# The Importance of Early Marine Growth to Interannual Variability in Production of Southeastern Alaska Pink Salmon

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A number of recent studies have provided increasing evidence that changes in climate play a significant role in determining production dynamics of salmon in the North Pacific (Beamish and Boullion 1993; Francis and Hare 1994; Pearcy 1996). However, our understanding of linkages between climate change and Pacific salmon production is still poor (Pearcy 1997). We present data that show a strong correlation between early ocean growth and production (commercial catch) of southeastern Alaska pink salmon (*Oncorhynchus gorbuscha*), and suggest that the relation may provide evidence of size-selective mortality in pink salmon during the early marine life-history stage.

Scales were collected from the late run adult pink salmon returning to the Auke Creek weir in the northern region of southeastern Alaska from 1979 to 1996, and scale circuli (C) distances were used as a proxy of somatic growth. Approximately 50 scales were selected each year, and a Calcomp Digitizing Tablet was used to count and measure distances between circuli along an axis 20 degrees from the anterolateral line. Commercial catches were used as an estimate of southeastern Alaska pink salmon production (data provided by Alaska Department of Fish and Game). Escapement data were not included in the estimate of production because escapement levels are estimated from peak counts of index streams and actual escapements are unknown.

We found differences in scale growth between years of high production (1979-1982, 1984, 1987, 1988) and low production (1983, 1985, 1986, 1989-1996) of southeastern Alaska pink salmon (Fig. 1). The largest difference in growth occurred at the earliest circuli intervals, and the difference in growth persisted through C8. Little difference in scale growth from C8 to C15 was observed between years of high and low production levels. These circuli coincide with the approximate location of a supplementary check in pink salmon scales (Bilton and Ricker 1965). Growth from C15 to C19 was also higher during years of higher production.

Year-to-year changes in early marine scale growth (C1-C6) were highly correlated ($p<0.001$) with production (commercial catch) of pink salmon in southeastern Alaska (Fig. 2). This association remained significant even after differencing both time series to remove trends, and when early marine scale growth was included in a spawner-recruit model. However,

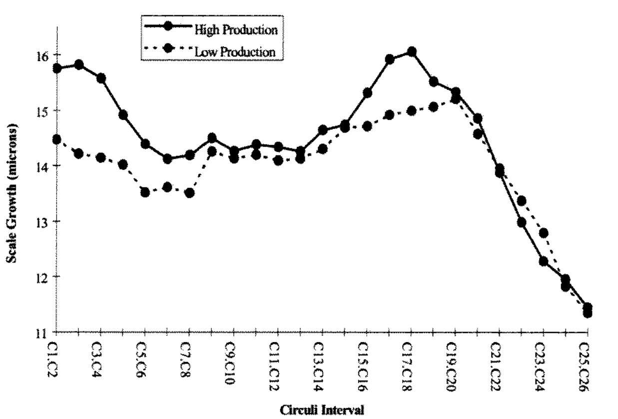


**Fig. 1. Southeastern Alaska pink salmon scale growth during high production (commercial catch > 30 million) and low production (commercial catch < 30 million).**

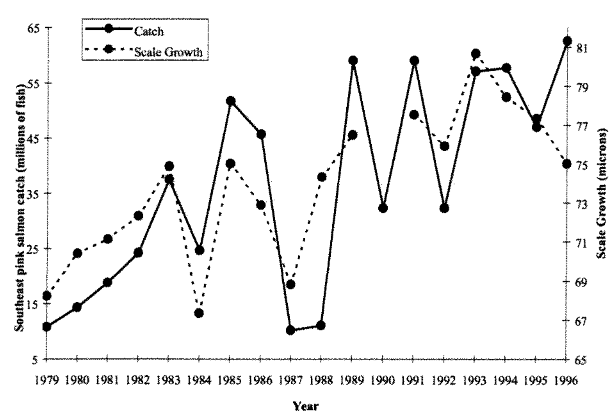


**Fig. 2. Southeastern Alaska pink salmon scale growth and commercial catch for 1979 to 1996. Scale data were not collected during 1990.**

scale growth during their later coastal ocean residency (C15-C19) was not significantly correlated with production. These findings are consistent with Healey (1982), who found production of chum salmon (*O. keta*) to be significantly related to scale growth from C2 to C4. Our results indicate that growth may be an important linkage between climate change and pink salmon production in southeastern Alaska through size-selective mortality where predation risk is higher for slower growing individuals.

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