Factors Affecting the Distribution of Juvenile Salmon in the Gulf of Alaska: Physical Oceanography

by

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Goal: Relate the distribution of juvenile salmon to oceanographic conditions in the Gulf of Alaska

Methods:

***F/V Great Pacific* underway instruments:**

- Thermosalinograph to measure temperature and salinity
- Fluorometer to measure chlorophyll fluorescence
- Acoustic Doppler current profiler (ADCP) to measure the ocean current at depth
- Satellite-tracked drifting buoys (sea anchors at 40 m) deployed to trace ocean currents

NMFS/Auke Bay Lab. measurements:

- Conductivity-temperature-depth (CTD) profiles
- Zooplankton from Tucker trawls
- Juvenile salmon distribution, condition and genetics from midwater rope trawls towed at the surface

Temperature Minima and Fluorescence Maxima:

At Portlock Bank (Gore Point line), Cape Chiniak and Cape Kaguyak
- Salinity intermediate
- Tidal currents accelerated by shoaling depths and narrowing channels
- Cold water mixed up from below
- Fluorescence maxima imply enhanced primary production due to nutrient input via mixing
- Drifters trapped over Portlock Bank and North Albatross Bank (between the Gore Point and Cape Chiniak lines)
- Plankton may be retained, enhancing ecosystem productivity

At Ocean Cape in 2001
- Salinity minimum
- Freshwater input from glacial melt entering Yakutat Bay

Drifters:

Shelikof Strait Destination
- 3 drifters entered in total
- 2 were deployed farthest upstream in their respective years (black tracks beginning off Cape Yakataga line in 2001 and off Ocean Cape in 2002)
- Drifter 3 (purple, 2001) was deployed off Cape Cleare
- Suggests nearshore water in the Gulf of Alaska is transported into Shelikof Strait by the Alaska Coastal Current

Prince William Sound Destination
- 7 drifters released west of Prince William Sound
- Only 1 (green, 2002) from nearshore off Ocean Cape entered the Sound
- 3 passed close to the mouth but failed to enter
- 3 more passed along the continental slope in the Alaska Current
- Suggests Sound water originates very near shore

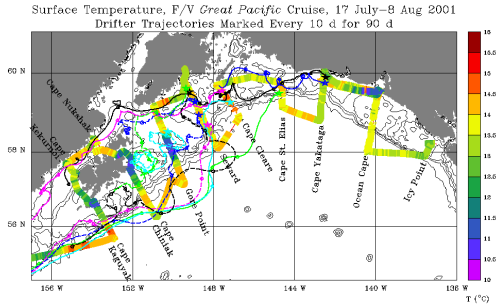
Amatouli Trough and Alaskan Stream
- Drifters often deflect seaward along the west edge of Amatouli Trough (just west of the Seward line)
- They accelerate in the Alaskan Stream, east and south of Kodiak Island
- Their paths gyrate, perhaps owing to eddy deflection

ADCP Velocities:
- Vector clusters represent trawl and CTD stations
- Currents are complex and time varying due to the tides

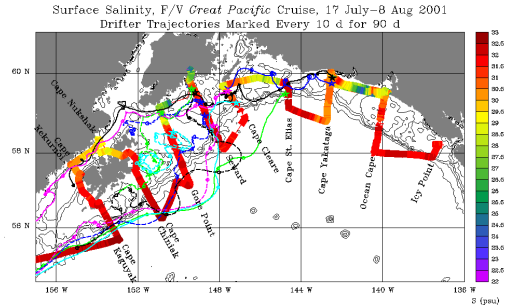
Plans:
- Repeat the measurements in 2003 and 2004
- Remove tidal effects by subtracting numerically modelled tidal curents
- Compare oceanographic results to coincident juvenile salmon distributions
- This research is in progress, and the results are preliminary.

2001

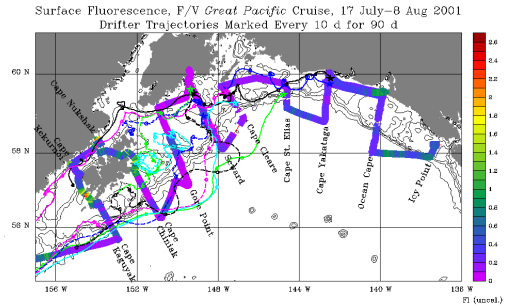
Temperature



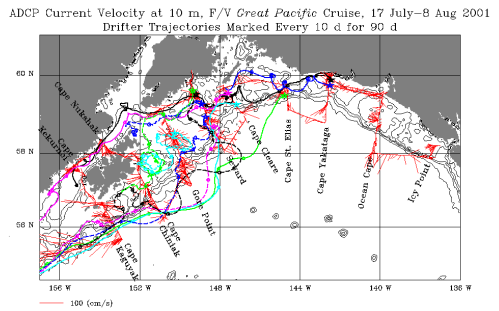
Salinity



Fluorescence



Velocity



2002