Insights Into the Marine Ecology and Survival of Chinook Salmon

NOAA FISHERIES
Alaska Fisheries Science Center
Auke Bay Laboratories

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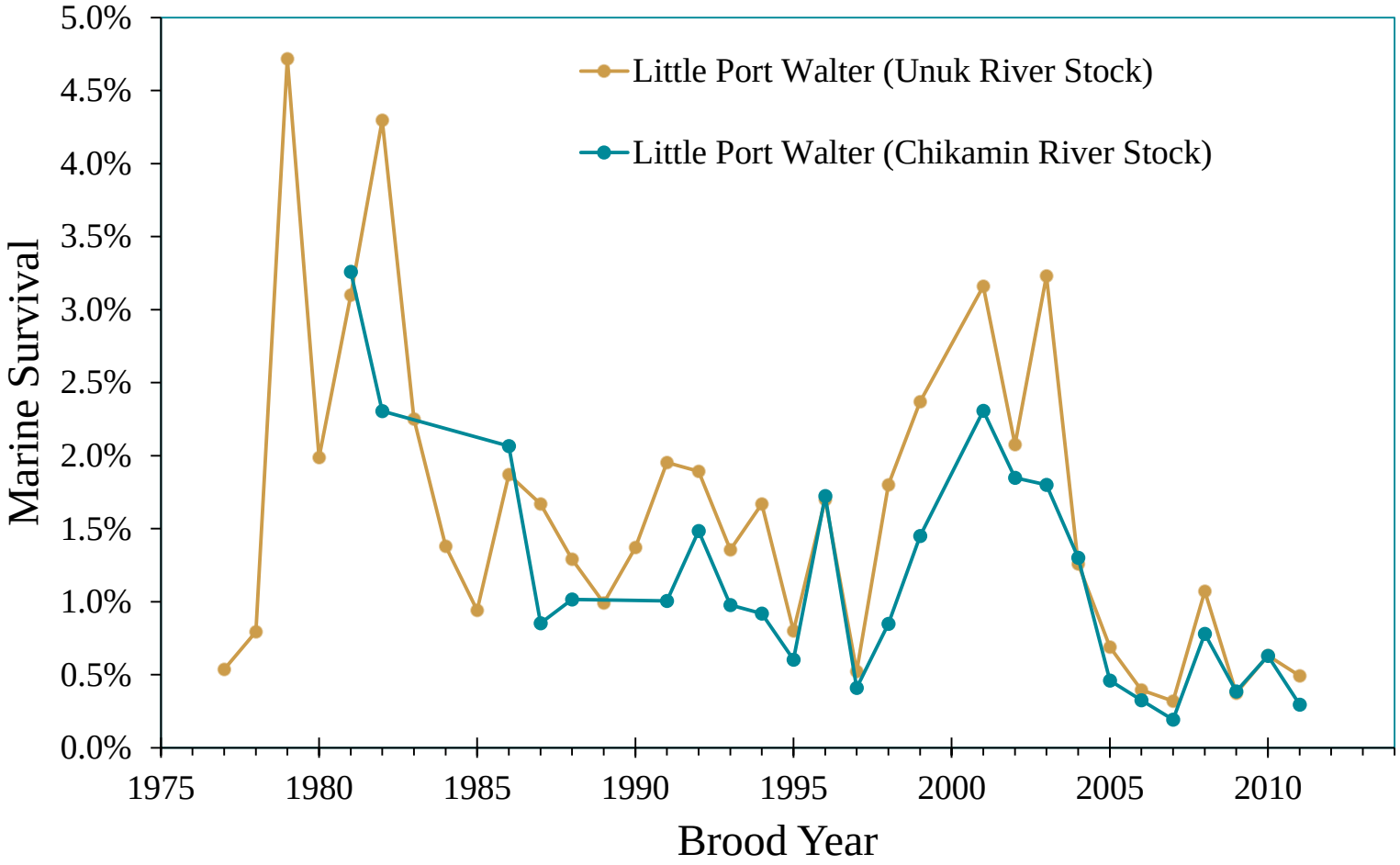
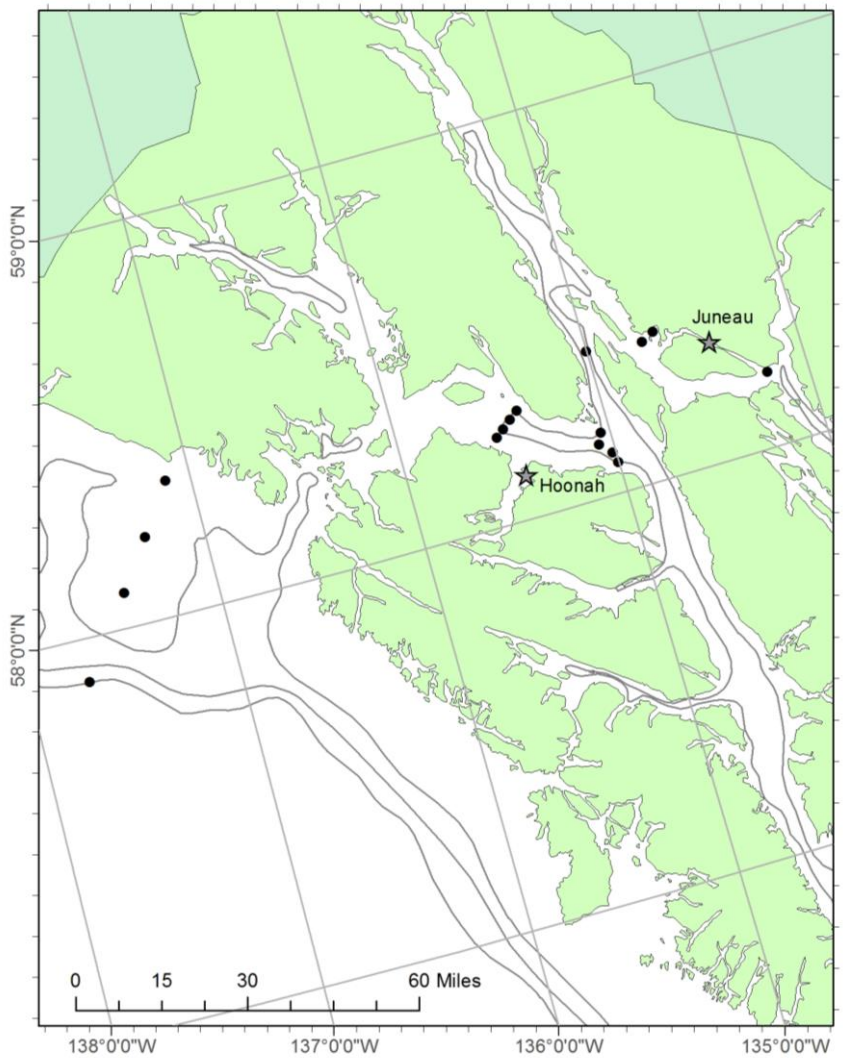
2017 King Salmon Symposium
Juneau, AK

April 13, 2017

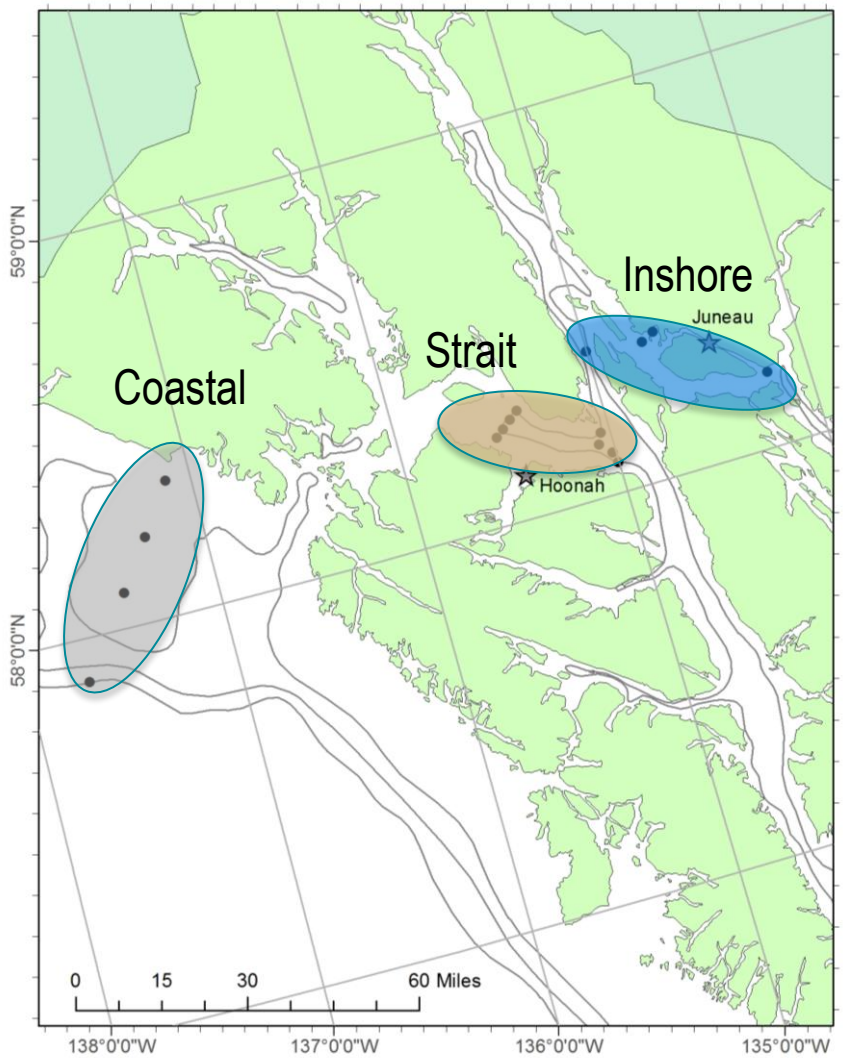
Poor marine survival is contribution to low returns of Chinook salmon throughout SE Alaska



