Apr 4th, 4:30 PM - 4:45 PM

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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**Speaker**
James West, Andrea Carey, Gina Ylitalo, John Incardona, Laurie Niewolny, Jennifer Lanksbury, and O'Neill Sandra

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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)
Ovarian eggs

Deployment control

Deployed Cage Reference

Natural Spawn Reference

2013 Inside Undisturbed CTP Field

2014/15 (pooled) Near Former CTP Field

2014/15 (pooled) Inside Former CTP Field

Four reference/controls, means <1 ng/g wet wt

2.7 ng/g wet wt

16 ng/g wet wt

62 ng/g wet wt

$\sum_{33}^{PAH}$ (ng/g wet wt)
Very low embryonic crude oil exposures cause lasting cardiac defects in salmon and herring.

compact myocardium, and a hypertrophic response in spongy myocardium, evident in juveniles 7 to 9 months after exposure. The thresholds for developmental cardiotoxicity were remarkably low, suggesting the scale of the Exxon Valdez impact in shoreline spawning habitats was much greater than previously appreciated. Moreover, an irreversible loss of cardiac fitness and consequent increases in delayed mortality in oil-exposed cohorts may have been important contributors to the delayed decline of pink salmon and herring stocks in Prince William Sound.
Incardona et al. (2015) effects concentration for oil exposed embryos.

Graph showing cyp1A expression (fold change relative to reference areas) versus \( \Sigma_{32} \) TPAH (ng/g wet wt).
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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