Comparison of three methods for estimating species and size composition of rockfishes in acoustic surveys of untrawlable areas

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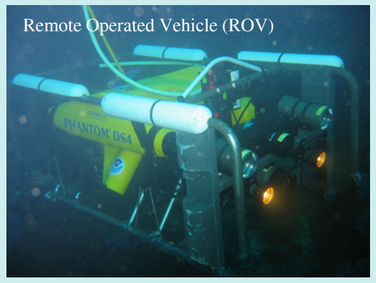
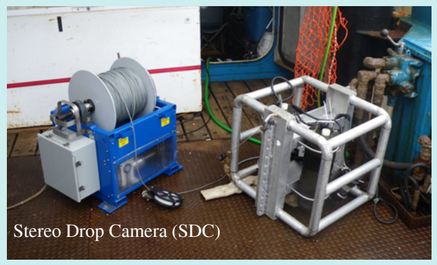




I. Background and Need

Rockfish constitute an important component of both marine ecosystems and commercial fisheries in Alaska. The biomass of some species including northern rockfish (*Sebastes polyspinis*) and dusky rockfish (*S. variabilis*) is difficult to assess using bottom trawl surveys due to their propensity to aggregate in rocky high-relief (untrawlable) areas. They are also difficult to assess acoustically due to their near-bottom distribution. Thus, new methods to estimate the biomass of these rockfishes are needed.

II. Overall Project Goals

1) Improve rockfish distribution and abundance estimates in untrawlable areas using quantitative echo sounder data collected at different acoustic frequencies
2) Characterize rockfish school morphology to improve classification of acoustic data by species using a newly developed fisheries multibeam sonar (Simrad ME70)
3) Develop methods to determine species and size composition of rockfishes in untrawlable areas
4) Compare rockfish species distribution and abundance between trawlable and untrawlable areas

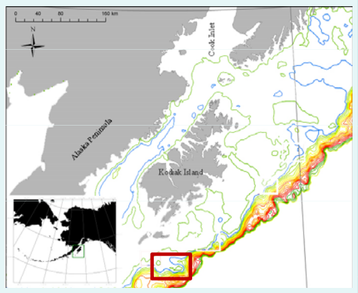
III. Poster Objectives

Compare the ability of a remotely operated vehicle (ROV), a modified bottom trawl, and a stereo drop camera system (SDC) to address objective #3 above. These groundtruthing methods were compared in terms of:

1) their ability to discriminate rockfish species composition,
2) their ability to estimate the size of rockfish targets,
3) the time necessary to collect and process the samples, and
4) potential biases in the size and species composition data

IV. Methods

We conducted an experimental acoustic survey for rockfishes in the "Snakehead" area of the Gulf of Alaska aboard the NOAA research vessel *Oscar Dyson* and the Commercial fishing vessel *Epic Explorer*. Acoustic data were collected with a multibeam sonar and scientific echosounder at multiple frequencies along 14 parallel transects (1.2 nmi spacing). Smaller scale acoustic surveys were also conducted at locations where fish sign was observed. The ROV, bottom trawl and SDC were deployed at sites where fish sign was observed to groundtruth acoustic targets.



The ROV collected video and still images to identify species, and parallel lasers to determine fish length. The drop camera system used video to identify species and stereo optic methods to determine fish size. All fish captured in the trawl were identified to species and a subsample measured to fork or total length.

