

Diet of the Western stock Steller sea lions (*Eumetopias jubatus*) from 1999-2009



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Objectives

- To examine Steller sea lion diet during the past decade (1999- 2009) both across the range and across seasons.
- To compare these results to prior work which examined sea lion diet between 1990 and 1998 (Sinclair & Zeppelin, 2002).

Methods – Scat collection and processing



Frequency of occurrence (FO) to compare sites

$$FO_{jk} = \frac{\sum_{i=1}^{n_k} O_{ijk}}{n_k}$$

where $O_{ijk} = 0$ if taxon j is absent in scat i in season k

1 if taxon j is present in scat i in season k

n_k = total number of scats contained identifiable prey in season k

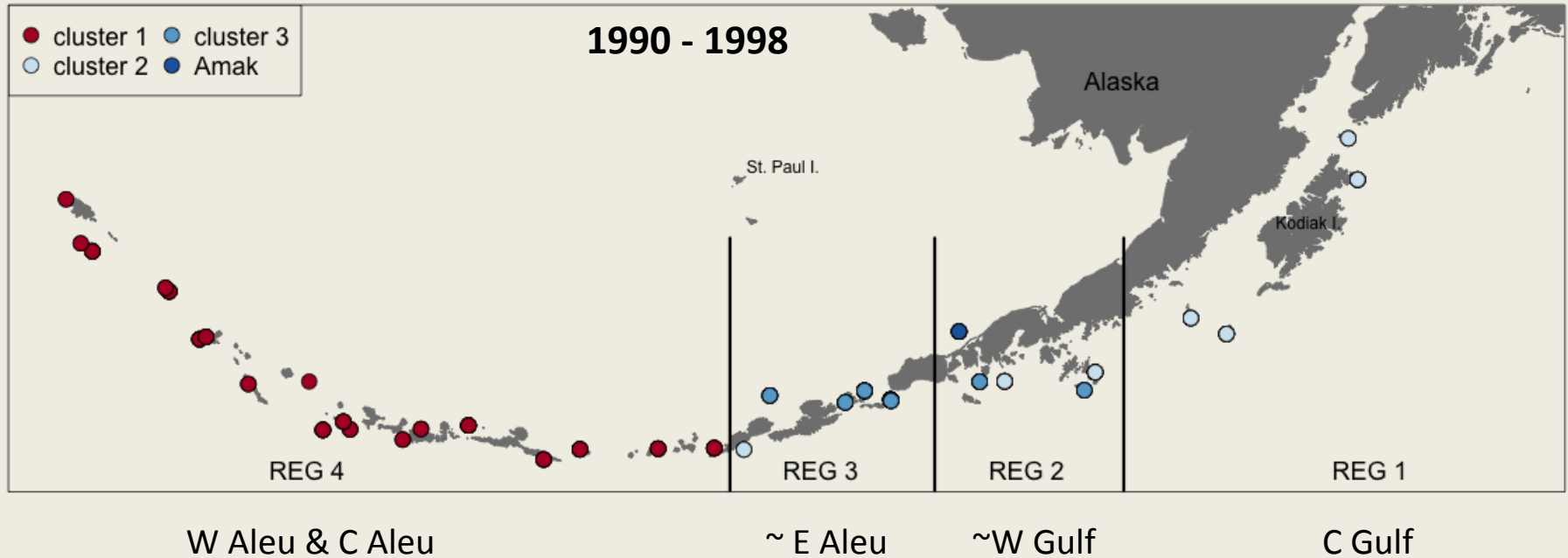
Grouping sites into regions using FO data

- **Principle Component Analysis (PCA)** - Used to reduce the data in representative factors that accounted for the majority of the variance.
- **Cluster Analysis** – Conducted on PCA factors using squared Euclidian distance as a measure of similarity between sites and Ward's method to compare cluster distances.

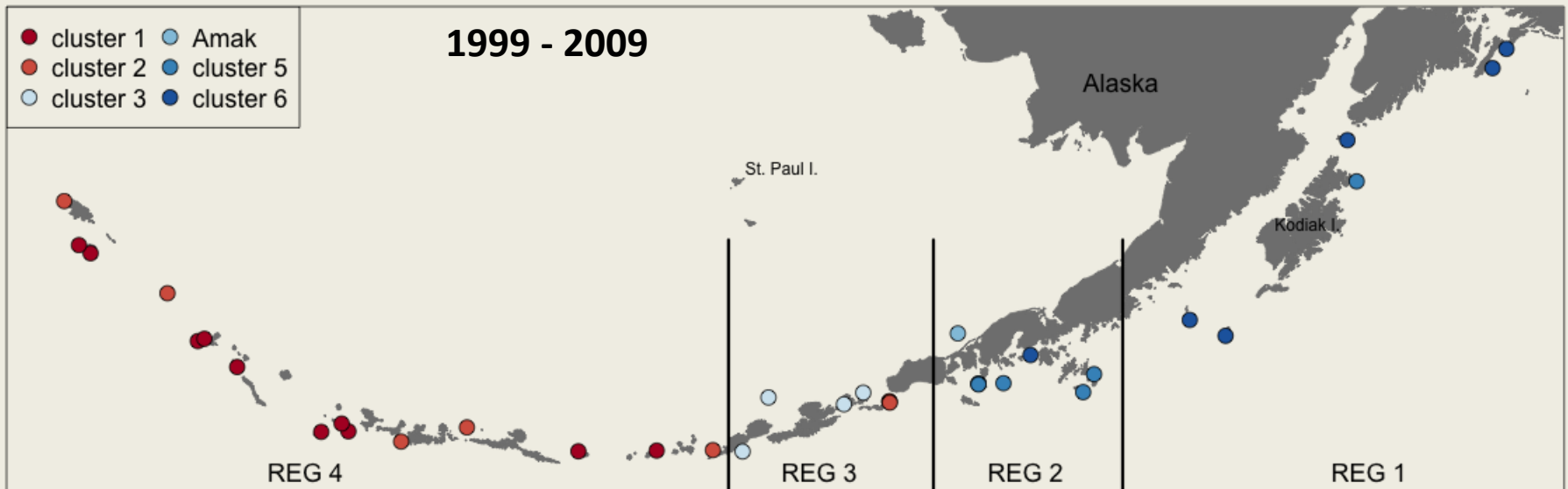
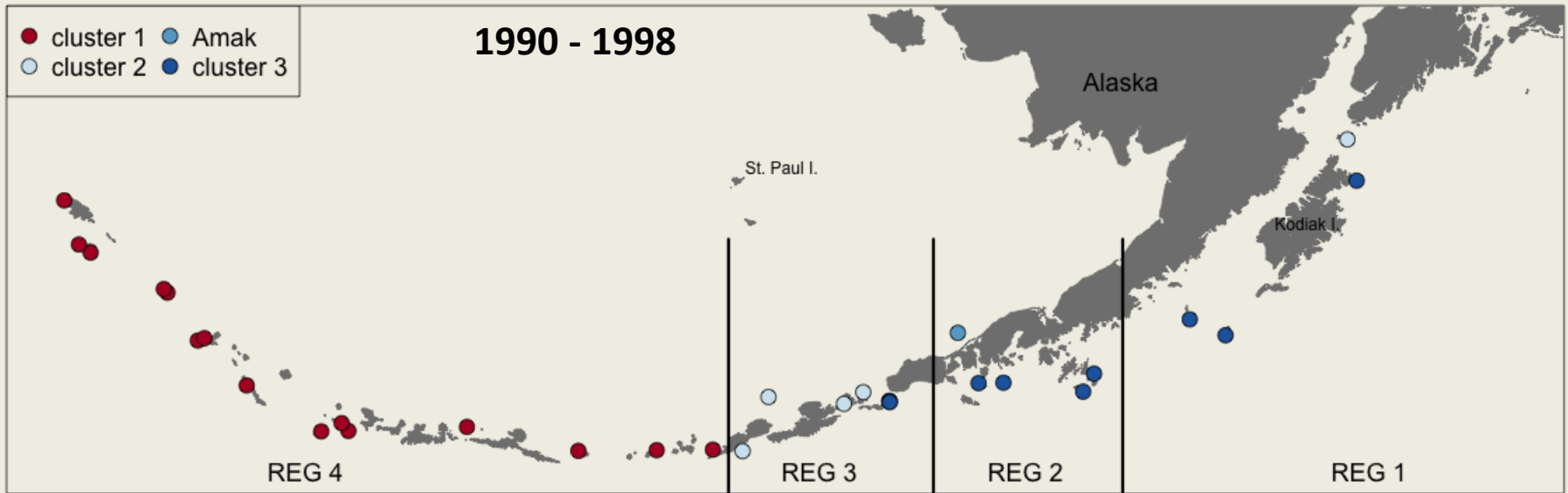
Comparisons between decades

