

Canada

Pacific Salmon in the Arctic

by

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at

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Objectives Today

- •Describe status of Pacific salmon in the Arctic
- •Discuss the role of northern marine environments as rearing areas for young salmon
- •Speculate on impacts of climate change
- •Obtain feedback on the above





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General Study Area











FIG. 1. Streams in the study area that apparently support small populations of pink and chum salmon. Location numbers and letters refer to Table 1.

Coho, sockeye, & chinook salmon, with apparently less tolerance for cold waters than pink & chum, are rarely encountered east of Point Hope

Figure from Craig, P., and L. Haldorson. 1986. ARCTIC 39:2-7.



Chum as far upstream as Fort Simpson & Liard River

Distribution of verified (closed triangles) & suspected (open triangles) chum salmon captures in the Canadian western Arctic. Each symbol may represent the capture of more than one fish over several years.

From:Stephenson, S.A. 2005. The distribution of Pacific salmon (*Oncorhynchus* spp.) in the Canadian Western Arctic. Can. Manuscr. Rep. Fish. Aquat. Sci. 2737: vi + 29 p.







Summary So Far

•All 5 species of Pacific salmon have been documented as far east as the Mackenzie watershed

•However, coho, sockeye, & chinook salmon, with apparently less tolerance for cold waters than pink & chum, are rarely encountered east of Point Hope.

 Chum is the only species believed to be natal to the Mackenzie & tributaries. Chum have been captured as far upstream as Fort Smith in the NT & the Liard River in NT/NE BC.

•Cold water appears to be limiting distribution of salmon





Summary So Far Cont'd

Where do Mackenzie salmon rear?

Nobody knows for sure, but:

• Stable isotope work by Dave Hamilton (UNBC) with $\delta^{13}C + \delta^{15}N$ suggests Liard chum reside in an estuarine environment rather than the open ocean.

Limited genetic results are inconclusive





NOAA Ship Oscar Dyson Survey Chukchi Sea 2007









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NOAA cruise results sig nos of chum & pink into Chukchi









Regional variations in size of juvenile chum & pink salmon. 2003-2007.





2007 tied for 2nd warmest in the period of instrumental data, behind the record 2005, in the Goddard Institute for Space Studies (GISS) analysis. Source: Goddard Inst. for Space Studies. While 2007 was warm, particularly in the Arctic, it was not warm everywhere conditions off BC were cooler than normal.

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Global Surface Temperature Anomaly (2007)



-3.5 -3

-2

-1



2

3

-0.5 -0.2 0.2 0.5





NASA, September 2007

http://www.nasa.gov/vision/earth/environment/arctic_minimum.html





Summary Part 2

- Juvenile salmon captured in significant numbers as far north as 70 N in the Chukchi Sea during 2007
- Juvenile salmon in the Chukchi Sea had higher growth rates than juvenile from other habitats in the eastern Bering Sea
- 2007 was tied for 2nd warmest year on record & sea ice was at all time minimum
- While salmon catches in the north Pacific continue to be relatively high overall, there have been recent declines in salmon numbers for some Bering Sea populations & fish are smaller than they used to be & migratory patterns may have changed





Some Predictions

With climate change we can expect

- reduced extent & duration of ice cover in the Arctic
- increased primary & secondary productivity & hence carrying capacity for salmon & other fish
- extensions in the distribution of rearing & possibly spawning salmon since distribution appears to be limited by cold water





Next Steps

•PFRCC report that will include information on Arctic salmon

- •NPAFC BASIS symposium where information from Bering & Chukchi seas will be presented & published
- •Would like to see

• more genetic & isotope analysis for Mackenzie (& other Arctic salmon) salmon to better understand rates of gene flow among populations, relatedness, & where these fish rear (theses underway by Erin Linn & Dave Hamilton)

 improved understanding of the potential role of the Chukchi & Beaufort seas & the Mackenzie estuary for young salmon

