Pink Salmon in Three Parts

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Part I:
Comments and Observations from the NPAFC Workshop on pink and chum, Nanaimo BC October 2011

Part II:
International Year of the Salmon

sponsors

International Year of the Salmon

- Helps everyone look at a bigger picture
- Tremendous encouragement to identify the mechanisms that control pink and chum production
- More accurate forecasts of long-term production which will help plan for economic opportunities while conforming to international standards of sustainability

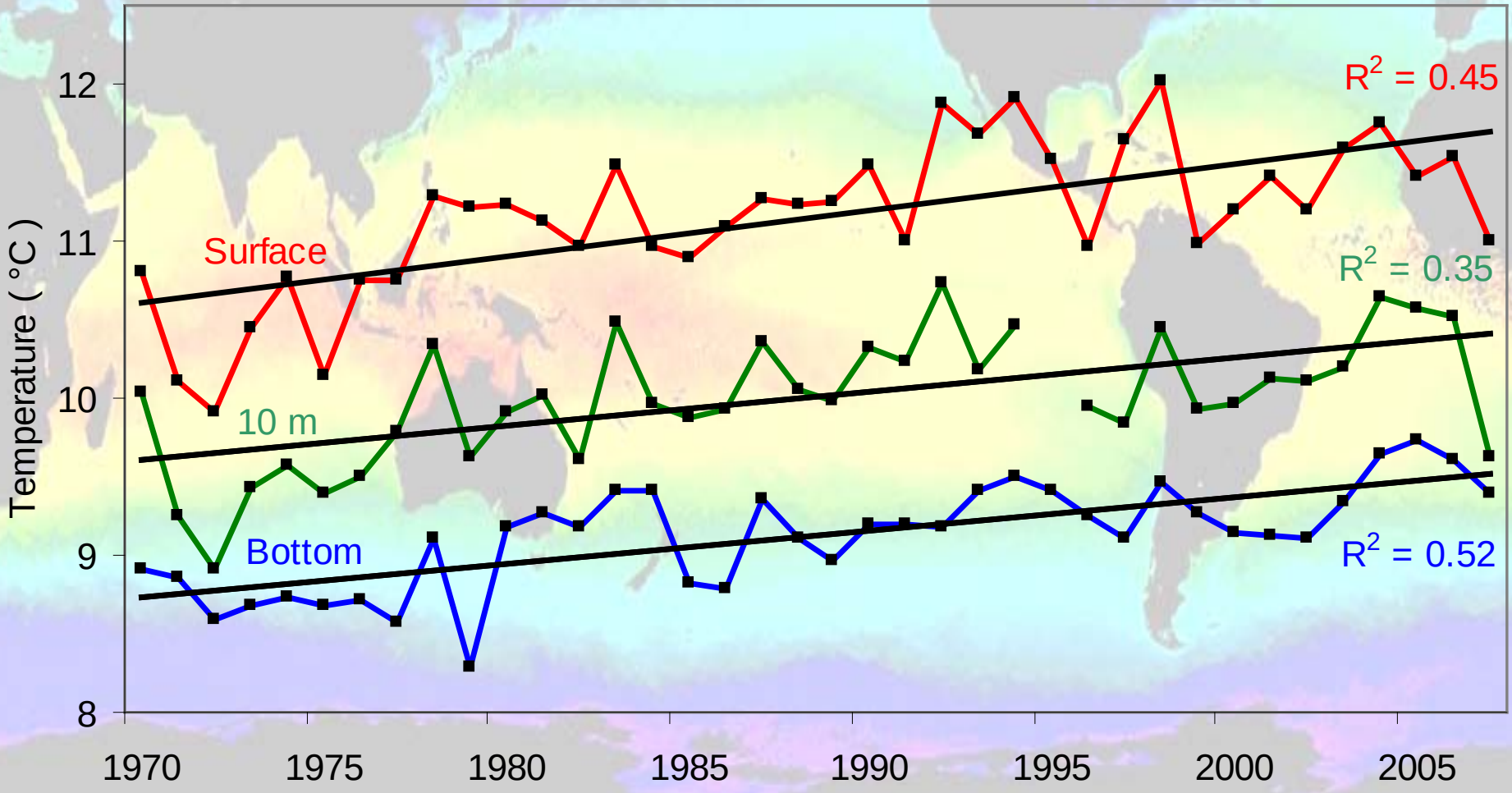
International Year of the Salmon

- Pink and Chum Workshop should not wait for the International Year of the Salmon to happen
- Find a sponsor - NPRB or the Bering Sea Fishermen's Association and become the International Pink and Chum Workshop

