# Early marine growth as an indicator for chum salmon production

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## INTRODUCTION

- Early marine growth is important in determining the survival of salmon during the first winter at sea.
- Pink salmon are the most abundant of the juvenile salmon in the ocean.
- Pink salmon may influence chum salmon growth and survival.

## OBJECTIVES

- Develop time series used to forecast chum salmon returns.
- Evaluate juvenile growth as an indicator for returns 3 years later.
- Evaluate interactions with pink salmon.

## METHODS

- Scales were collected from age-0.3 chum salmon at Fish Creek southeast Alaska by National Marine Fisheries Service in mid-August, 1980-1996.
- Early marine growth (1977-1993) was estimated as the distance from the edge of the focus to the 9th circulus (Figure 1).
- Peak counts of live chum salmon in-river were made by ADF&G (Pistol & Heinl, 2011) and used as an index of abundance (1980-1996).
- Juvenile and adult pink salmon abundances (1977-1993) were estimated using a mortality schedule and harvest data from southern southeast Alaska.

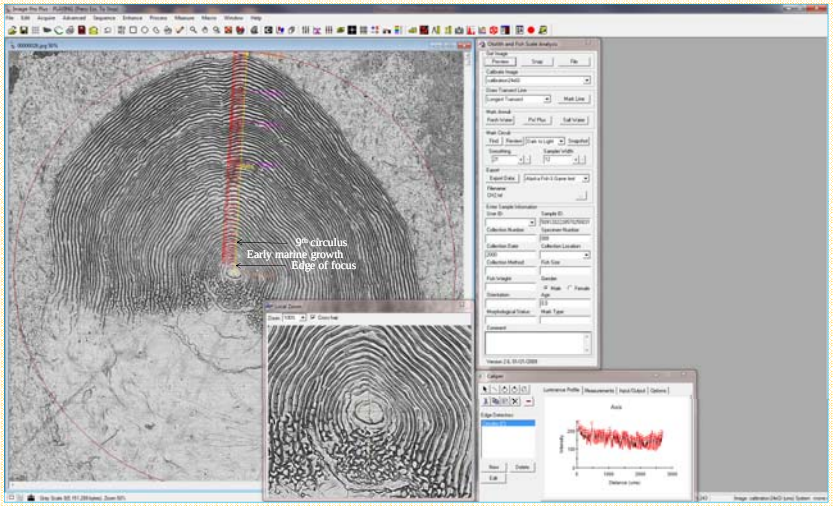



Figure 1. Scale image from an age-0.3 chum salmon digitized using Image Pro software Ring Structure macro (Media Cybernetics).

## ANALYSIS

- Time plots were used to show the relationship between juvenile growth (t-3) and the adult return index (t).
- A linear regression model was used to describe peak counts of chum salmon as a function of early marine growth of chum salmon, and the estimated abundances of juvenile and adult pink salmon during the first marine year.
- Analyses were conducted in SigmaPlot (Systat software. Inc, version 12.0).

## RESULTS

$R^2 = 0.675$; $P < 0.001$

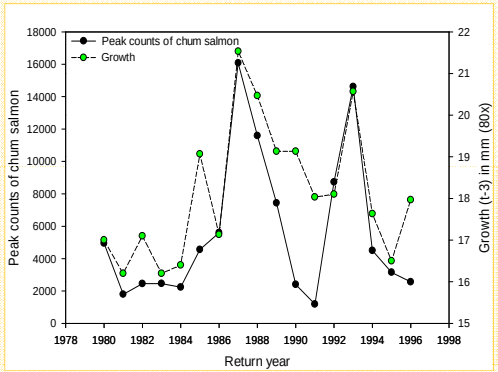



Figure 2. Growth (t-3) and counts of chum salmon (t) at Fish Creek, Hyder in southeast Alaska over time.

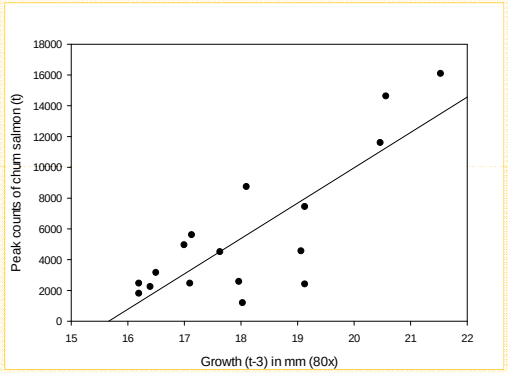
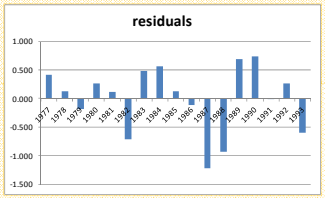



Figure 3. Relationship between growth (t-3) and peak counts of chum salmon (t) at Fish Creek, Hyder in southeast Alaska.

## CONCLUSIONS

- There was no apparent interaction with pink salmon.
- Early marine growth was a good indicator for strong returns 3 years later for chum salmon.
- This relationship needs to be assessed using juvenile salmon scales to predict returns.




## ACKNOWLEDGMENTS

- Ketchikan ADF&G
- John Helle, retired NMFS.

## THE DATA

| Year | growth (t-3) | counts |
|---|---|---|
| 1980 | 16.35 | 4951 |
| 1981 | 15.89 | 1797 |
| 1982 | 17.10 | 2452 |
| 1983 | 16.20 | 2455 |
| 1984 | 16.24 | 2237 |
| 1985 | 19.07 | 4556 |
| 1986 | 17.13 | 5604 |
| 1987 | 21.53 | 16080 |
| 1988 | 20.47 | 11591 |
| 1989 | 19.13 | 7433 |
| 1990 | 19.13 | 2403 |
| 1991 | 18.03 | 1187 |
| 1992 | 18.10 | 8731 |
| 1993 | 20.57 | 14620 |
| 1994 | 17.63 | 4500 |
| 1995 | 16.50 | 3150 |
| 1996 | 17.97 | 2564 |