



NOAA
FISHERIES

- Alaska
Fisheries
Science
Center

Insights Into Salmon Ecology and Production Dynamics through Nearshore Marine Surveys

- Chinook Salmon Symposium
- Ed Farley (Presenter)
 - Anchorage, AK
 - October 2012

History

COMMERCE SECRETARY DALEY ANNOUNCES THE AVAILABILITY OF \$7 MILLION IN FEDERAL AID TO ALASKANS FOR 1997 SALMON FAILURE

"The Bristol Bay/Kuskokwim salmon failure is a glaring example of how important environment is to a healthy economy. We need to improve our knowledge of how climatic changes impact the health of our coastal resources in order to ensure their preservation,"



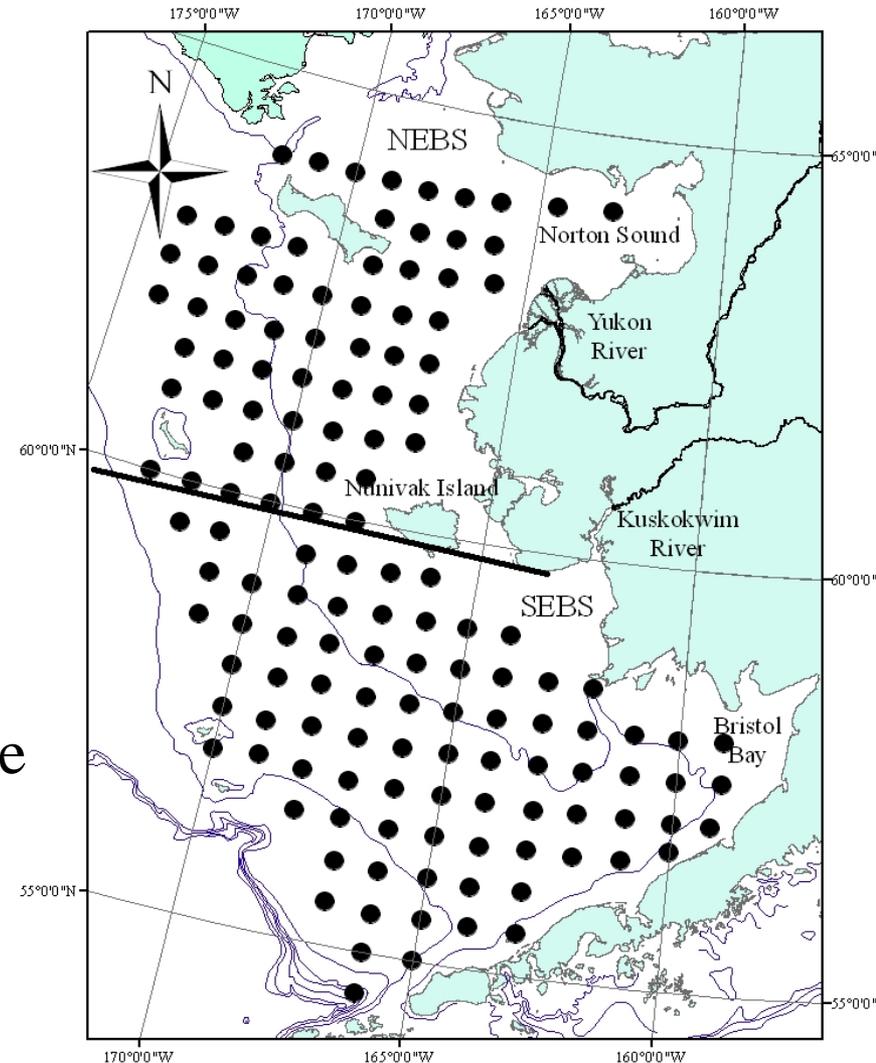
Bering Sea Research (late summer to fall)

- 1999: Bristol Bay
- 2002: BASIS
- 2007: AYK SSI
- 2008: BSIERP (NPRB)
- 2011: AYK SSI and AKSSF
- 2012: CIAP and BOEM

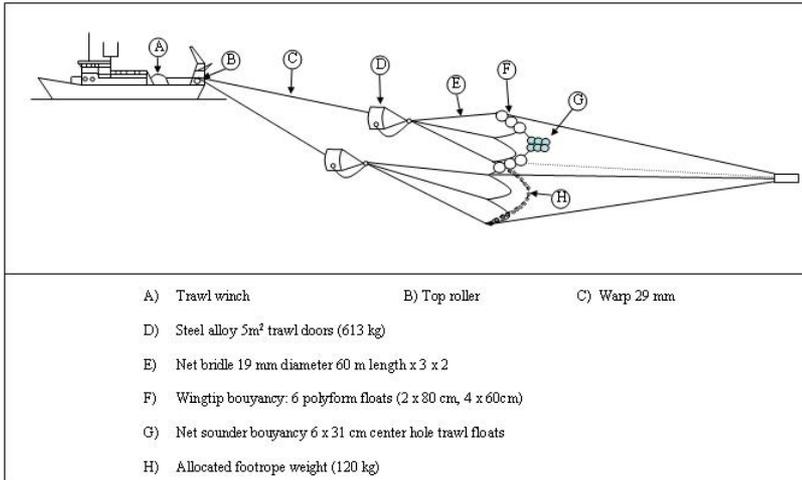
Goal: Determine impact of climate variability and change on early marine ecology of juvenile western Alaska salmon.

SECOND CRITICAL PERIOD

Size and Energetic Status prior to Winter



Net Sampling



Mid-water trawl rigged to fish near surface to 25-m depth with a width of 60-m.

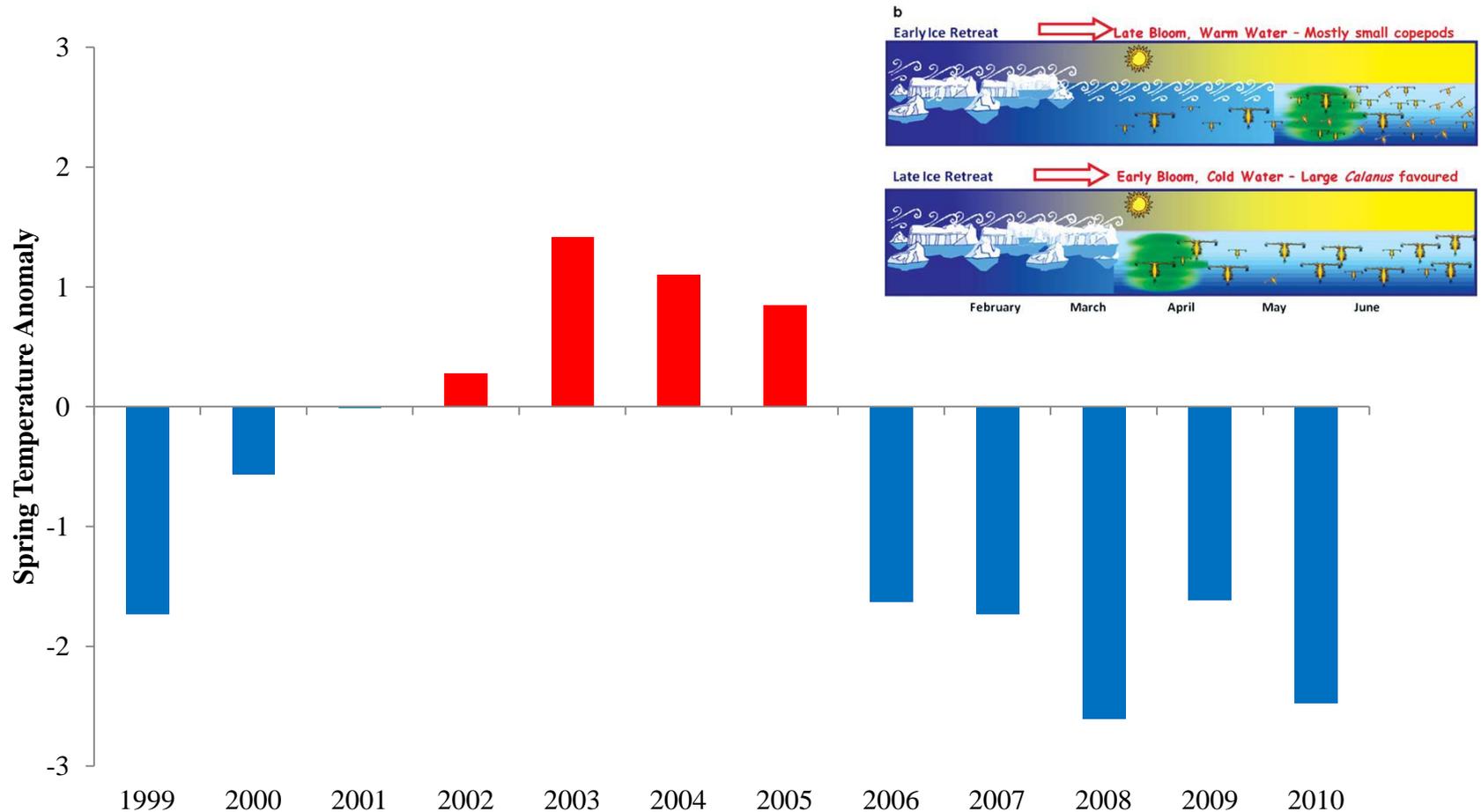


Ecosystem Indicators

- Physical Oceanography
- Biological Oceanography
 - Zooplankton species comp and biomass
- Distribution
- Relative Abundance
- Fish Diet
- Size
- Energetics



