

A possible reason for the poor returns of sockeye salmon to the Fraser River in 2009

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The trend in sockeye salmon production in all Fraser River stocks started to decline in the early 1990s (Figure 1). This change occurred at about the same time that coho salmon behaviour changed, pink salmon started to enter the Fraser River earlier and late-run sockeye salmon started entering the river earlier. Subsequently, the early marine survival (mid-May to mid-September) of coho salmon declined from 15% to 1%. Harrison sockeye salmon production also increased dramatically about this time. All of this means that the Strait of Georgia ecosystem changed substantially by the mid-1990s.

The attached graph for Chilko Lake sockeye salmon is from a paper we are completing (Figure 2). It is a CuSum trend that shows a very clear relationship between production and wind in April. This indicates that the early marine period affects the production of Chilko Lake sockeye salmon probably because there is less of their preferred prey produced.

We also attached a relationship between Harrison sockeye salmon production and our catches of juvenile Harrison sockeye salmon in September (Figure 3). This is a reasonable relationship which demonstrates that the brood year strength can be indexed by the survey in September. Note that in even-numbered years the production is reduced (Figure 4). This shows that juvenile pink salmon compete with juvenile sockeye salmon. Managers need to be aware that large escapements of pink salmon can affect the survival of sockeye salmon when the juvenile sockeye salmon enter the ocean.

In the 2008 FOWG report, we wrote that the 2009 return of sockeye salmon to the Fraser River could be “extremely poor.” It appears that we were the only group to make this forecast. We recognize that our July surveys occur when many lake-rearing sockeye salmon may have left the survey area. However, it is possible that our surveys capture abundance trends by measuring the end of the migration. Thus, we interpreted the very poor catches of juvenile sockeye salmon in our July 2007 surveys as an indicator of very large early marine mortalities (Figure 5). Figure 5 is important because it shows that there is a significant relationship between our surveys and return. Note the forecast for 2010 and 2011 is for a good return.

In summary, we propose that the capacity of the Strait of Georgia to support lake-rearing juvenile sockeye salmon is declining. The poor return in 2009 appears to have been determined before the juveniles left the Strait of Georgia. The decline may relate to a mortality associated with a reduced ability to grow quickly in the early marine period. The actual cause of death may be a combination of predation and disease. We can test our idea when the 2010 and 2011 sockeye salmon returns are known. If this turns out to be a reliable method of forecasting, we all would know the number returning well over a year in advance.

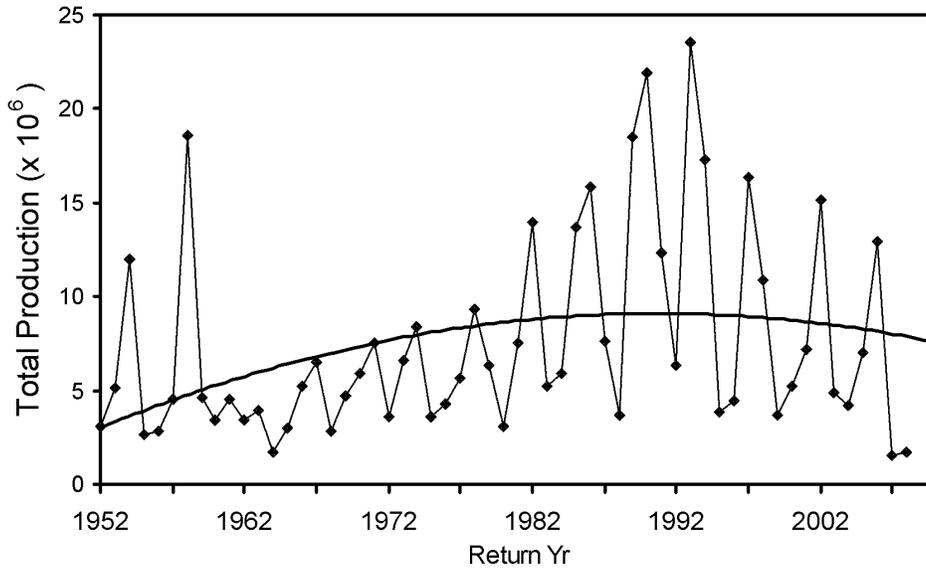


Figure 1. Sockeye salmon production of all Fraser River stocks from 1952 to 2008.