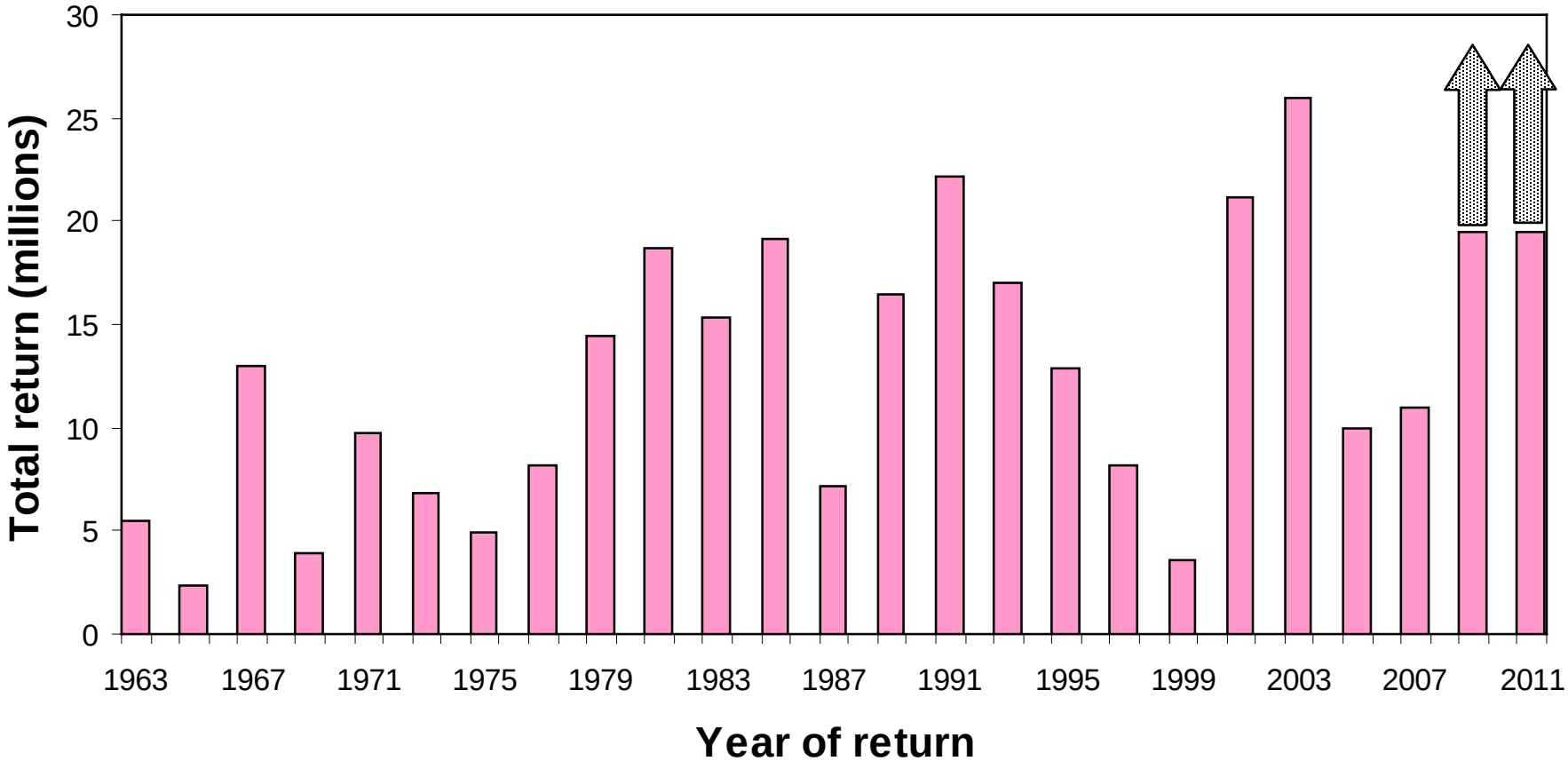
Part III:
Observations and speculations on the reasons for the recent increases in pink salmon production

Satellite Image of the Strait of Georgia and Vancouver Island

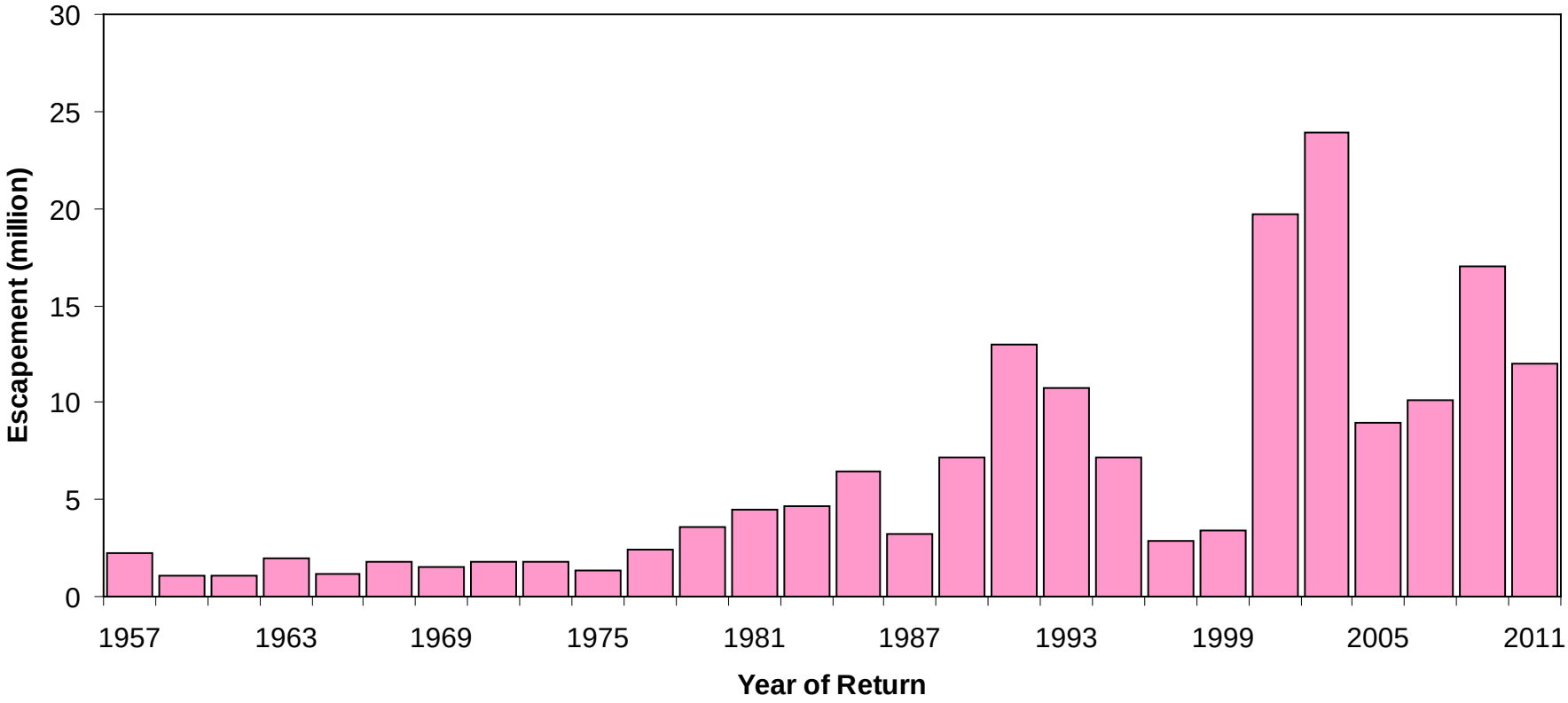
Average temperature at the Nanoose site in the Strait of Georgia