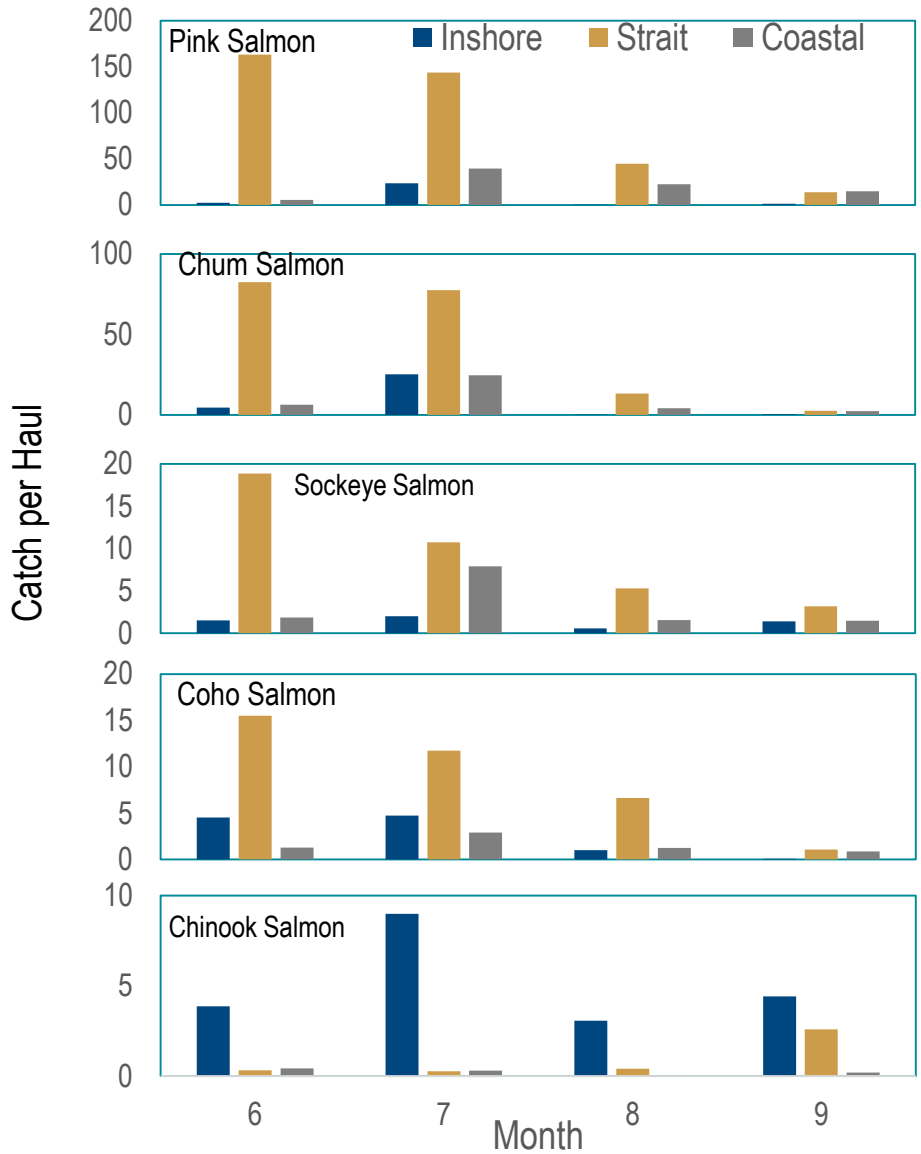
Southeast Alaska Coastal Monitoring



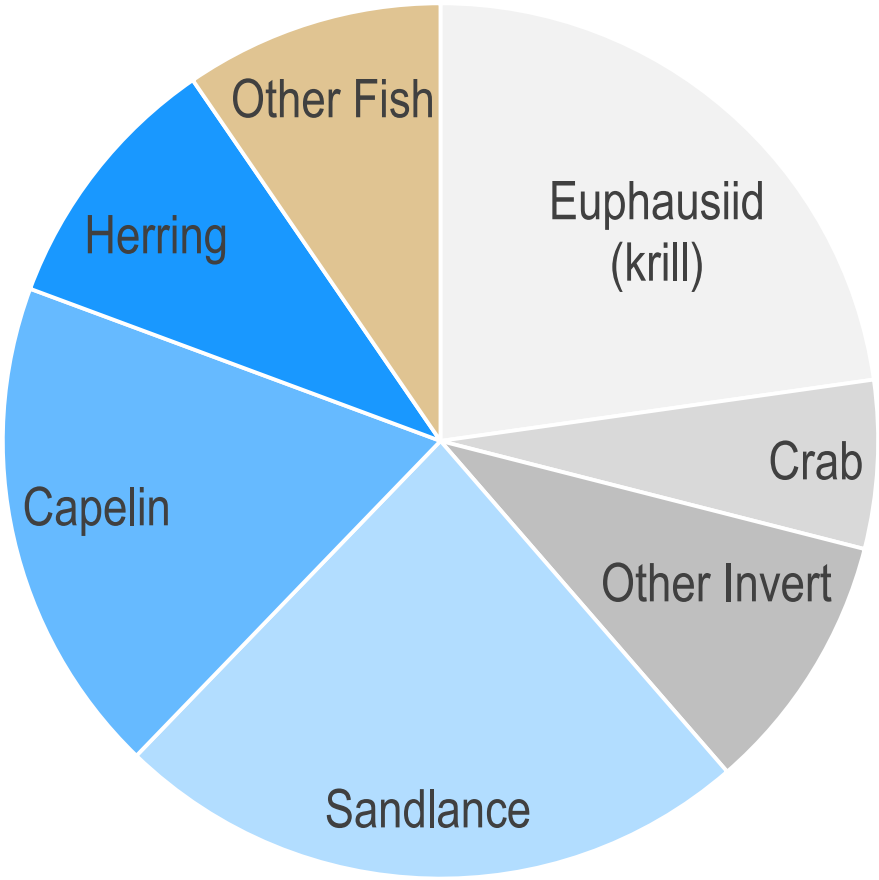
Southeast Alaska Coastal Monitoring



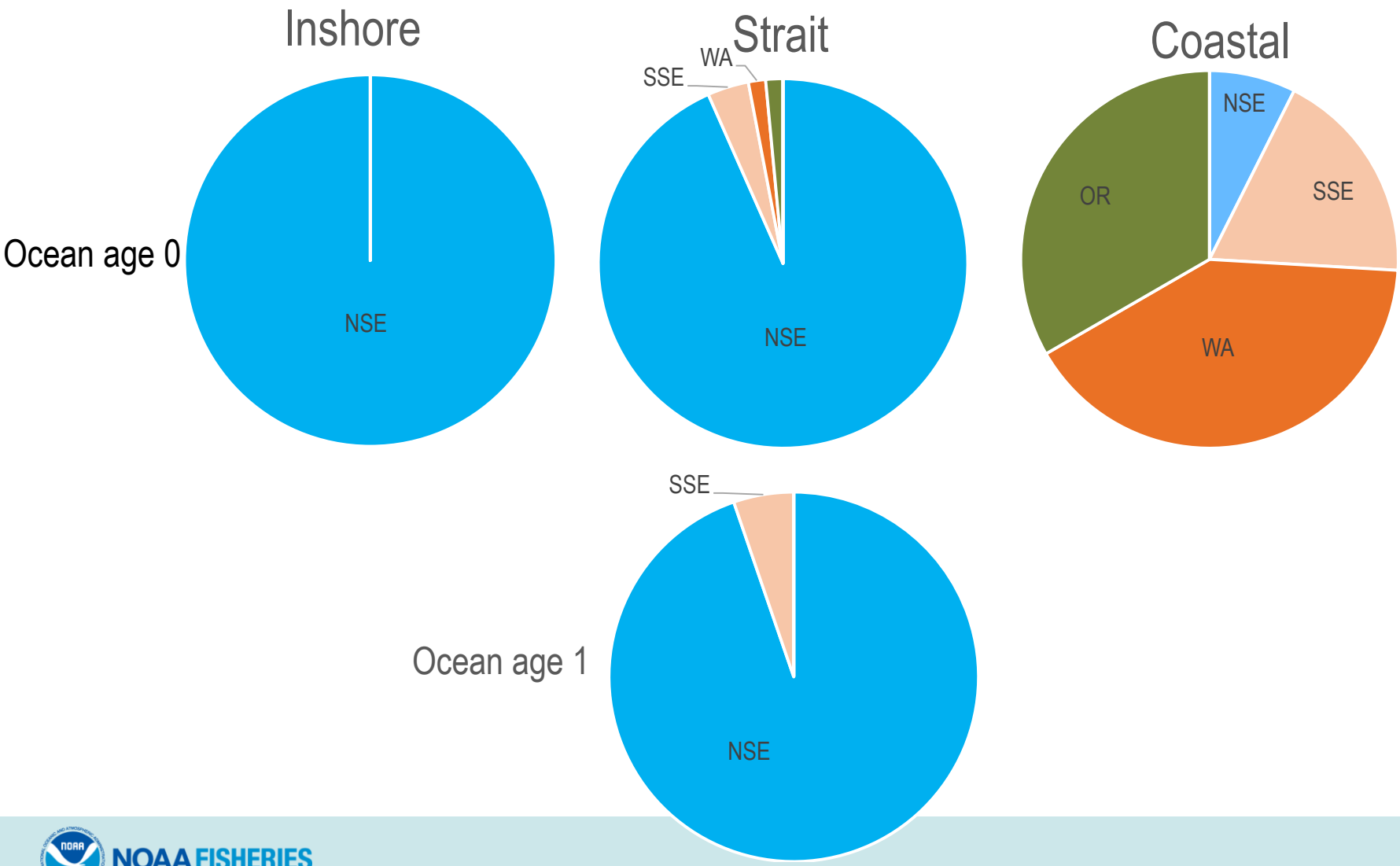
Surface Trawl Catch of Juvenile Salmon by Habitat and Month



