How do Oceanographic Characteristics in the Northern Bering Sea Relate to Juvenile Salmon Biomass?

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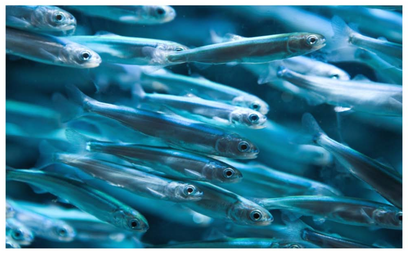
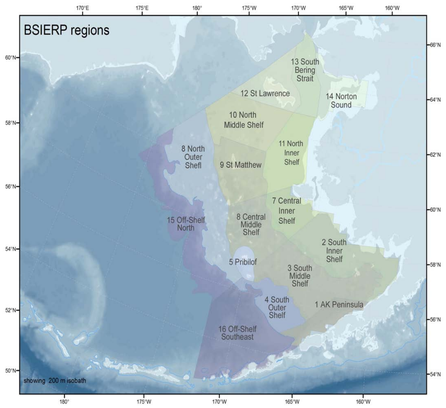
Overview:
We describe spatial and temporal variations in oceanography and fisheries for the northeastern Bering Sea shelf, and highlight relationships between parameters.

Oceanography
Data collected from CTD casts (2002-2011), moorings (1987-2006), and the World Ocean Database (WOD, 1975- present).

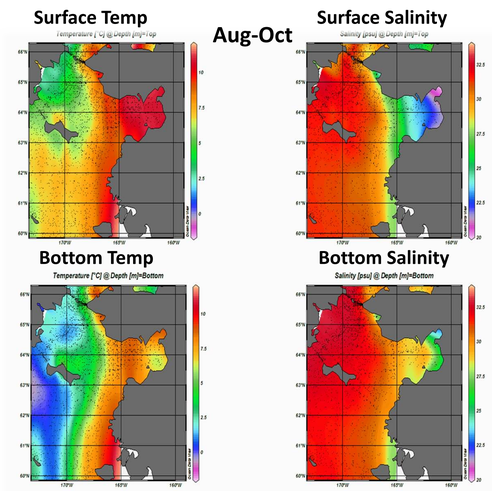
Zooplankton
Large and small taxa collected with oblique bongo-net tows (505 um) and vertical Juday-net tows (168 um).



Juvenile Salmon
Salmon collected with a surface rope net (Can trawl model 400 580): spread 60 m (width) by 15 m (depth).

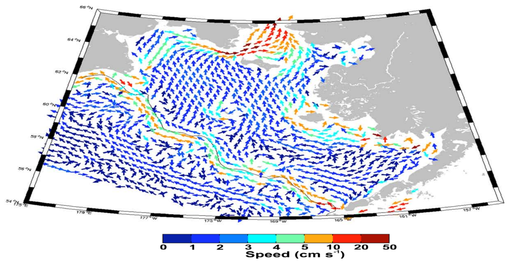


Region delineations (Ortiz et al 2013). Regions between 60- 65 °N latitude were used for analyses.



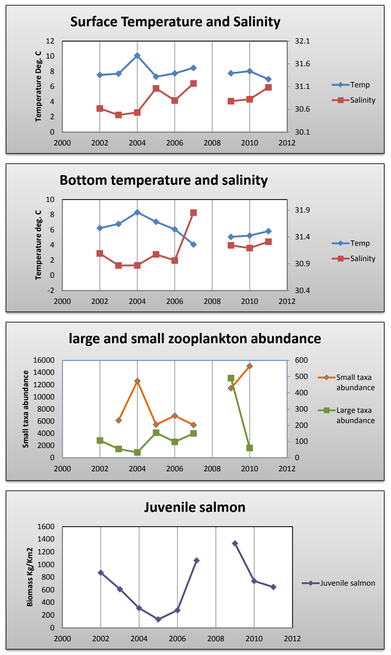
- Highest temperatures (T) and lowest salinities (S) in Norton Sound, with T ↓ and S ↑ E to W.
- Lowest S in Norton Sound due to large fresh water inputs coastal discharge.
- Low bottom T observed below St Lawrence I. shows cold pool location (<2 °C, formed during previous winter freezing.).

Currents (1987-2007 mean)



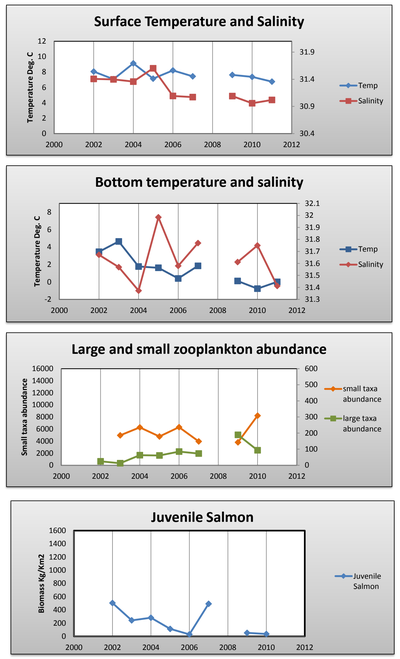
- Surface flow generally northward at ~2-3 cm s-1 over northern Bering Sea.
- Current speeds increase around St. Lawrence I. and the Bering Strait.

N Inner + S Bering Strait Combined



- Surface S and large zooplankton show a positive relationship until 2009-2010.
- Large and small zooplankton have an inverse relationship.
- Juvenile salmon biomass associated positively with bottom S and negatively with bottom T.

N Middle + St. Mathews Combined



- Large and small zooplankton trend weakly in the same direction until 2009-2010.
- Juvenile salmon biomass and bottom T show a positive relationship.

Juvenile salmon and zooplankton vary by oceanographic region:

- **The highest juvenile salmon biomass is found in S Bering Strait and N Inner regions**
- **The highest large zooplankton abundance is found in S Bering Strait.**
- **The highest small zooplankton abundance is found in N Inner region.**

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BSIERP region	Temp Top (° C)	Temp Bottom (° C)	Salinity Top	Salinity Bottom	Transmission (% light trans)	Large zoo abund. (# m-3)	Small zoo abund. (# m-3)	Juvenile salmon biomass (kg per km2)
North Inner	8.25	6.53	30.63	30.92	82	84	**104127**	**3706**
North Middle	7.83	1.26	31.15	31.57	83	90	54969	819
Norton Sound	9.70	8.92	27.00	28.29	65	41	13037	575
South Bering Strait	7.51	5.15	31.11	31.59	82	**2418**	10399	**2287**
St. Lawrence	7.65	2.97	31.80	32.20	89	183	13108	194
St. Matthews	7.61	1.33	31.32	31.74	84	67	5941	930

- Highest juvenile salmon biomass in N Inner and S Bering Strait domains.
- Highest large zooplankton abundance in S Bering Strait, likely due to the input of large crustacean zooplankton from the Anadyr Waters, which flow through Anadyr Strait and around the E side of St Lawrence Island
- Highest small zooplankton abundance in N Inner domain
- Low light transmission (high particulates) in Norton Sound