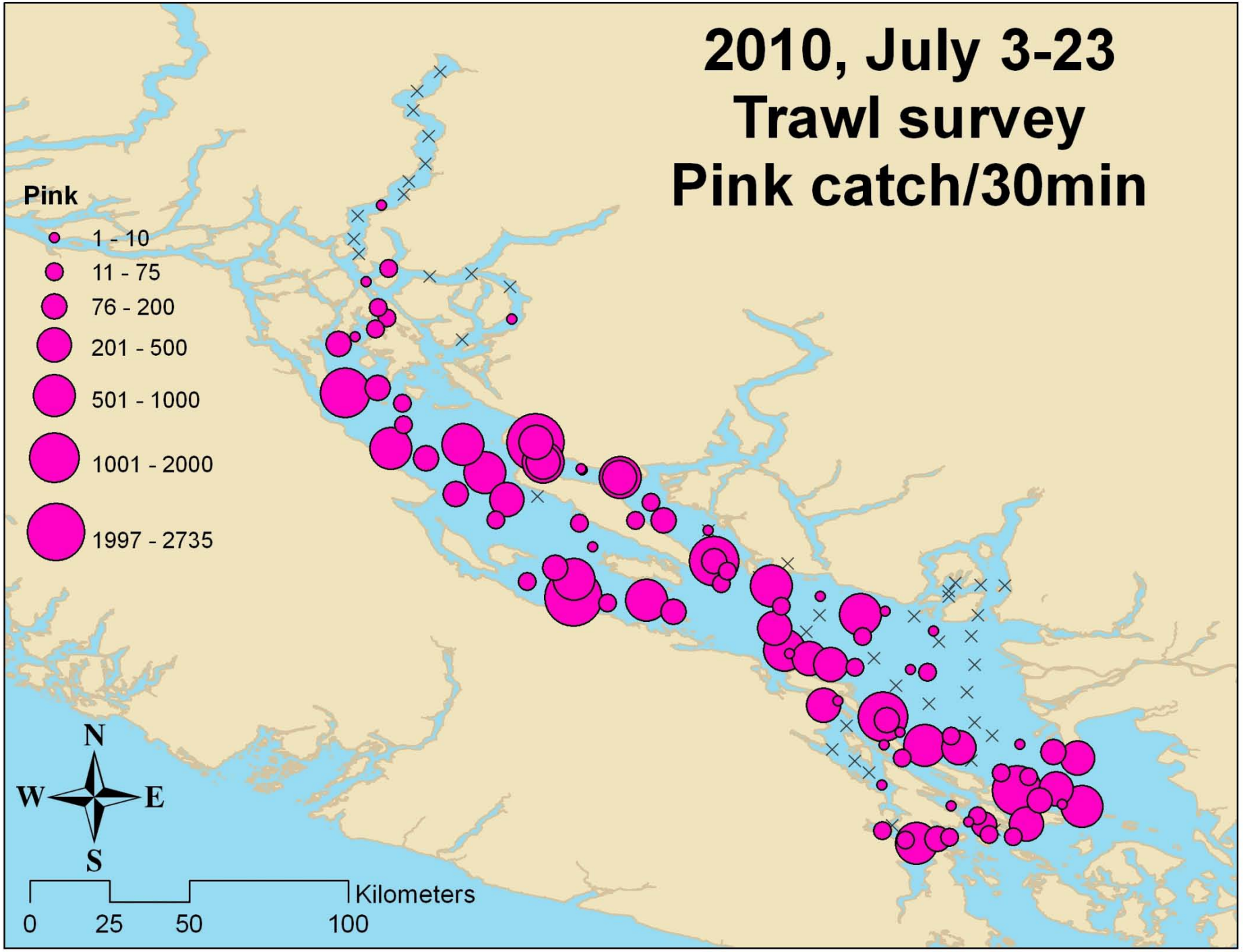


Total returns of Fraser River pink salmon

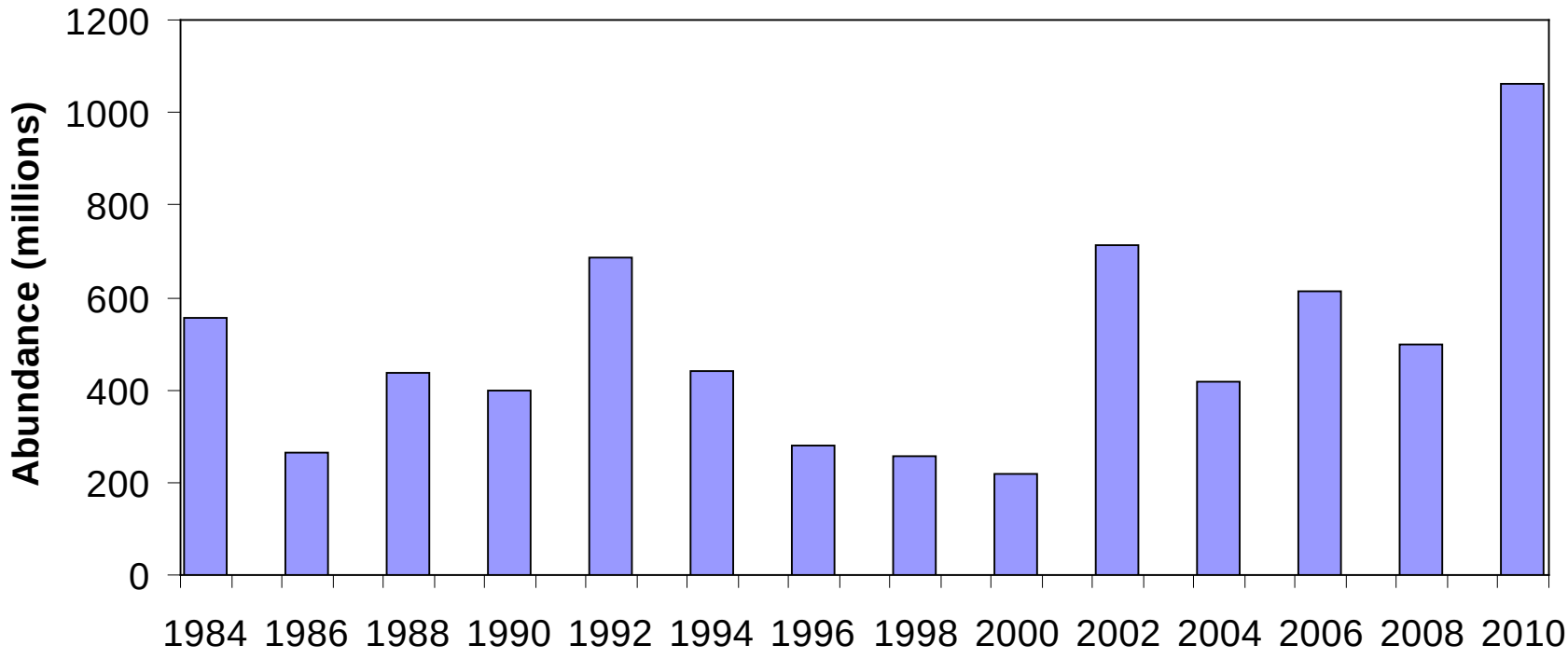


Escapement of pink salmon to the Fraser River