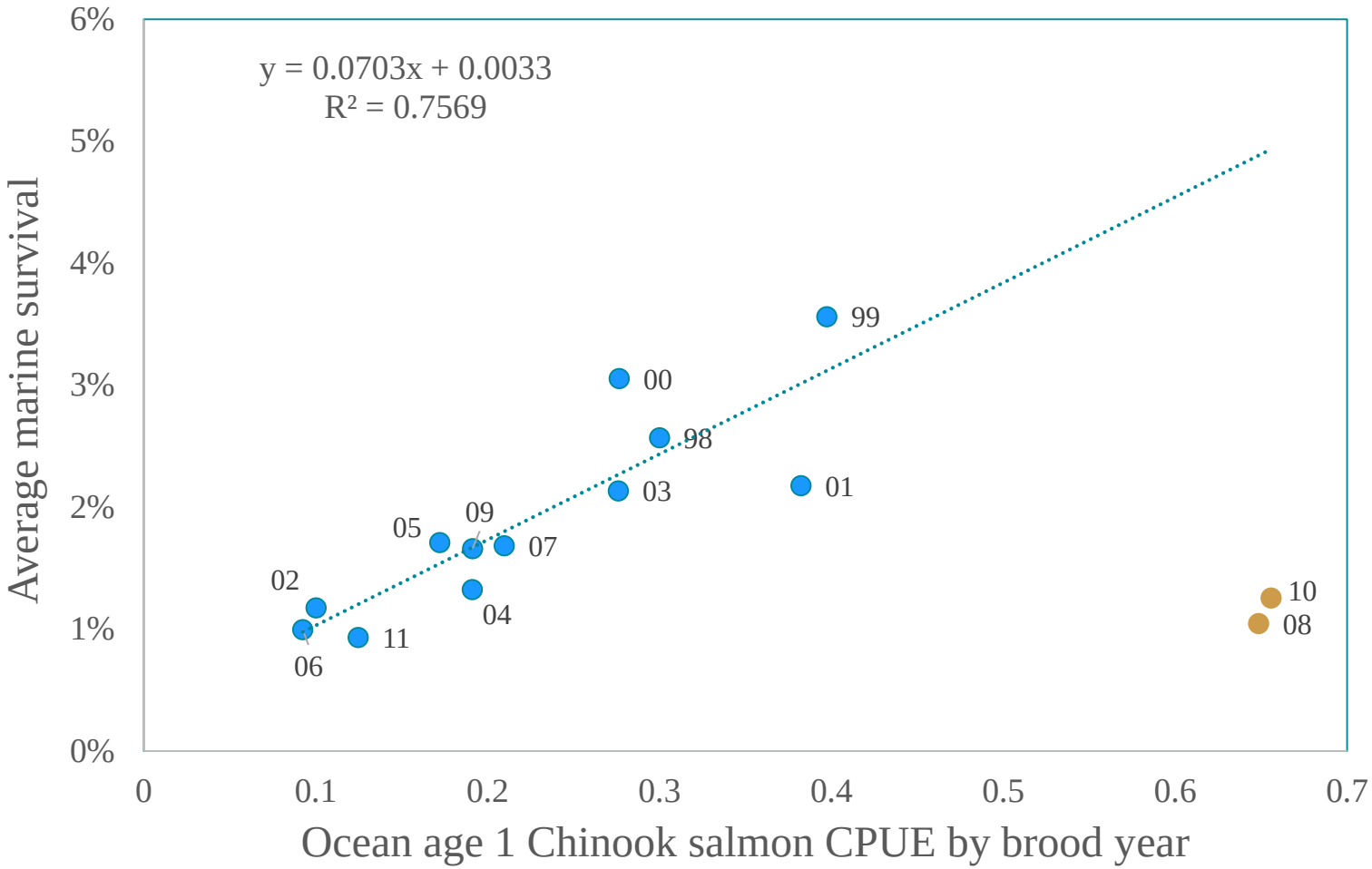
Juvenile Chinook Diet
(Weitkamp and Sturdevant, 2008)



Coded Wire Tag Recoveries by Habitat

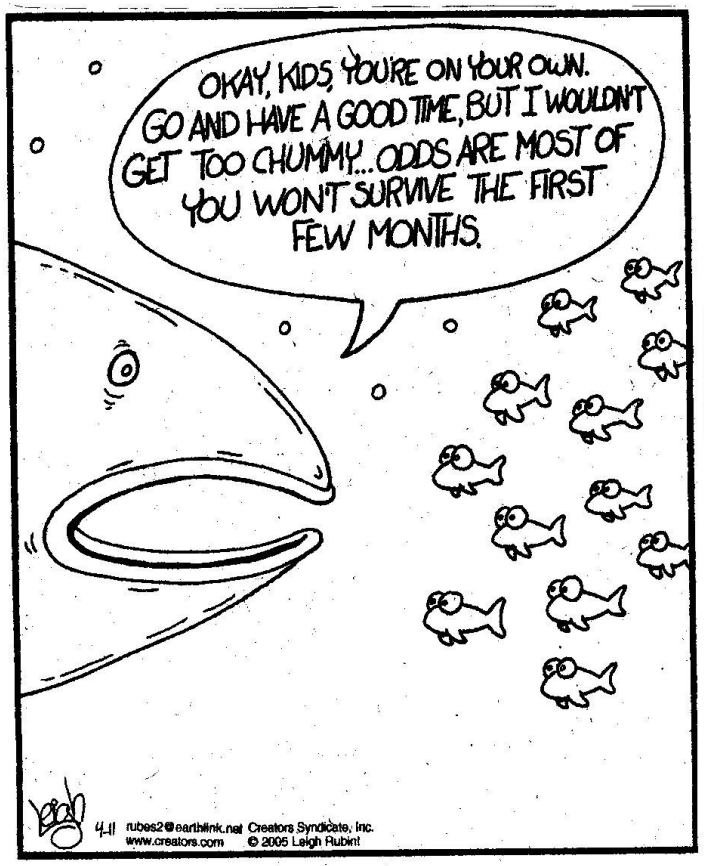


Surface trawl catches of ocean age 1 Chinook in Icy Strait is typically correlated with marine survival of northern SE Chinook salmon stocks



1. Critical Size and Period Hypothesis

Two critical periods within the first year at sea contribute to variation in marine survival