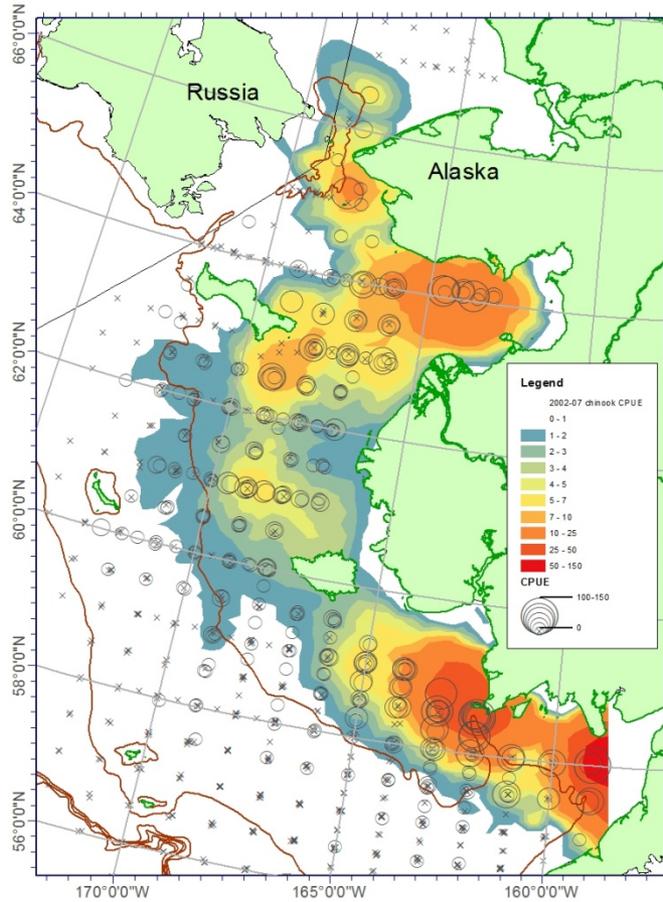
Survey occurred during periods of anomalously warm and cold years



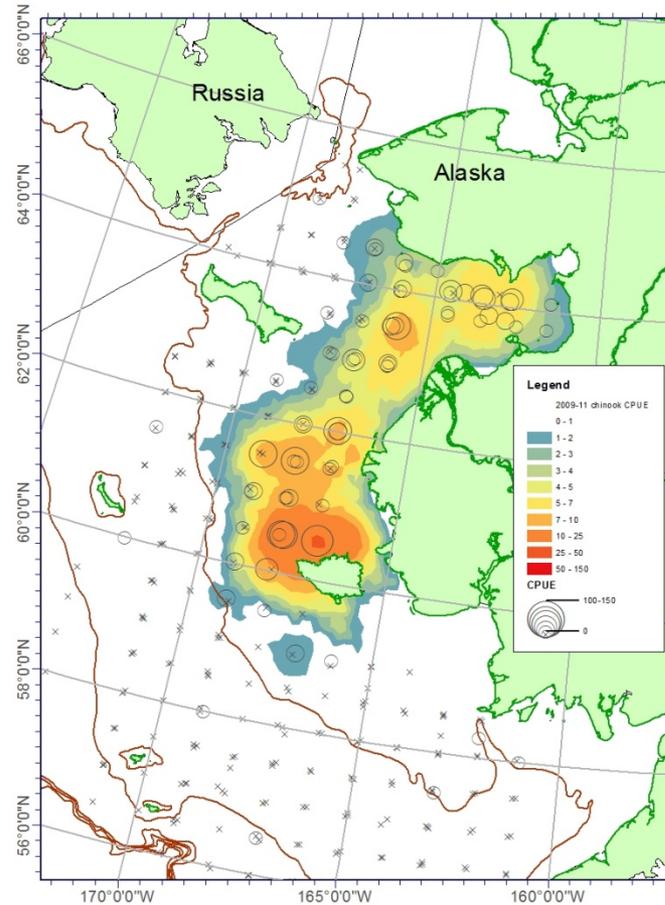
Data from <http://www.beringclimate.noaa.gov/>

Juvenile Chinook Distribution

(2002-2007)

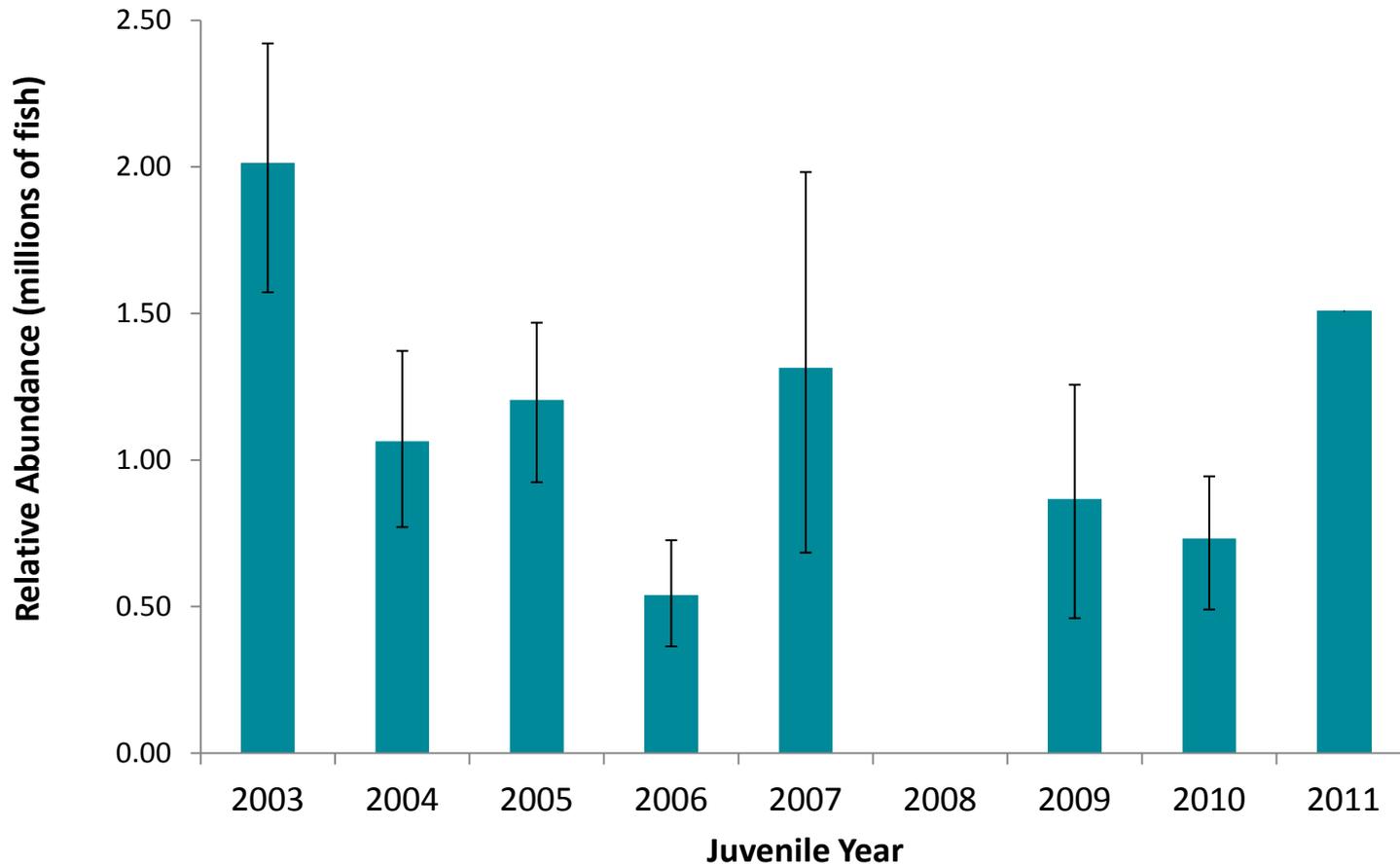


(2009-2011)



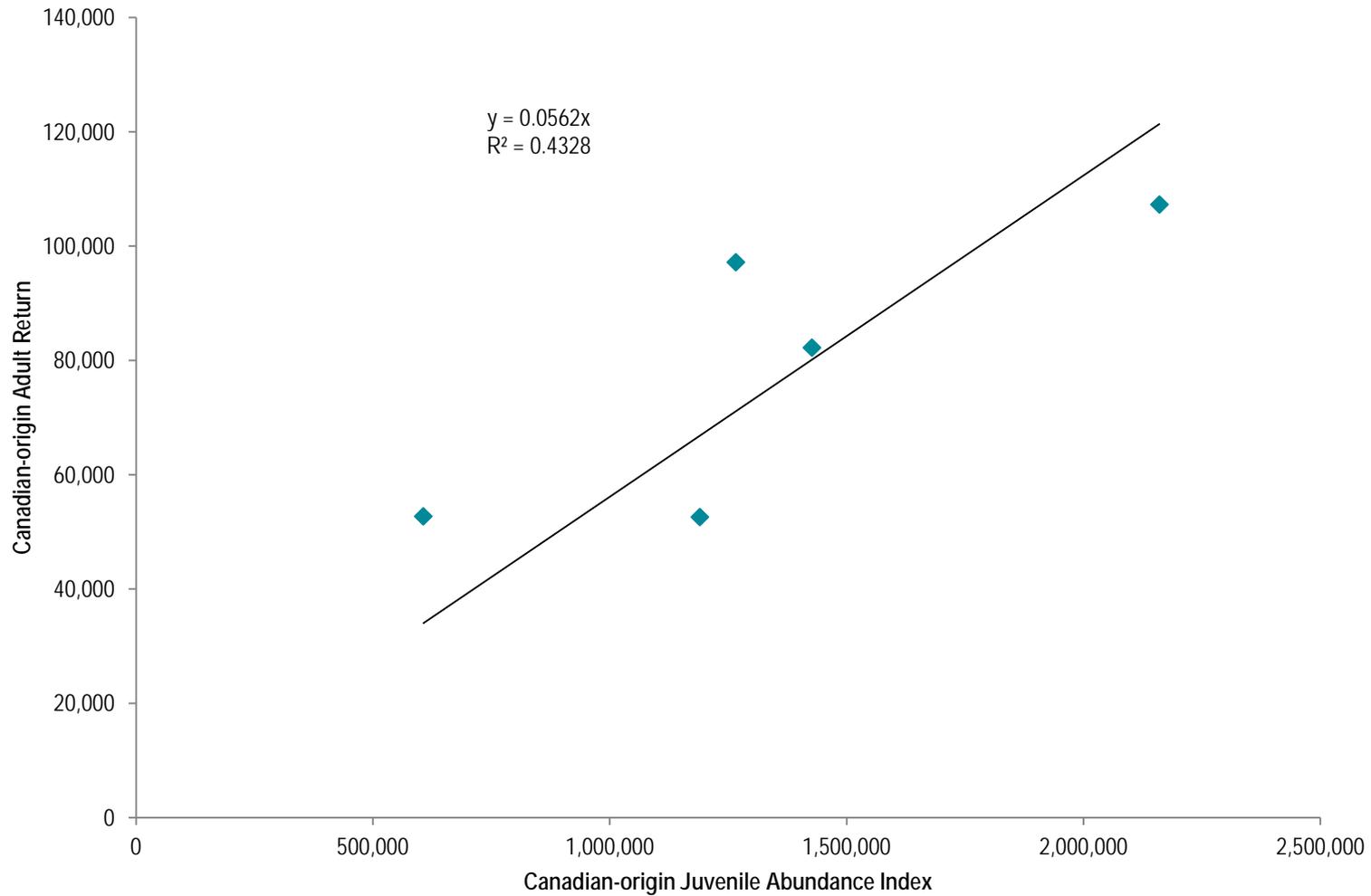
Murphy et al. in prep

Canadian-origin juvenile Chinook salmon Abundance Index (Northern Bering Sea shelf)



