

In two earlier submissions (0044 and 0179), I argued that the presence of large (diatom) phytoplankton and the occurrence of highly productive regions within the Gulf of Alaska could be sufficient to either enhance sockeye salmon production, or to negatively impact sockeye salmon production by their absence. Recently it has been reported by the Pacific Salmon Commission that in contrast to the failure of the 2009 returns, a phenomenally large return has been recorded for 2010. An approximation of their data is given as follows:

Sockeye salmon forecasts and returns for the Fraser

(source: Pacific Salmon Commission)

No. in millions

No. in millions

(All estimates are approximate)

2009	Forecast	10.6	Returns	1.5
2010	Forecast	11.4	Returns	34.5*

(Range:7-18)

*Numbers not entirely complete

Following the surprising change in returns for the 2010 versus the 2009 returns, a paper has appeared by Roberta Hamme (R.Hamme et al (in press, 2010) that reports on the phenomenal growth of a diatom bloom in the general area of the Gulf of Alaska starting in 2008. The question is, could this bloom be related to the equally extraordinary switch in the number of sockeye returning in 2010 vs 2009.

It has been hypothesized previously (Greve and Parsons, 1977: Parsons, 1979) that food chains in the sea that are supported by diatom growth support fish production while smaller phytoplankton give rise to other predators such microzooplankton and some jellies, such as ctenophores and jellyfish. Thus the occurrence of a large bloom of diatoms in 2008 might have been very beneficial to sockeye production.

The question is, if this occurred in 2008, why did it not also benefit returns in 2009 instead of only in 2010 ?

One answer to this question may be given in the growth curve of salmon over their 4 year life span. As with all animal growth curves, growth is lowest at the beginning and end of their life cycle. The salmon returning in 2010 would have been in the midpoint of their growth cycle and could benefit most by the diatom, large crustacean food chain set up by the fall of volcanic ash. The 2009 sockeye would be ending their period of maximum growth and possibly had been supported by the poorer food chain prior to the ash fall, i.e. flagellate, small zooplankton food chain. This difference in food chains for salmon is documented in Koeller and Parsons, 1976.

The lesson to be studied from these results is that the forecasting of sockeye salmon returns should be based much more on food conditions in the Gulf of Alaska, than has even been considered before.

References:

Hamme, R. et al, (2010) Volcanic ash fuels anomalous plankton bloom in the subarctic northeast Pacific. *Geophysical Research Letters* 37: (in press)

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(*Oncorhynchus keta*) in controlled ecosystems. *Bull Mar. Sci.* 27; 114-118