SUT
WA Research Night

An introduction to acoustic seafloor observation and geostatistical data interpolation

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Northern Demersal Scalefish Fishery: Acoustic Project

Provide a cheap, low risk and long term monitoring tool for the Department of Fisheries, by:

• Mapping seafloor habitats
• Mapping water column biomass
• Determine relative demersal fish biomass
• Identify possible locations of significant fish biomass outside current areas of commercial effort
Northern Demersal Scalefish Fishery: Acoustic Project

A single beam echo-sounder was attached to a fishing vessel to collect data at four frequencies to help map:

- Bathymetry
- Seafloor substrate (using backscatter)
- Water column biomass
Study Area – Depth from first trip (April 2012)

1 Week of data collection (locations blurred)
Study Area – Depth from all trips to date and still collecting...

18 months of data collection (locations blurred)
The Problem

Interpolation of single-beam echo sounder bathymetry towards development of a continuous bathymetry grid for the offshore Kimberley region

• Bathymetry estimates from SBES (single-beam echo sounder)
• Interpolation between tracks
• Compilation of multiple data sources for broad-scale grid
Background: Geostatistics

- Data demands for broad-scale observation and continuous datasets
- Geostatistics vs other estimators (Nearest neighbour, inverse distance weighting, or triangulated irregular networks)
- Surface Interpolation
  - Variogram modelling
  - Kriging
Methodology

- Exploratory data analysis
- Data transformation and filtering
- Variograms and interpolation
- Data comparison and compilation
- Error assessment
Methodology: Pre-Processing

- Exploratory data analysis, spatial statistics
- Trend surface fitting
- Model residuals
- Statistical modelling and normal distributions
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Methodology: Interpolation

- Variogram modelling of residuals
- Kriging interpolation with variogram input
- Cokriging with GA 250m grid
Methodology: Bathymetry Grids
Methodology: Bathymetry Grids
Results
Direction

• Extend interpolation of bathymetry to other properties; sediment composition, substrate depth, and/or water column biomass
• Continuous collection of SBES to contribute to baseline mapping
• Trial of techniques across new geographic extents
Summary

• Use of acoustic observation for broad-scale monitoring of the seabed
• Challenges of interpolating sparse samples to a continuous surface
• Potential to apply techniques to various marine habitat variables
Questions?
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