Murphy et al. in prep

Predictive Power

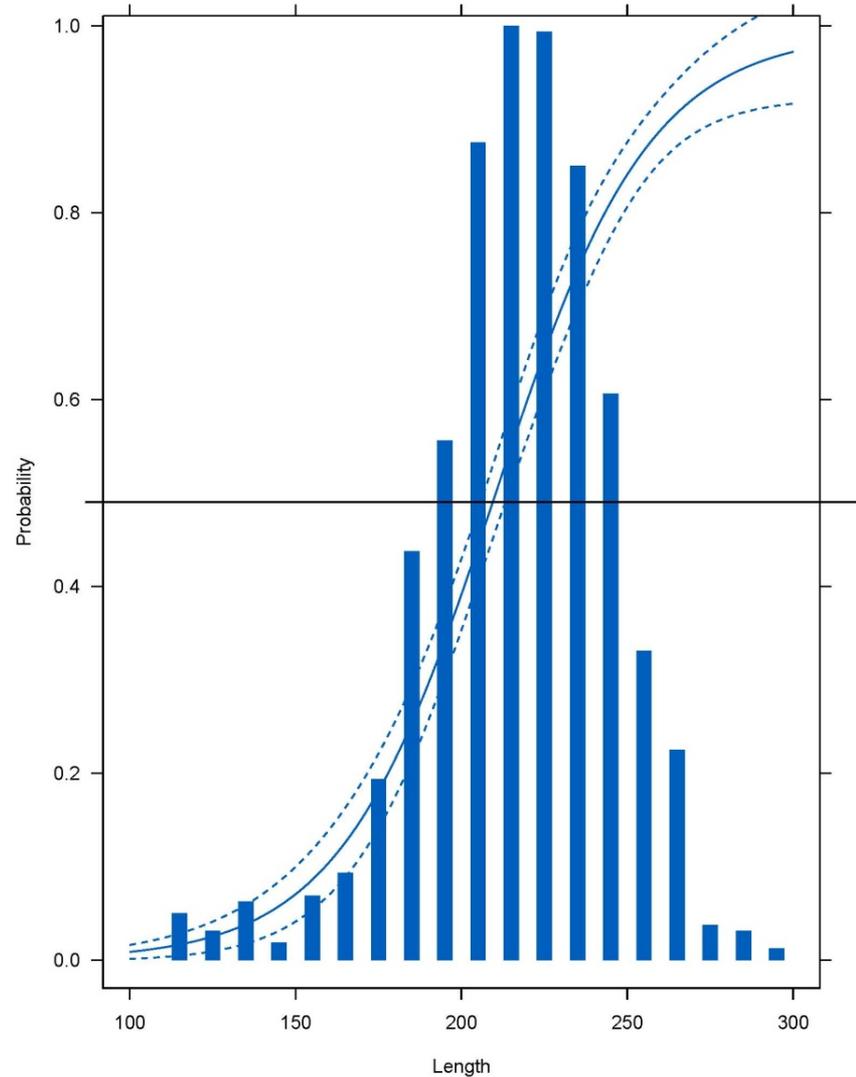


Murphy et al. in prep

Growth During Summer is Key to Surviving Winter

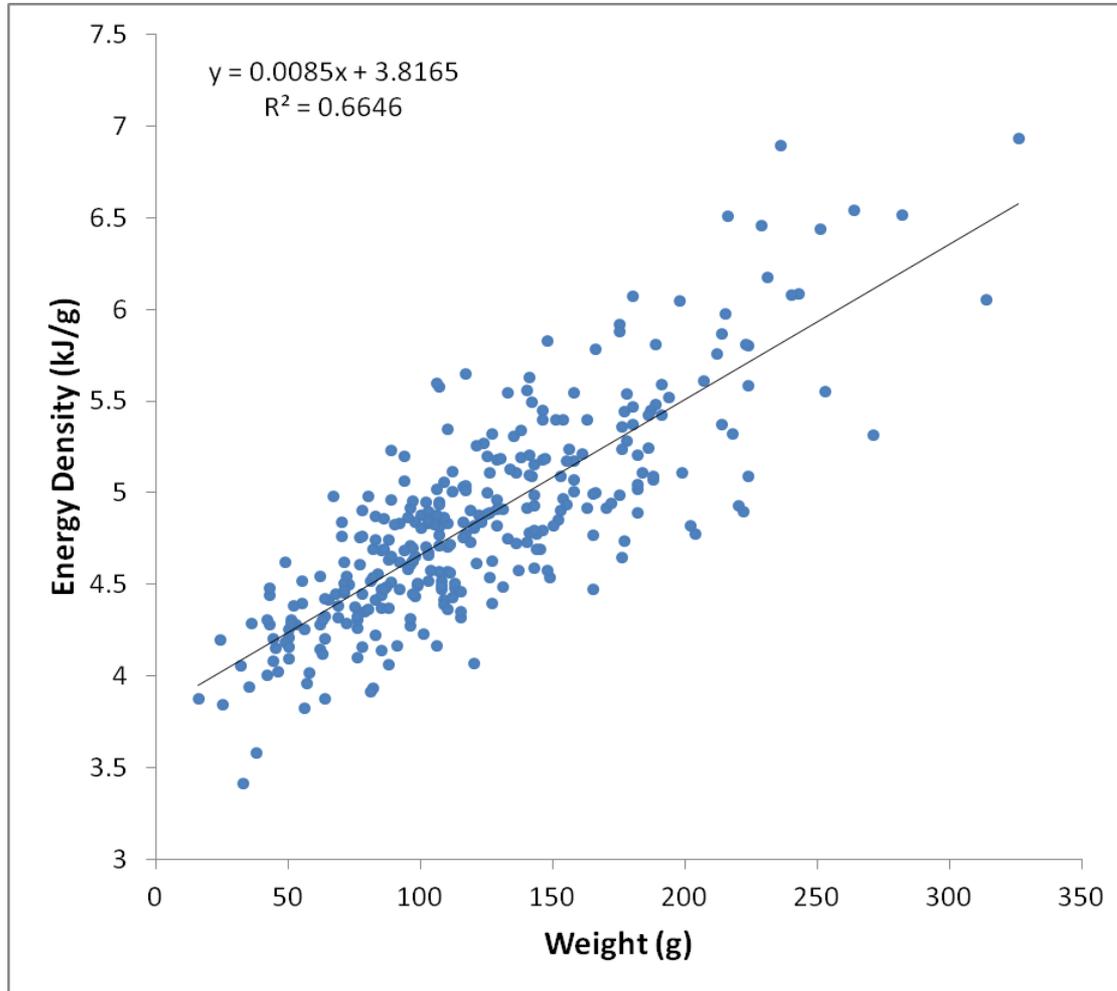


Yukon River Chinook Salmon



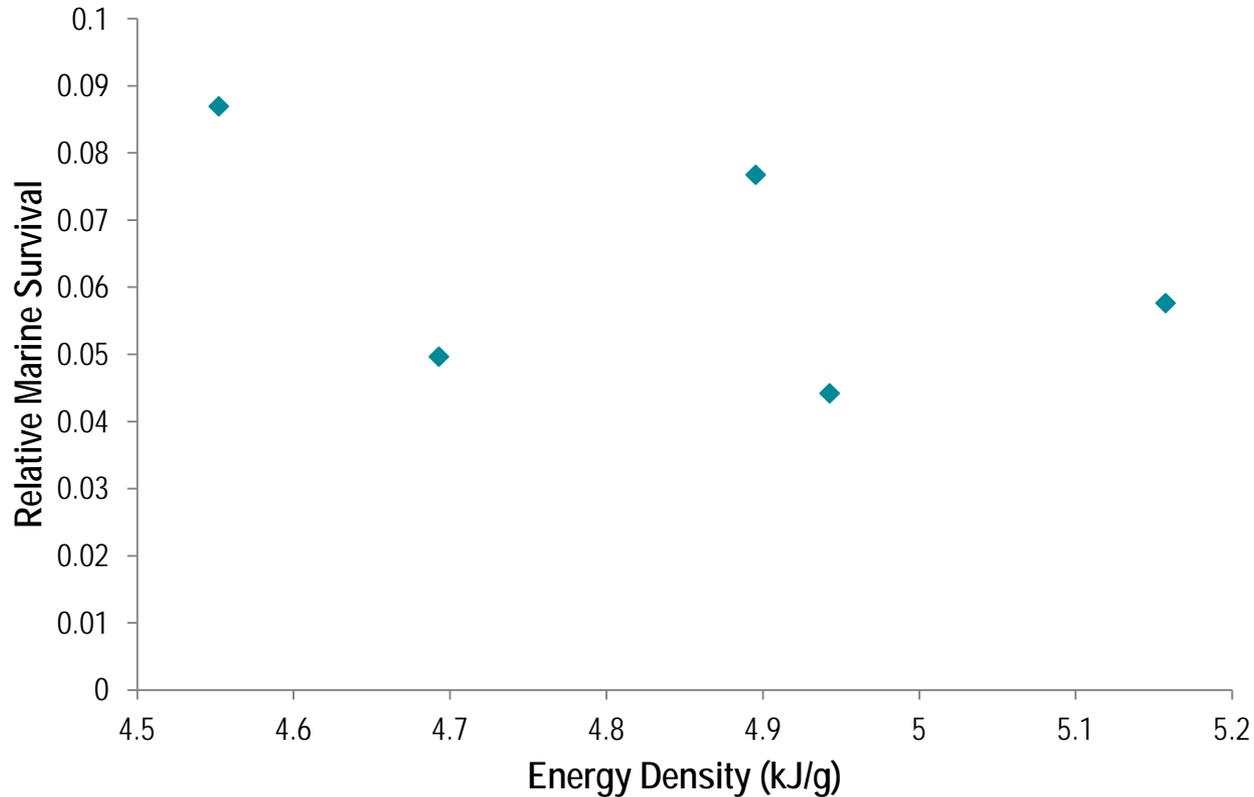
Murphy et al. in prep.

