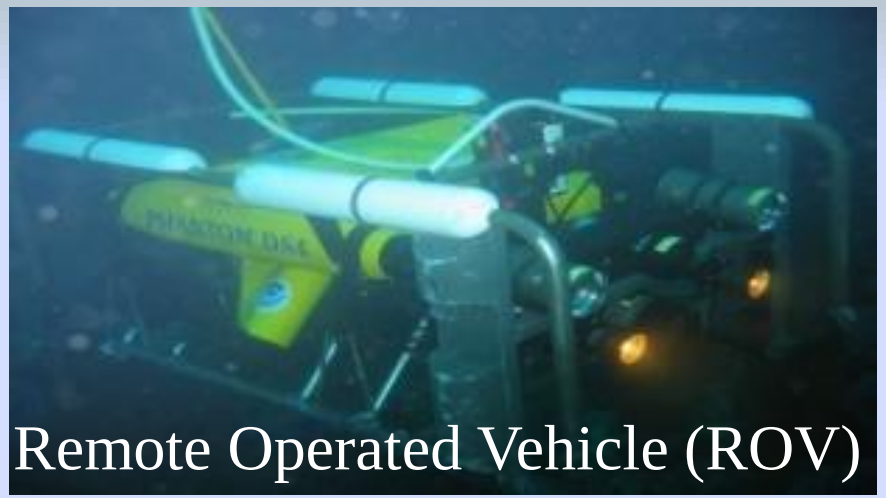
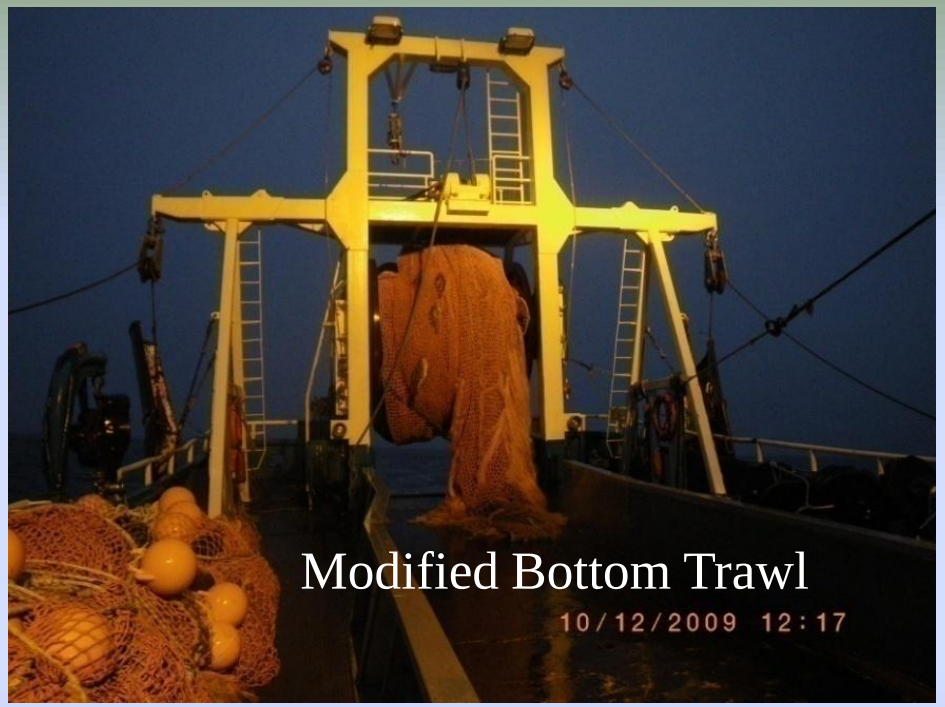
14
Event
CAMERA
ROV
TRAWL
marginal trawlability
Untrawlable
Trawlable
0 0.5 1 2 3 4
Nautical Miles
154°W
Longitude
56°N
Latitude

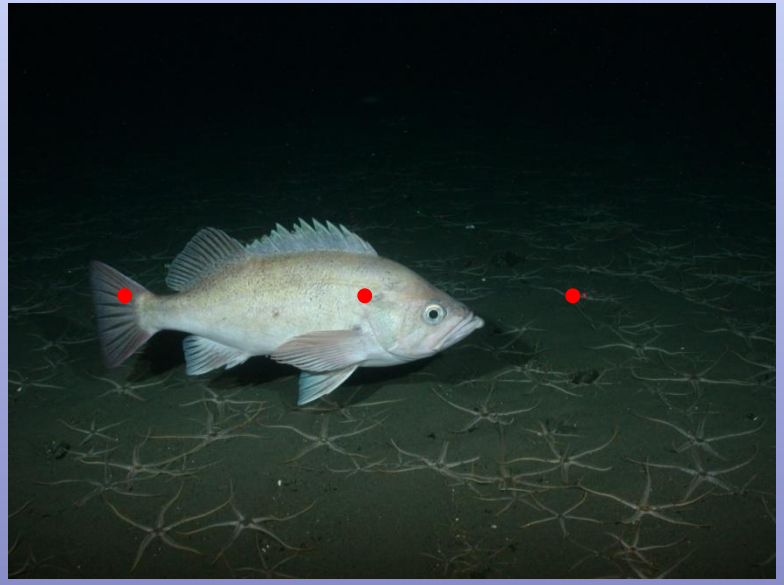
Tools:



Remote Operated Vehicle (ROV)

