

# Chilko Sockeye Salmon “Marine” Survivals and Early Ocean Conditions

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# State of the Pacific Ocean

Reports of the  
Fisheries  
Oceanography  
Working Group  
Chaired by: Jim Irvine/Bill  
Crawford

CANADA'S POLICY  
FOR CONSERVATION OF  
WILD PACIFIC SALMON

Canada

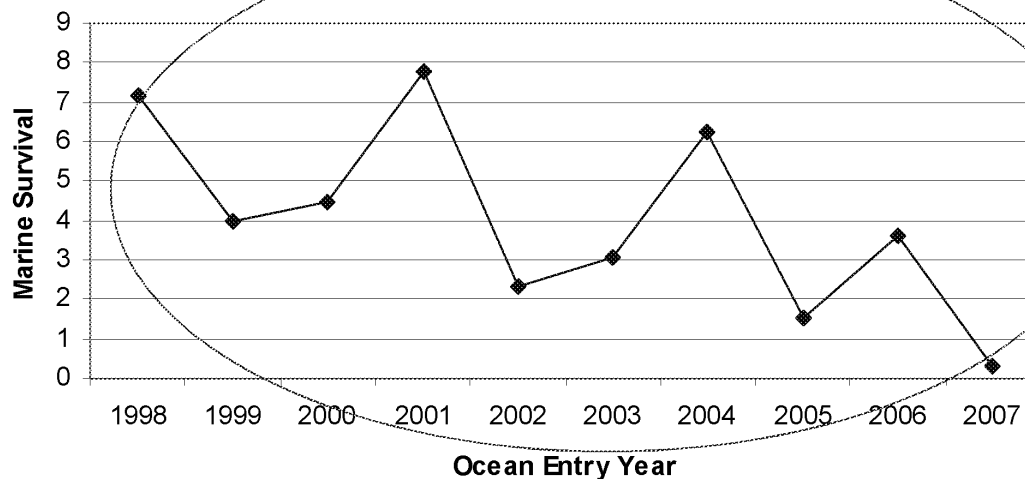
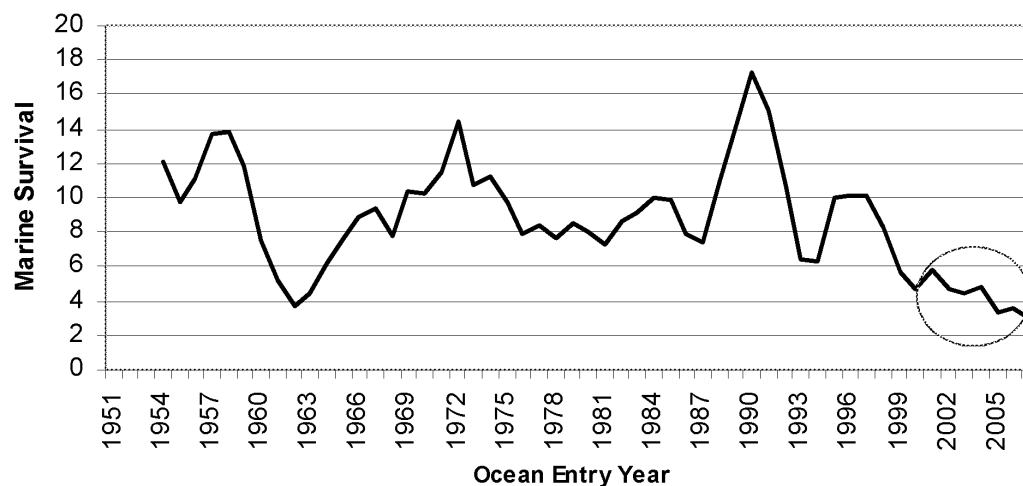
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## Objectives

- to categorise Chilko sockeye “marine” survivals into good, average, and poor years
- to examine satellite derived chlorophyll data for these years
- to develop plausible hypotheses to explain survival variations

Long time series of "marine" survival data - significant declines in recent years