Generalized linear models were used to determine differences in frequency of occurrence of prey species between time periods within each region.

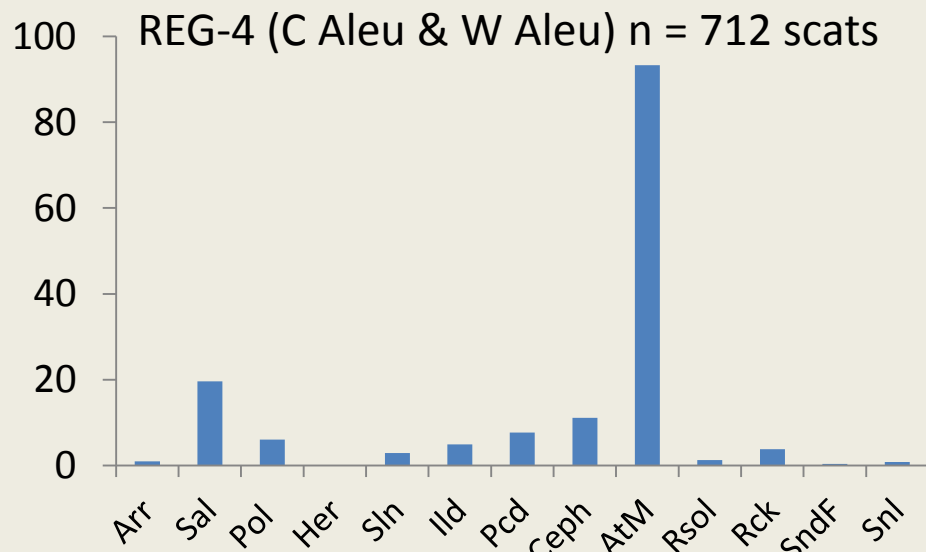
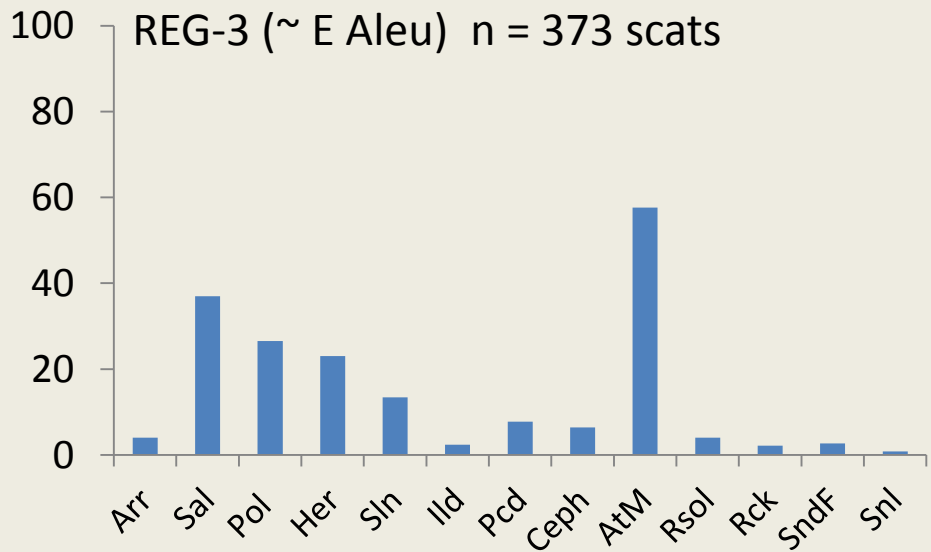
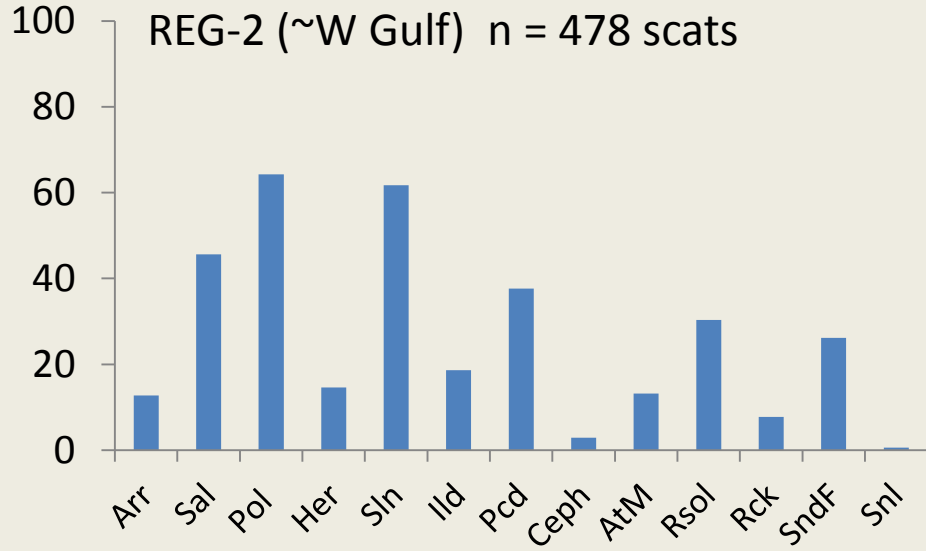
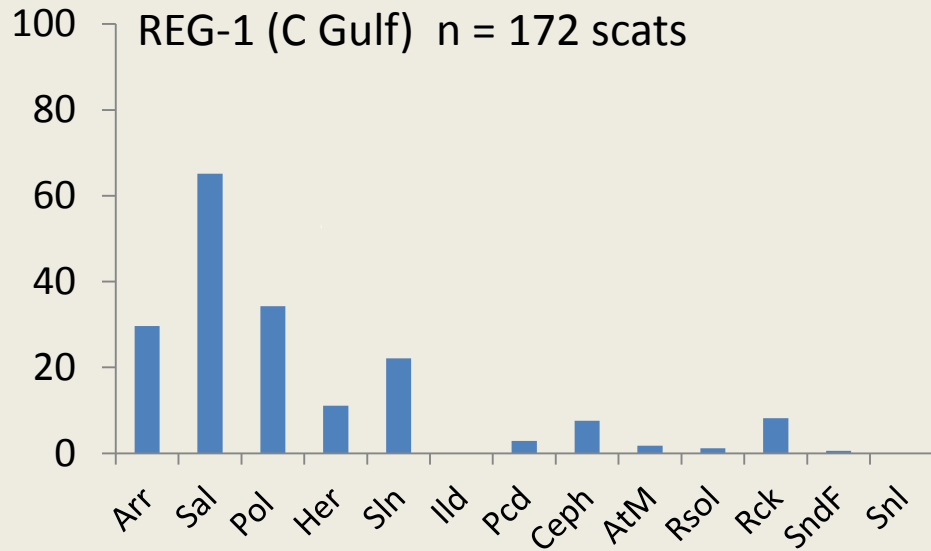
Regional divisions based on cluster analysis (Sinclair & Zeppelin, 2002)



