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Investigating the Impacts of Dredging on Coastal Inlet Habitat Function Using Acoustic Imaging

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ECU

Link to ARIS Videos

North Carolina Coastal Reserve & National Estuarine Research Reserve

Sea Grant North Carolina

Introduction

Coastal inlets are essential movement corridors for marine organisms at multiple life stages

Inlet areas play a significant role in coastal economies; dredging is required to allow ship passage

An examination of dredge impacts on inlet utilization by fish is needed, specifically during a previously closed dredging window

Methods

Adaptive Resolution Imaging Sonar (ARIS) used in a vertical down orientation for stratified random one-minute samples

Stationary samples were taken from a 24' skiff within 7 inlet strata (4 control, 3 impact, *see Fig 1*) before, during and after dredging activity from June through November 2022

Sampling effort totaled 2,555 files (95 GB) and over 42 hours of acoustic recordings

Figure 1: Google Earth imagery of the sampling strata.

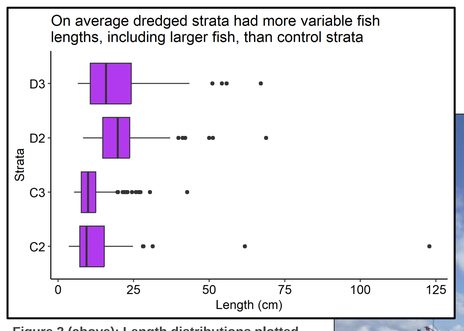

Figure 2 (above): Length distributions plotted across strata.

Figure 3 (right): Dredging vessel Dodge Island in Beaufort Inlet, NC.

Results

During most sampling dates, fish densities in the inlet were low

Mean predatory fish counts were frequently higher in dredged strata when compared to the controls

Preliminary results do not show a negative impact of dredging on fish abundance

Fish consistently moved with the current independent of date and strata

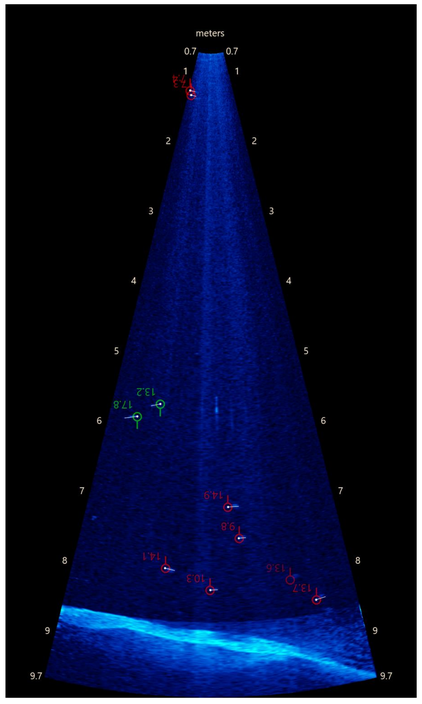

Figure 4: ARIS image in the vertical down orientation with lengths displayed, showing small pelagic fish. Color indicates the direction of travel for each fish.

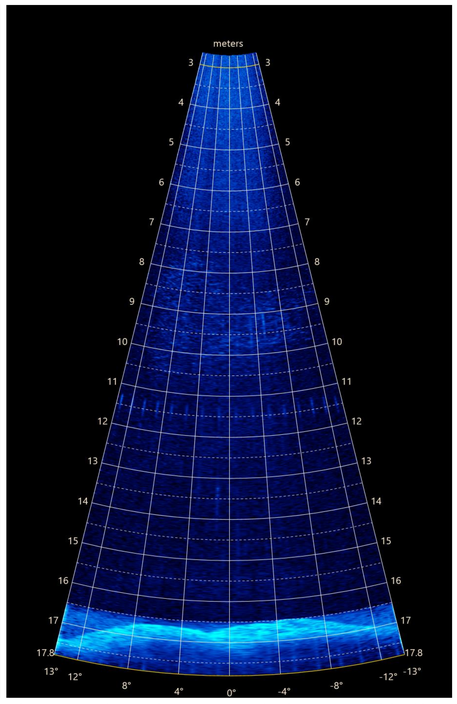

Figure 5: ARIS image of a prey aggregation (7.5m to 11m of depth), the size and density of these aggregations is quantified using a gridding method.

