The Influence of Adult Salmon Carcasses on Energy Allocation in Resident Dolly Varden

**Purpose**
Adult salmon deliver marine derived energy to fluvial habitats but the influence of that energy on resident and juvenile salmonids is unknown. Juvenile fish must allocate energy between growth and storage in order to maximize survival, particularly over winter. Adult salmon carcasses may therefore represent an important subsidy to juvenile salmonids.

**Hypothesis**
Dolly Varden sympatric with anadromous salmon will have greater amounts of energy in storage relative to those in non-anadromous streams.

**Sampling Locations**
Dolly Varden (DV) were collected from two pairs of anadromous and non-anadromous (barriered) streams between May and October of 2004. One pair of streams was near Homer, on the Kenai peninsula. The other pair was near Juneau in southeast AK.

Selection of the streams also allowed for evaluating the roles of nutrient levels and stream size (discharge) on energy allocation in resident DV.

The Chakok River, the anadromous stream near Homer has resident chinook, pink, coho and steelhead runs. Chinook provide the greatest biomass and return in early July.

Shrine Creek, the anadromous stream near Juneau has chum, pink and coho runs. Chums return in late July.

**Conclusions**
Contrary to the hypothesis, the DV in the barriered stream grew faster and had higher amounts of energy allocated to lipid... the faster growth and higher energy stores in DV from barriered streams likely results from improved foraging conditions.

Nevertheless, DV from the anadromous streams consume marine lipids. The presence of carcasses may therefore ameliorate the effects of reduced foraging opportunities by providing resident DV a high quality energy source. Consequently, marine nutrients may play an important role in maintaining resident DV populations in anadromous streams.

**Fatty Acids Show Marine Influence**
The fatty acid (FA) compositions of the DV and adult salmon were examined to determine if DV from anadromous streams consumed marine lipids. Fatty acids from marine sources differ in composition from those derived from terrestrial or fresh water sources.

In these plots of dissimilarity vs. length, it is clear that large DV are consuming marine lipids. In the anadromous stream, FAs in large DV become more similar to those in chinook when spawning is over. Note that there is no relation between length and dissimilarity in the barriered stream.

**Carcasses Did Not Affect Energy Content**
Mass specific energy content was estimated for energy derived from protein and lipid. These values were calculated multiplying the total lipid or protein mass by their calorific equivalents and dividing by the wet mass.

These graphs compare the mass specific energy content in each of the pairs of streams. Error bars depict 95% CI’s.

Protein accounted for most of the energy in these fish and the amount of energy derived from protein was the same in fish from anadromous and barriered streams.

Lipid contributed significantly more energy to fish in barriered streams. The arrival of adult salmon (vertical lines) had no effect on the amount of lipid energy in DV.