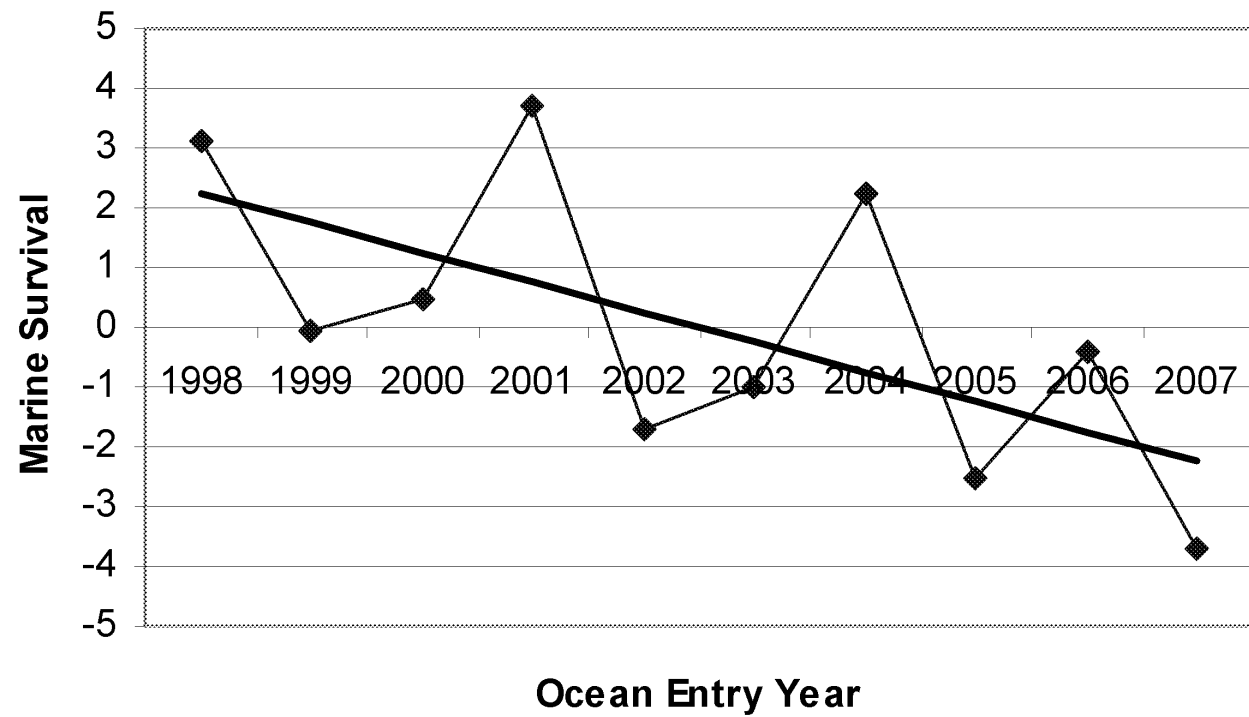
Chilko Sockeye "Marine" Survivals (Last Yr of 4 yr Moving Av)



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## Chilko Sockeye



Compute survival residuals and also residuals from linear regression

Compute good ( $>0.5$  SD above mean), average ( $\pm 0.5$  SD of mean) and poor ( $<0.5$  SD below mean) survival means

OEY	Res1	Res2
1998	3.10 G	0.84 A
1999	-0.07 A	-1.82 P
2000	0.44 A	-0.81 A
2001	3.71 G	2.96 G
2002	-1.71 P	-1.96 P
2003	-0.99 A	-0.74 A
2004	2.21 G	2.96 G
2005	-2.54 P	-1.29 P
2006	-0.43 A	1.32 G
2007	-3.72 P	-1.47 P
mean + 1/2 SD	1.21	0.95
mean - 1/2 SD	-1.21	-0.95