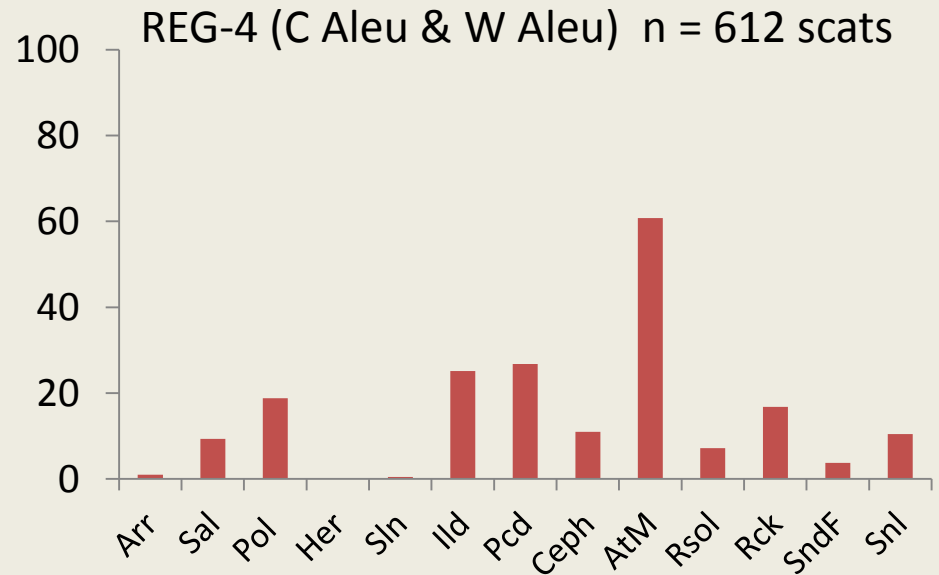
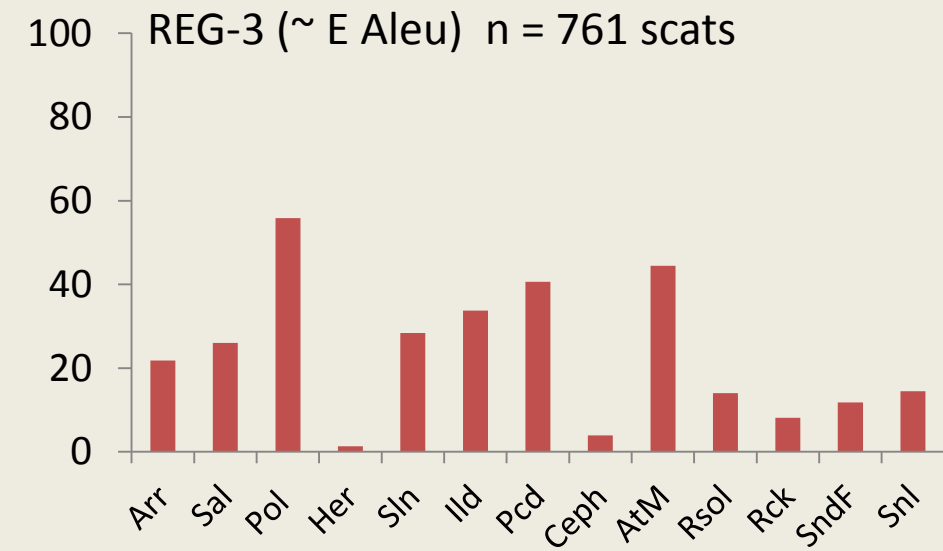
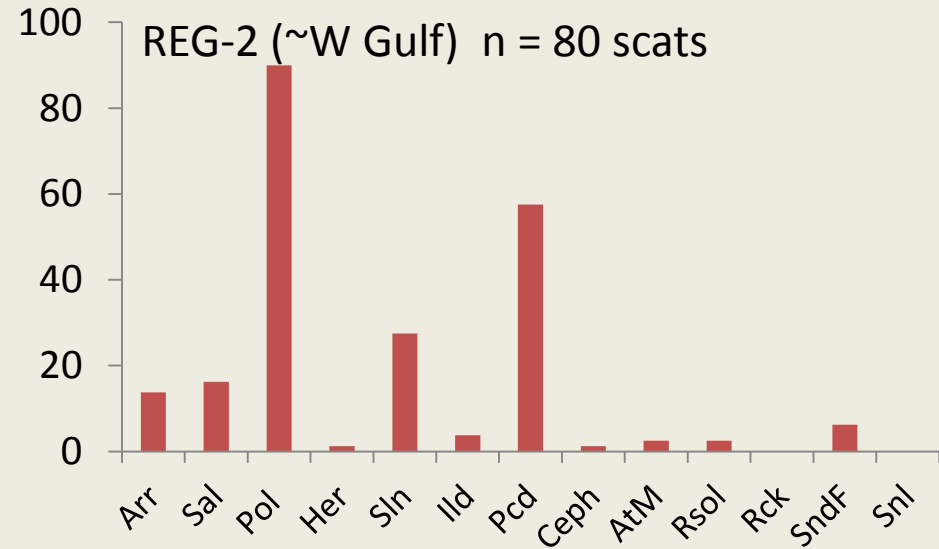
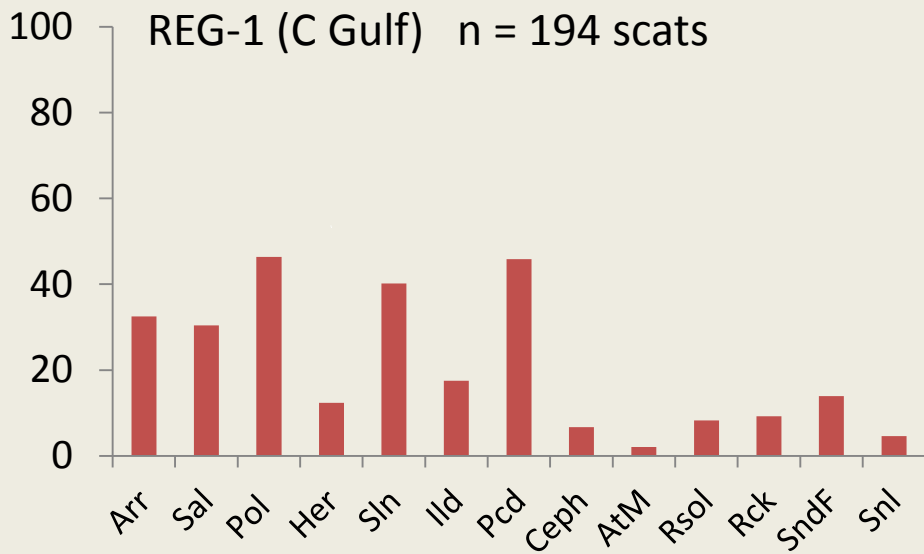
Regional divisions based on cluster analysis



