Monitoring interannual variability in marine mammal and prey distribution near Kodiak Island, Alaska

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INTRODUCTION

Variability is a constant of the Kodiak marine environment. Regional, seasonal and interannual changes in diets of apex predators and prey availability have been noted during studies conducted as a part of the Gulf Apex Predator prey (GAP) project. Variability GAP has documented in the diet and distribution of opportunistic marine mammals are reflective of changes in the distribution and abundance of their prey, which in turn suggests changes in the prey-specific suitability of marine conditions. Although high degrees of interannual variability in the distribution of apex predators have been documented, GAP has lacked a means of measuring and comparing conditions associated with changes to their prey fields. In response, we surveyed “Variability Index Sites” (VIS) in Kodiak waters for a suite of biological and physical parameters.

APPROACH

• Identified three VIS in Kodiak waters (Marmot Bay, Shuyak Is, and Uganik Bay; Figure 1) that have historically supported large aggregations of fish, birds and marine mammals
• Within each VIS, we established systematic sampling grids and transects to measure physical and biological parameters in 2012 and 2013.
• Parameters recorded:
  - Water temperature and salinity profiles (CTD)
  - Dual frequency backscatter (38 & 120 kHz)
  - Species-specific whale counts
  - Zooplankton samples (300 µm mesh bongo net)
• Backscatter (σb) was partitioned into signals consistent with “fish” or “zooplankton” based on their relative frequency response and ratios of fish to zooplankton σb were calculated.

PRELIMINARY RESULTS & OBSERVATIONS

• Documented conditions were considerably different between the two years.
• There was a scarcity of zooplankton backscatter in 2013.
• Fewer whales of both species were sighted in 2013 than in 2012.
• In 2012, fin whales were associated with moderate levels of zooplankton σb at the Uganik site, while humpbacks were associated with very dense zooplankton at the Marmot site and forage fish (likely capelin) at the Shuyak site (Figure 2).
• In 2013, the only significant backscatter was seen at the Shuyak site and was attributed to forage fish (again, likely capelin) and this is the only VIS where whales were sighted.
• High fish σb documented in 2013 in Marmot Bay was not attributed to forage fish, but rather larger demersal fish (such as adult pollock and cod).
• CTD data showed that surface temperatures were more variable in 2013 than in 2012 (Figure 3).

<table>
<thead>
<tr>
<th>VIS</th>
<th>Average Backscatter (σb)</th>
<th>Number of Whales</th>
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<tbody>
<tr>
<td></td>
<td>Fish</td>
<td>Zooplankton</td>
</tr>
<tr>
<td>Marmot Bay</td>
<td>19277</td>
<td>230</td>
</tr>
<tr>
<td>Shuyak Is</td>
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<td>230</td>
</tr>
<tr>
<td>Uganik Bay</td>
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