Juvenile condition: energy density (all years all regions)



Murphy et al. in prep.

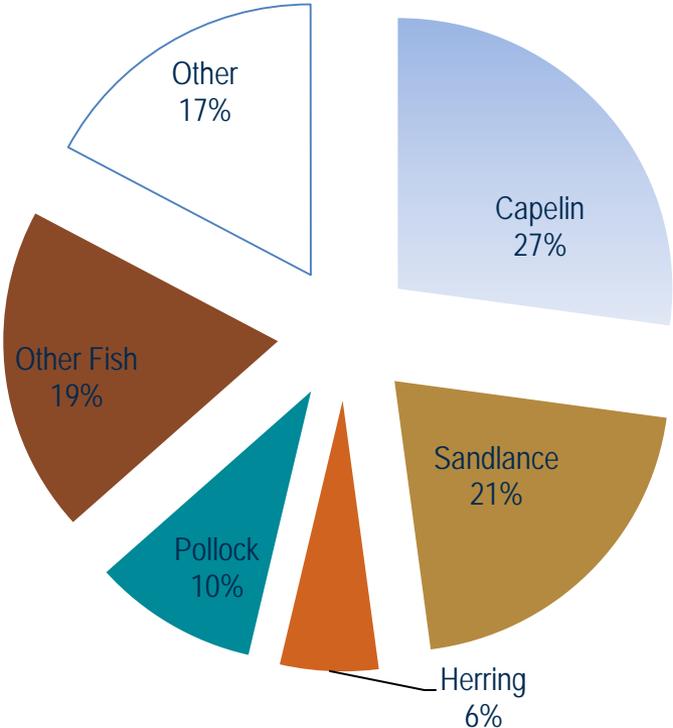
Relationship between Juvenile Chinook Energetic Status and Survival



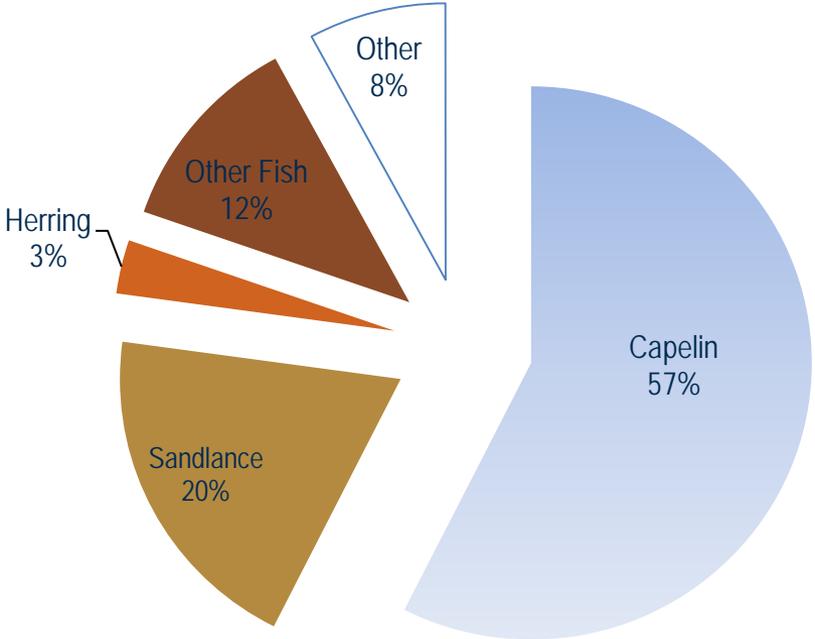
Murphy et al. in prep.

Juvenile Chinook Diet

Warm (2004-07)



Cold (2009-11)

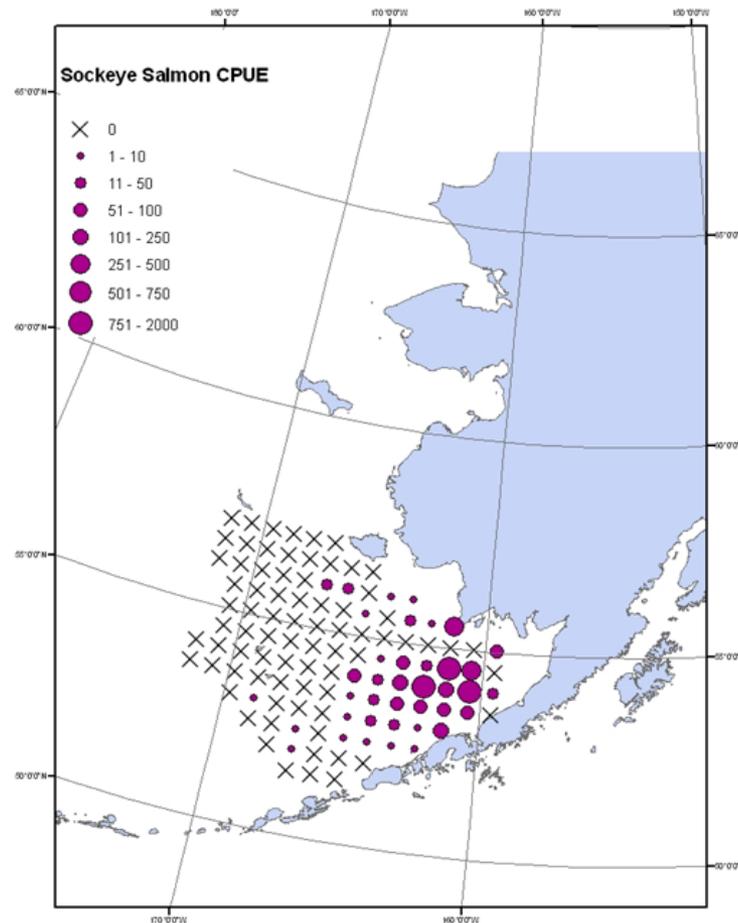
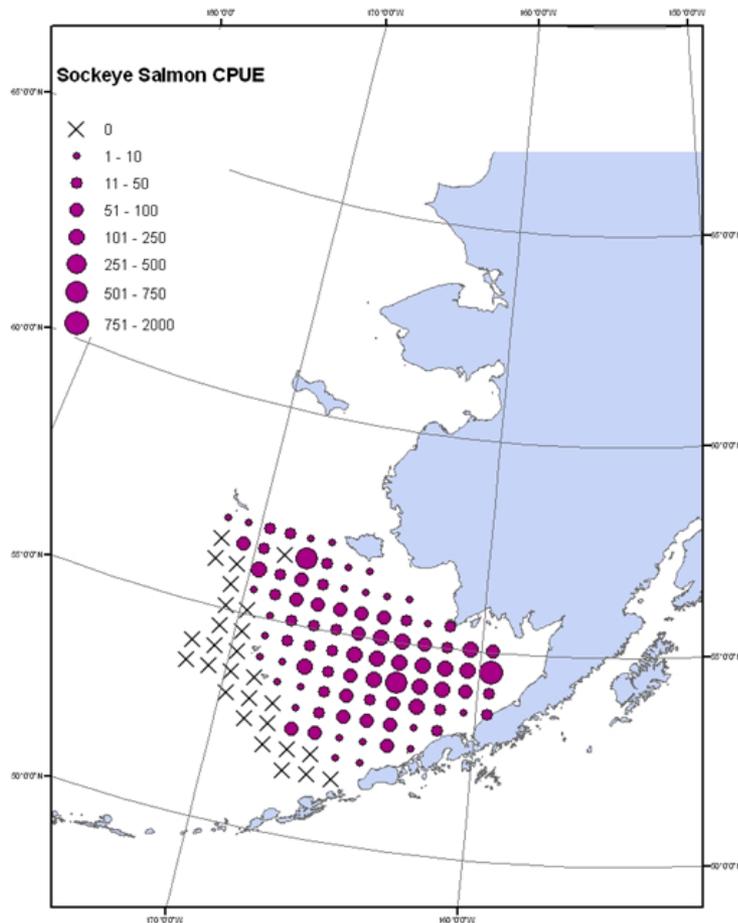


Murphy et al. in prep.