Salmon moms

Critical Periods

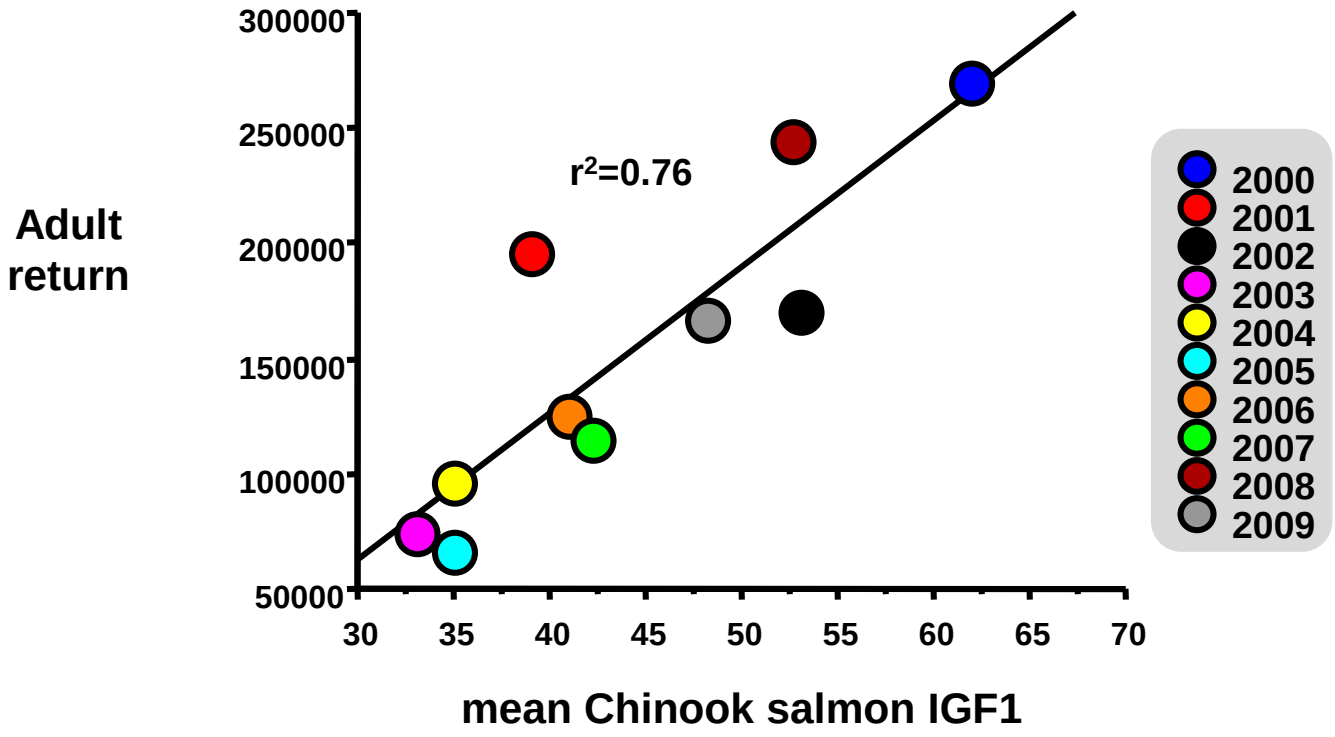
First Spring

Larger salmon escape predation and can feed on larger prey species

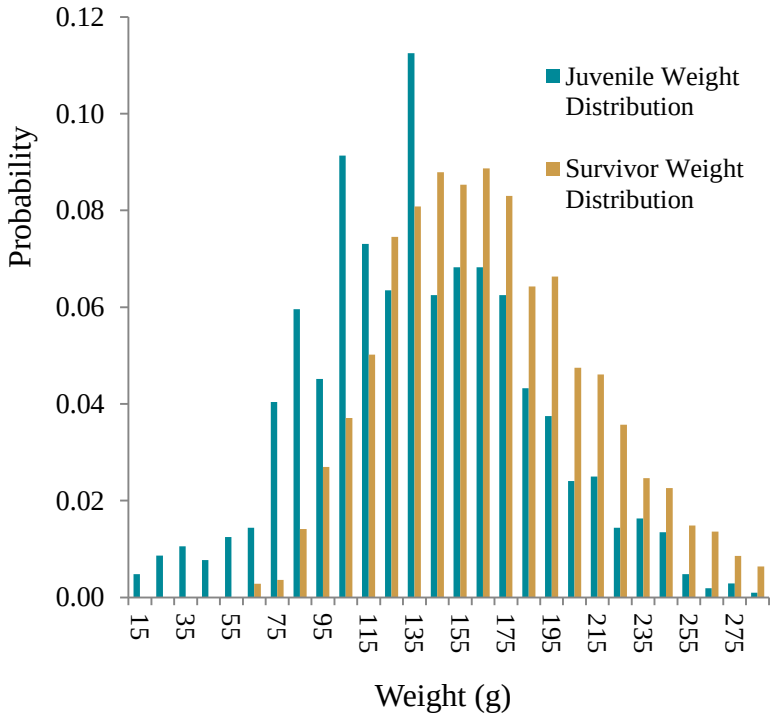
First Winter

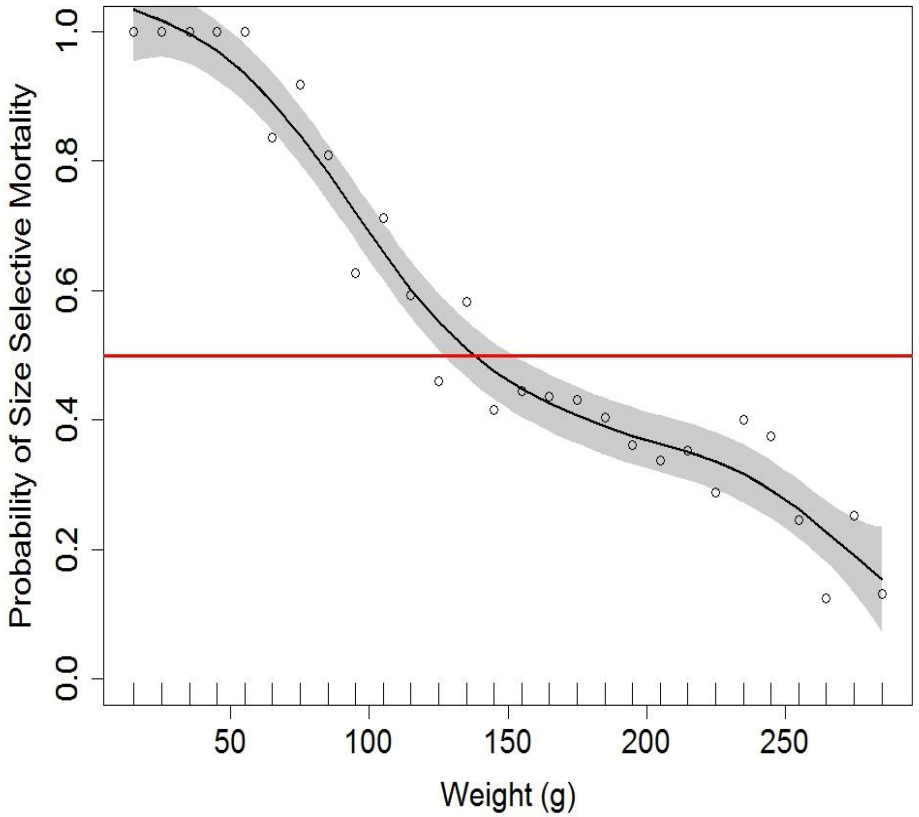
Larger salmon with higher fat content can survive longer periods with limited forage (winter)

Early marine growth (IGF1) and adult returns of Columbia River Chinook salmon (Brian Beckman)



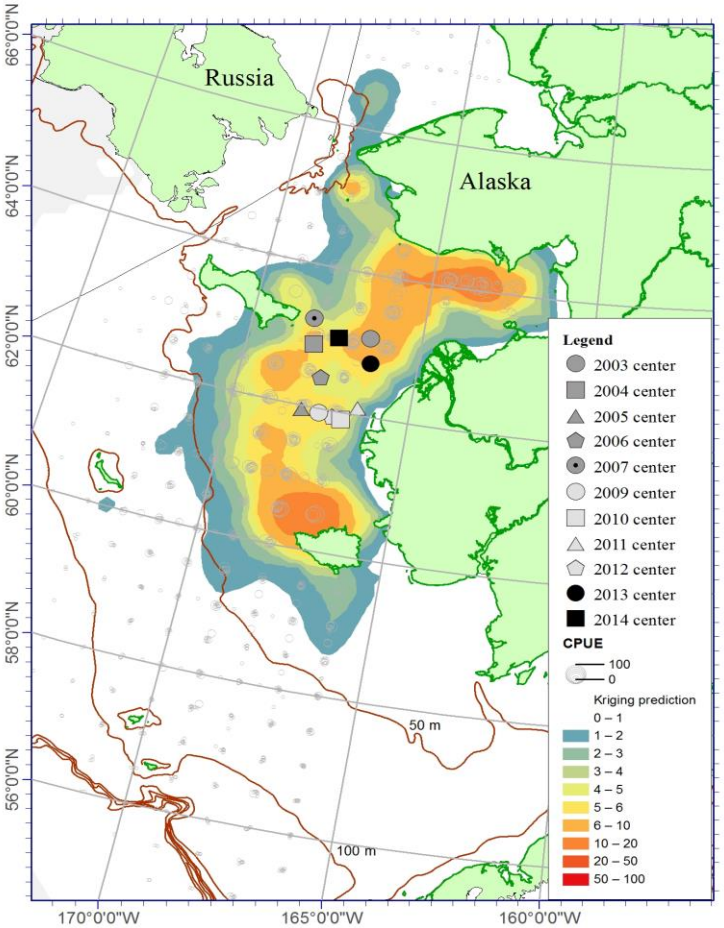
Size-selective mortality of juvenile Yukon River Chinook Salmon

