

The effects of post-smolt growth and thermal regime on the marine survival of steelhead trout (*Oncorhynchus mykiss*) from the Keogh River, B.C.

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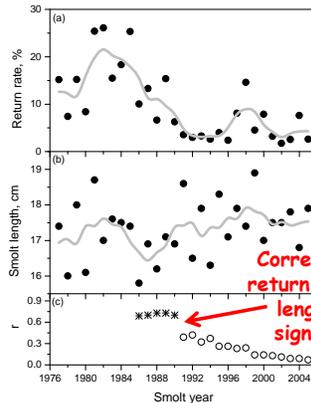
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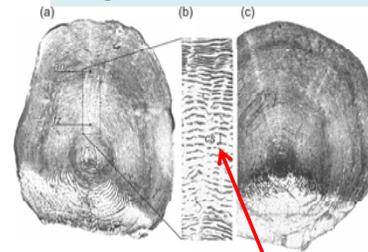
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1. What controls the recruitment of steelhead trout? In part influenced by work done on hatchery fish, recruitment was thought to be a function of smolt size at ocean entry (Ward 2000). That correlation deteriorated in the 1990s, suggesting other factors may be important.

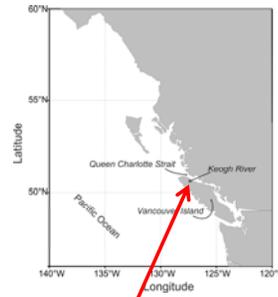


Correlation between return rate and smolt length no longer significant after 1990.

2. We measured the circuli spacing recorded in the first year of ocean growth for scales of returning adult Keogh River steelhead.



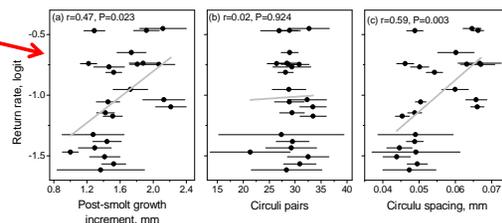
Circuli spacing in the post-smolt zone of salmon is a record of growth.



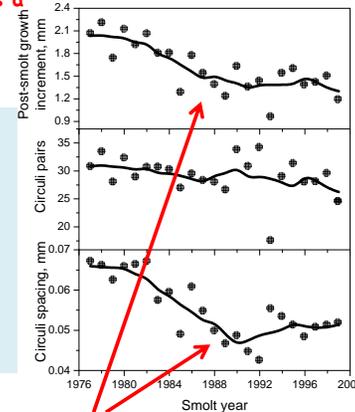
Location of Keogh River, British Columbia.

4. Post-smolt growth increment and spacing correlate with the marine survival (return rate), whereas circuli pair count does not.

The wider increments indicates greater growth in length, which suggests fish grew out of sizes vulnerable to predation and accumulated less mortality in good growth years.

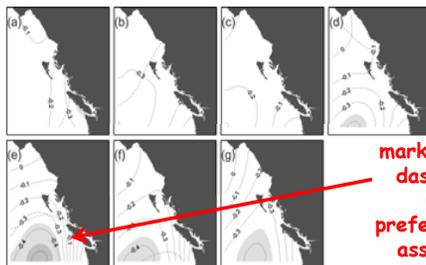


3. The circuli measurements were used to construct time series of post-smolt growth increment, number of circuli in the post-smolt growth zone, and mean circuli spacing of the increments.



Note the decline in post-smolt growth that occurred in the 1980s.

5. Keogh River return rates are also correlated with fall SST, suggesting environmental variability is affecting growth.



Spatial correlation fields between return rate and SST by month (a-g, June-Dec.). Hatched area marks significant correlation, dashed line marks 12.5°C indicator of thermal preference. SST variability is associated with steelhead marine survival.

6. Two consistencies: 1) These data are consistent with the hypothesis that post-smolt growth influences survival of juvenile steelhead. 2) The survival mechanism for steelhead is consistent with what has been observed for European Atlantic salmon (NE Atlantic)...SST variability that it is related to ecosystem and food web change results in change in post-smolt growth and change in survival and recruitment of Atlantic salmon (Friedland et al. 2009).

Friedland, K.D., et al. 2009. The recruitment of Atlantic salmon in Europe. ICES J. Mar. Sci. 66, 289-304.

Ward, B.R. 2000. Declivity in steelhead (*Oncorhynchus mykiss*) recruitment at the Keogh River over the past decade. Can. J. Fish. Aquat. Sci. 57(2): 298-306.