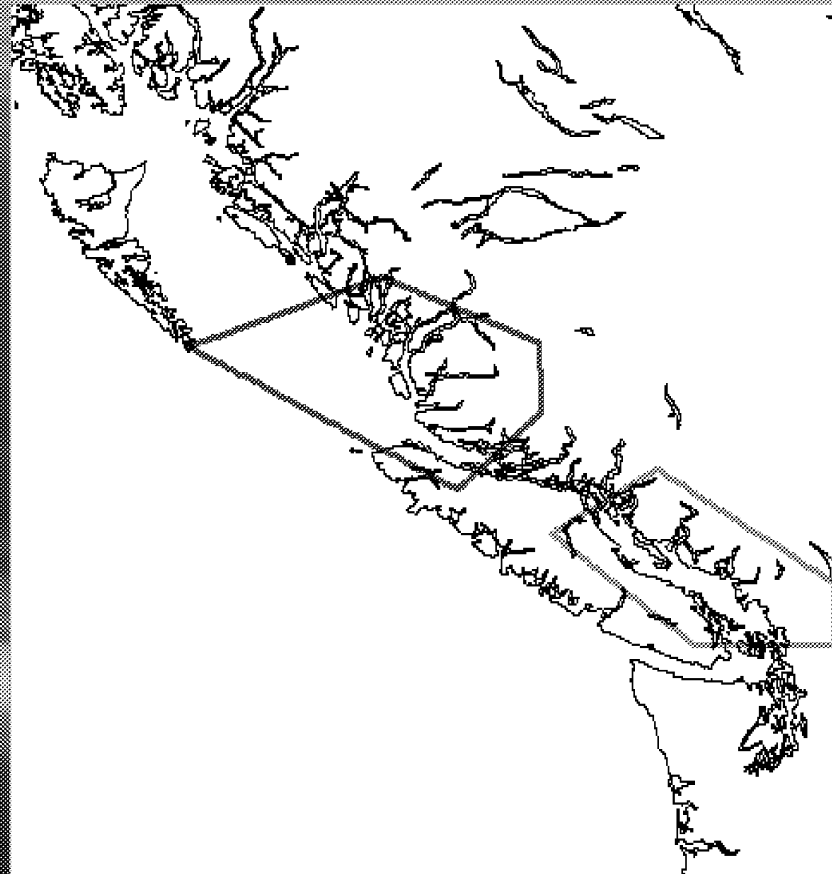
# Results

- 2001 and 2004 were consistently rated Good ocean entry years
- 2000 and 2003 were consistently rated Average
- 2002, 2005, and 2007 were consistently rated Poor
- 1998, 1999, and 2006 were rated differently depending on the approach

Do oceanographic factors vary among these year groupings that might be linked to survival?

Most Chilko smolts arrive Fraser estuary by mid May and appear to move North – we have satellite image data for Strait of Georgia and Queen Charlotte Sound

Examine satellite derived chlorophyll data for Strait of Georgia and Queen Charlotte Sound in the spring/early summer by ocean entry years



90 % of Chilko smolts exit Chilko Lake between 21 April & 11 May (J. Hume, pers. com)