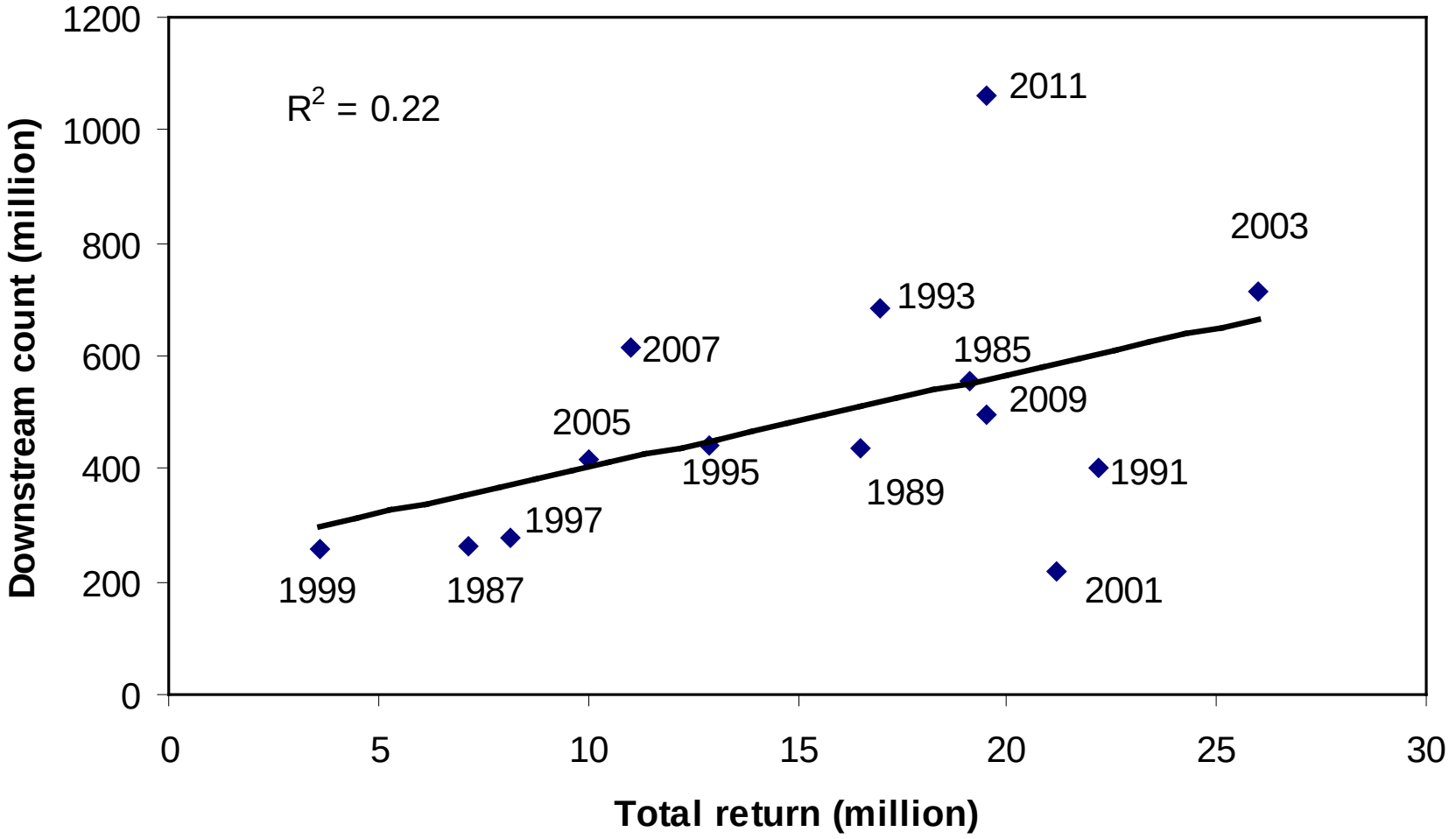



2010, July 3-23
Trawl survey
Pink catch/30min
Pink
1 - 10
11 - 75
76 - 200
201 - 500
501 - 1000
1001 - 2000
1997 - 2735
N
W
E
S
Kilometers
0
25
50
100