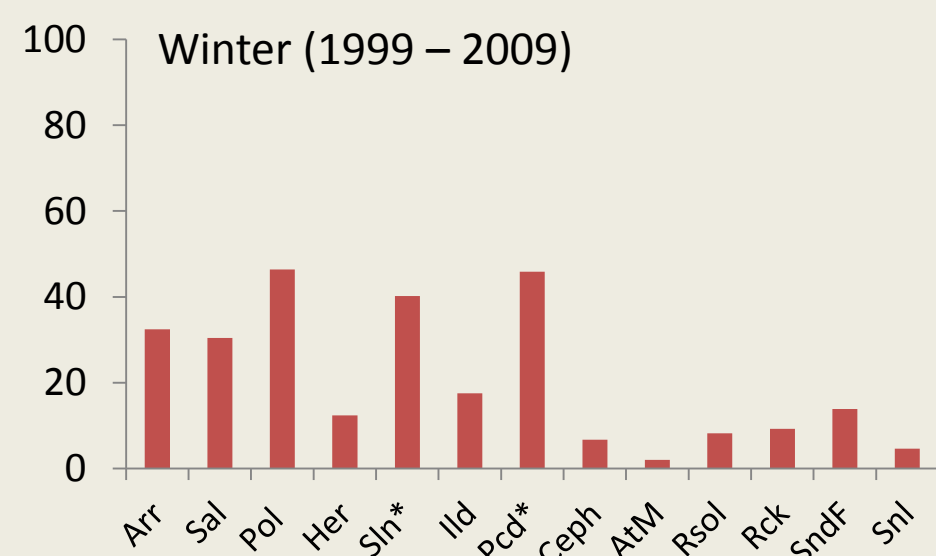
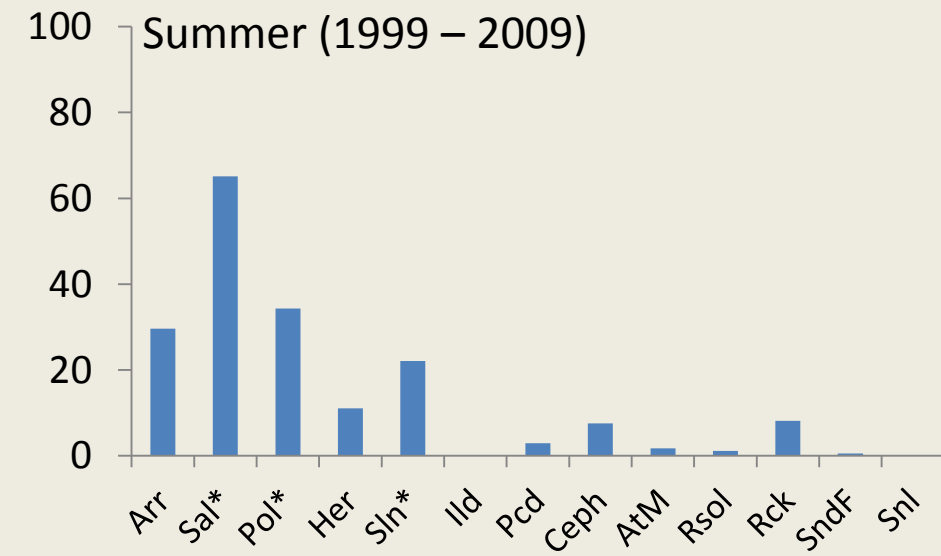
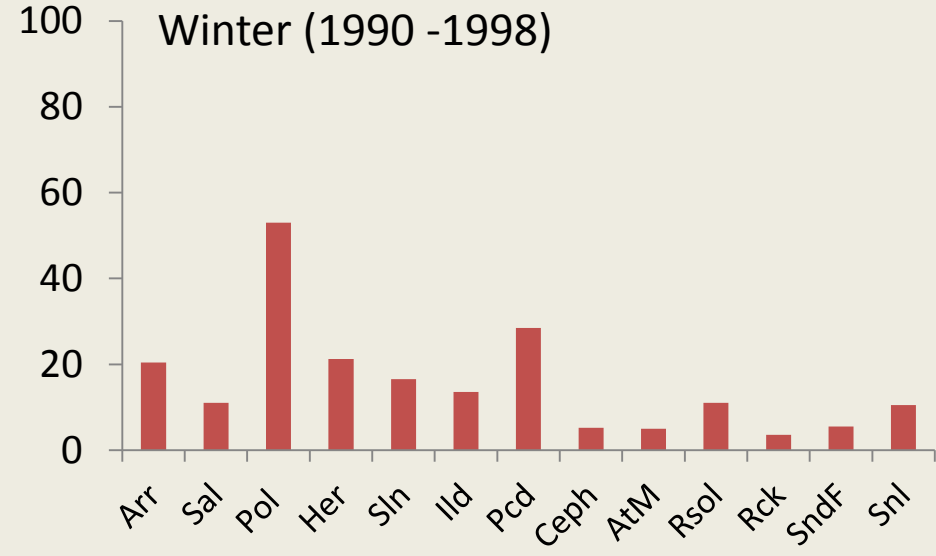
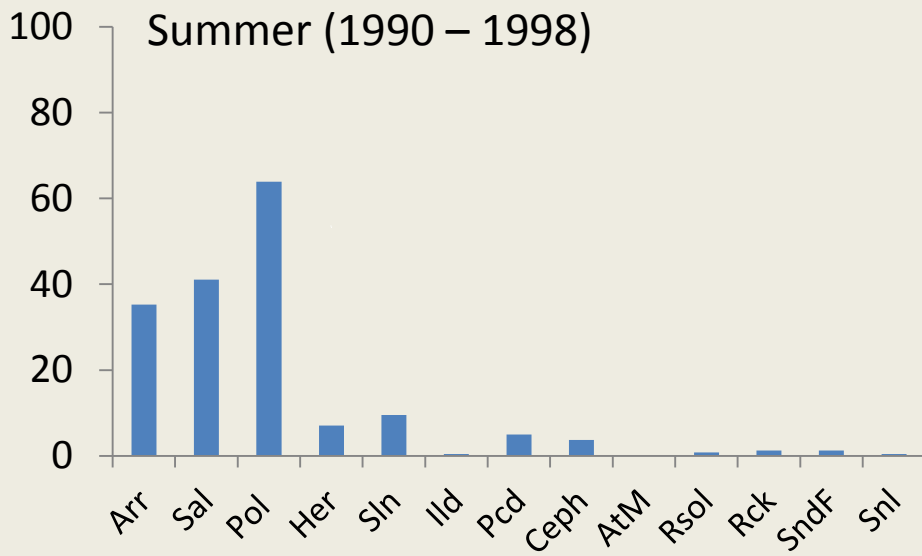
FO by Region – Summer (1999 – 2009)