V. Species Composition

The number of rockfish species observed by each method were

ROV = 10
Bottom Trawl = 9
SDC = 7

The percentage of fish not identified to species by each method were

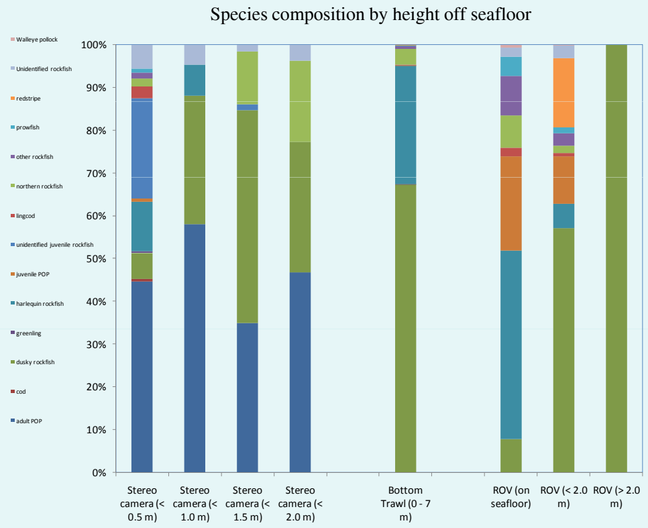
ROV = 2.67%
Bottom Trawl = 0.00%
SDC = 16.76%

The three methods agreed that fish observed in the water column were typically dusky rockfish, northern rockfish, and at location adult Pacific ocean perch

Fishes observed in highest abundance near the seafloor were harlequin rockfish, juvenile Pacific ocean perch, redstripe rockfish and lingcod

All rockfish species were observed in untrawlable habitats, but only Pacific ocean perch, dusky rockfish and northern rockfish were also observed in trawlable habitats

Differences in species composition among the methods was mostly the result of deployments in different habitats and locations



VI. Size Composition

Sample sizes for length measurement varied among the three methods with the highest percentage of observed fish measured with the SDC

Length frequency distributions were similar among the ROV, bottom trawl and SDC

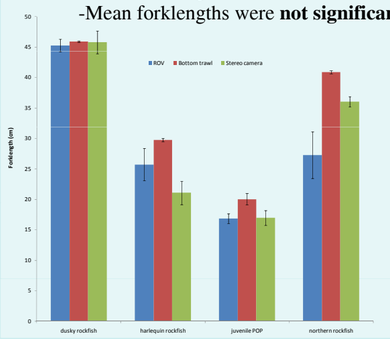
There were significant differences in mean length among species between the bottom trawl and video methods for species except dusky rockfish

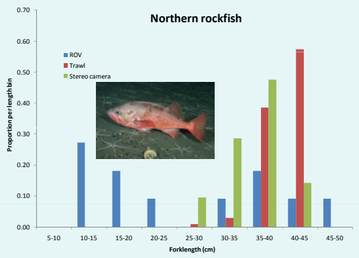
-Mean forklengths from the ROV and SDC were **smaller** than the bottom trawl for harlequin rockfish, juvenile POP and northern rockfish

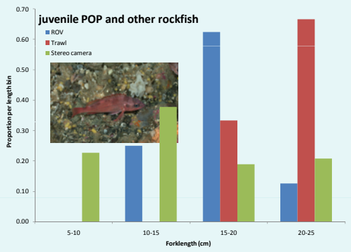
-Mean forklengths were **not significantly** different between the ROV and SDC

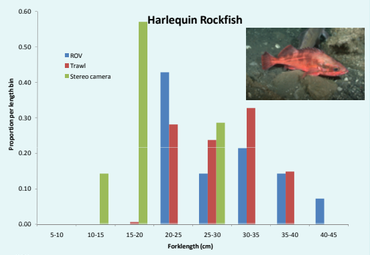
Percentage measured

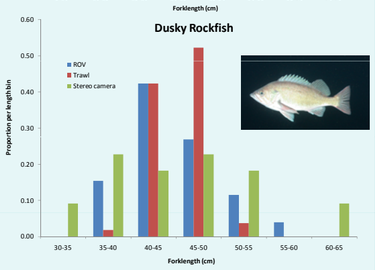
Species	ROV	Bottom trawl	SDC
Dusky rockfish	3.2%	9.3%	28.2%
Harlequin rockfish	7.1%	17.8%	46.7%
Pacific ocean perch	8.0%	100.0%	19.7%
Northern rockfish	25.0%	39.8%	17.6%