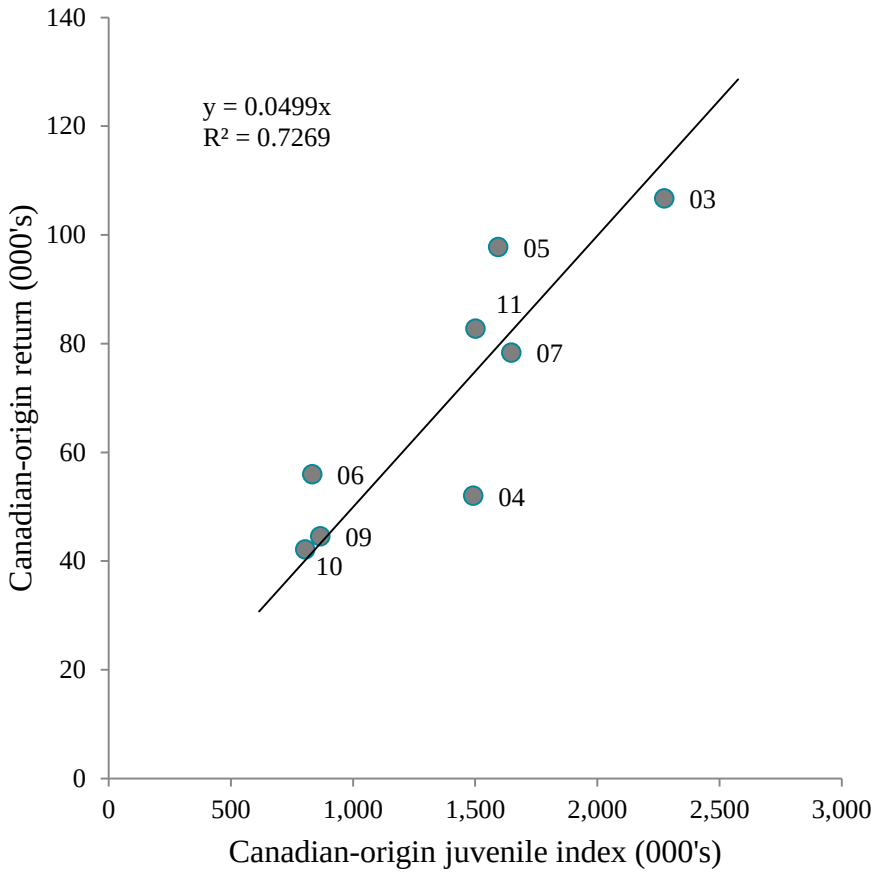




Murphy, J., Howard, K., L. Eisner, A. Andrews, W. Templin, C. Guthrie, K. Cox, and E. Farley. 2013. Linking abundance, distribution, and size of juvenile Yukon River Chinook salmon to survival in the Northern Bering Sea. N. Pac. Anad. Fish. Comm. Tech. Report 8:25-30.

Juvenile Chinook salmon abundance in the northern Bering Sea (Sep) is correlated to adult returns to the Yukon River



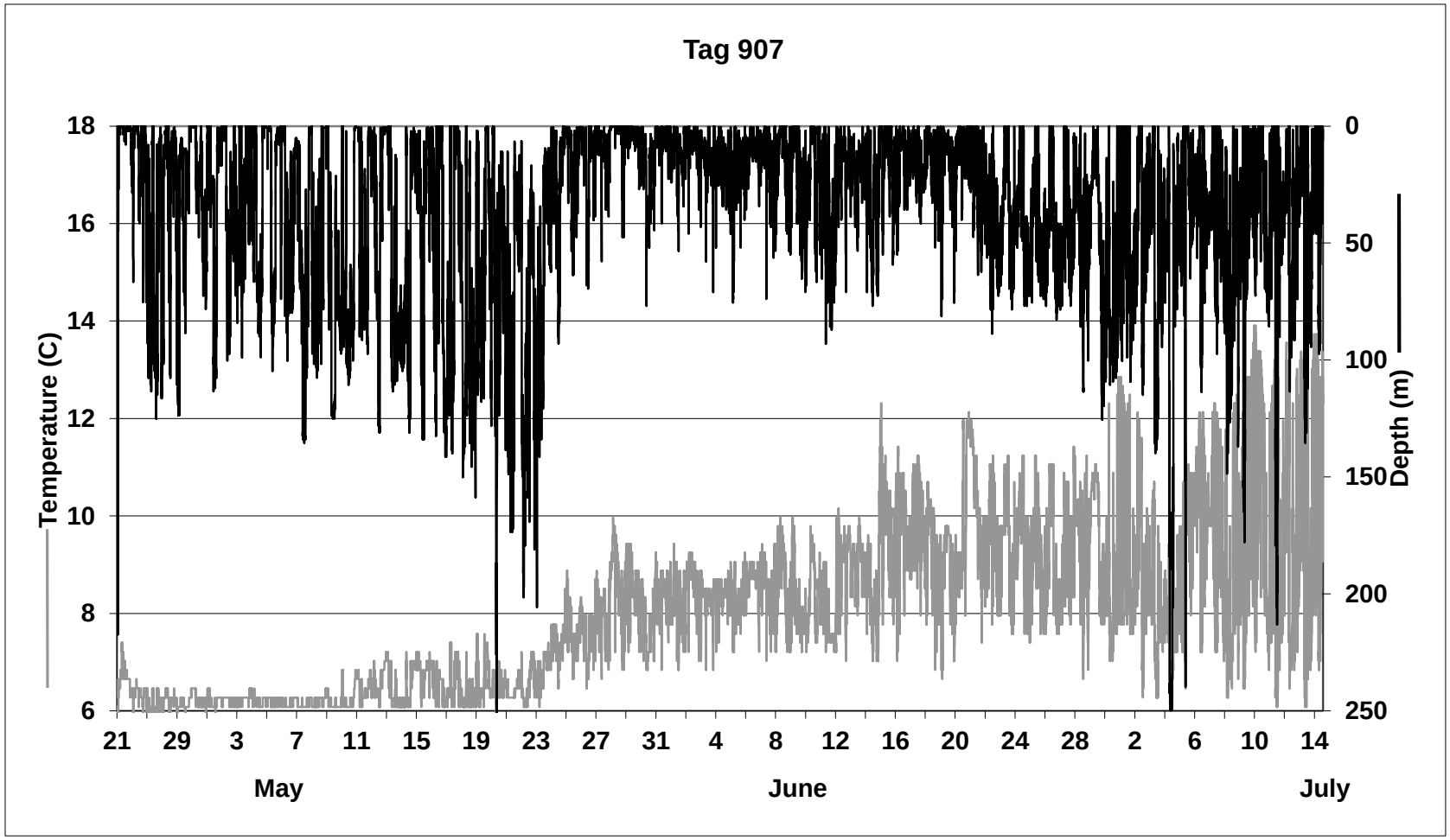


Murphy, J., K. Howard, K. Cieciel, J. Gann, W. Templin, C. Guthrie. 2017. Juvenile Chinook Salmon abundance in the northern Bering Sea: implications for future returns and fisheries in the Yukon River. Deep Sea Research II.

Data Tags: Migration, Distribution, and Predation

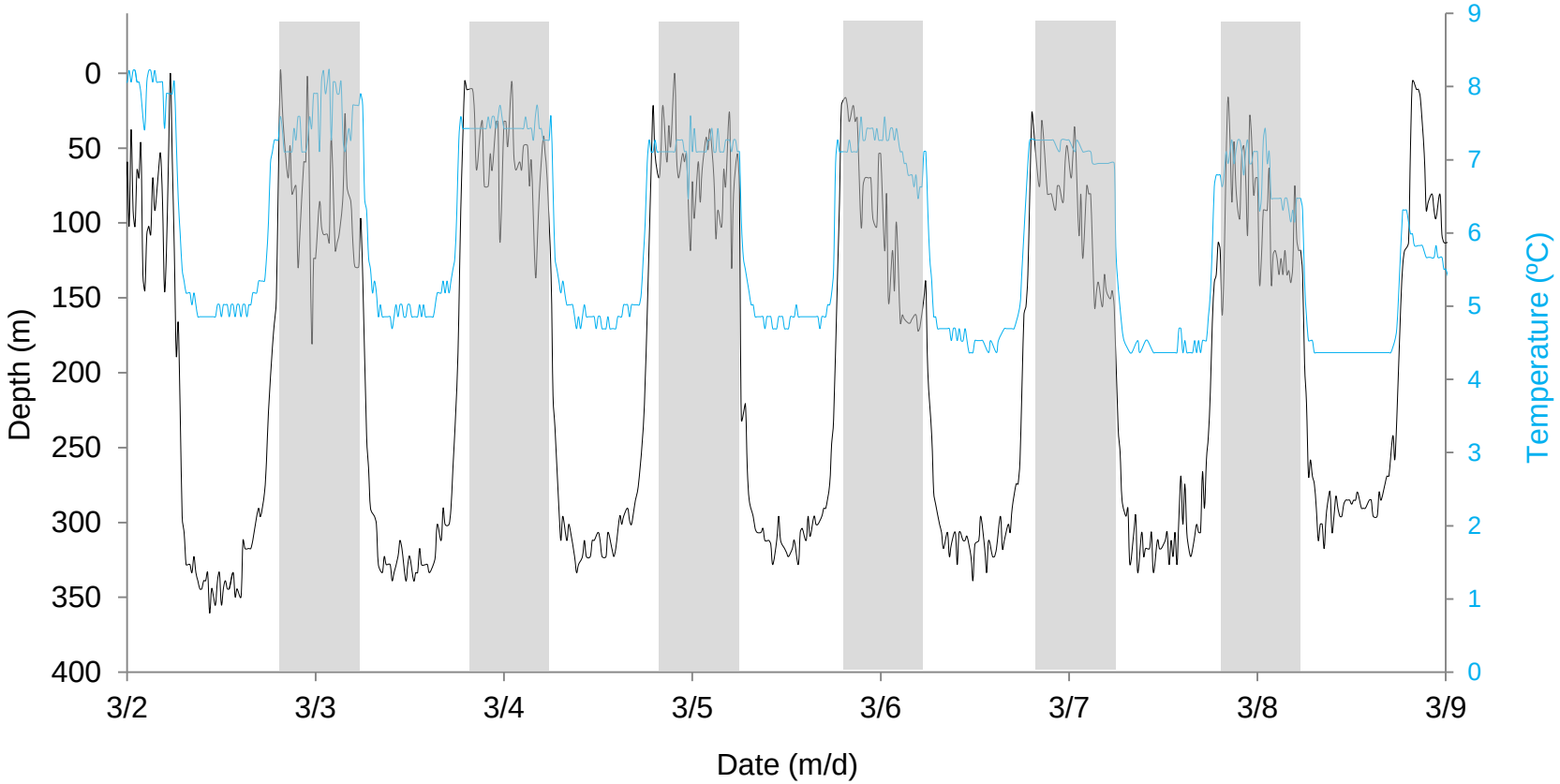
Vertical Migration of Chinook Salmon (Coastal SE Alaska and BC)