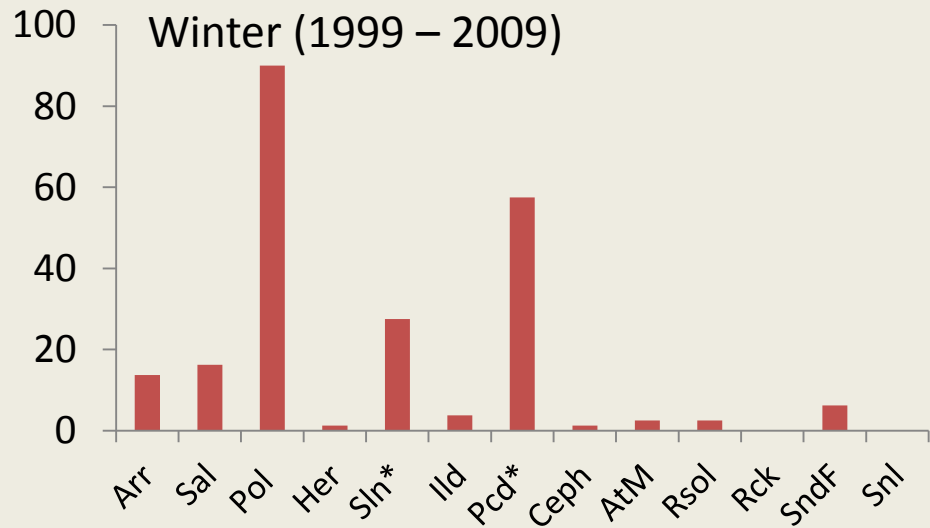
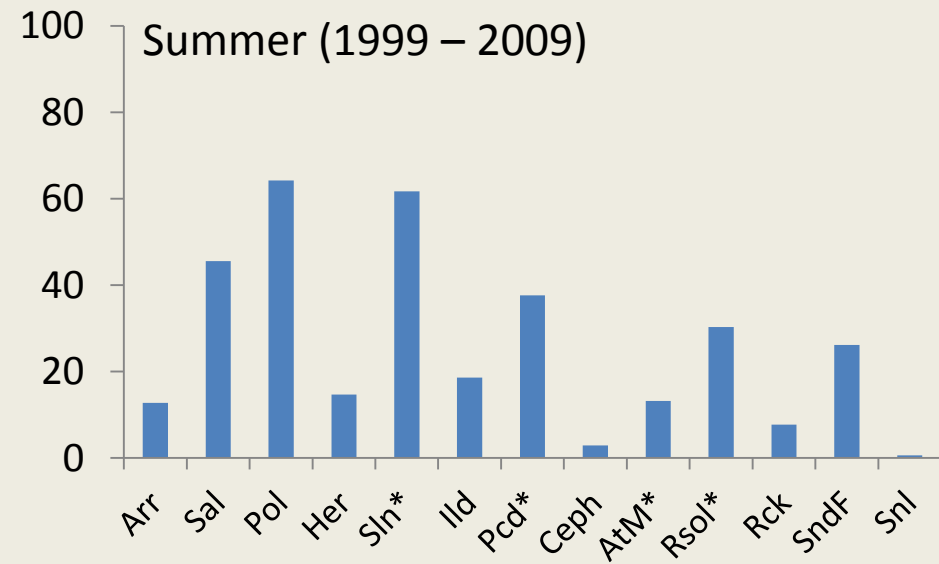
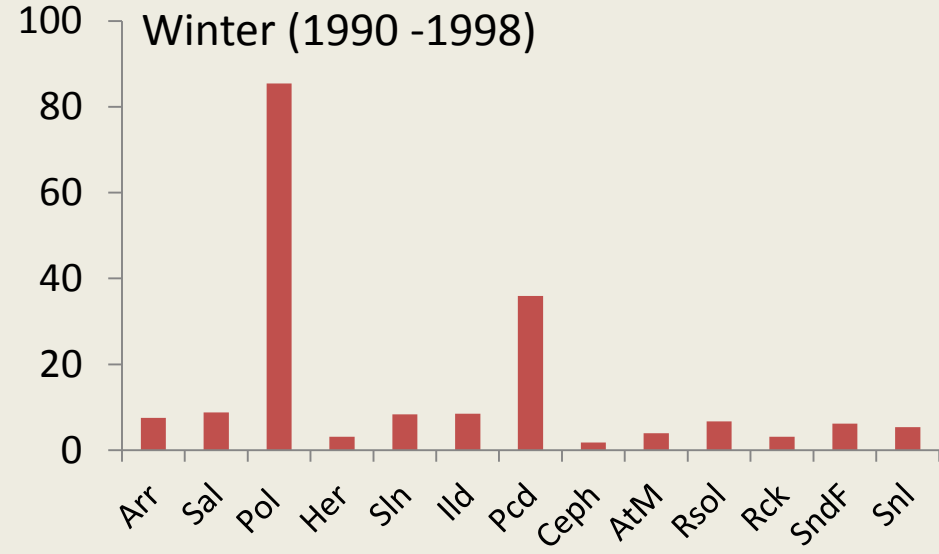
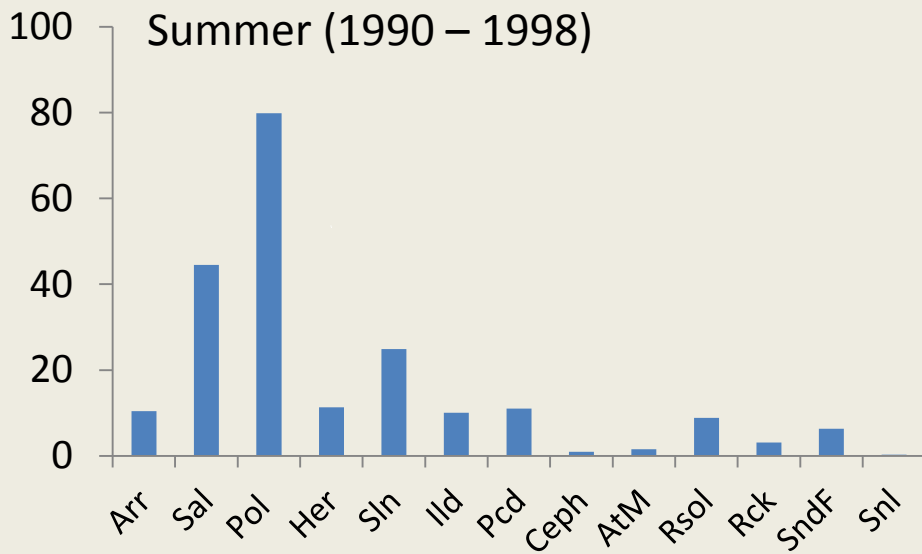
FO by Region – Winter (1999 – 2009)