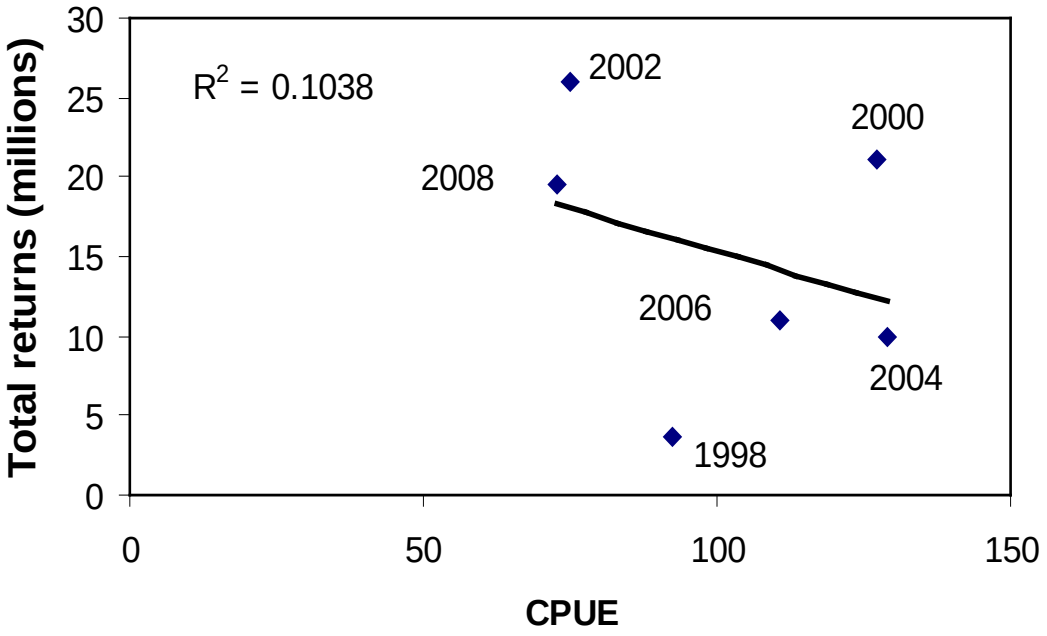
Estimate of abundance of pink salmon fry at Mission (100 km from the mouth of the Fraser River) from mid April to mid May

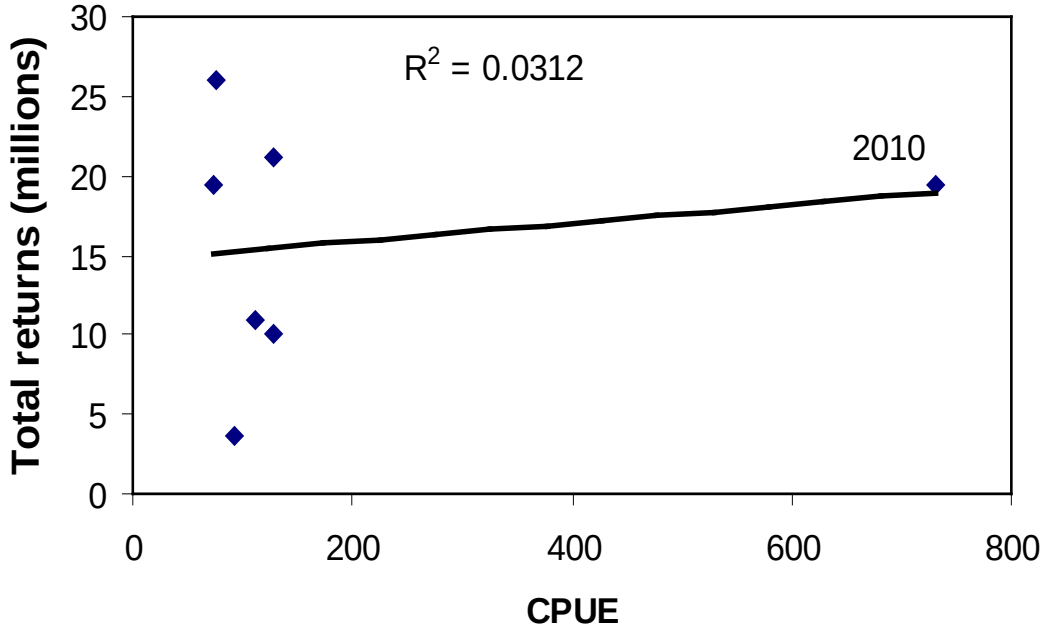


Downstream counts of pink salmon fry compared to the total return for the same brood year