(Murphy and Heard, 2001)



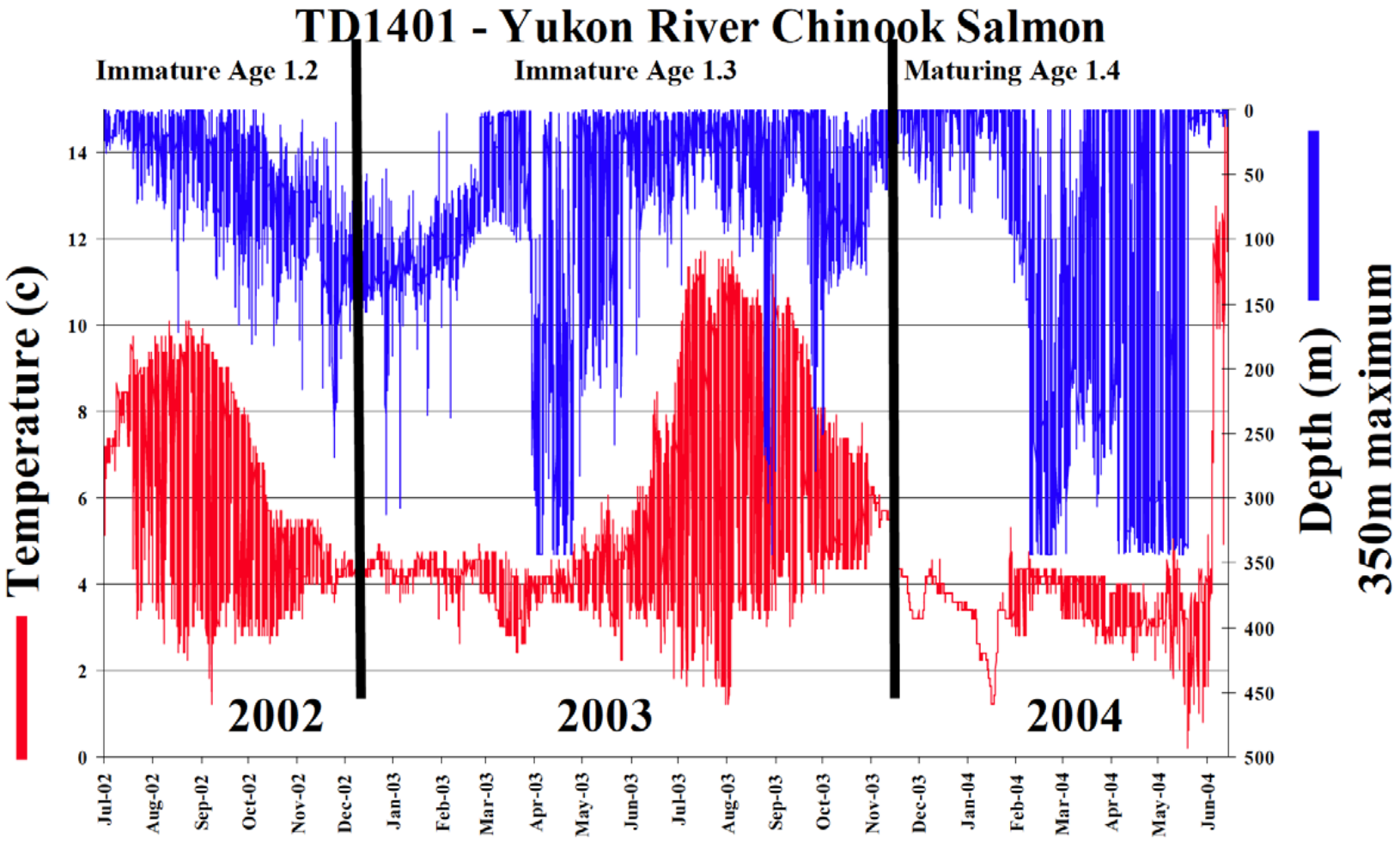
Vertical Migration of Chinook Salmon (Central Gulf of Alaska)

(Seitz et al. 2016)



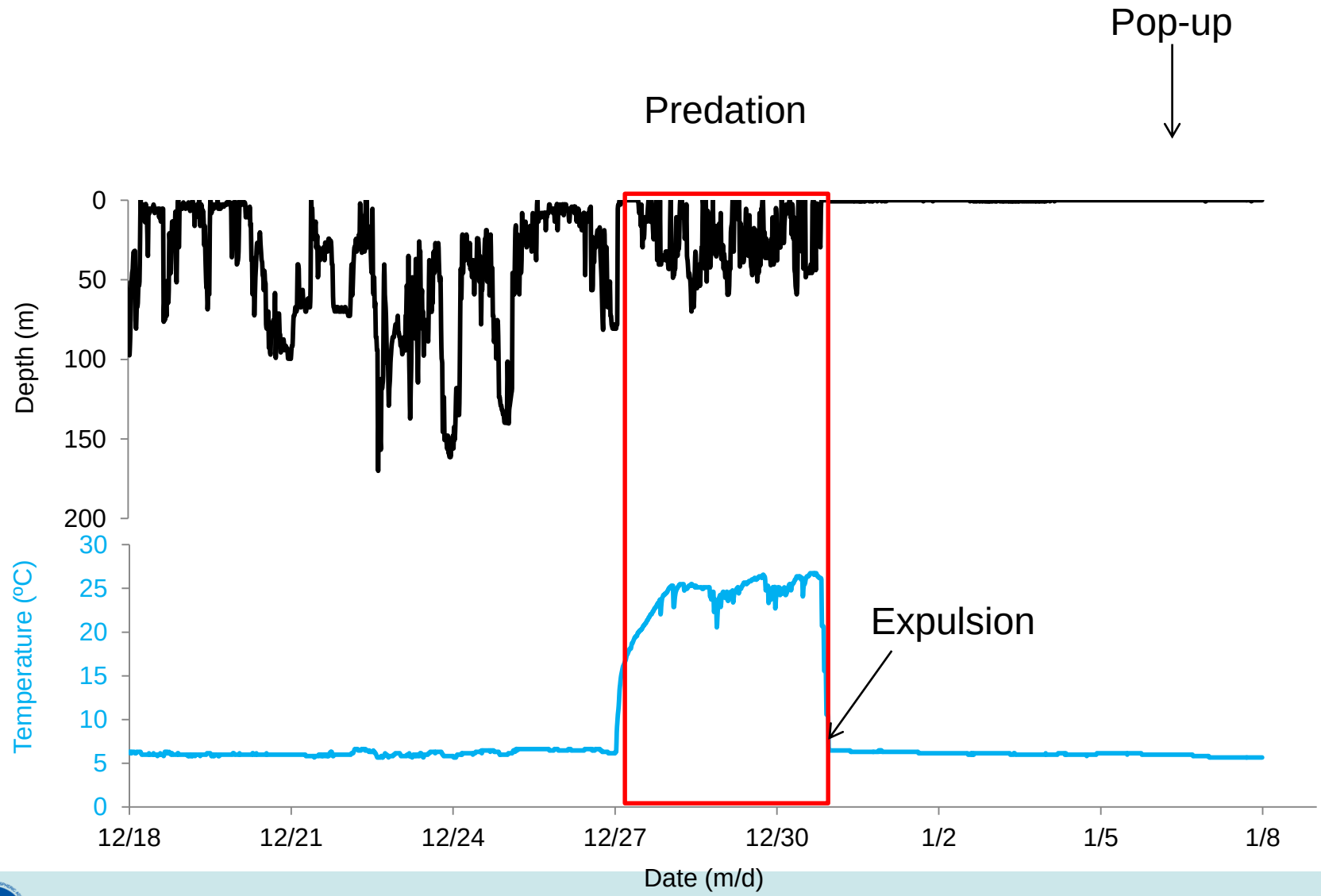
Vertical Migration of Chinook Salmon (Bering Sea)