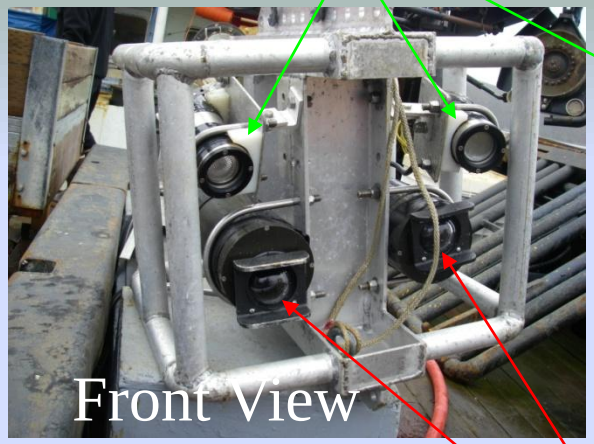


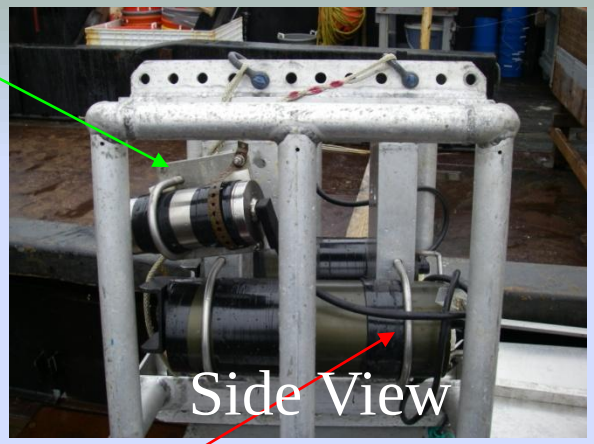
Modified Bottom Trawl



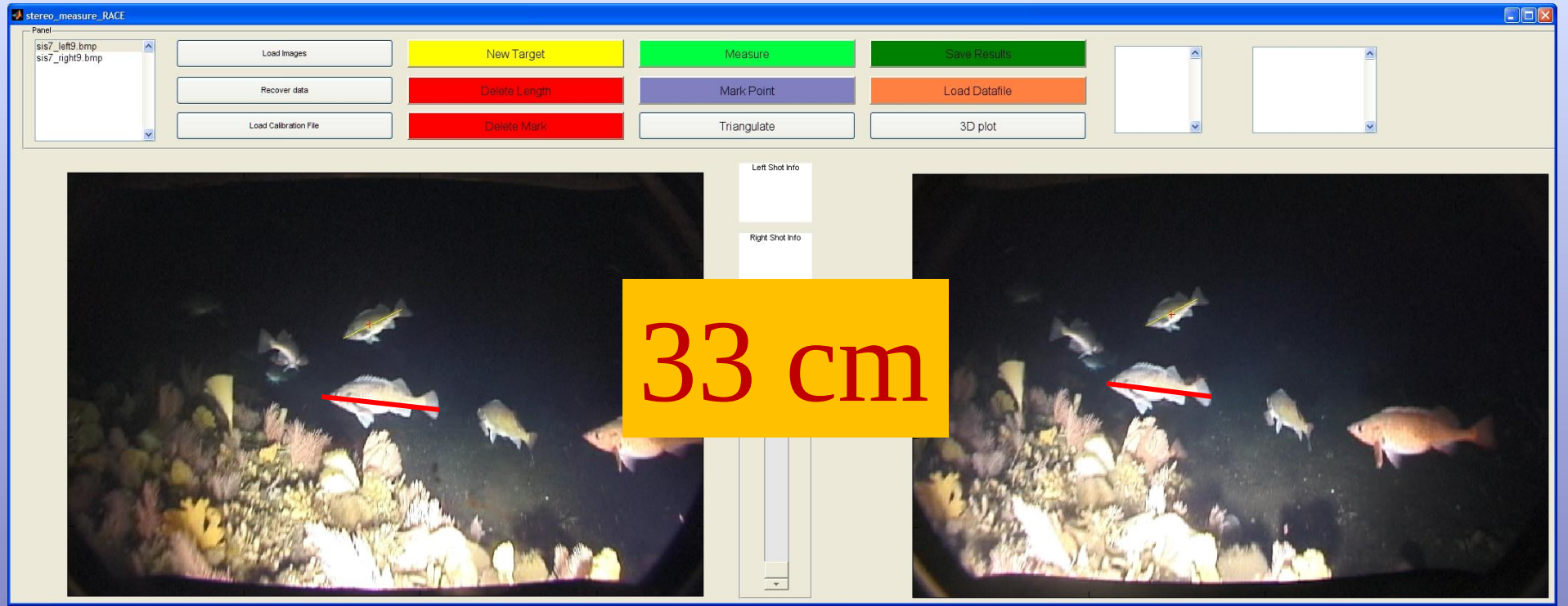
Stereo camera methods

Lights

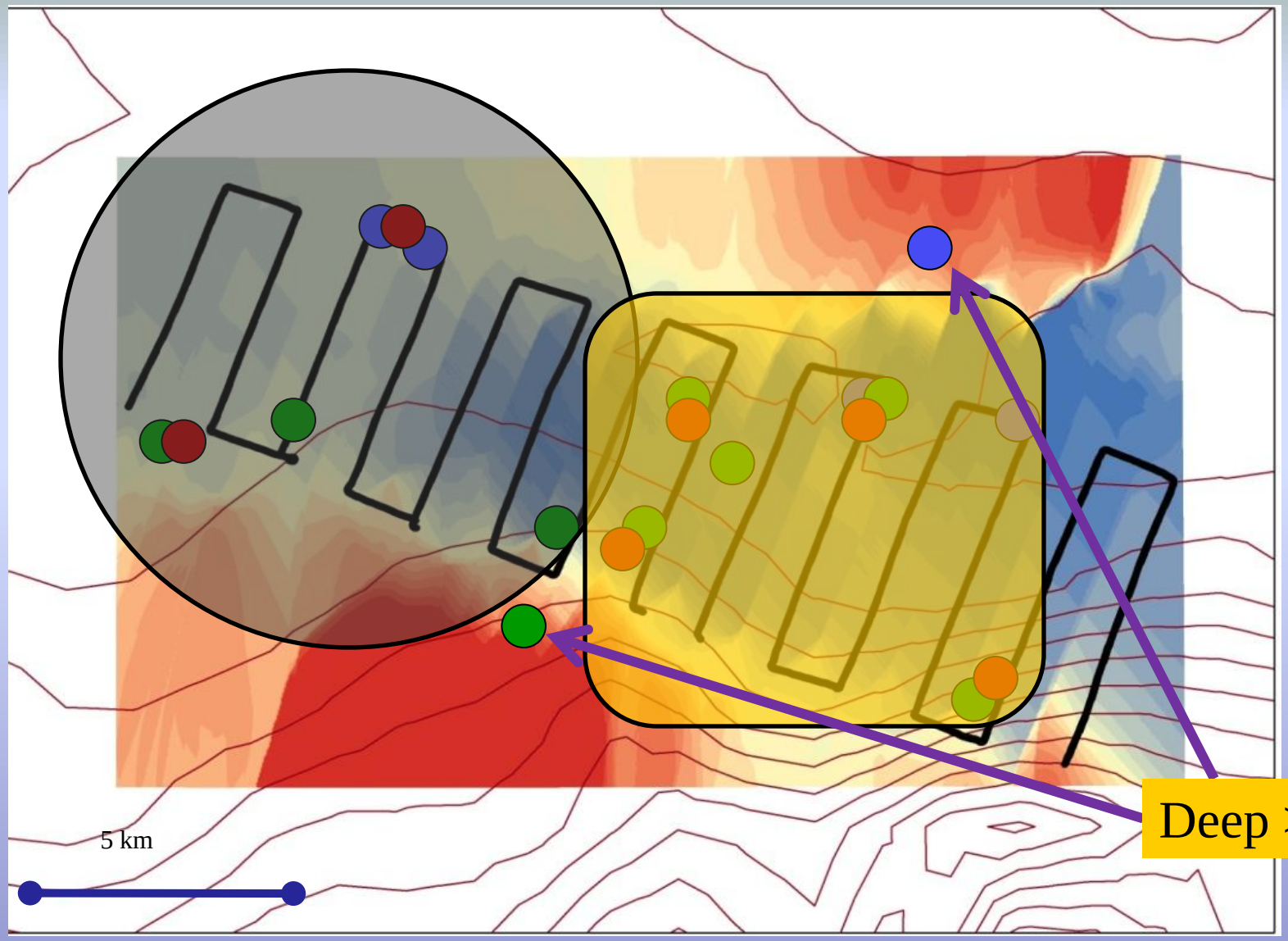