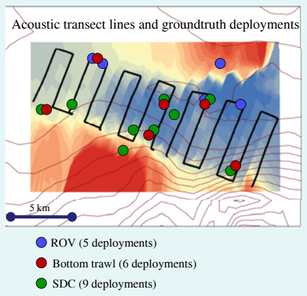


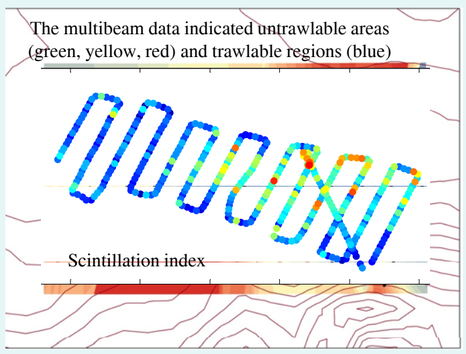


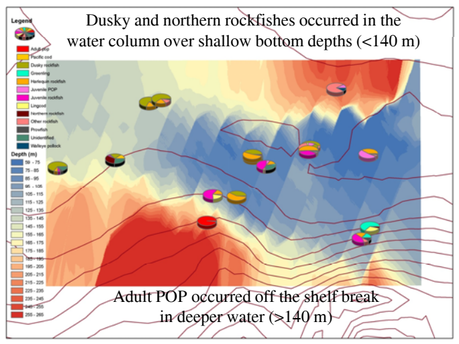


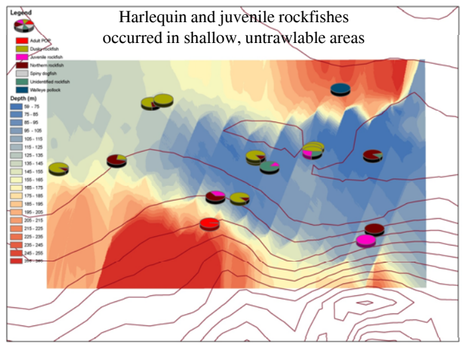


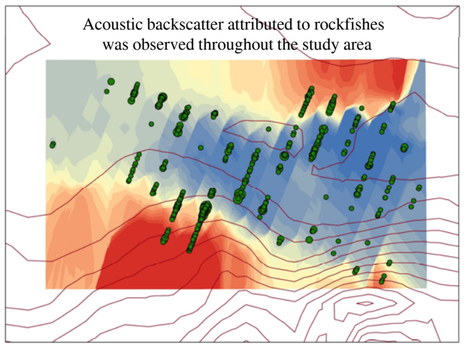
VII. Spatial Distribution











VIII. Data Collection and Processing

- The bottom trawl and SDC required ~ 1 hour per deployment, the ROV ~ 3.5 hours
- Roughly 4 - 8 hours were needed to completely process each hour of video collected
  - SDC = Two hours to count fish and do habitat classification on each deployment
    = Two hours to measure up to 200 fish per deployment
  - ROV = Three to eight hours to do habitat classification, count fish, and measure fish per deployment (1.5 hours of video collected)
- Bottom trawl data were easily processed, catch required < 3 hours of processing per tow

IX. Conclusions

- The ability to discriminate rockfish species decreased from bottom trawl to ROV to SDC
- All three methods identified similar size distributions of fish
  - the bottom trawl did not appear to sample the smallest fish
  - the percentage of potentially measureable fish for the ROV was less than the other methods
- Video based methods can provide depth distribution relative to the seafloor
- Fish behavior and fish-habitat associations can be resolved from the video methods
- The results show that selection of the appropriate method for groundtruthing depends on the specific objectives, habitat types and species complexes that will be examined

X. Continuing Research

- Determine how close to the seafloor fish targets can be resolved from the bottom echo in acoustic data
- Need to apply species and size composition to calculate biomass of rockfish
- Collect *in-situ* target strength using drop TS sytem (March)
- Complete bottom typing analysis
- Complete analysis of school size structure and characteristics

XI. Acknowledgements

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