Juvenile Sockeye Salmon Distribution

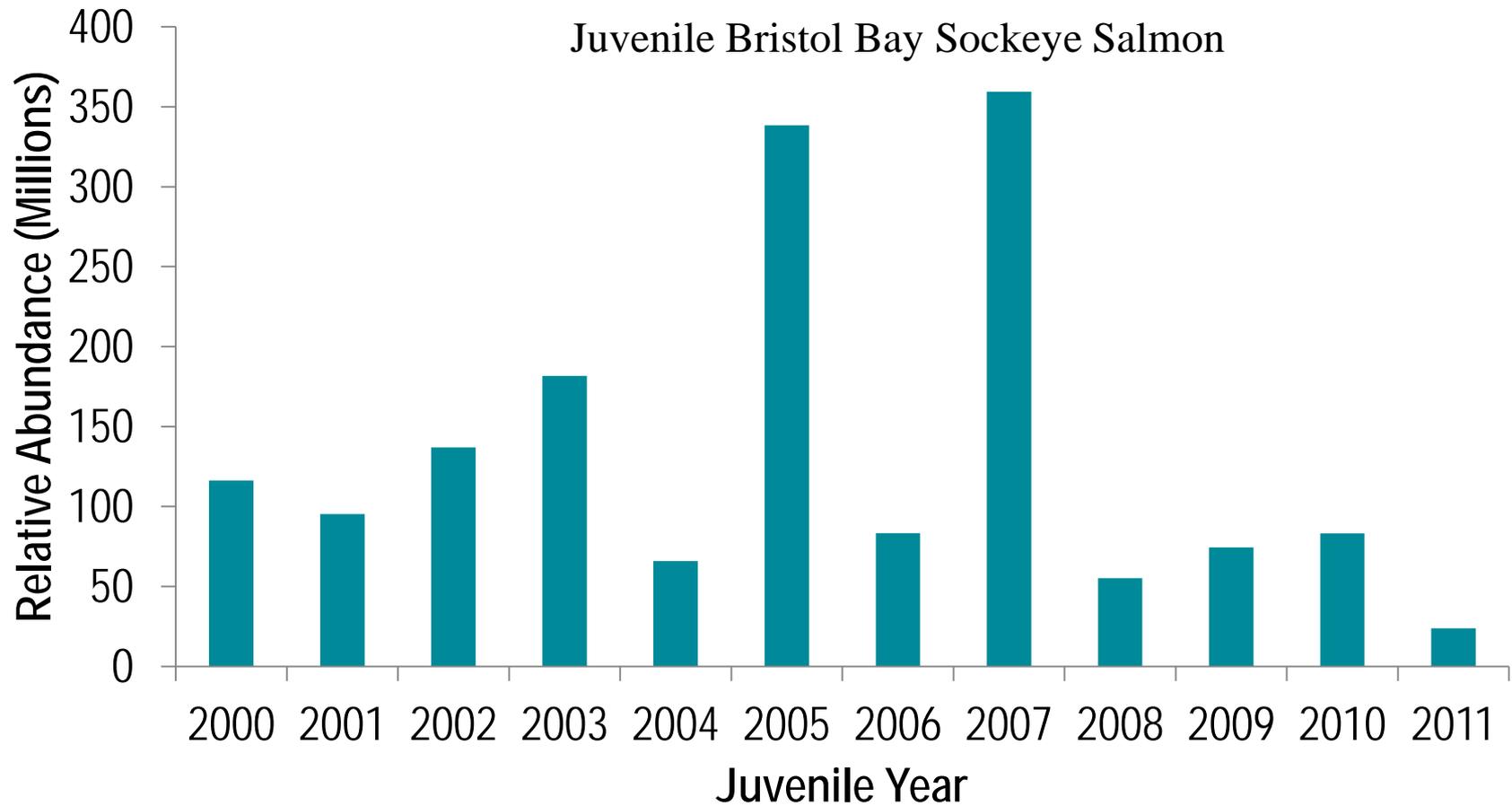
Warm

Cold

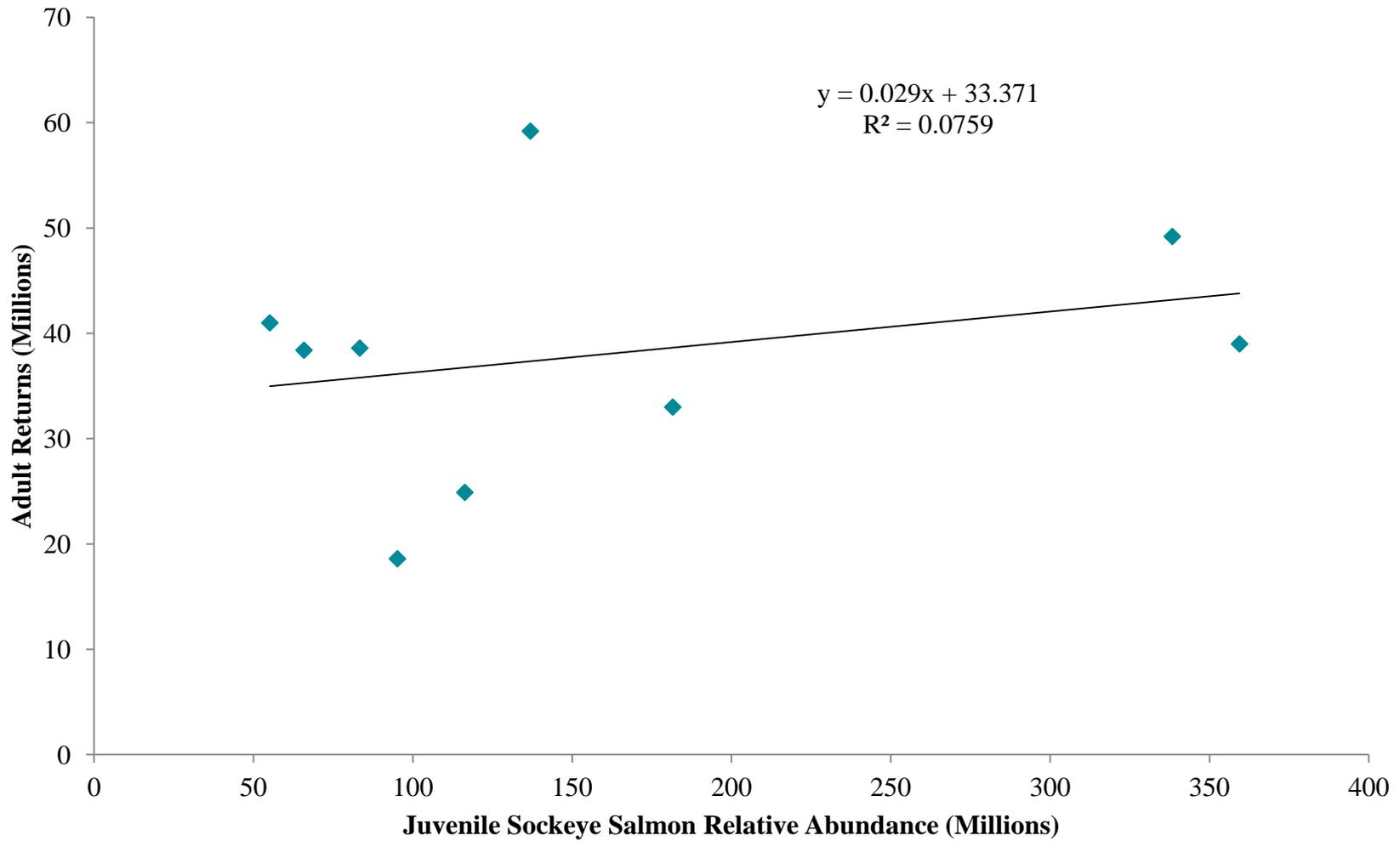


Farley et al. 2009

Relative Abundance

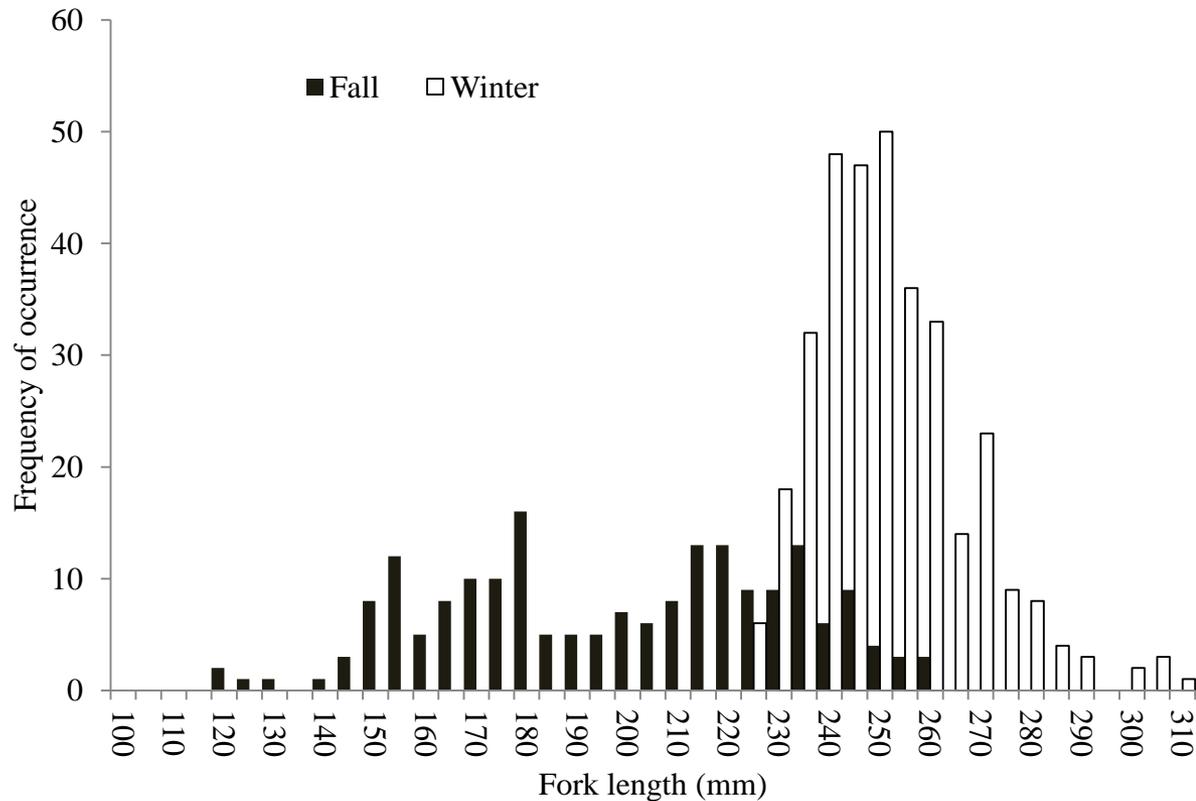


Predictive Power



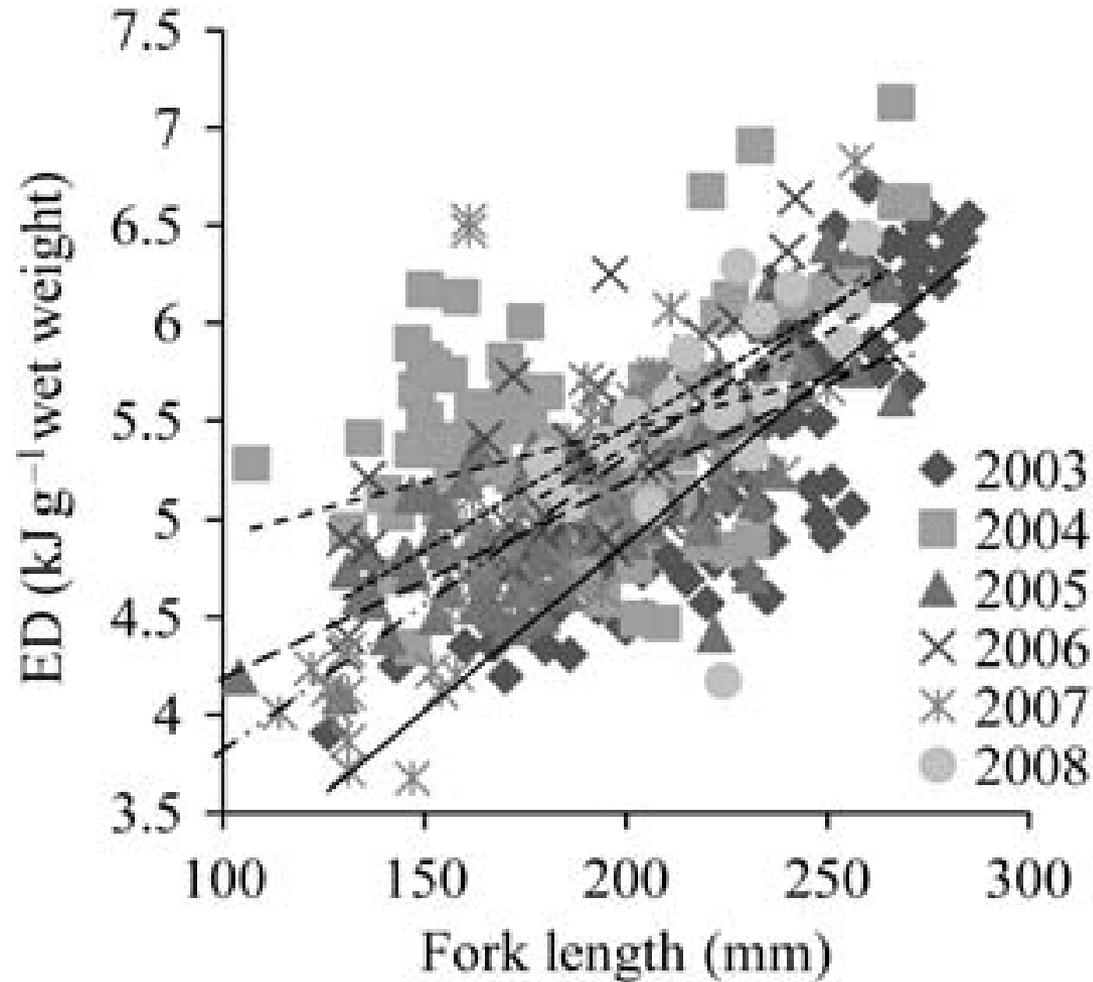
Growth During Summer is Key to Surviving Winter

Bristol Bay Sockeye Salmon



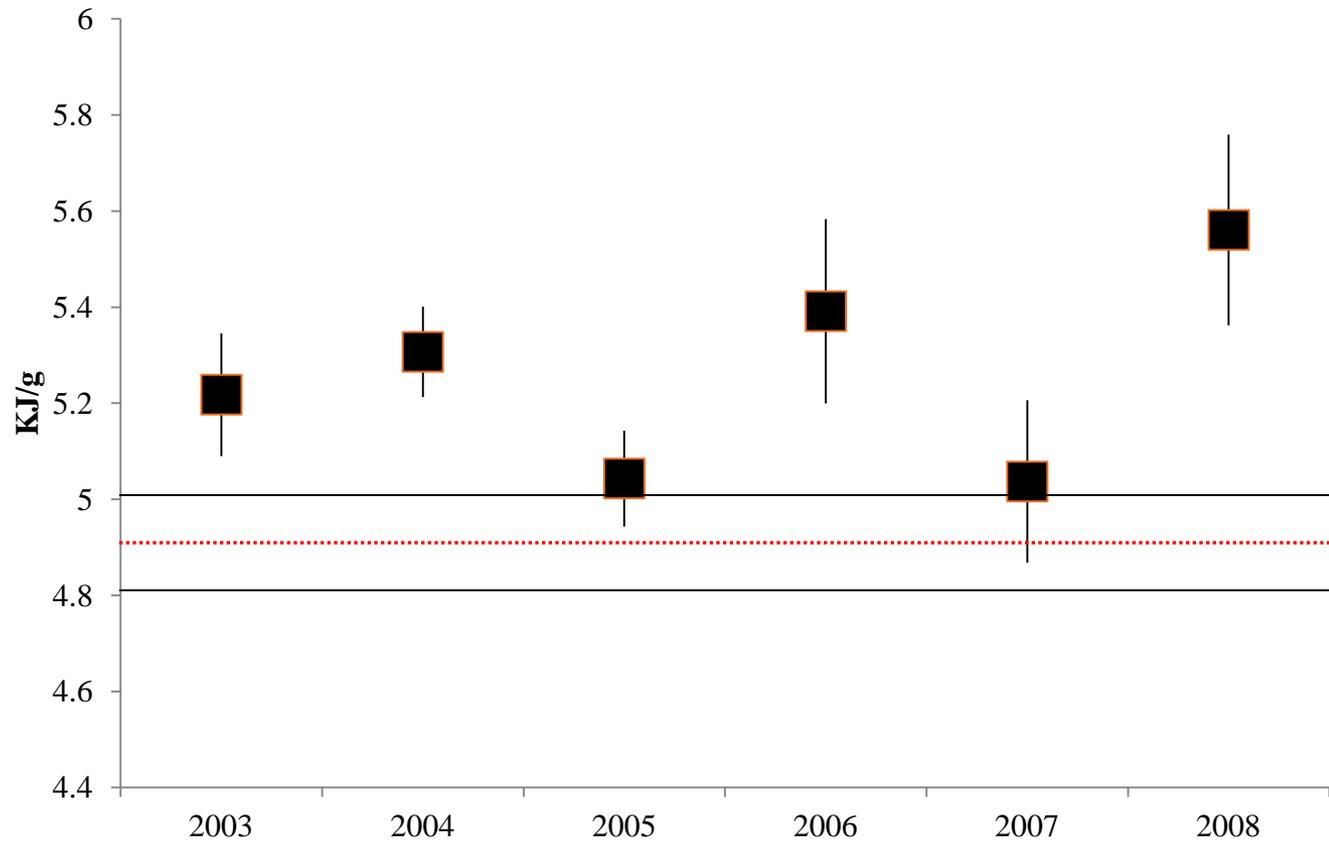
Farley et al. 2011

Juvenile Condition: Energy Density