Cameras



Acoustic transect lines and groundtruth deployments

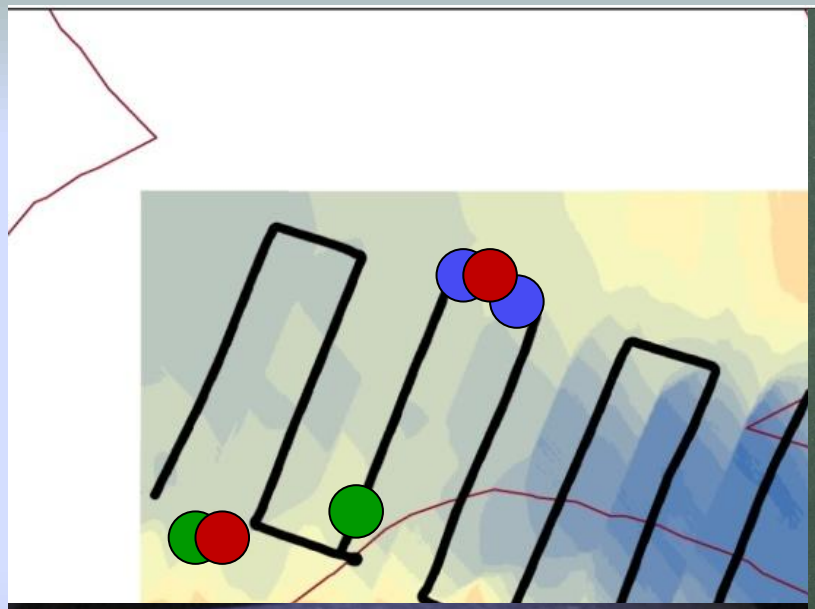


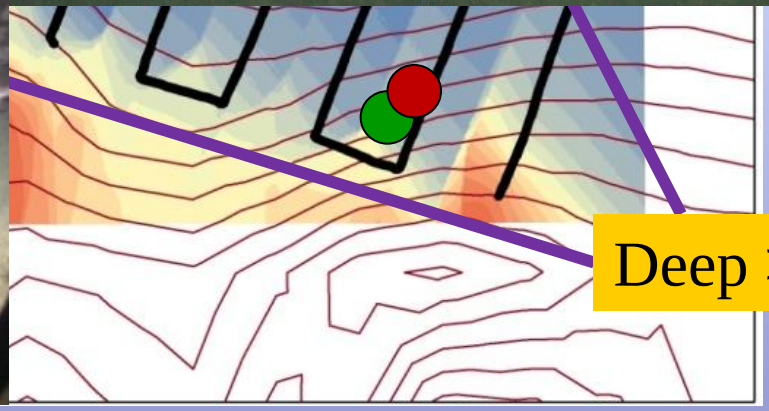
ROV (5 deployments)

Trawl (6 deployments)

SDC (9 deployments)