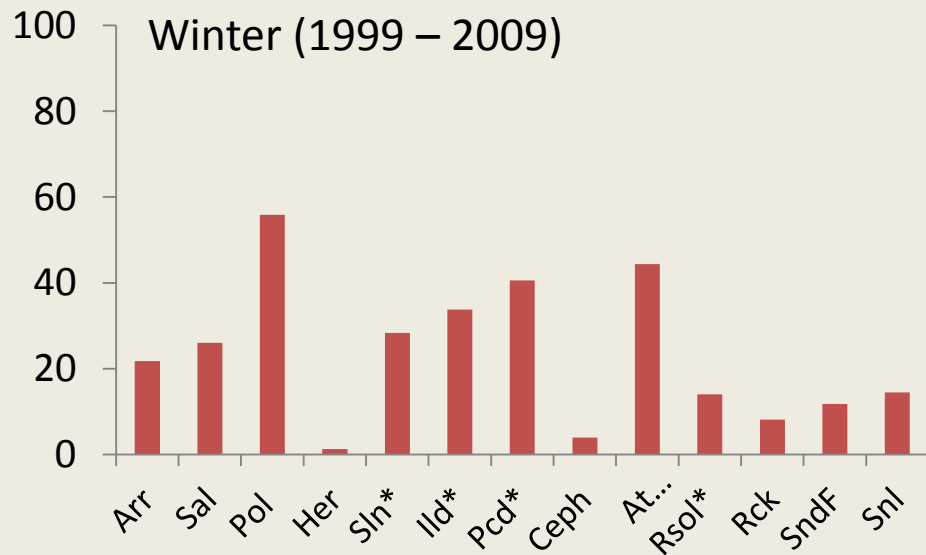
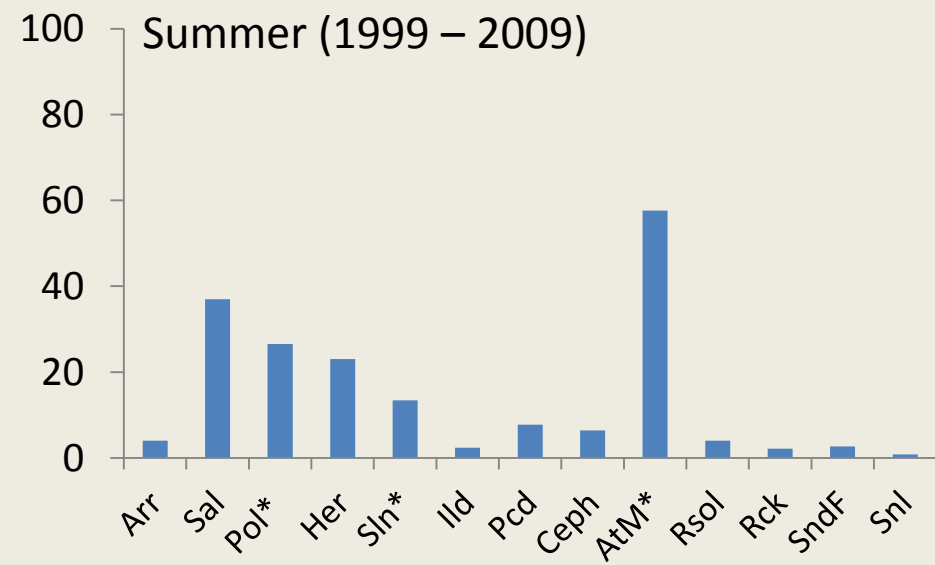
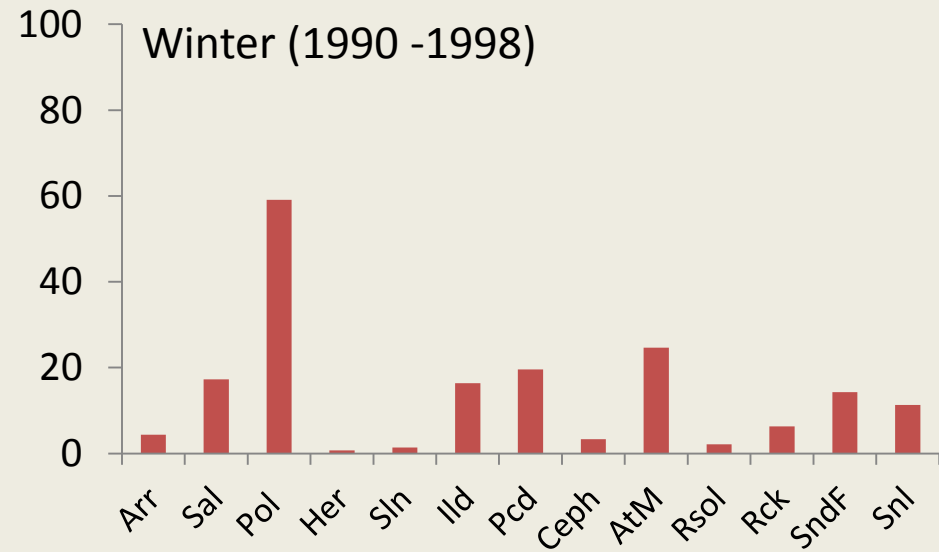
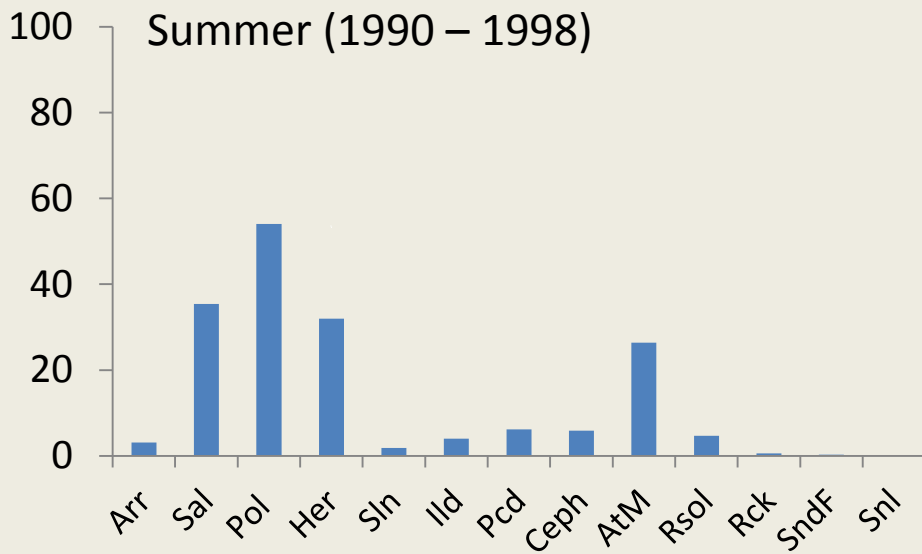
FO comparison between decades – Region 1