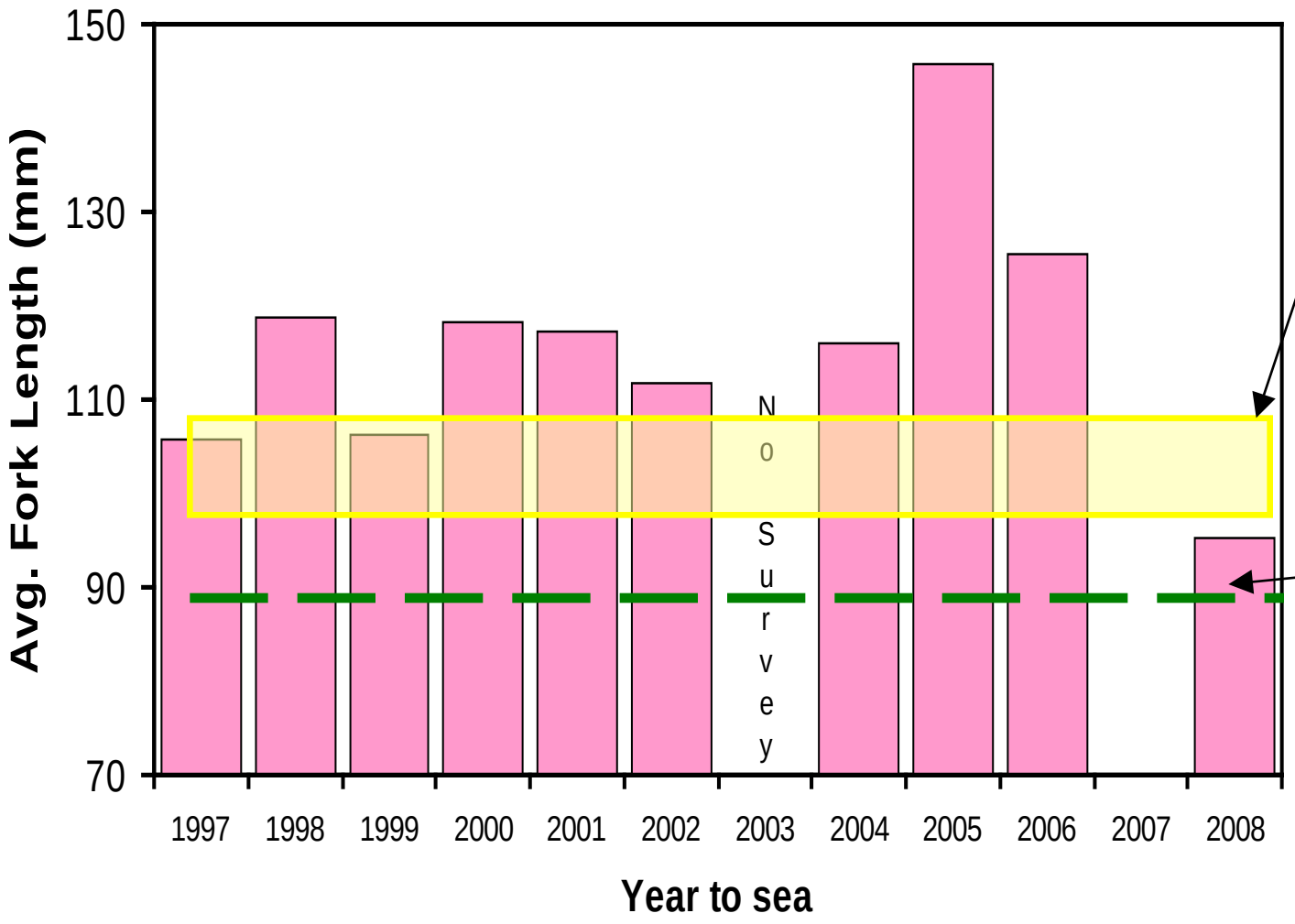
Total returns of pink salmon to the Fraser River compared to CPUE in the trawl survey





Year shown is year to sea

Average size of juvenile pink salmon in July (1997-2008)



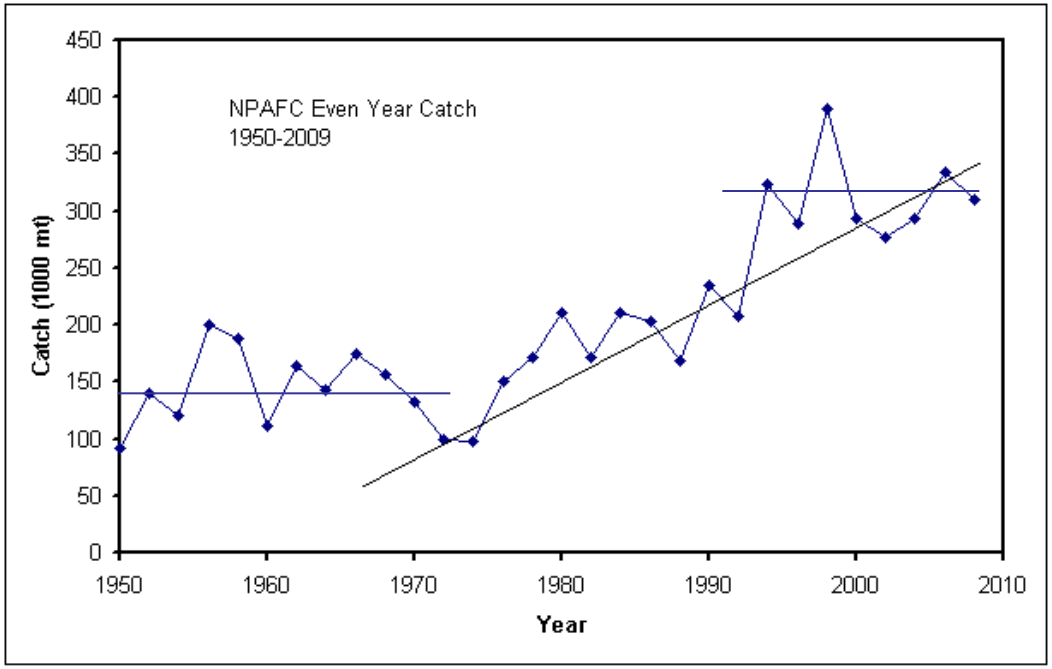
Average size of pink salmon in July 1966-68 (Phillips and Barraclough, 1978 (N~250)

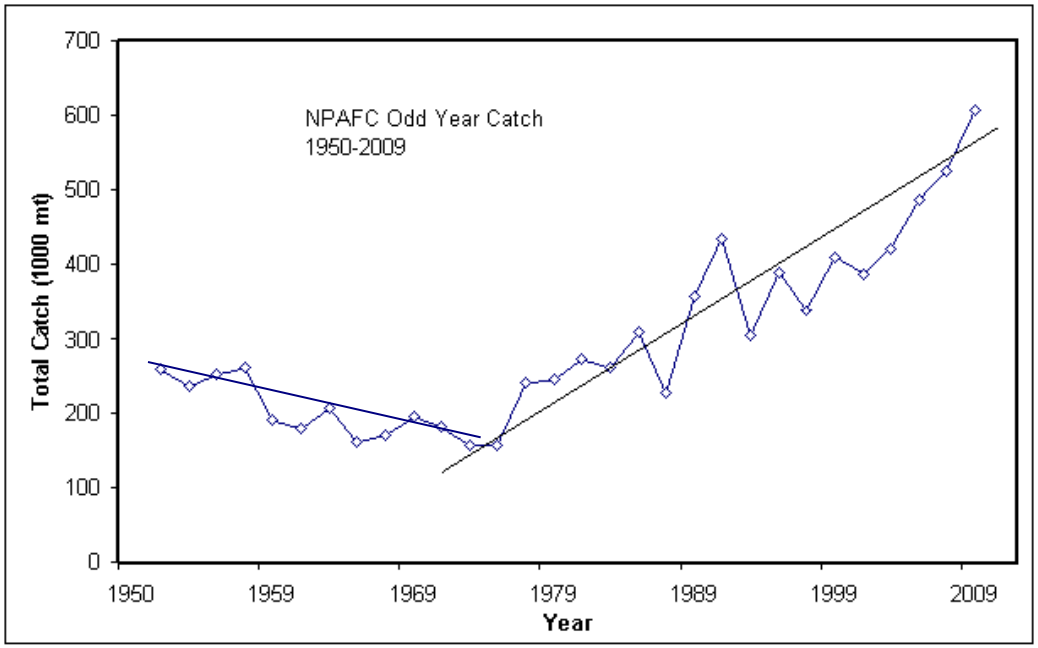
Average size of pink salmon in July 1976 (Healey)