Deep Transects





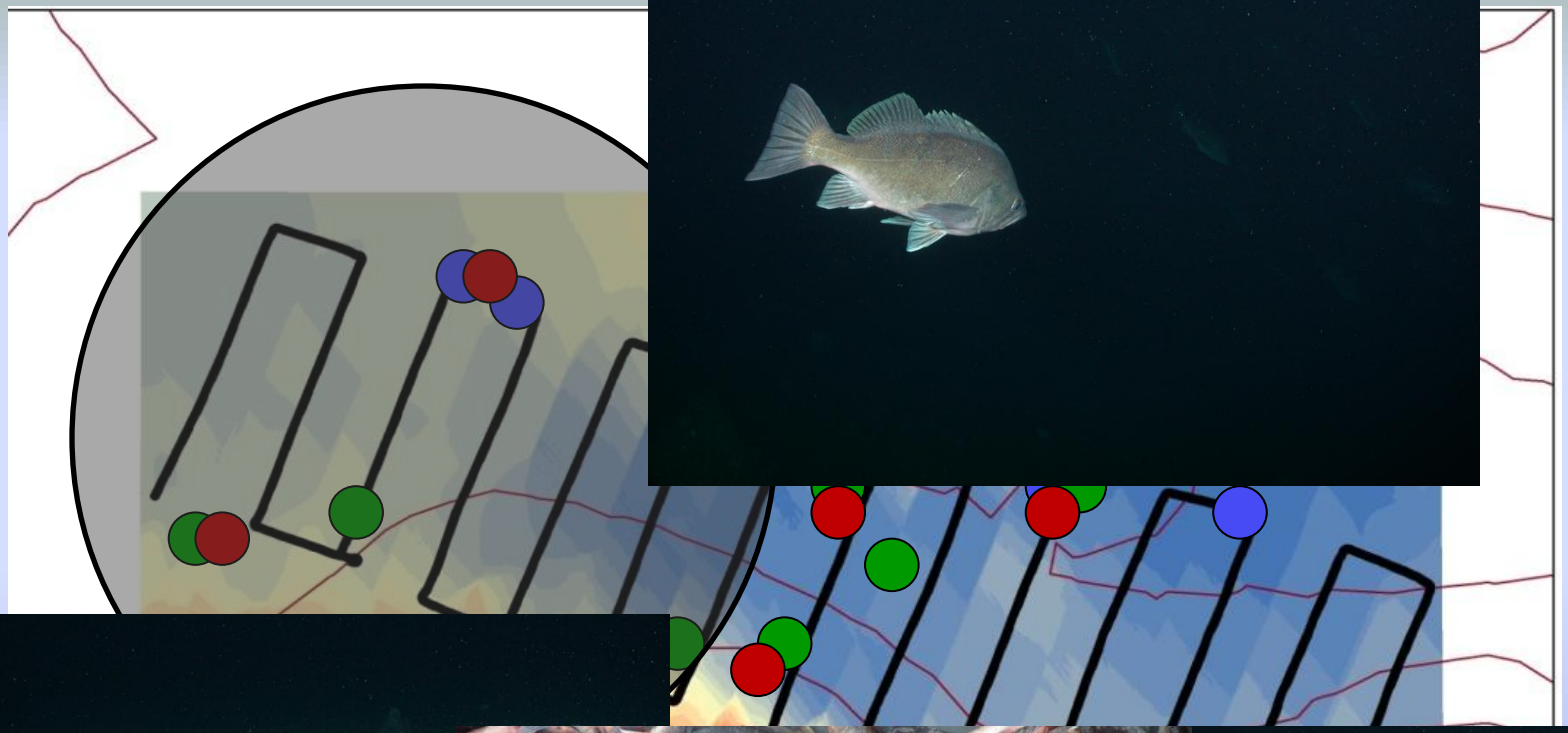
Deep > 200 m

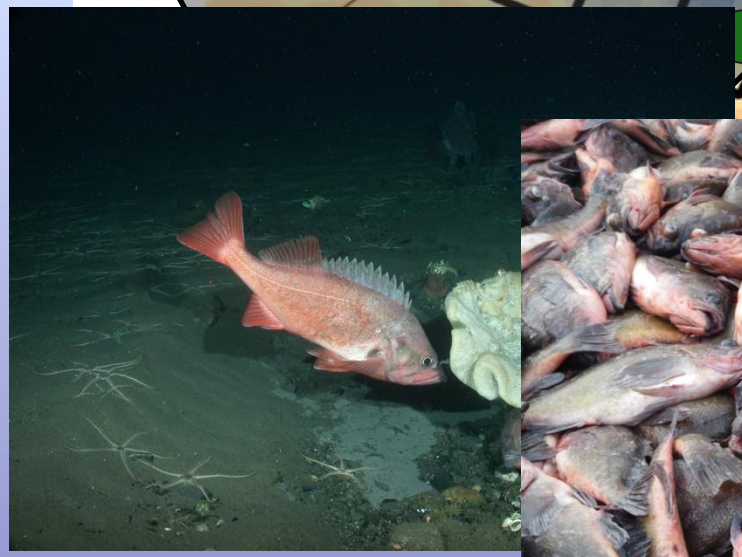
ROV (5 deployments)

Trawl (6 deployments)

SDC (9 deployments)

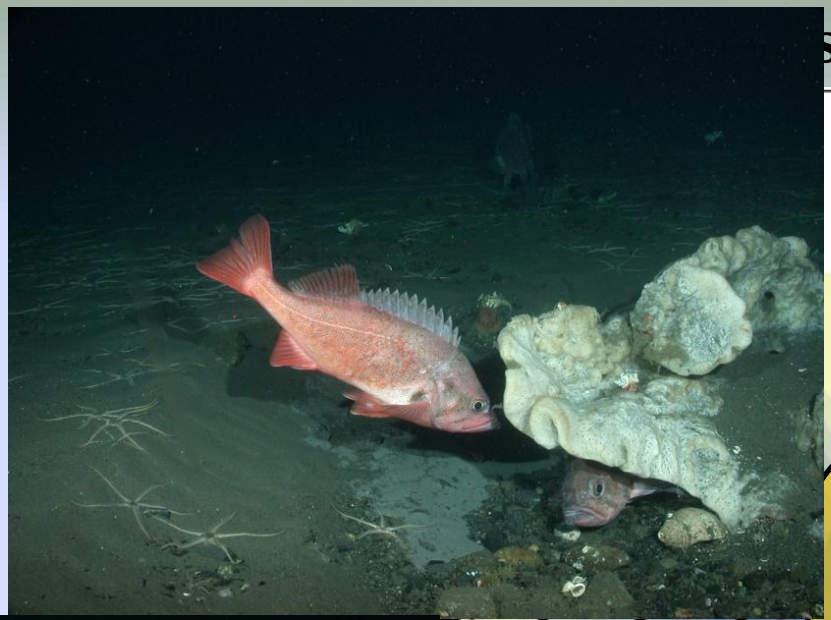
Shallow – Trawlable Tran

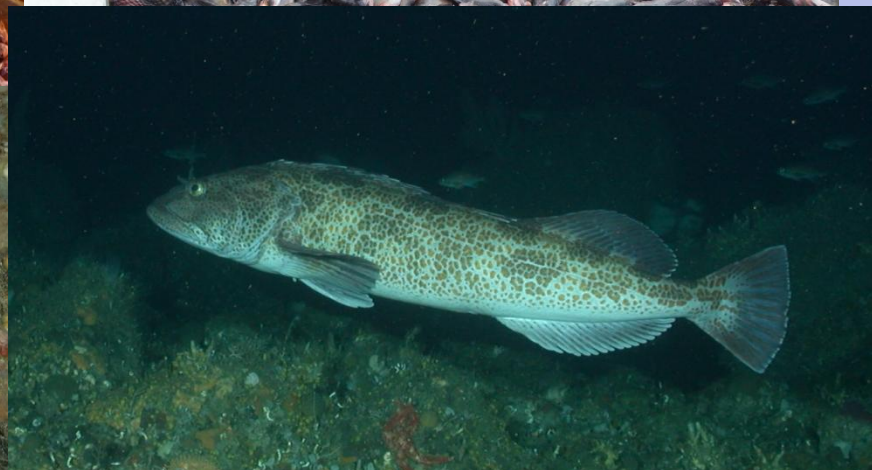




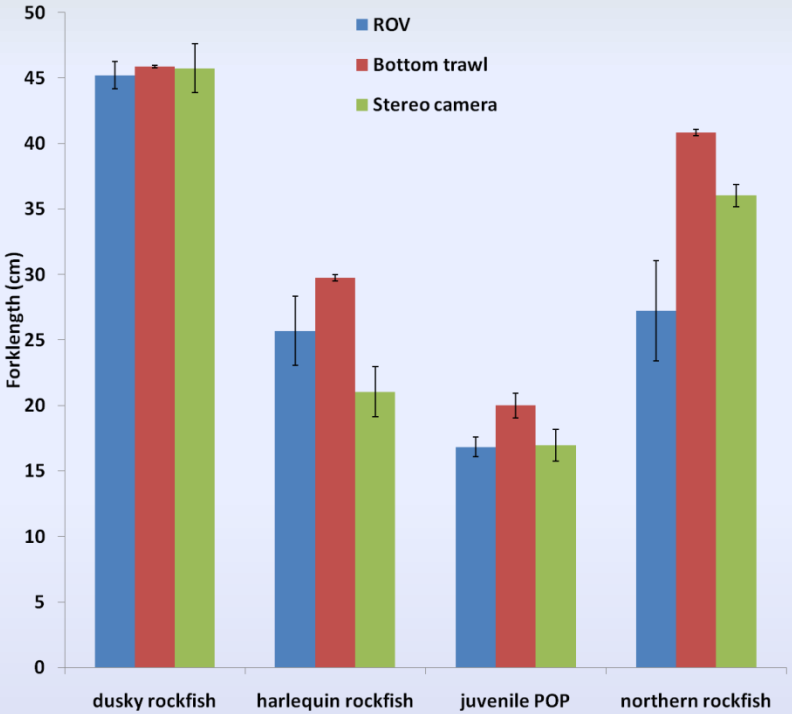
ROV (5 deployments)

sects





Size Composition



Mean fish length

Unidentified fish

ROV = 2.7%

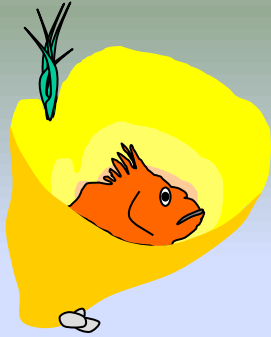
Trawl = 0.0%

SDC = 16.8%

Percentage of fish measurable

Species	ROV	Bottom trawl	SDC
Dusky rockfish	3.2%	100%	28.2%
Harlequin rockfish	7.1%	100%	46.7%
Pacific ocean perch	8.0%	100%	19.7%
Northern rockfish	25.0%	100%	17.6%