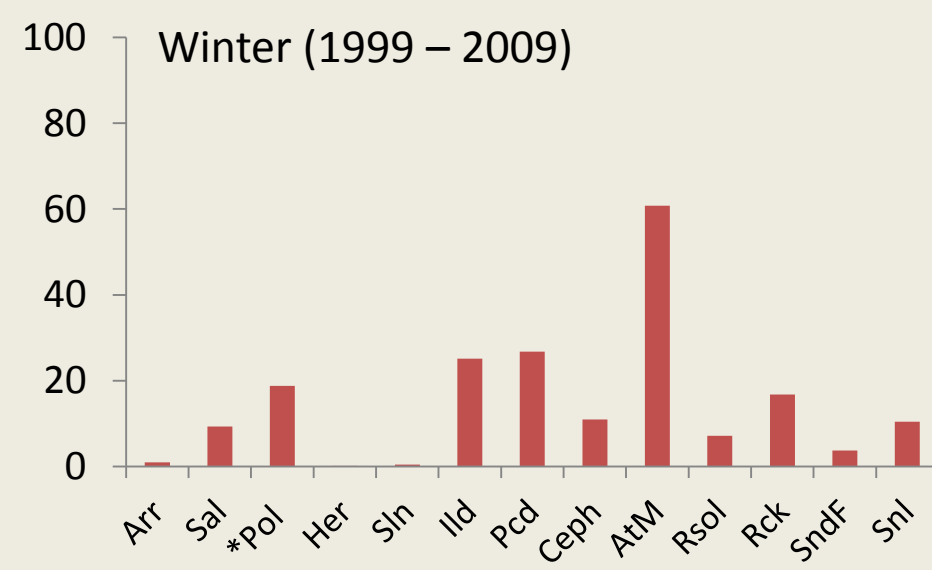
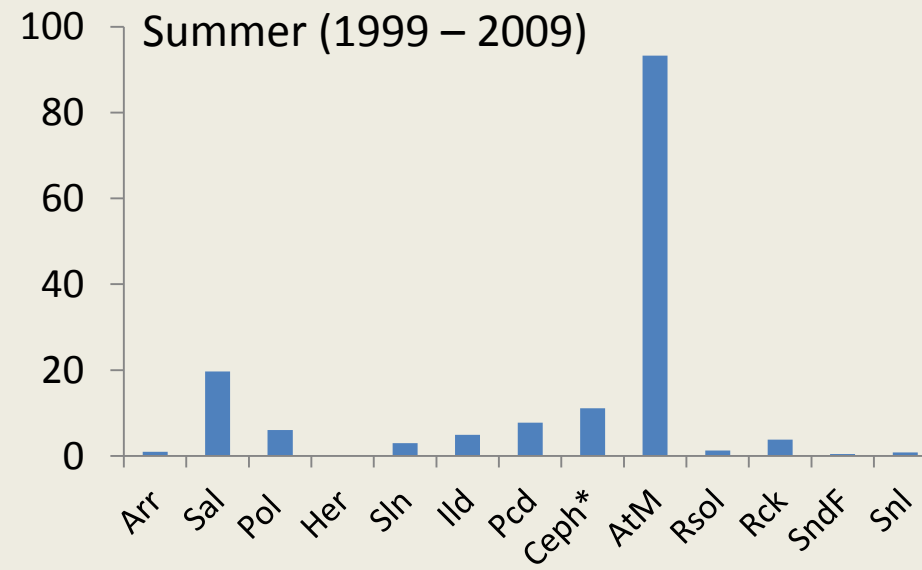
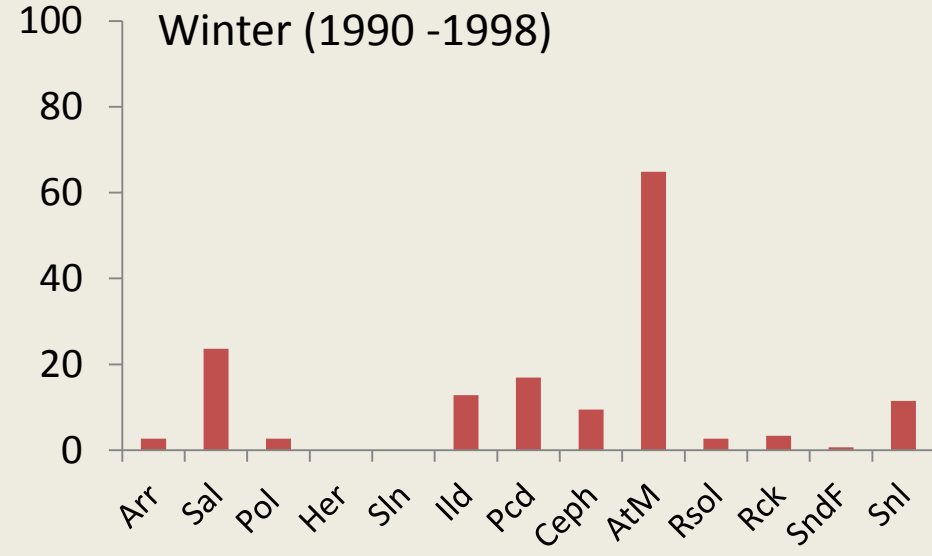
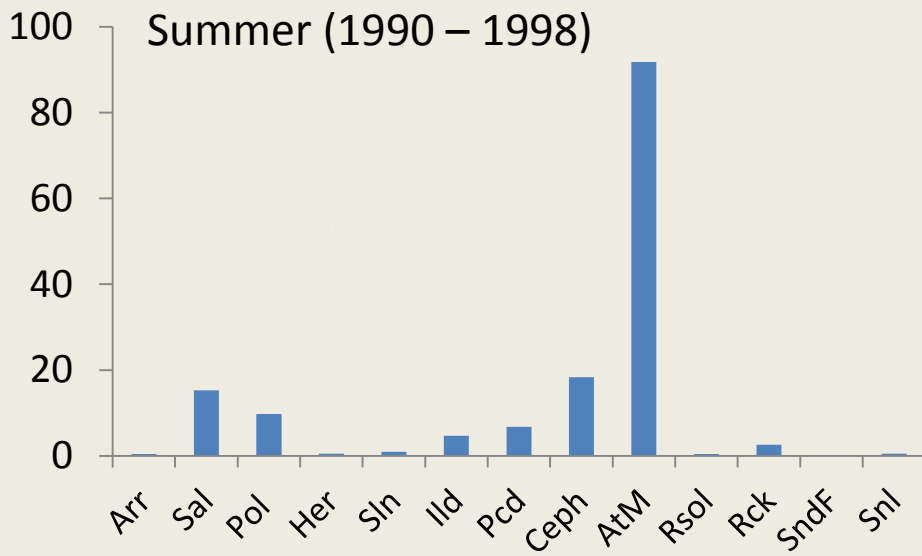
FO comparison between decades – Region 2



FO comparison between decades – Region 3



FO comparison between decades – Region 4



Summary

All of our analyses found the same regional breaks which corresponded with population trends.

Summer

Decline in Walleye pollock (REG 1,3)

Increase in Sand lance (REG 1-3)

Increase in Atka mackerel (REG 2-3)

Increase in Salmon (REG 1)

Increase in Pacific cod & Rock sole (REG 2)

Decrease in Cephalopods (REG 4)

Winter

Increase in Sand lance (REG 1-3)

Increase in Pacific cod (REG 1-3)

Increase in Atka mackerel, Irish lord, Rock sole (REG 3)

Increase in Walleye pollock (REG 4)



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