Conclusions

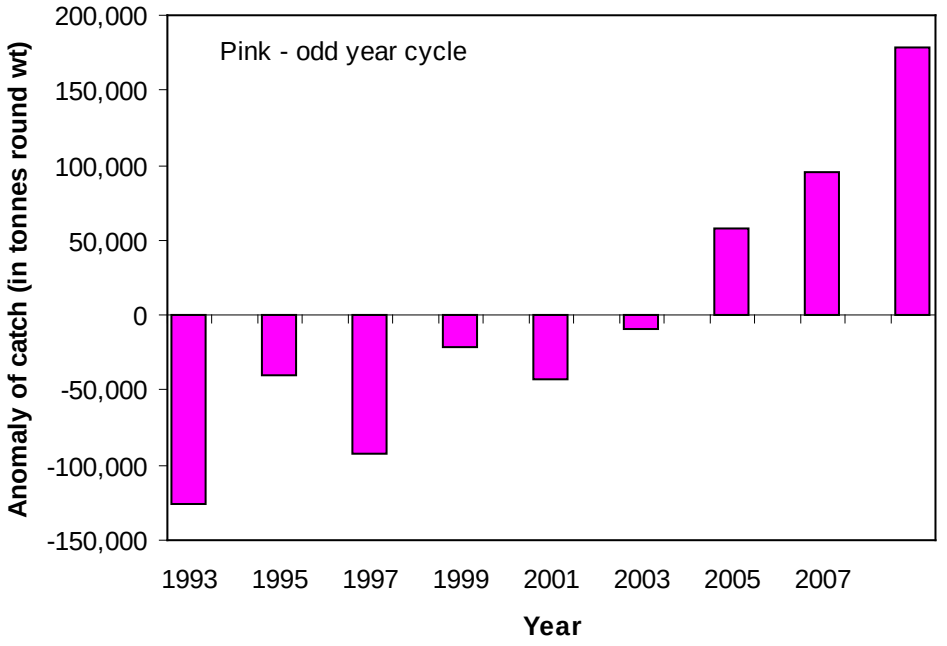
- There is no apparent relationship between juvenile pink salmon dynamics in the Strait of Georgia and brood year strength

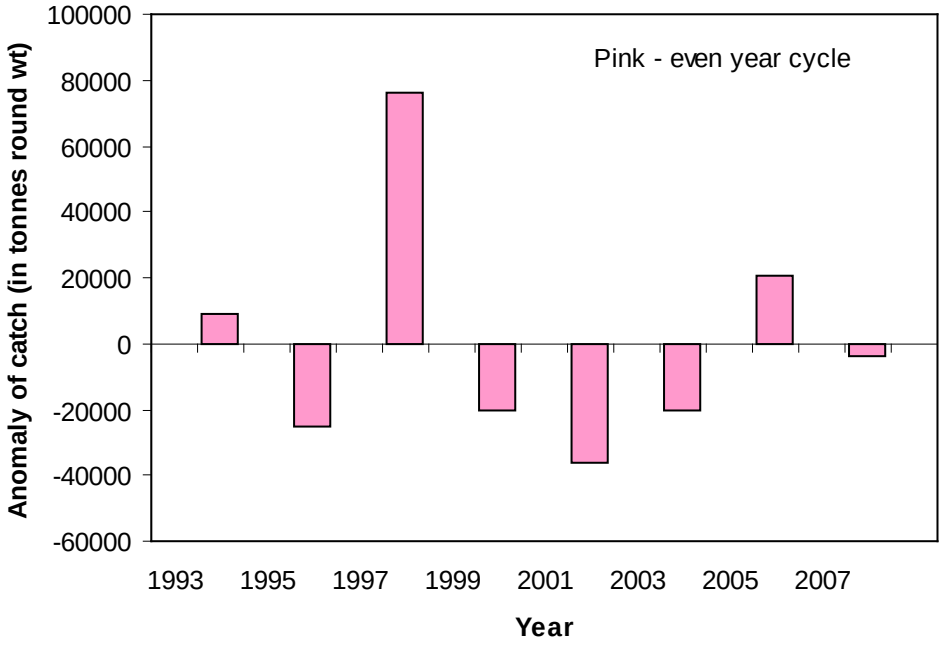
North Pacific catch of pink salmon, 1950-2009





Anomaly of all country catch of pink salmon (1993-2009)





Average of first 5 intercirculii spaces for pink salmon from the Broughton Island area

2002	2003	2004
Escapement 123,000	Enter ocean	Adult escapement 1,076,000
	0.034mm (n = 134)	0.032mm (n = 283)