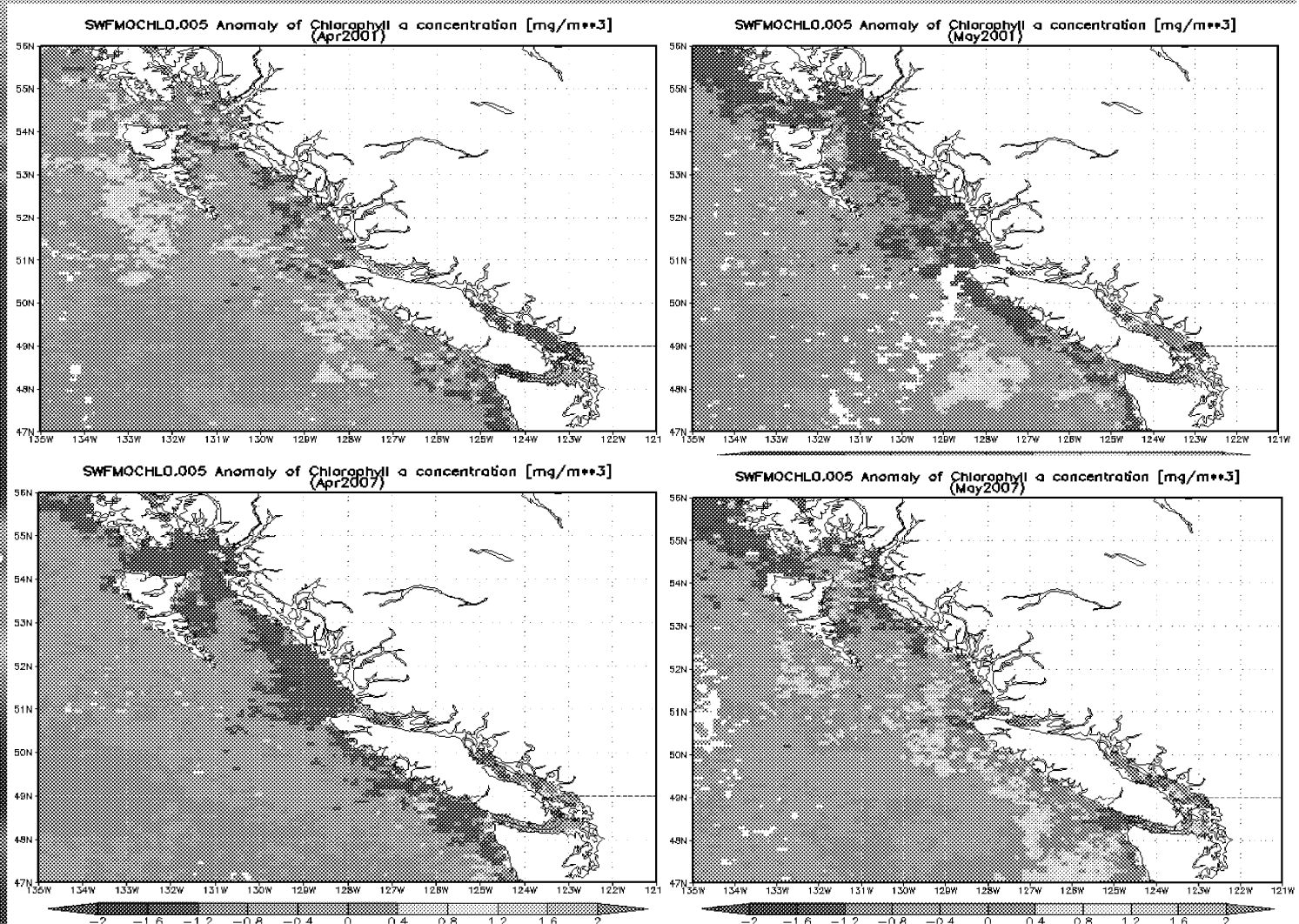
There are differences in the timing, location, and magnitude of chlorophyll blooms between good and poor survival years

Apr

May

e.g. 2001  
good  
ocean  
entry  
survival  
year

e.g. 2007  
poor  
ocean  
entry  
survival  
year



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# Correlation ( $r^2$ ) Between Marine Survival and SeaWiFS chlorophyll averaged over selected time periods (98-07)