Project Goals



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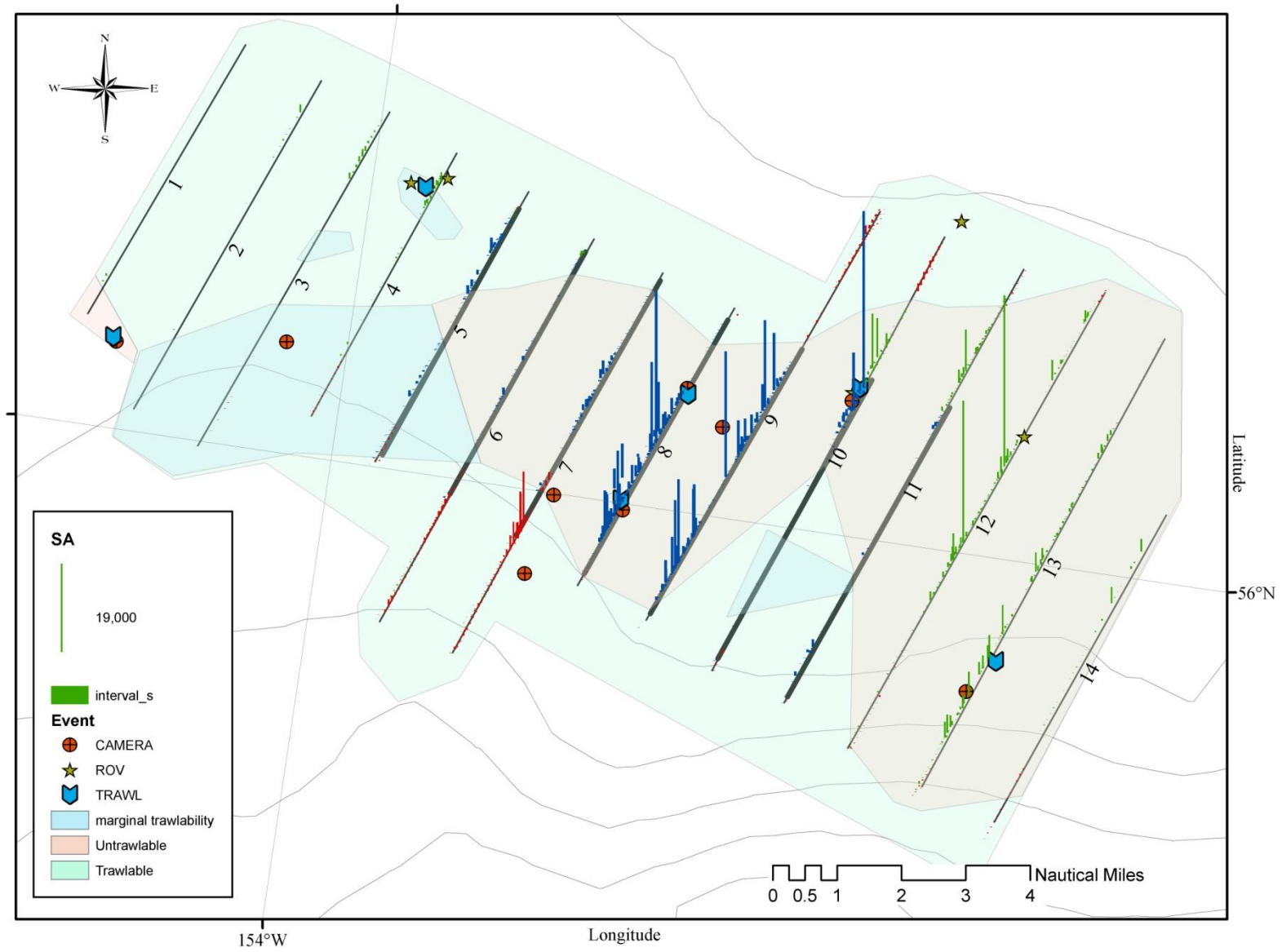
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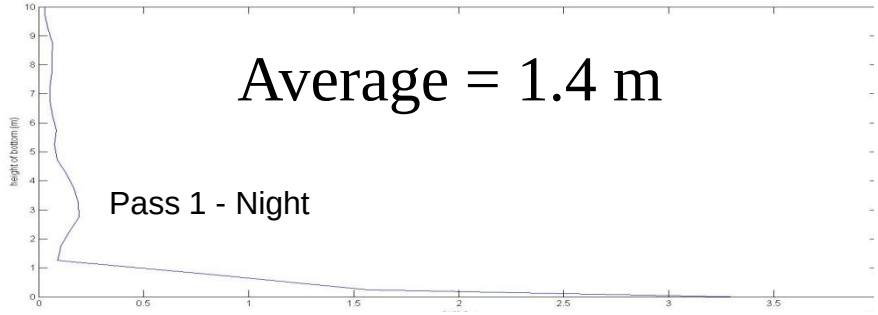
14
SA
19,000
interval_s
Event
CAMERA
ROV
TRAWL
marginal trawlability
Untrawlable
Trawlable
0 0.5 1 2 3 4
Nautical Miles
Latitude
56°N
154°W
Longitude

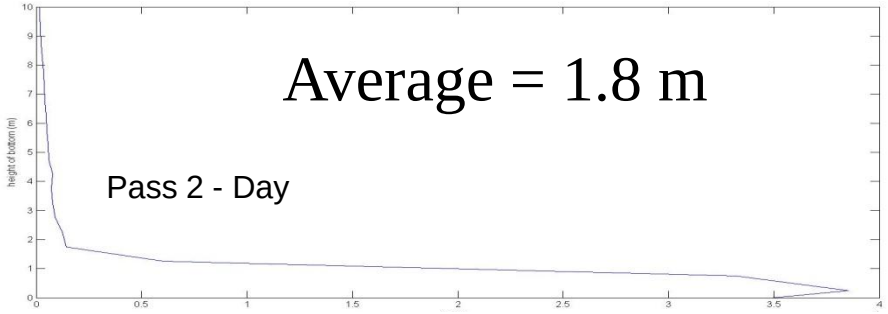
Rockfish SA height off bottom (to 10m) by pass