GOOD WINTER SURVIVAL

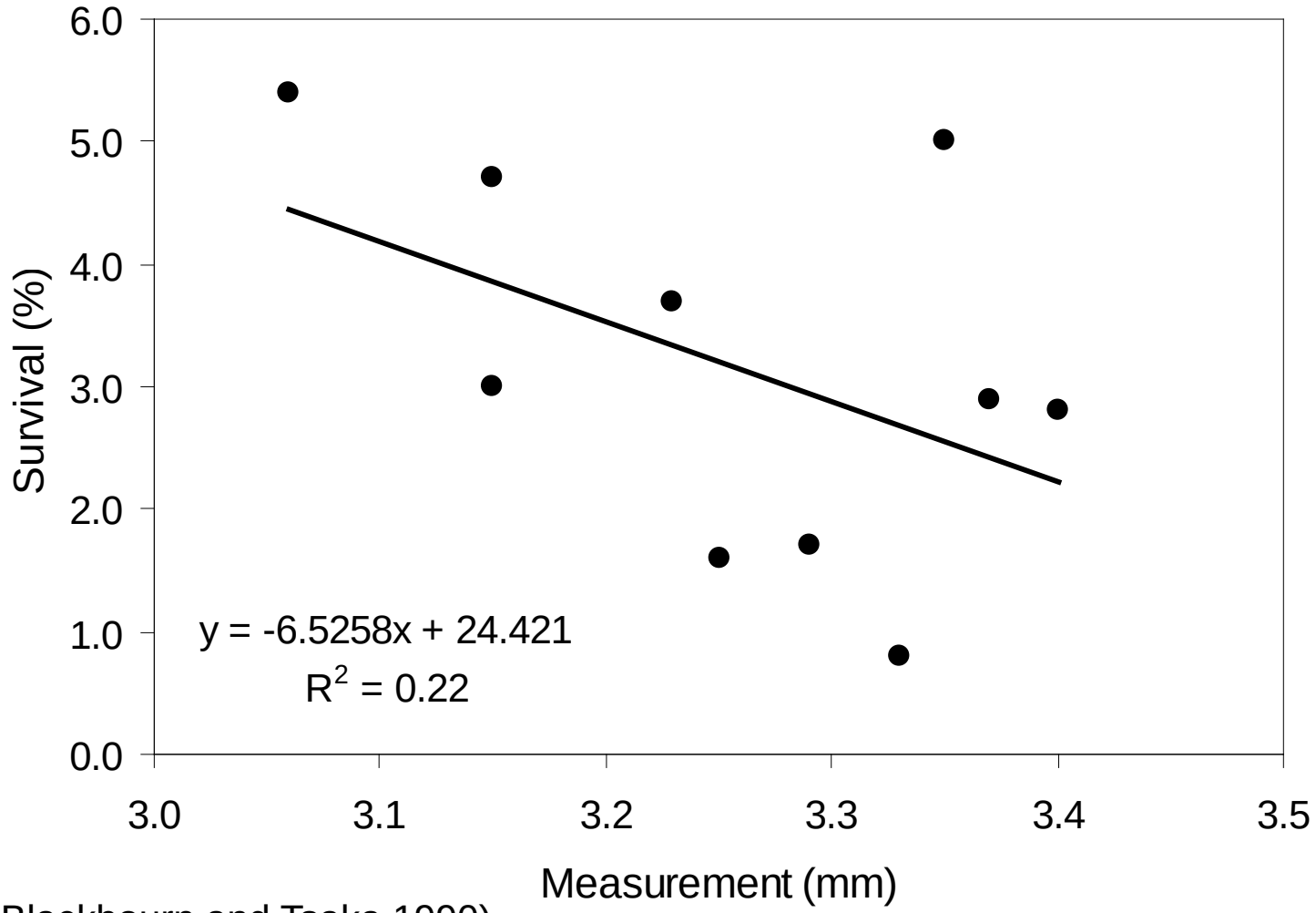
2004	2005	2006
Escapement 1,076,000	Enter ocean	Adult escapement 337,000
	0.035mm (n = 66)	0.040mm (n = 288)

POOR WINTER SURVIVAL

Cross et al. (2008) reported that in years of poorer survival, the pink salmon that survived to return as adults had wider intercircular spacing in the early marine period.

Cross, A.D., D.A. Beauchamp, K.W. Myers and J.H. Moss. 2008. Early marine growth of pink salmon in Prince William Sound and the coastal Gulf of Alaska during years of low and high survival. *Transactions of the American Fisheries Society* 137(3):927-939.

Relationship between growth from the tenth circuli to the annulus and survival for pink salmon in the odd-numbered return years, 1963-1981



(data from Blackbourn and Tsaka 1990)

Seeb et al. (2011) reported that the greatest amount (6.5%) of diversity exists between broodlines with more diversity among the odd-year lineage.

Lisa Seeb, Ryan Waples and James Seeb. 2011. Comparisons of Even- and Odd-year Broodlines of Pink Salmon using Genotyping by Sequencing. Poster for NPAFC Pink and Chum Workshop.

1. Variation at 16 microsatellite loci was surveyed for approximately 46,500 pink salmon sampled from 146 localities in the odd-year broodline and 116 localities in the even-year broodline
2. Differentiation in pink salmon allele frequencies between broodlines was approximately 5.5 times greater than that of regional differentiation within broodlines
3. Greater genetic diversity was observed in the odd-year broodline

Beacham, T.D., McIntosh, B., Macconachie, C., Spilsted, B., and White, B.A. 2012. Pink salmon (*Oncorhynchus gorbuscha*) population structure in British Columbia and Washington as determined with microsatellites. (“almost” in press)

Ricker et al. (1978) noted that pink salmon tend to be larger in odd-numbered years than in even-numbered years and the differences increase from Alaska to the Strait of Georgia.

Ricker, W.E., H.T. Bilton, and K.V.Aro. 1978. Causes of the decrease in size of pink salmon (*Oncorhynchus gorbuscha*). Fisheries and Marine Services Technical Report 820, 93p.

Interpretation

- The lack of synchrony between the odd and even lines of pink salmon could indicate a fundamental genetic difference in the use of energy for growth and lipid storage between the two lines during the early marine period and the marine winter.
- Odd-year pink salmon use most of their energy in the marine period for growth and do not begin to store lipids in the first marine summer as much as even year pink salmon.

Interpretation (cont'd)

- This strategy would place a dependency on finding adequate prey during the winter and recent climate changes result in more frequent production of optimal feeding conditions in the winter.
- Odd year pink salmon are an evolving new species that use more of their energy for growth during the first marine year than other Pacific salmon, including even year pink salmon.

International Year of the Salmon

END