Seasonal Distribution and Relative Abundance of Steller Sea Lion Prey in the Aleutian Islands

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Background

Groundfish stocks in Alaska are managed at large scales, however important ecological interactions, such as predation, spawning, and habitat selection occur on local scales. Furthermore, commercial fishing is an activity with potential for localized effects. Improved understanding of the local abundance of fish is critical to understanding the potential for localized depletion by fishing. In 1997, the western stock of the Steller sea lion population was declared endangered. One of the hypotheses for this decline was competition between the commercial groundfishery and Steller sea lions for prey. In order to understand the effects of fishing on a local scale, we need to assess abundance and distribution of the prey fields in local areas.

Study Objective

This study assesses Steller sea lion prey distribution around rookeries and haulouts in the fished area of the central Aleutian Islands in the summer and winter. Catch per unit effort indices during a NMFS chartered research cruise are used to examine small scale patterns in Steller sea lion prey distribution in three local areas in the central Aleutian Islands: Petrel Bank, Tanaga Island, and Seguam Pass. The results of this study contribute to an improved understanding of the importance of predator-prey interactions between sea lions and groundfish.

Methods

The data were collected during a NMFS Atka mackerel tag recovery cruise aboard the FT Seafisher, a 230 ft factory trawler. We employed heavy duty bottom trawl gear to conduct 1-2 mile trawl tows in the three study areas. Tow locations were selected near tag release stations with an adaptive sampling design that covered almost the entire trawlable grounds in the designated study areas open to commercial fishing (Figs. 1a and 1b).

Sampling of the catch: Catch species composition was determined by subsampling each catch and extrapolating species composition to the total haul weight using methods similar to standard NMFS observer sampling procedures.

CPUE estimation: CPUE was calculated by dividing total tons of species’ catch by the time fished (time of the net actively fishing on the seafloor) for a particular haul. The haul CPUEs were averaged to form day CPUEs following the methods of Meintz (1999).

Species composition estimation: Species composition was estimated by calculating the percent of average CPUE for each species by area and season.

Results:

In all three study areas Atka mackerel was found to be dominant making up more than 80% of the catch in both seasons. At Petrel Bank and Seguam Pass rockfish were the second most dominant species group with northern rockfish prevalent at Petrel Bank and Pacific ocean perch prevalent at Seguam Pass. Pacific cod was the second most abundant species with rockfish being the most abundant species at Tanaga Pass. Species composition was similar between seasons, however Pacific cod comprised more of the total catch at Tanaga and Seguam Pass in the summer of 2011 than in the following spring of 2012.

Conclusions

Relative abundance of the five predominant species in the catches close to Steller sea lion rookeries and haulouts are presented in this study during summer and winter to spring season. Atka mackerel dominated the species composition and relative abundance in all areas and seasons. Rockfish and Pacific cod were the second most abundant species with rockfish being more abundant in Petrel Bank and Seguam Pass and Pacific cod being more abundant in Tanaga Pass. Walleye pollock was found only in small densities in all areas except during the summer at Petrel Bank. Pacific cod was low in abundance in all areas and seasons except at Tanaga Pass where it was most abundant during the spring season.

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Table 1. ANOVA (5 plus software) results of area and season effect on CPUE for the five prey species with significance level at 0.05, the significant results are shown in orange.

<table>
<thead>
<tr>
<th>Species</th>
<th>Petrel Bank</th>
<th>Pacific Ocean Perch</th>
<th>Rockfish</th>
<th>Pacific Cod</th>
<th>Pollock</th>
</tr>
</thead>
<tbody>
<tr>
<td>Season</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>p-value</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Summer</td>
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<td>0.412</td>
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<td>0.000</td>
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<tr>
<td>Spring</td>
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<td>0.122</td>
<td>0.978</td>
<td>0.421</td>
<td>0.196</td>
</tr>
</tbody>
</table>

Atka mackerel CPUE varied greatly between areas and seasons with the highest CPUE at Petrel Bank in the summer of 2011 and high CPUE in Tanaga Pass and Petrel Bank in the spring of 2012. Seguam and Tanaga Pass both showed a much lower relative abundance during the summer season whereas Petrel Bank CPUE was consistently high during both seasons.

Northern rockfish were mostly found at Petrel Bank and showed low abundance at Seguam and Tanaga Pass.

Pacific ocean Perch were most abundant at Seguam Pass and Petrel Bank, especially during the spring season.

Walleye pollock was not very abundant in all areas except during the summer at Petrel Bank.

Pacific cod was low in abundance in all areas and seasons except at Tanaga Pass where it was most abundant during the spring season.