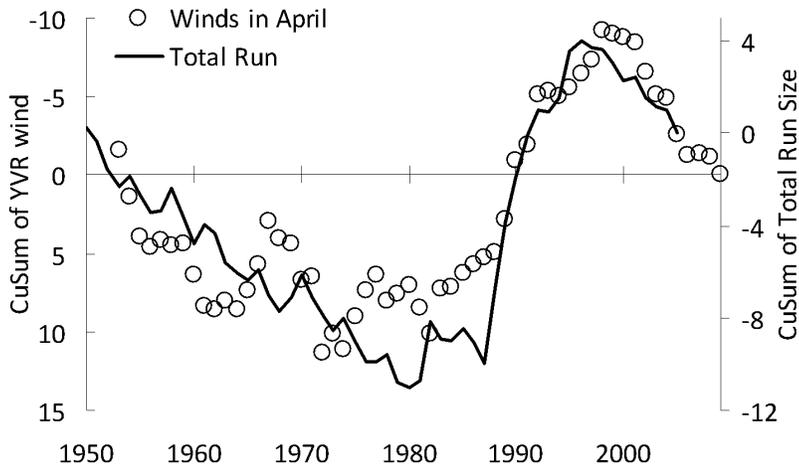


Figure 2. The CuSum trend for Chilko Lake sockeye salmon.

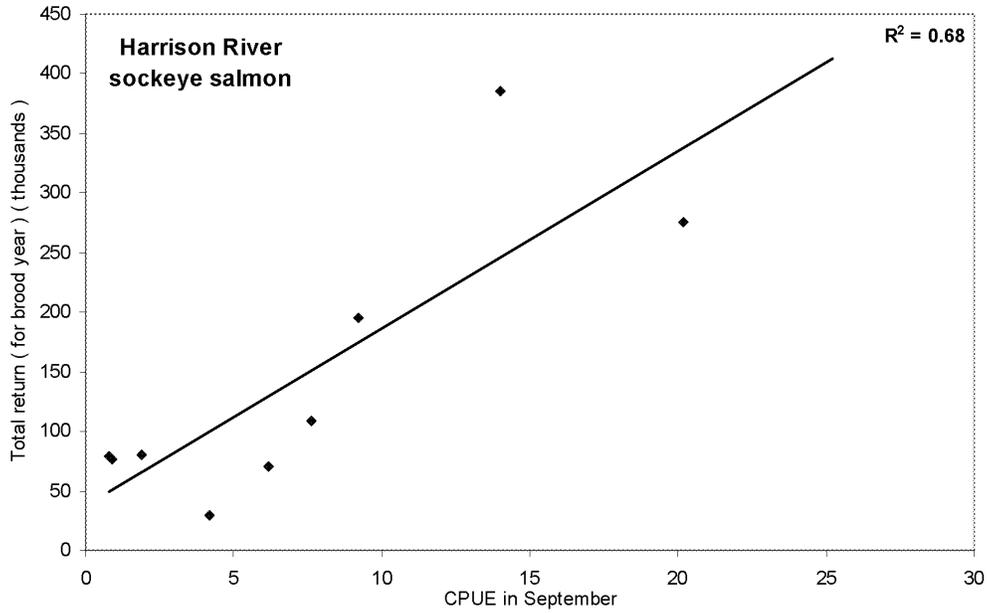


Figure 3. The relationship between Harrison River sockeye salmon returns (by brood year) and the CPUE of juvenile sockeye salmon in our September surveys.