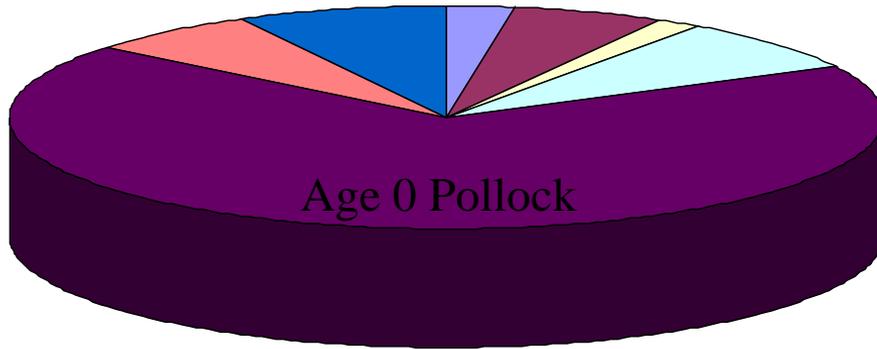
Farley et al. 2011

Juvenile Sockeye Salmon Energetic Status



Juvenile Sockeye Salmon Diets

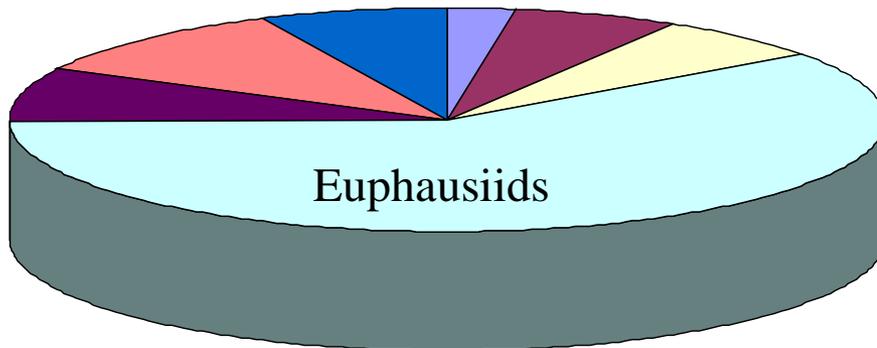
Warm SST



- Other Zoop
- Other Fish
- Amphipod
- Euphausiids
- Age 0 pollock
- Crab larvae
- Limacina



Cool SST

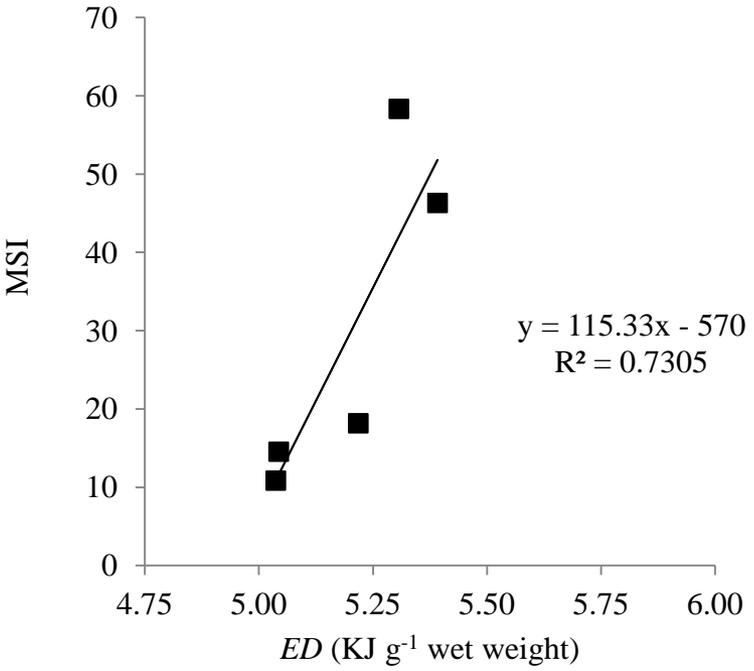


- Other Zoop
- Other Fish
- Amphipod
- Euphausiids
- Age 0 pollock
- Crab larvae
- Limacina