(Walker et al. 2009)



Salmon Shark Predation on Chinook Salmon in the Bering Sea

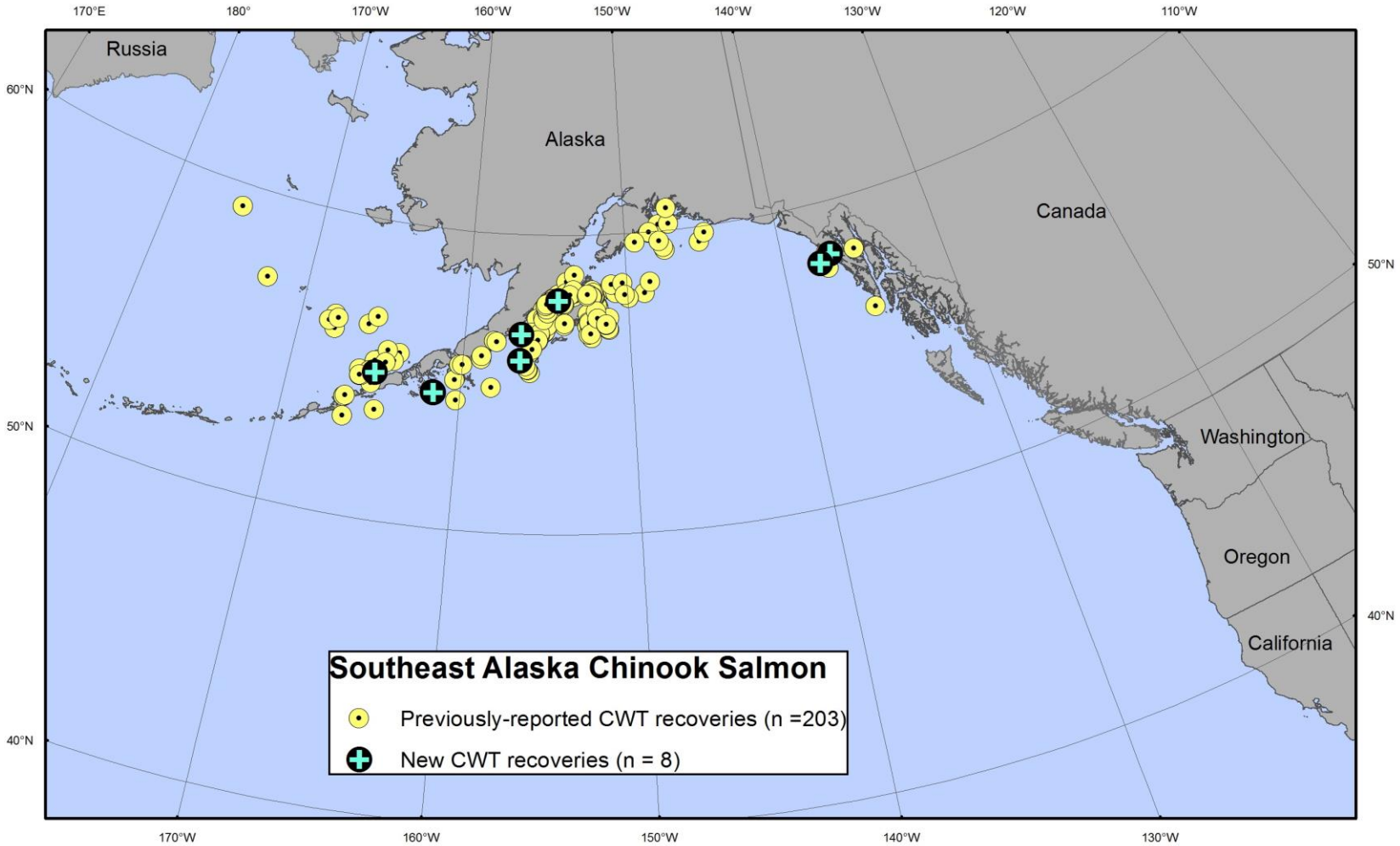
(Seitz et al. 2016)



Final Thoughts…

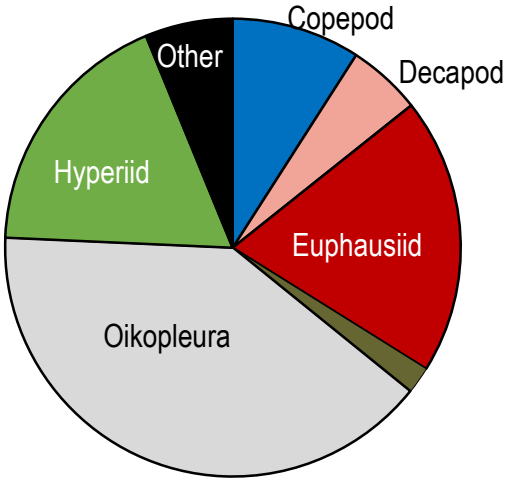
- Poor marine survival is the primary reason for the decline of Chinook Salmon stocks throughout Southeast Alaska.
- Variation in marine survival of northern Southeast Chinook salmon stocks appears to typically occur within their first year at sea.
- Migratory patterns of Chinook salmon are complex and highly variable, and may be linked to feeding behavior.
- Apex predators (sharks and marine mammals) are an important source of marine mortality in salmon.

Highseas coded-wire tag recoveries of SE Alaska Chinook salmon

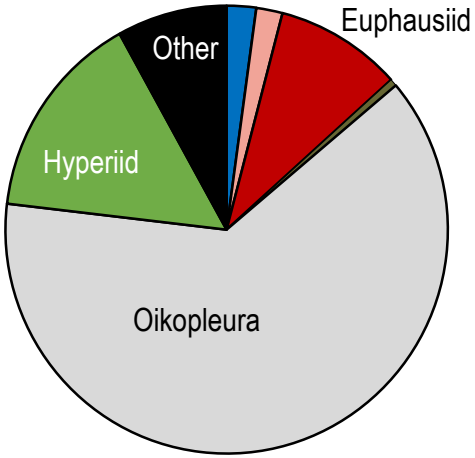


Juvenile Salmon Diet (Northern Southeast)

