Assessing potential interactions of in-river hydrokinetic turbines and fishes

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Background

• Fishes in Alaska are important in sport, commercial and subsistence fisheries

• Many of them undertake predictable migratory movements down or up rivers
Fish may migrate in river margins...

...or the deepest, fastest part of a river

Potential overlap in time and space of hydrokinetic devices and fishes
Goal: Assess potential interactions of turbines and juvenile fishes by conducting pre-deployment baseline sampling studies at potential turbine sites.

Objectives:
1. Species composition
2. Relative abundance of species
3. Migration locations
4. Migration timing
Pre-deployment baseline studies

Yukon River 2010
Tanana River 2011
River Margin Methods

Picture courtesy of Todd Paris - UAF
Mid-channel Methods
After capture
Pre-deployment studies

• Yielded important information about:
  – Species composition of catches
  – Relative abundance of species
  – Migration locations
  – Migration timing
Yukon River margins

- Captured 6,312 fishes
- 499 total fyke net settings

- Longnose Sucker - 2,523
- Arctic Grayling - 1,932
- Whitefish spp. - 1,167
- Chum salmon - 336
- Chinook salmon - 131
- Lake Chub - 90
- Lamprey - 77
- Burbot - 28
- Inconnu - 23
- Slimy sculpin - 5
Tanana River margins

- Captured 4,136 fishes
- 384 total fyke net settings

- Whitefish spp. - 1,589
- Longnose sucker - 1,000
- Chum salmon - 775
- Lake chub - 559
- Arctic lamprey - 131
- Arctic grayling - 31
- Chinook /Coho salmon - 22
- Burbot - 22
- Slimy sculpin - 4
- Alaska brook lamprey - 2
- Northern pike - 1
Tanana River mid-channel

• Captured 583 fishes
• 73 total incline plane trap sets

• Chinook/Coho salmon - 330
• Chum salmon - 239
• Whitefish sp. - 10
• Arctic Lamprey - 3
• Burbot - 1
Tanana River 2011
Chinook/coho salmon

CPUE

May  June  July
Information from pre-deployment studies

- Abundance and species composition of catches depends on river, and timing and location of sampling
- Some primarily captured in margins
  - Longnose Sucker
  - Arctic Grayling
  - Whitefish spp.
  - Chum salmon
  - Lake Chub
  - Burbot
  - Inconnu
  - Slimy Sculpin
  - Northern Pike
  - Lamprey
- Some primarily captured in the middle of the channel
  - Chinook/coho Salmon
  - Chum Salmon
**Information from pre-deployment studies**

<table>
<thead>
<tr>
<th>Some occur in seasonal peaks</th>
<th>Some occur during entire ice-free period</th>
<th>Implications:</th>
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<tr>
<td>Arctic Grayling</td>
<td>Whitefish spp.</td>
<td>Chum salmon</td>
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<td>Chinook/coho salmon (Age 1)</td>
<td>Chinook salmon (Age 0)</td>
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<td>Inconnu</td>
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<td>Longnose Sucker</td>
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Downmigrating Chinook, coho and chum salmon smolts during the months of May and June potentially will have the most interactions with a hydrokinetic turbine.
Needed information

• Adult fish abundance, species composition, and migratory distribution and timing, especially in relation to hydrographic features
• Post-deployment studies:
  - Changes in distribution in response to turbine
  - Fish behavior near turbine
  - Viability of fishes passing through turbine
Funding:
Alaska Energy Authority
Denali Commission
ORPC Alaska
University of Alaska Fairbanks