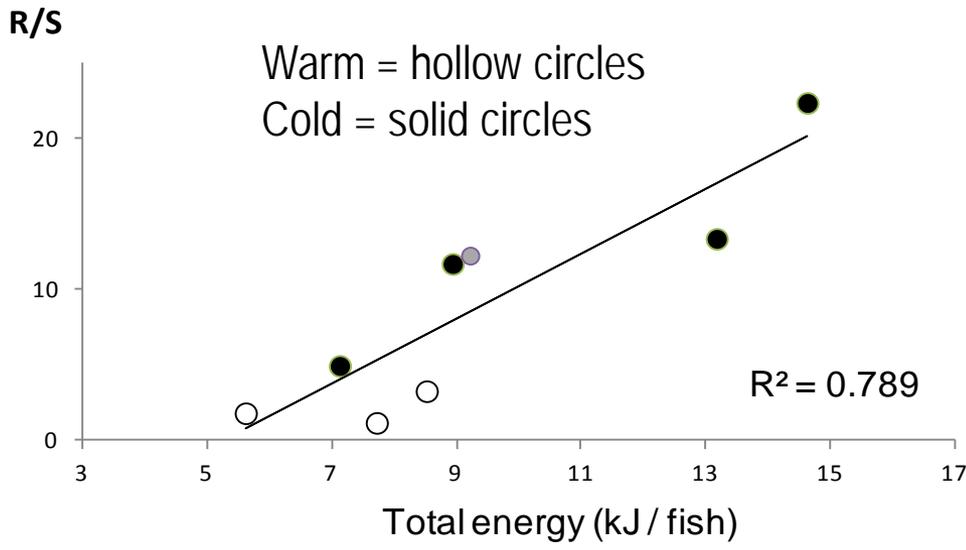


Energy (lipid) gained during Summer/Fall is also key to surviving winter

Juvenile Sockeye Salmon



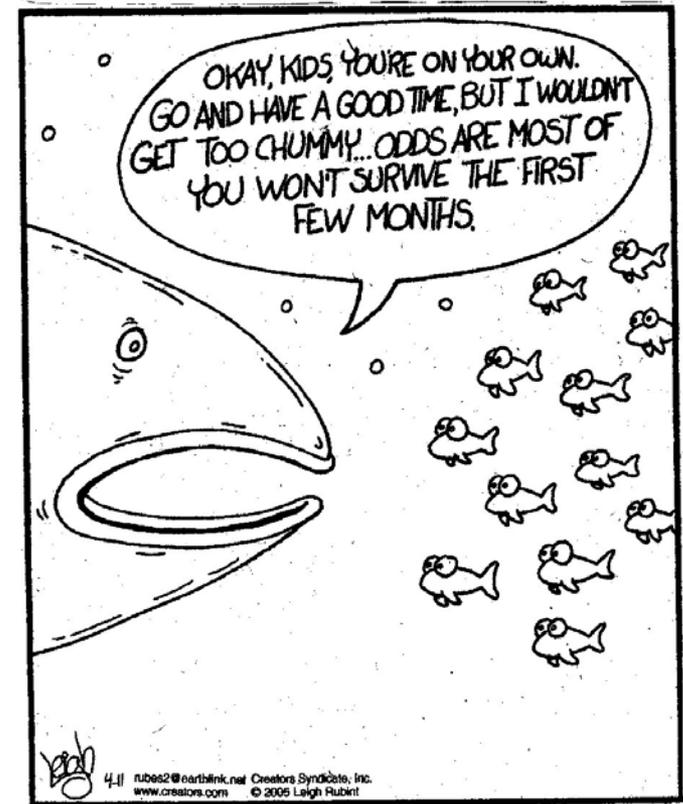
Age 0 Walleye Pollock



Conclusions

- Juvenile surveys and research on marine ecological processes impacting survival can improve our understanding of linkages between salmon production and climate.

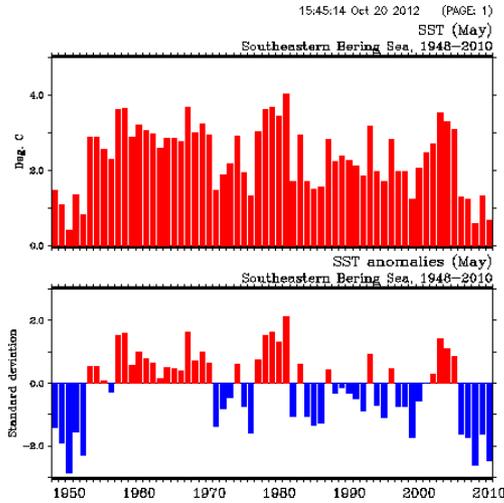
(GAP) Model to connect impact of climate variability to salmon growth rate potential – survival



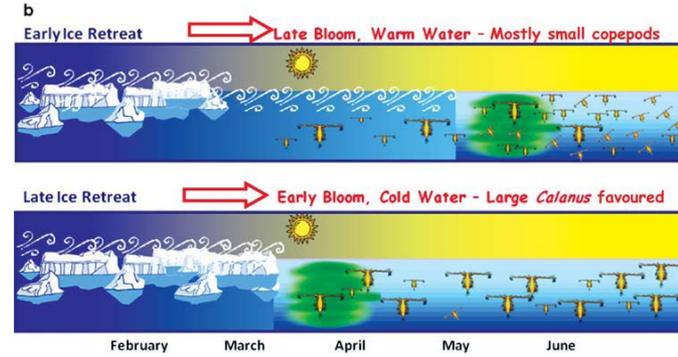
Salmon moms

Conclusions

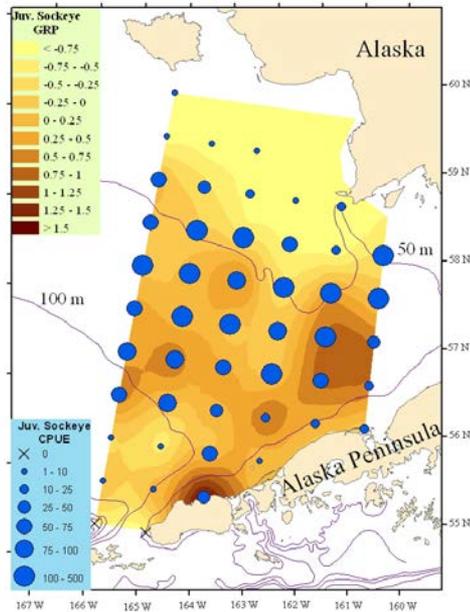
Climate



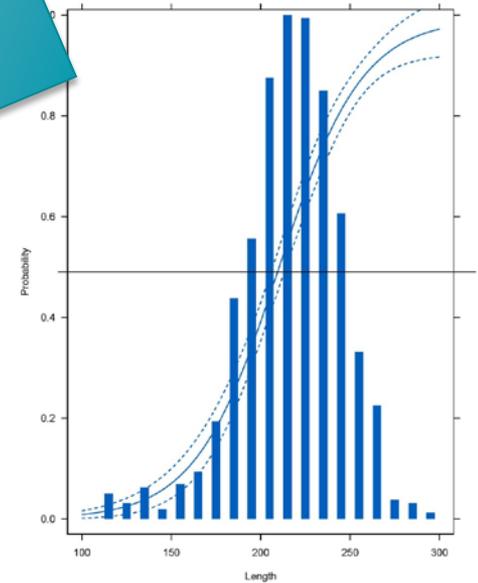
Productivity



Growth Potential
Grams/day



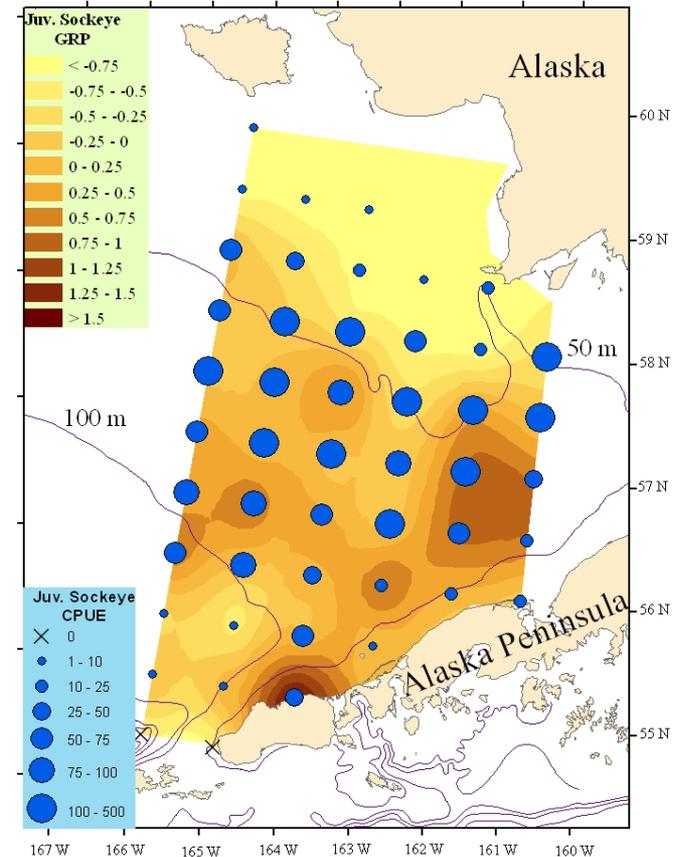
Probability of survival



Conclusions

- Growth/size and energetic status are key features of juveniles that integrate marine ecosystem processes.

(GAP) First critical period (nearshore) may be important for understanding processes affecting year class strength of Yukon River Chinook. Is this also true for Kuskokwim/Nushagak Chinook?



Thanks!