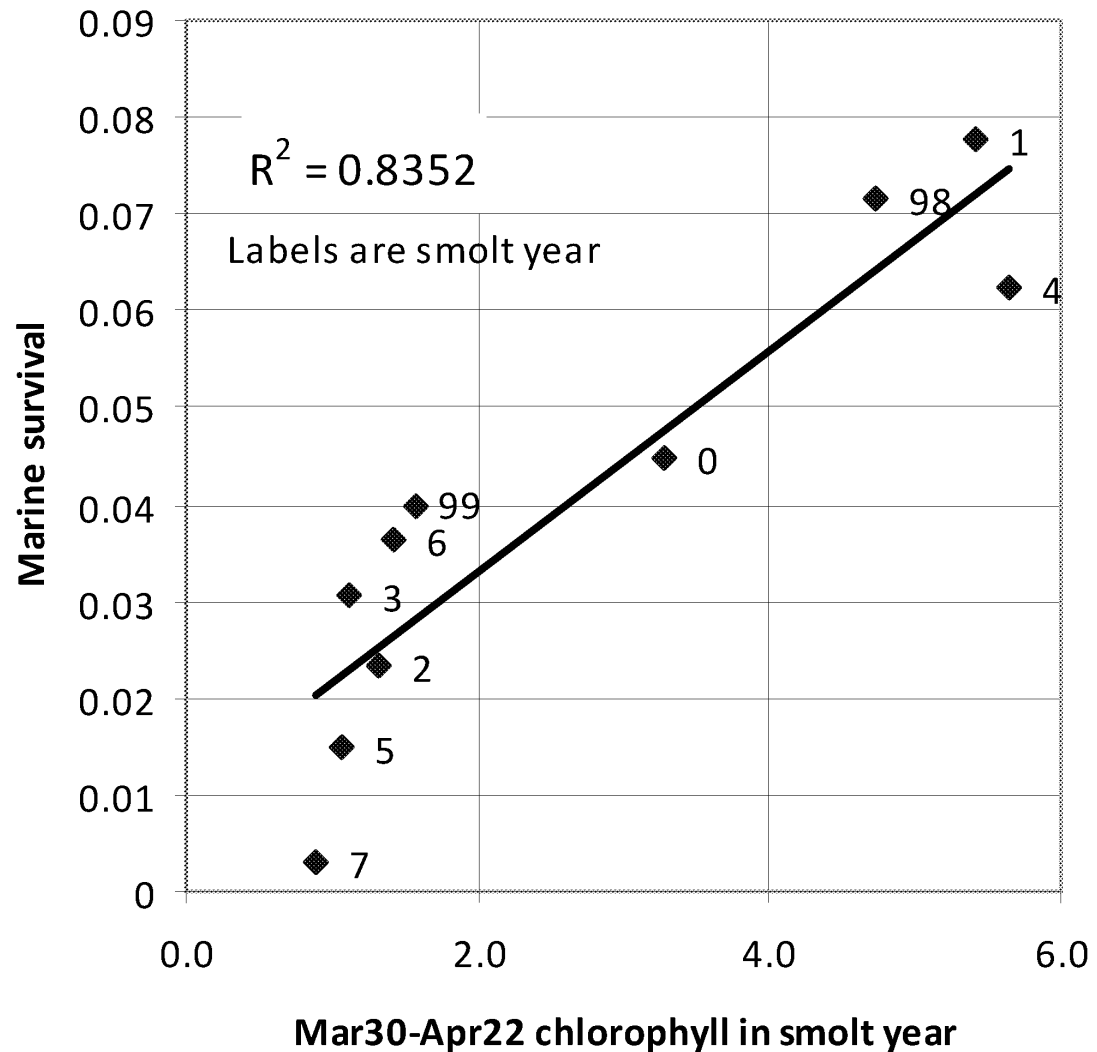
	30 Mar – 22 April	23 April – 16 May	17 May – 9 June
Queen Charlotte Sd	0.84**	-0.27	-0.23
Strait of Georgia	-0.42*	-0.40*	-0.14

\* $p < 0.05$

\*\* $p < 0.01$

Correlation  
between  
spring  
chlorophyll in  
Queen  
Charlotte  
Sound and  
Chilko  
marine  
survival