Average = 1.4 m

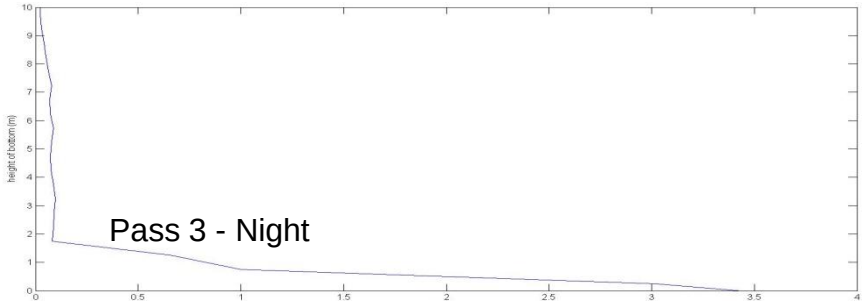


Pass 1 - Night

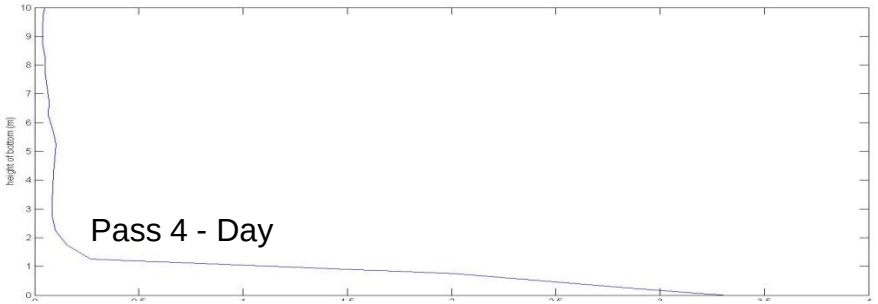
Average = 1.8 m



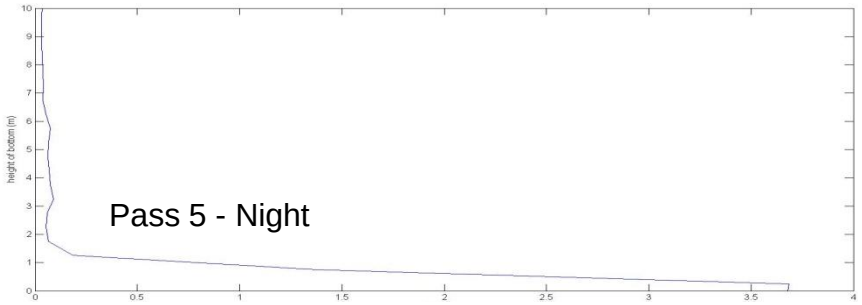
Pass 2 - Day



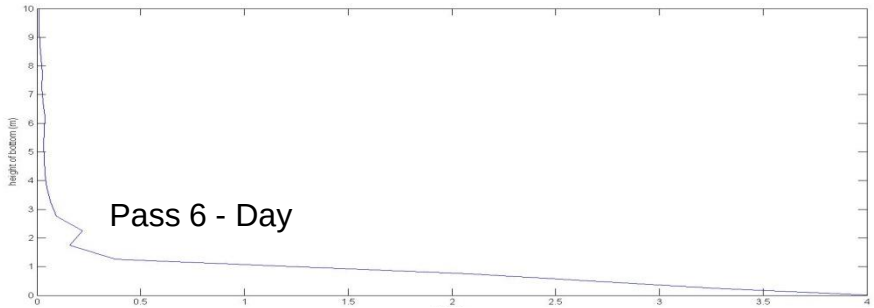
Pass 3 - Night



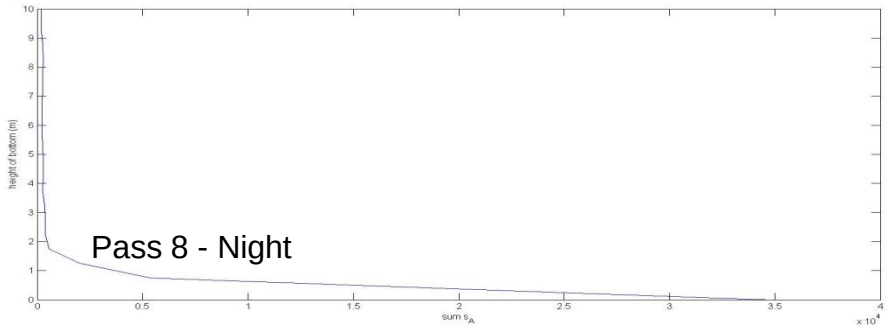
Pass 4 - Day



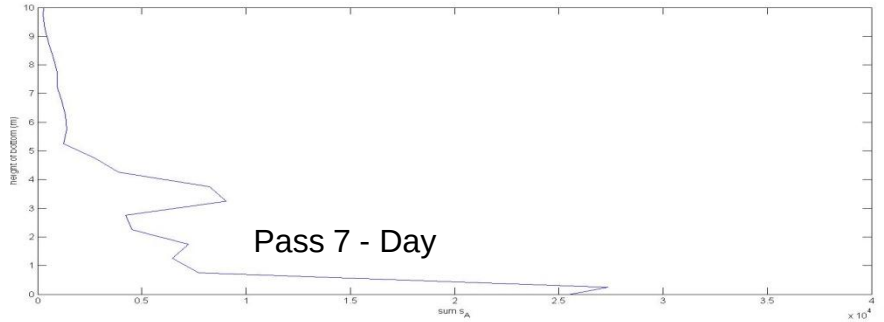
Pass 5 - Night



Pass 6 - Day



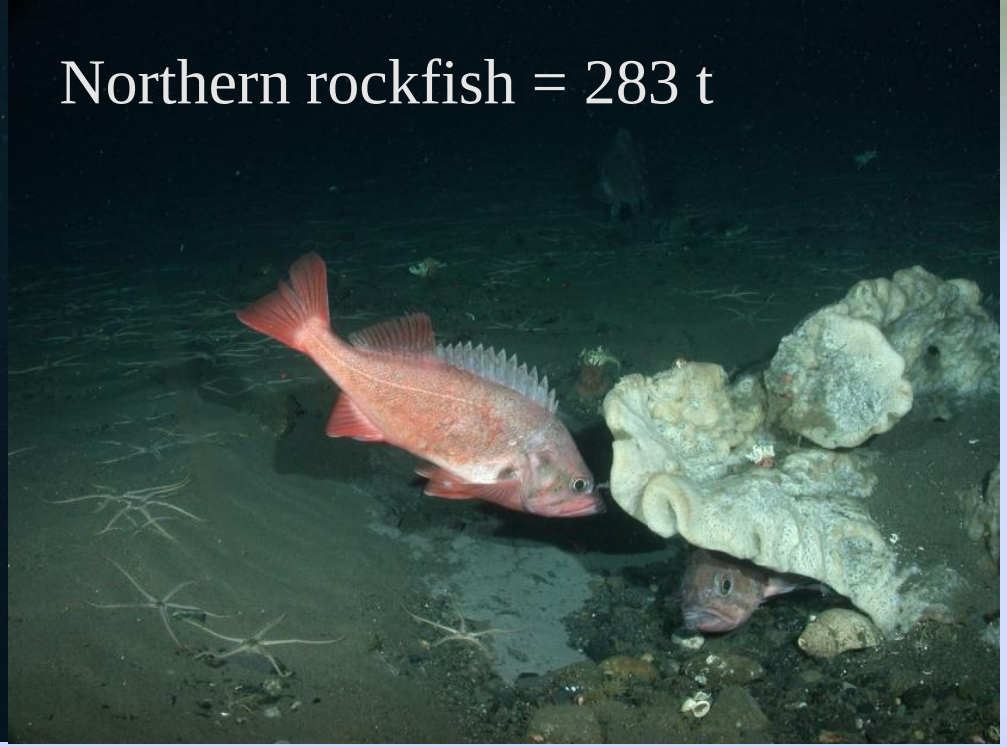
Pass 8 - Night

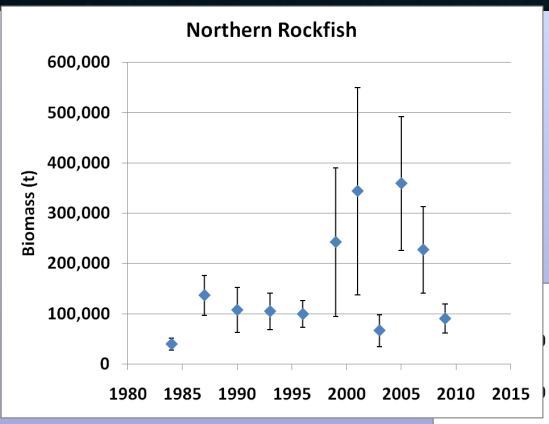


Pass 7 - Day

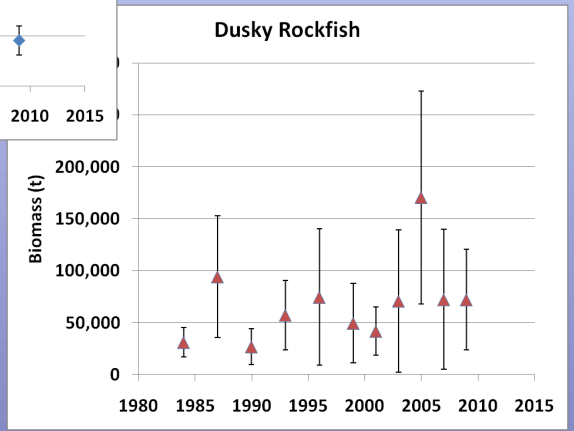
Dusky rockfish = 2,006 t

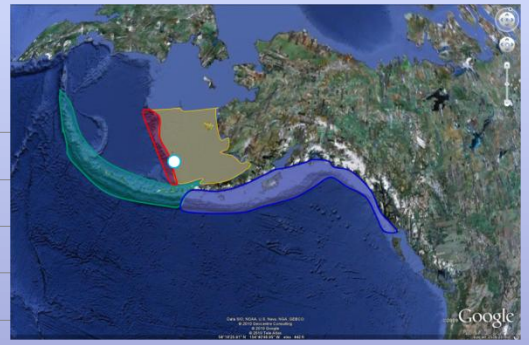
Northern rockfish = 283 t

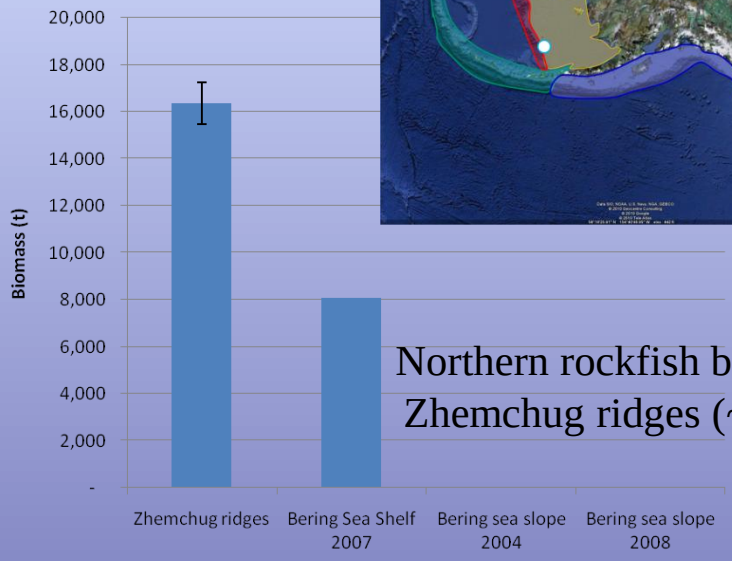




Biomass estimates from Gulf of Alaska bottom trawl surveys







Northern rockfish biomass at Zhemchug ridges (~60 km^2)

Conclusions – Groundtruth Methodology

1. The ability to identify species decreased from bottom trawl to ROV to SDC

2. Size distributions of rockfish were similar from all methods
   bottom trawl missed the smallest fish
   less fish were measurable for the ROV

3. Processing time was 2.0 - 3.0 × longer for video methods

4. Species compositions were similar for all methods

Additional Considerations

•Video based methods can provide depth distribution relative to the seafloor

• Fish behavior and fish-habitat associations can be resolved from the video methods