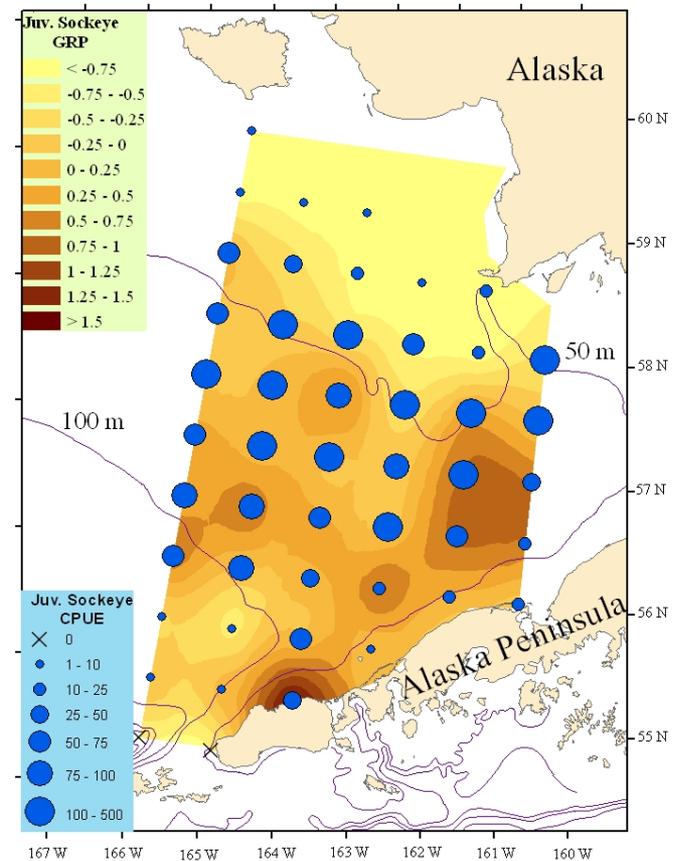
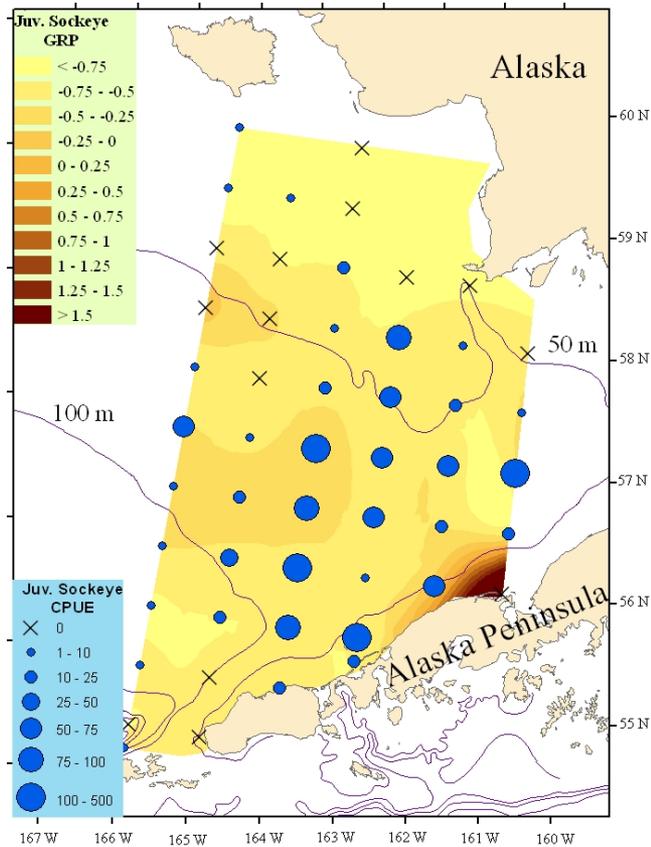
ADFG
AYKSSI
AKSSF
BSFA
YRDFA
NPRB
UAF
CIAP
BOEM
NOAA
B&N Fisheries
Sea Storm Inc.
NPAFC



Juvenile Sockeye Salmon Growth Rate Potential (% body weight per day)

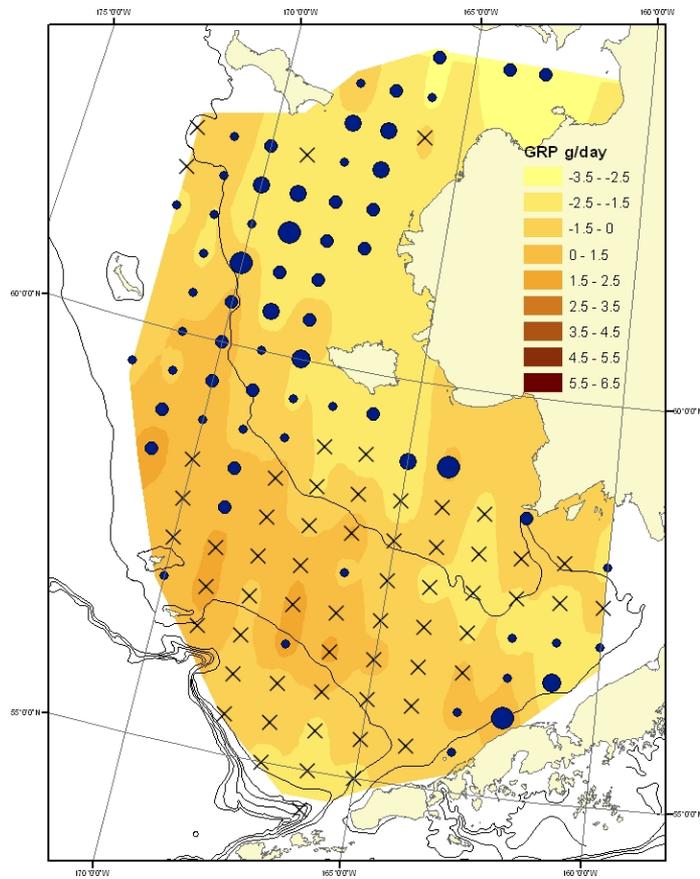
COOL

WARM

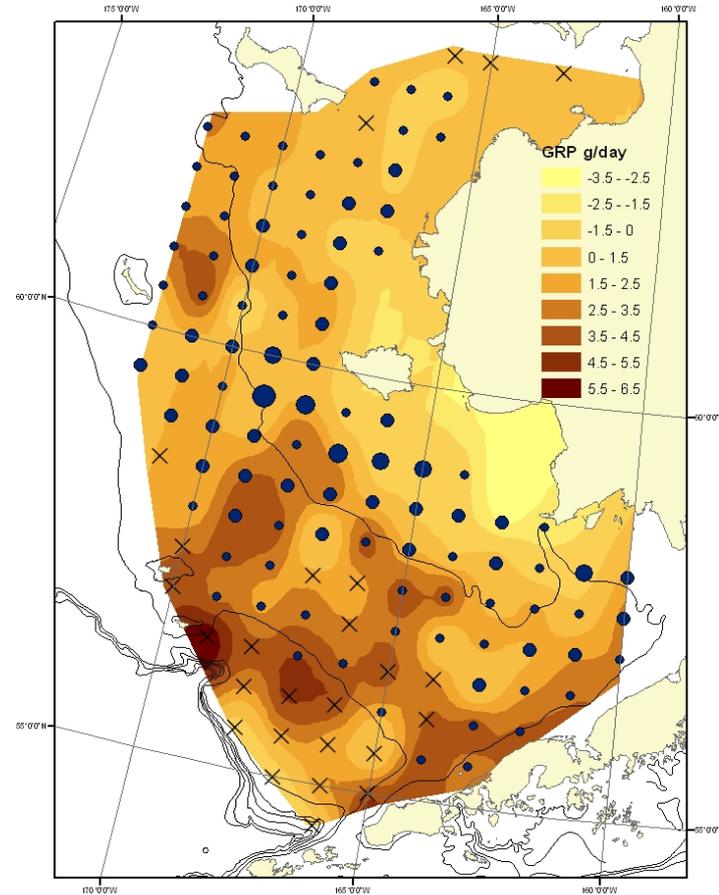


Juvenile Chum Salmon Growth Rate Potential (grams/day)

COOL



WARM

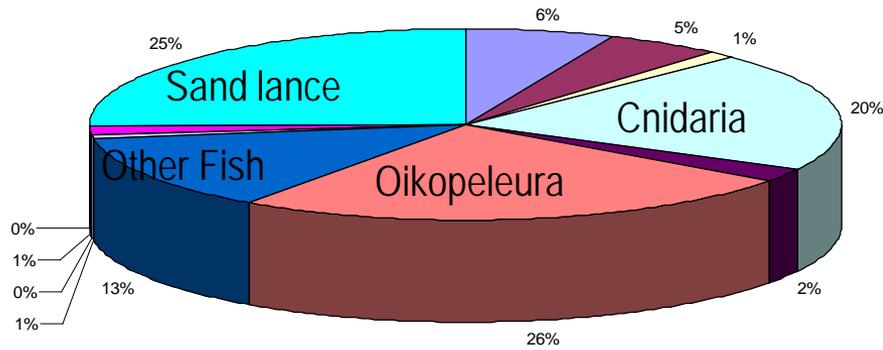


Juvenile Chum Salmon Diet

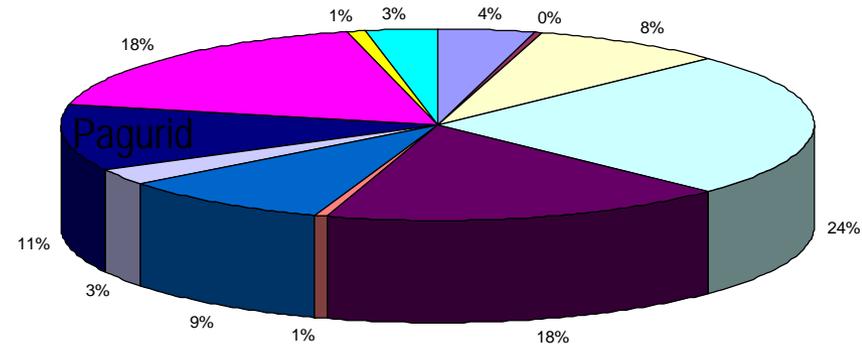
COOL

WARM

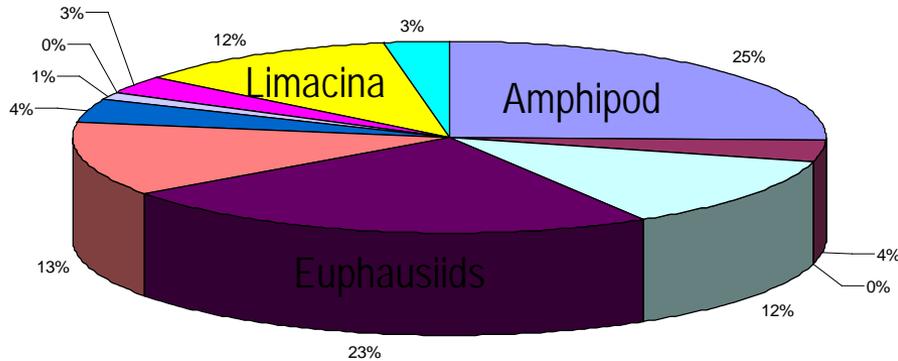
NORTHERN



NORTHERN



SOUTHERN



SOUTHERN