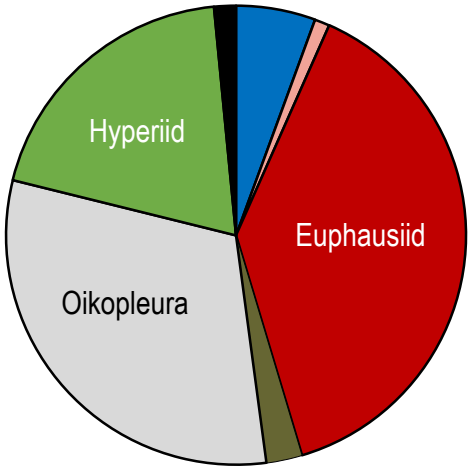
Pink salmon



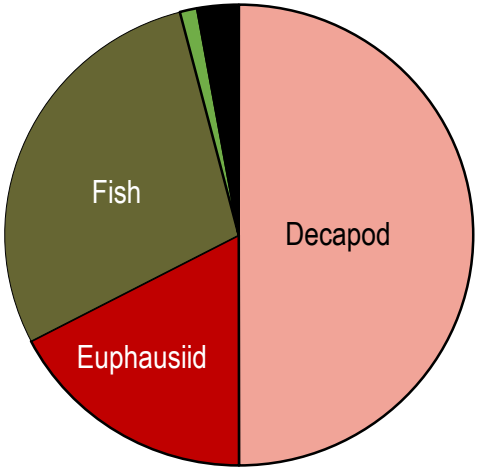
Chum salmon



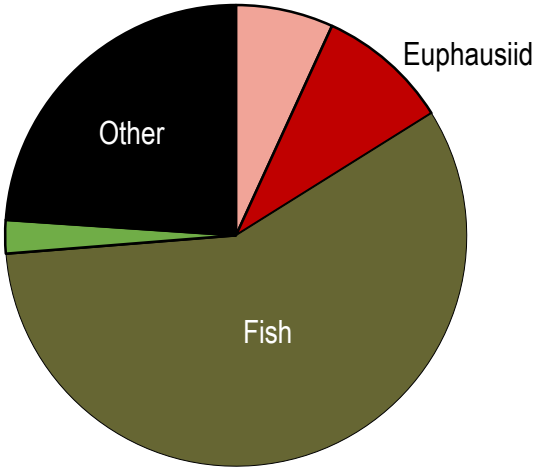
Sockeye salmon



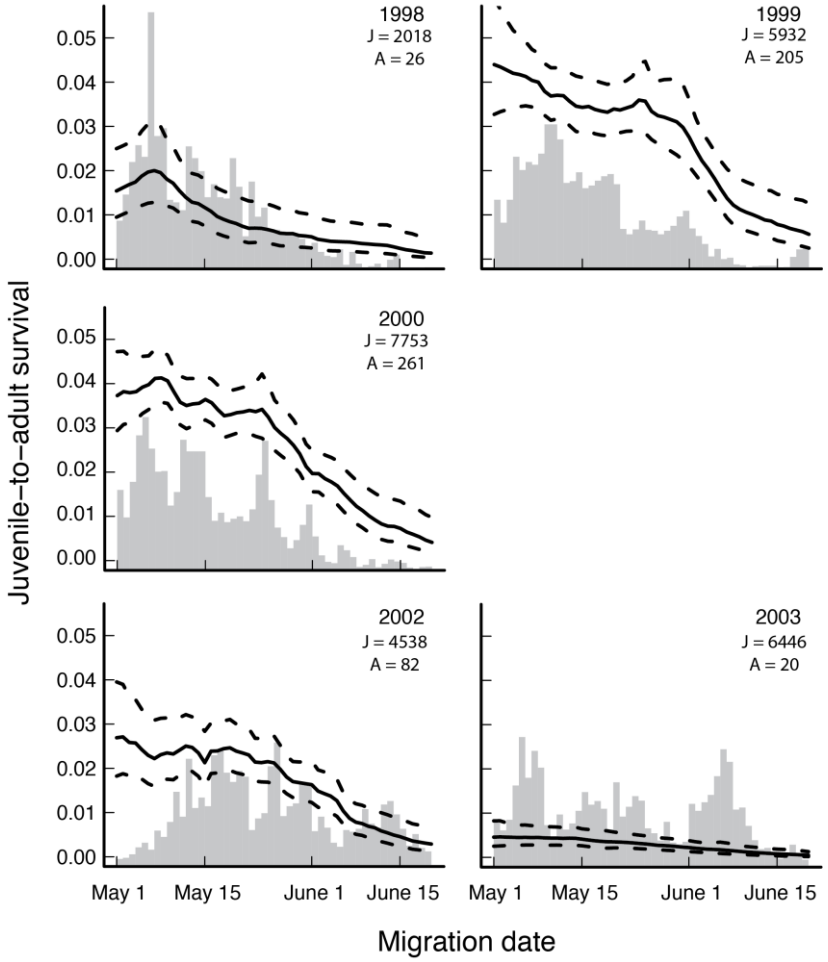
Coho salmon



Chinook salmon

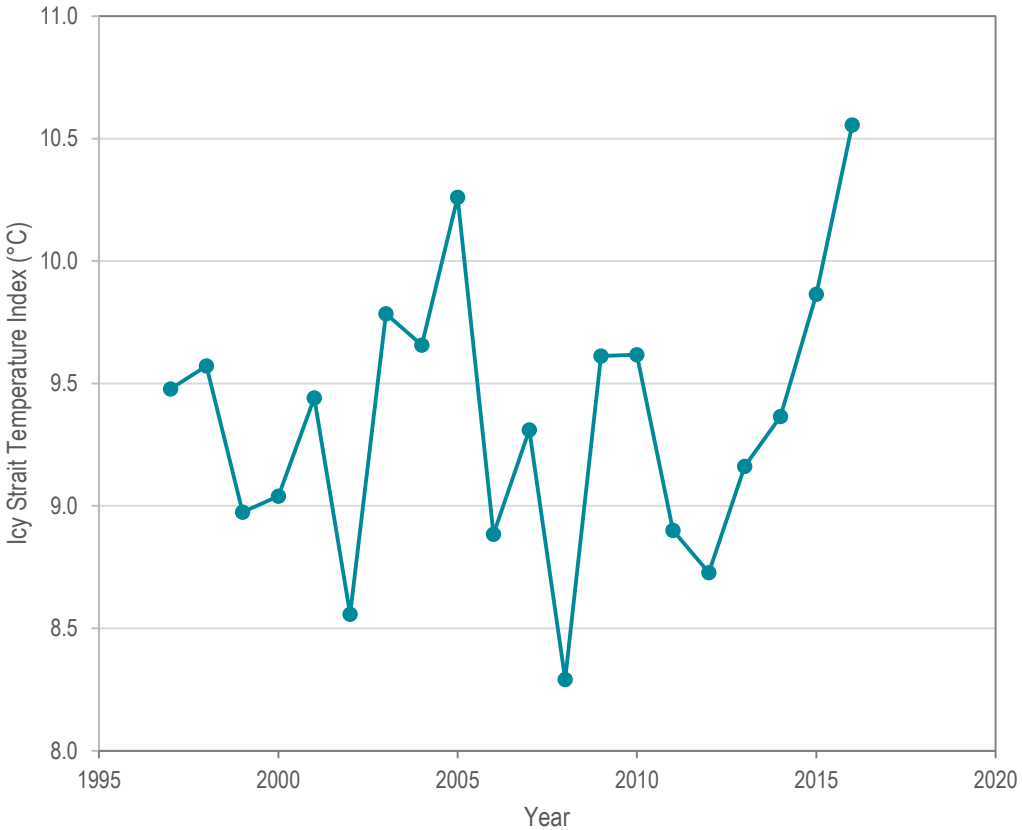


Timing of ocean entry and survival of Columbia River Chinook salmon (Scheurell et al. 2009)

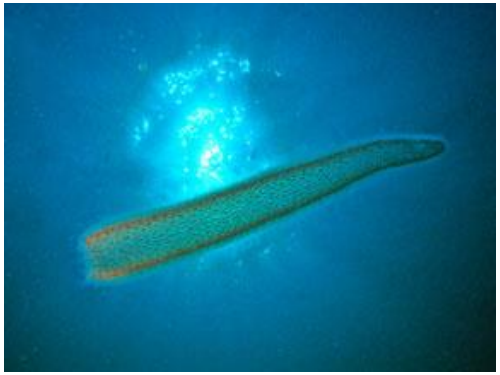


Warming Climate in Southeast Alaska

Icy Strait Temperature Index

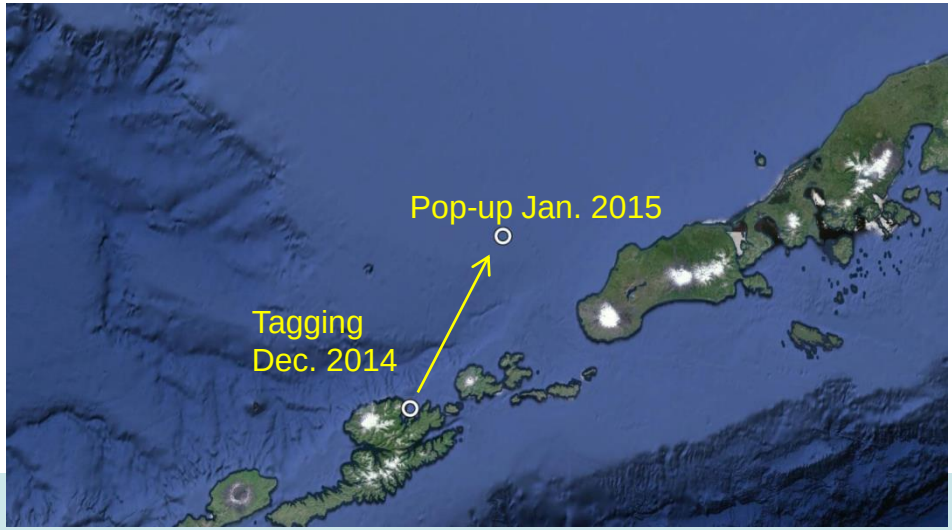


Pelagic Species Composition

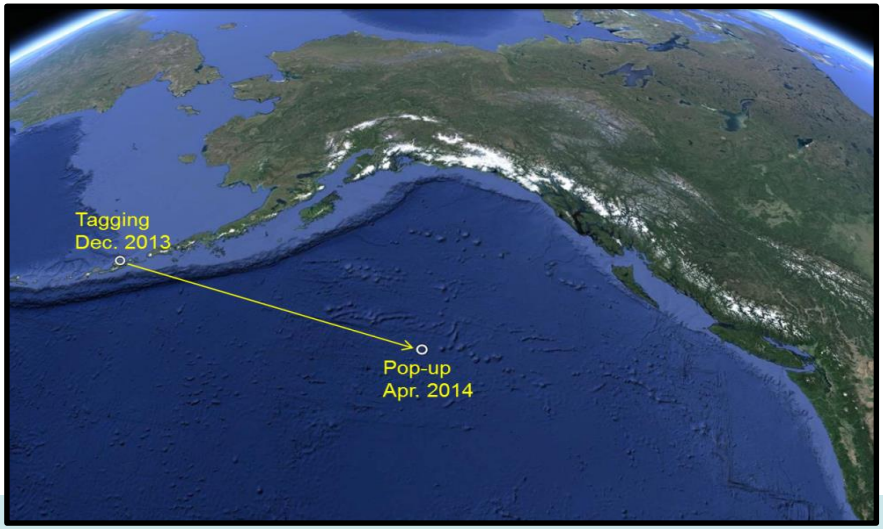


Fish ID #129840

- 79.0 cm Fork length
- Captured and released in Unalaska Bay on 17 December 2014
- Reported to satellites on 7 Jan. 2015
- Minimum transit of 130 km
- Warm-blooded predation event



Preliminary Results

Fish ID #129843

- 85.0 cm Fork length
- Captured and released in Unalaska Bay on 18 December 2013
- Reported to satellites on 9 April 2014 from the central Gulf of Alaska
- Minimum transit of 1,470 km