# Chilko Marine survival vs Mar30-Apr22 chlorophyll in smolt year



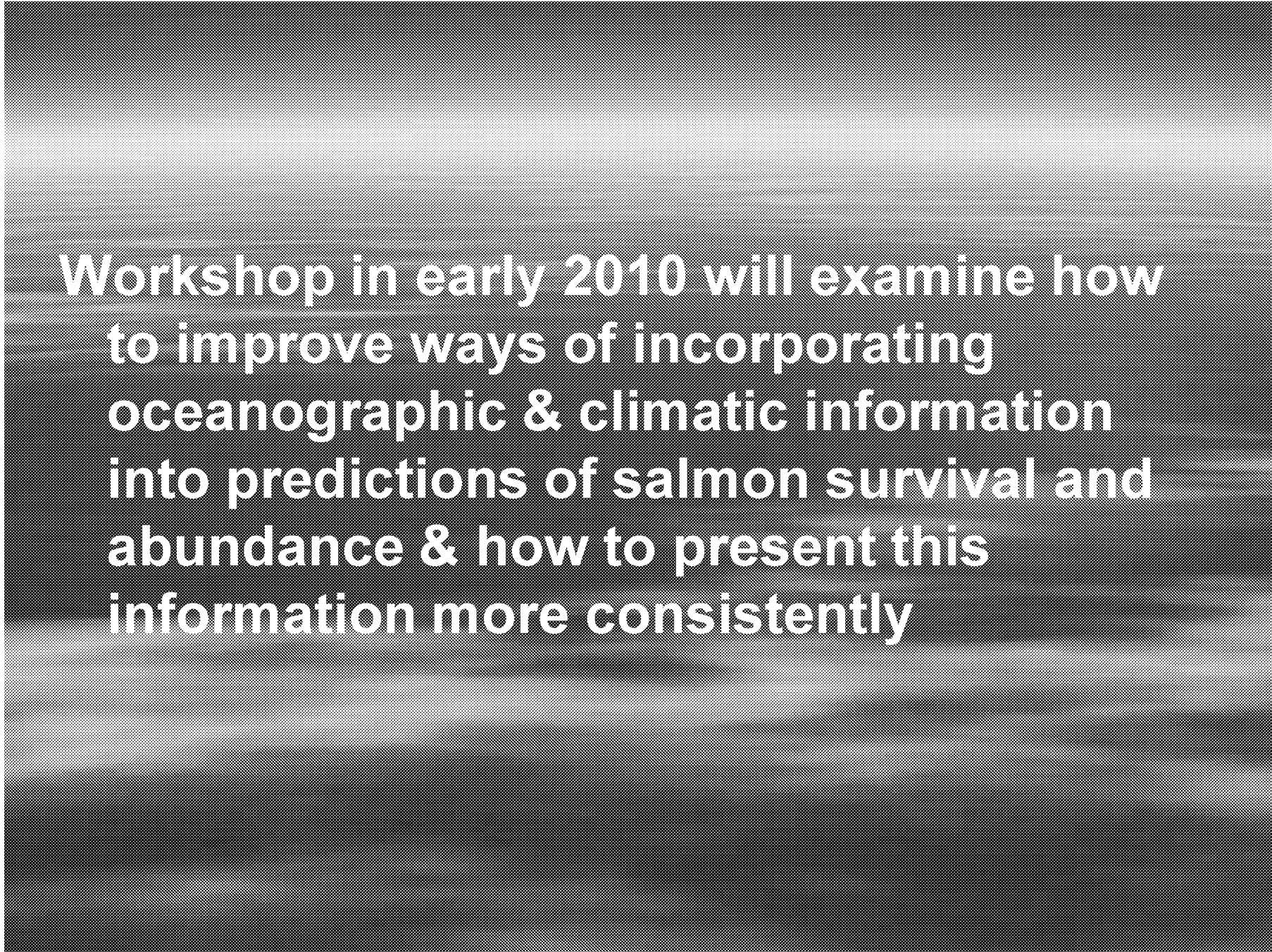
# Preliminary Findings

- Ocean entry years with high survivals (01, 04) coincided with mid-April chlorophyll blooms in Queen Charlotte Sound
- OEY with low ms (02, 05, 07), coincided with later peak blooms (after 30 April) in QCS
- Survivals negatively associated with GS chlorophyll, and QCS chlorophyll after late April



# Next Steps

- Look at other types of data including those from satellite imagery
- Evaluate precision of satellite data based on cloud cover
- Examine other sockeye data (e.g. Rivers and Smith Inlet)
- Develop plausible hypotheses
- Incorporate these types of information into salmon forecasts



**Workshop in early 2010 will examine how to improve ways of incorporating oceanographic & climatic information into predictions of salmon survival and abundance & how to present this information more consistently**

# Questions or Comments?

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