Juvenile Chinook and Coho Salmon Winter Habitats in the Susitna River
Overwintering juvenile Chinook and coho salmon

- Juvenile salmon migrate to overwintering habitats due to:
  - changes in light,
  - decreasing fall flows,
  - winter freshets, and

- In glacial rivers:
  - Juvenile Chinook and coho salmon overwinter in off-channel habitats of the glacial Taku River (Murphy et al. 1984).
  - Juvenile Chinook have been documented overwintering in non-natal tributaries of the Yukon River.
What is known about overwintering juvenile salmon

- Juvenile salmon generally select overwintering habitats with low water velocity, cover, and relatively warmer water from springs or upwelling groundwater (Giannico and Hinch 2003, Hillman et al. 1987, Cunjak 1996).

- Chinook
  - Lower water velocities up to <20 cm/s
  - Preference for cobble/boulder substrate
  - Preference for cover provided by woody debris (Hillman et al. 1987, Bjornn 1971).

- Coho salmon
  - Slow water (<15 cm/s) off-channel habitats fed by groundwater (Giannico and Hinch 2003),
  - Beaver ponds (Bustard and Narver 1975)
  - Cover provided by woody debris (Petersen 1982, Swales et al. 1986).
Research Questions

• Test for significant small-scale localized \((m^2)\) correlations between juvenile coho and Chinook salmon and habitat characteristics and determine if those relationships can be used to characterize overwintering habitat at higher spatial scales: sampling sites (~1,000 \(m^2\)) and macrohabitat classes.
Glacial River Macrohabitats

- Tributary Mouth
- Sloughs
- Side Channel
- Main Channel
Glacial River Macrohabitats (March 29)

- Tributary Mouth
- Sloughs
- Side Channel
- Main Channel
Results Coho: Small Scale (~m²)

- Significant relationship with water velocity ($p < 0.001$, $N = 1123$).
Results Coho: Small Scale ($\sim m^2$)

- No significant relationship with water depth.
Results Coho: Small Scale (~m$^2$)

- Significant difference in coho CPUT between cobble gravel, and silt substrates.
Results Coho: Small Scale (~m²)

- No significant difference in coho CPUT between sampling locations with cover (LWD, shrubs, macrophytes) and no cover (includes ice cover).
- Better relationship with velocity when large wood absent.
Results Coho: Small Scale ($\sim m^2$)

- Significant relationship with water temperature ($p < 0.001$, $N = 1123$).

![Graph showing the relationship between water temperature and coho salmon CPUT](image-url)
If overwintering juvenile salmon prefer warmer, low velocity, deep water habitats with cover; then, do sites or macrohabitats with these characteristics have a greater abundance of overwintering juvenile salmon.
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<thead>
<tr>
<th>Chinook/coho CPUT</th>
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<tbody>
<tr>
<td>Water Depth (cm)</td>
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<tr>
<td>Cover</td>
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<tr>
<td>Velocity (cm/s)</td>
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<td>Velocity (cm/s)</td>
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Short-term adverse conditions
Change in CPUT (Jan – Oct)
Summary

- Low water velocity, cover, substrate, and temperature were important habitat characteristics for overwintering juvenile salmon.
- Site habitat characteristics could not be used to estimate coho salmon winter habitat as adverse conditions during ice formation may displace salmon or inhibit habitat selection.
- Mainstem ice formation, channel location and stage height can have a large influence on velocity and depth in off-channel habitats.
References

- Bell, E. 2001. Survival, growth and movement of juvenile coho salmon over-wintering in alcoves, backwaters, and main channel pools in Prairie Creek, California.
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- Johnston, NT; Irvine, JR; Perrin, CJ. 1993. Experimental analysis of microhabitat selection by juvenile steelhead (Oncorhynchus kisutch) utilization of tributary lakes and streams in the Kechikan River drainage, British Columbia. ISSN: 0706-6473.
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