Effects of polycyclic aromatic hydrocarbons (PAHs) on Pacific herring (Clupea pallasii) embryos exposed to creosote-treated pilings related to a piling removal project in Quilcene Bay, Washington

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Effects of polycyclic aromatic hydrocarbons (PAHs) on Pacific herring (Clupea pallasii) embryos exposed to creosote-treated pilings (CTPs) in a temperate nearshore marine habitat

Salish Sea Ecosystem Conference, 4 Apr, 2018
James E. West
Washington Department of Fish and Wildlife

http://wdfw.wa.gov/conservation/research/projects/marine_toxics
Effectiveness Monitoring for (Partial) Removal of Creosote-Treated Pilings

- Many pilings cut off at seafloor
- Splintered CTP wood remained at the site
  - Measure PAHs 12dpf
  - Measure cyp1a induction
Location of CTP-removal study site in Quilcene Bay and two reference areas
The method.......
Study focused on the area of “High Density Pilings”
Phase 1 (2013)

Cages were deployed at four distances (0 cm, 30 cm, 100 cm, and 200 cm) from each of five individual CTPs within the high density CTP area (n=20).
Phase 2 (2014), approx. 1 week after removal activities had ceased:

Six cages within the same area as 2013, and eight cages further away from the location of the former high density CTP field
Phase 3 (2015) repeat of the 2014 deployment, one year after CTPs were removed (n=14)
Four reference/controls, means <1 ng/g wet wt.

<table>
<thead>
<tr>
<th>Year</th>
<th>Location</th>
<th>PAH Concentration (ng/g wet wt)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>Inside Undisturbed CTP Field</td>
<td>2.7</td>
</tr>
<tr>
<td>2014/15 (pooled)</td>
<td>Near Former CTP Field</td>
<td>16</td>
</tr>
<tr>
<td>2014/15 (pooled)</td>
<td>Inside Former CTP Field</td>
<td>62</td>
</tr>
</tbody>
</table>
Very low embryonic crude oil exposures cause lasting cardiac defects in salmon and herring.
Incardona et al. (2015) effects concentration for oil exposed embryos.
Results Herring Embryo Study

• Caged embryo technique was successful
• Undisturbed 100+ year old CTPs *still leaching* PAHs
• Incomplete CTP removal increased PAH exposure up to *20x nearby and 5x further away*
• Exposure/effects *persisted after 1 year*
• PAHs at *levels high enough to predict health effects*
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