Using Acoustics to Characterize Sediments for Essential Fish Habitat Models

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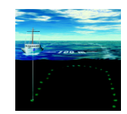
INTRODUCTION

The importance and broad scope of the Essential Fish Habitat (EFH) mandate requires an efficient and objective method for describing and mapping the habitats of federally managed species. To this end, we are using density estimates from annual bottom trawl surveys and synoptic environmental data to develop quantitative habitat models for eastern Bering Sea (EBS) species.

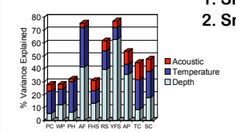
Previous research indicates that surficial sediments affect the distribution and abundance of EBS groundfish. However, traditional sampling with grabs and cores is impractical over large areas. Acoustic tools, on the other hand, are suitable for broad-scale surveying but it is unknown if they measure the relevant properties of sediments.

Pilot studies with a split-beam echosounder and a side scan sonar indicate significant yet variable contributions to habitat models. Based on these results, a definitive experiment was conducted to develop operational guidelines for acoustic mapping of the EBS seabed.

PILOT STUDY – SINGLE BEAM ECHOSOUNDER



Simrad EK-500 (38 kHz)

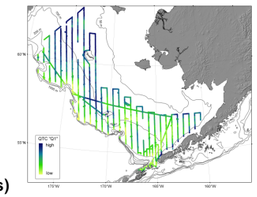


Background

Pilot study investigated correlations between *QTC VIEW*-processed backscatter and EBS fish distributions

Conclusions

1. Significant but minor contributions to EFH models (2-13%)
2. Small acoustic footprint limits survey efficiency (31 m at 12 kts)

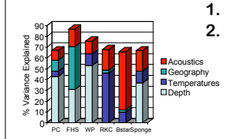


Eastern Bering Sea - 1999

MILLER FREEMAN, R-223

PILOT STUDY – SIDE SCAN SONAR

Klein 5410 (455 kHz)

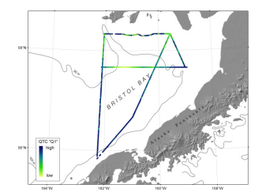


Background

Pilot study investigated correlations between *QTC Sideview*-processed backscatter and EBS fish distributions

Conclusions

1. Statistically significant contributions to EFH models (9-54%)
2. Swath coverage improves survey efficiency (150 m at 10 kts)



Bristol Bay - 2002

F/V OCEAN EXPLORER

DEFINITIVE STUDY – COMPARE COST-BENEFIT OF MULTIPLE ACOUSTIC SYSTEMS

Objectives

1. Investigate the utility of normalized backscatter for characterizing EFH in the EBS
2. Compare operational costs and EFH benefits of five different acoustic systems
3. Transfer hydrographic-quality bathymetry data for improving NOAA nautical charts

Status & Plans

1. 2,000 nmi surveyed along six survey lines
2. Acoustic and groundtruth data processing underway, then statistical analysis and data synthesis
3. Synoptic mapping with "best" system begins summer 2009/2010

Reson 8111-ER multibeam

- Backscatter (snippets)
- Bathymetry
- Survey depths to 400 m
- 100% coverage at 7 kts
- 150° swath coverage

100 kHz

Reson 8160 multibeam

- Backscatter (snippets)
- Bathymetry
- Survey depths to 3,000 m
- 100% coverage at 7 kts
- Swath is > 4x water depth

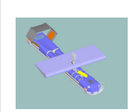
50 kHz

Klein 5410 side scan sonar

- High-resolution backscatter
- Bathymetry (interferometry)
- Survey depths to 200 m
- 100% coverage at 10 kts
- 100 - 300 m swath

455 kHz

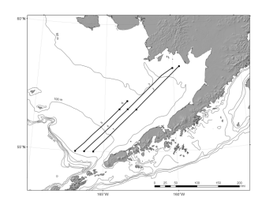
Klein 7180 side scan sonar *



- Quantitative backscatter
- Bathymetry (multibeam)
- Survey depths to 600 m
- 100% coverage at 7.5 kts
- 600 - 1,500 m swath

180 kHz

* Prototype includes a 38 kHz single beam echosounder



Bristol Bay - 2006

FAIRWEATHER, S-220

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