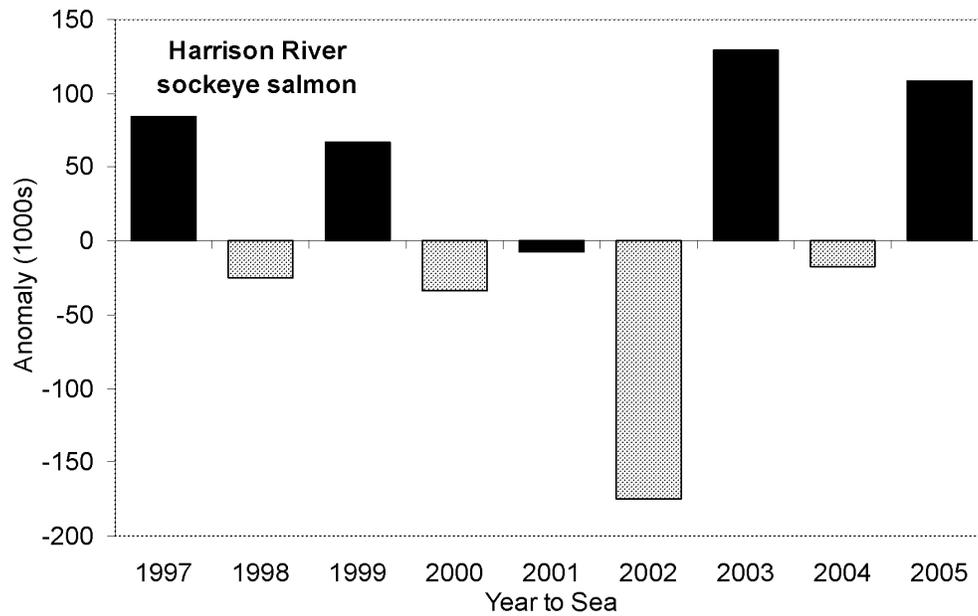


Figure 4. Harrison River sockeye salmon anomaly.

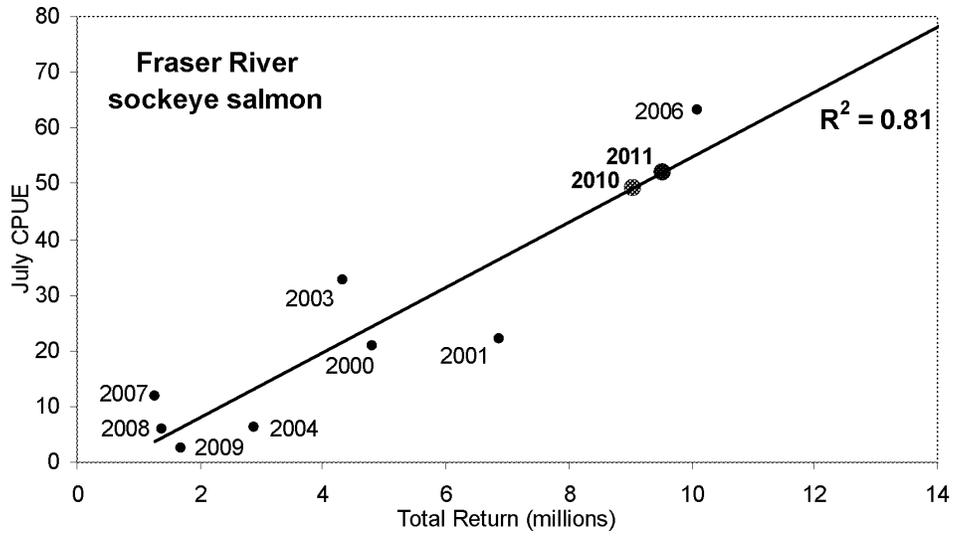


Figure 5. The relationship between Fraser River sockeye salmon returns and the CPUE of juvenile sockeye salmon in our July surveys.