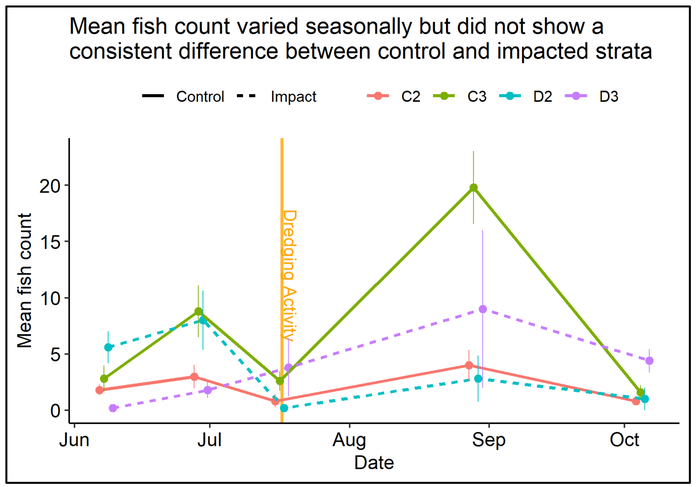

Figure 6: Mean non-prey fish counts plotted across dates and strata.

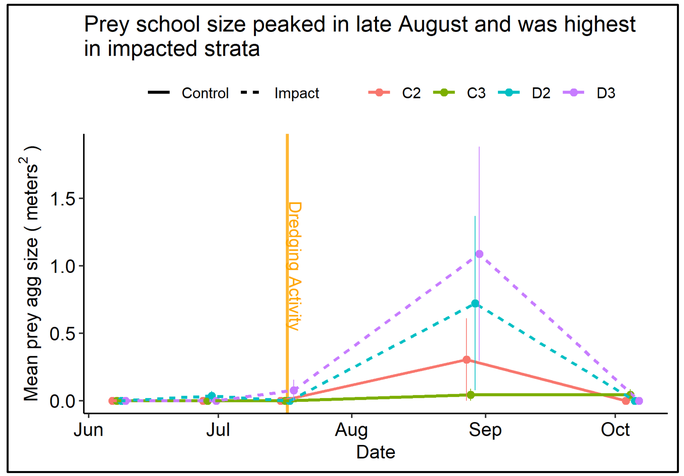

Figure 7: Mean prey aggregative size (in meters^2) plotted across dates and strata

Conclusion and Future Direction

Analysis is completed for ~15% of vertical down samples; so far, the hypothesized negative effect of dredging is not evident on the time scale examined. The less visually evident impacts of dredging will need to be determined statistically once the data processing is completed.

Future Direction

Complete processing for remaining sampling days, three additional strata, and the outgoing tide

Analyze horizontal ARIS sampling to better quantify prey abundance and distribution (*see image right*)

Examine simultaneous ARIS and SIMRAD (splitbeam) data to corroborate targets and identify the strengths of each sampling method (*see below*)

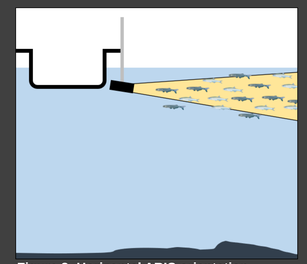

Figure 8: Horizontal ARIS orientation.

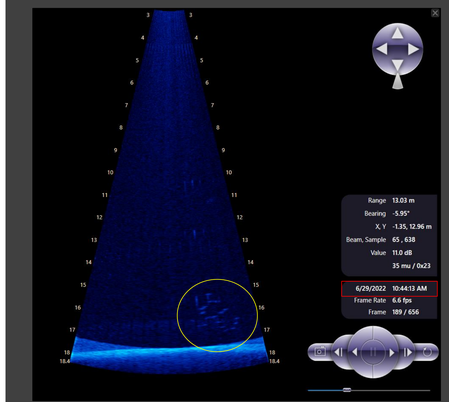

Figure 9: ARIS image of a small school of fish, recorded in tandem with a SIMRAD sonar

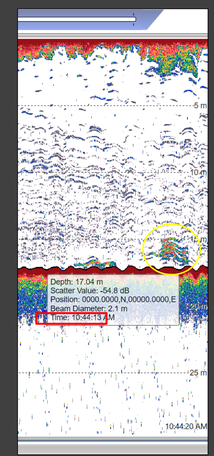

Figure 10: SIMRAD image of a small school of fish, recorded in tandem with an ARIS

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