•Trawl provides ancillary data: maturity, length-weight, etc. that video cannot

Conclusions – Acoustic Biomass Assessment

1. 5-frequency acoustics able to resolve fish sign to ~ 0.75 m off bottom

2. Biomass was greatest in untrawlable areas

3. Minimal day-night movement was observed

4. Most rockfish were within 2 m of seafloor

5. Rockfish biomass was consistent among multiple passes

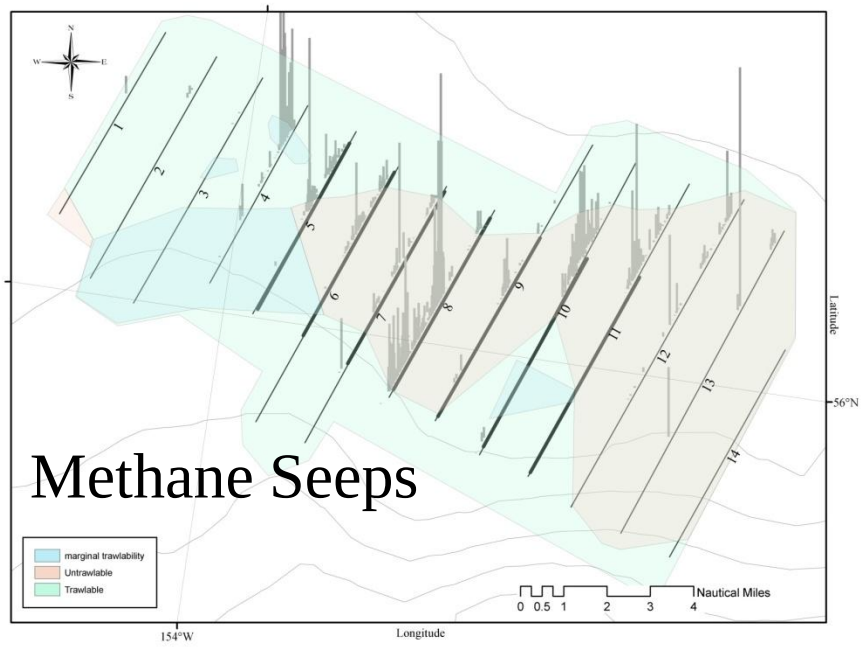
6. Primary species of rockfish (Northern and Dusky) at the Snakehead site had an estimated biomass of ~2,300 t

Future Work

1. Drop T-S instrument to measure fish target strength for acoustics

2. ME-70 analysis to examine fish school characteristics

3. Investigate of methane vents (FY2010-11)



4. Using ME-70 for substrate classification (FY2011)

5. Analysis of multi-frequency acoustics for delineating trawlability aboard vessels of opportunity

6. Index survey for rockfish at selected untrawlable banks in the Gulf of Alaska (FY2012)

Acknowlegements

- Video and Acoustics Assistance
- Gary McMurrin – RACE RSST
- Scott McEntire - MACE
- Kresimir Williams – MACE
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- Data Collection and Analysis Advice
- Christina Conrath – RACE Kodiak Lab
- Dave Murfin – SWFSC
- Scott Mau – SWFSC
- Kevin Stierhoff – SWFSC
- Jennifer Boldt – DFO-PBS
- F/V *Epic Explorer*
- R/V *Oscar Dyson*

- **Funding Sources**
- North Pacific Research Board
- AFSC - Resource Assessment and Conservation Engineering Division

Data Collection and Processing Times

	ROV	TRAWL	SDC
Time required to deploy	2.5	1	1.5
Fish count and habitat classification	2	--	2
Catch processing	--	1.5	--
Fish measurement	3	0.5	2
Data processing	2	1	2
Total	**9.5**	**4**	**7.5**

Species Composition

Species Diversity

ROV = 10

Trawl = 9

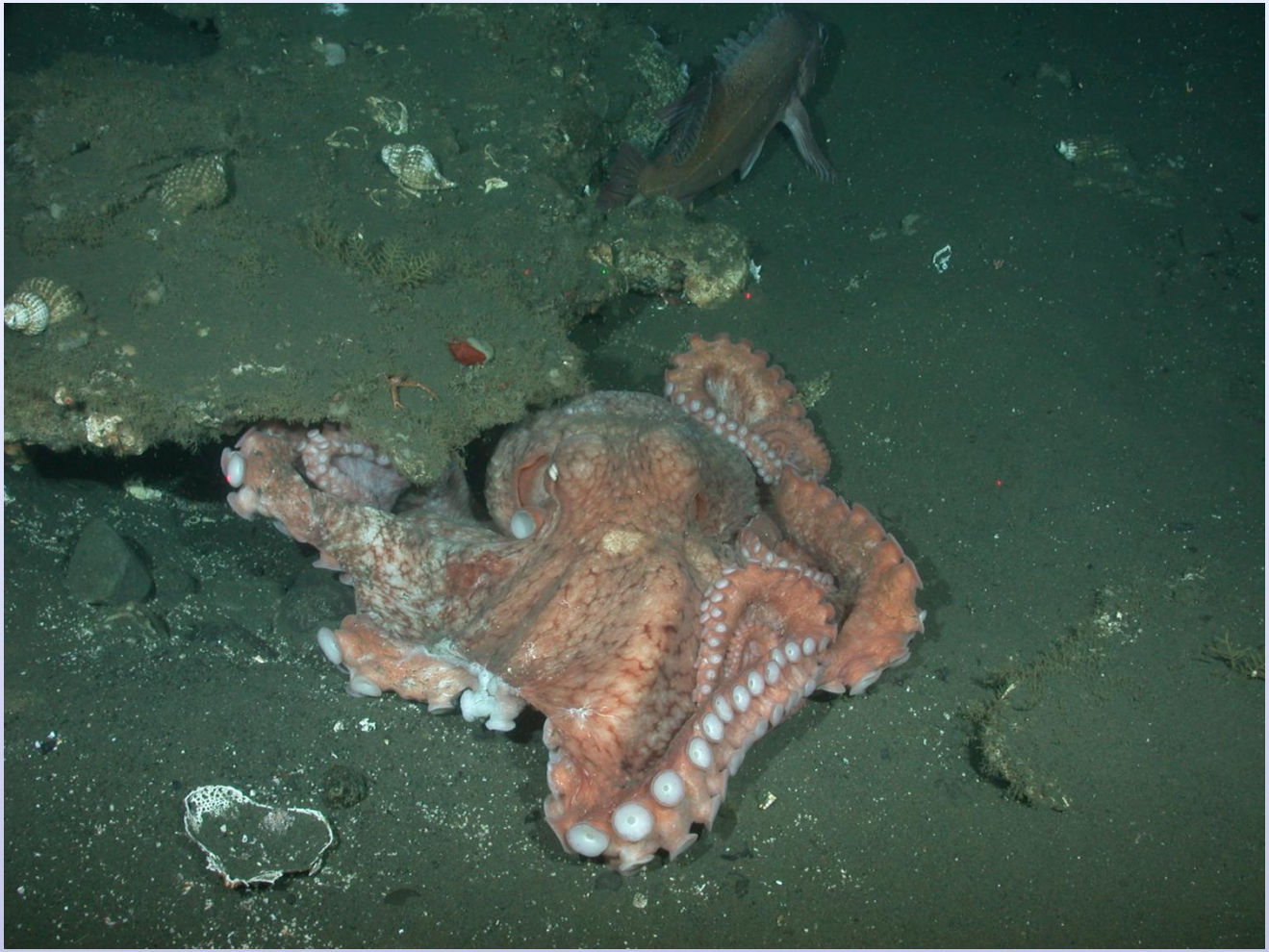
SDC = 7

Unidentified fish

ROV = 2.7%

Trawl = 0.0%

SDC = 16.8%



Survey issues with some rockfish species

1. Occur in untrawlable habitat

2. Patchy distribution

Important, Yet Difficult to Assess Using Surveys