Can we differentiate krill-eating and herring-eating whales using fatty acid trophic markers in blubber samples?

**Background**

Understanding humpback whale diets in southeast Alaska (SEAK) is crucial to the management of herring and other prey species in the region.

SEAK Humpback diets are dominated by euphausiids (krill) and small schooling fish such as herring, though little information exists regarding relative proportions.

In this study, whales with at least a month of diet observations were classified as primarily-krill or primarily-herring eaters, and fatty acid analysis was used in an attempt to discriminate between these classes.

Classification of a whale of undisclosed feeding behavior was then attempted based on this method of diet discrimination using only blubber samples.

**Choice of diet items**

**Fatty Acid trophic markers identified to distinguish between feeding behaviors**

**Conclusions**

Using ANOSIM (Analysis of Similarity) on the blubber fatty acid profiles, whales with different observed feeding behaviors (primarily-krill vs. primarily-herring) were separated to a significant degree. Furthermore, the whale with undisclosed feeding behavior was correctly classified using this method.

Several individual fatty acid trophic markers were also identified that may serve as simpler and more qualitative indicators of primary diet items. For instance, a relatively high abundance of C18:4n3, typically high in krill, was immediately evident in (primarily) krill-eating whales, and C20:1n11, typically high in herring, was noticeably elevated in (primarily) herring-eating whales.

Further studies applying the same technique to larger sample sizes and for humpbacks from various geographical regions are now underway.

**Technique**

Biopsy crossbow bolts were used to capture blubber plugs from whales for which we had direct feeding observations. Lipid was extracted from these blubber samples and their fatty acids characterized. Similarly, fatty acid profiles were obtained for krill and herring from the same region for comparison and identification of potential markers for diet discrimination.

In addition, complete blubber cores were compared to outer blubber biopsy samples and found to have fatty acid profiles that did not differ significantly.