Characterization of the relationship between concentrations of previously unregulated PAHs in aquatic organisms and lipid-free tubing passive sampling devices

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OBJECTIVE

Investigate PAH concentrations in LFT and in crayfish, *Pacifastacus leniusculus*, at the Portland Harbor Superfund site

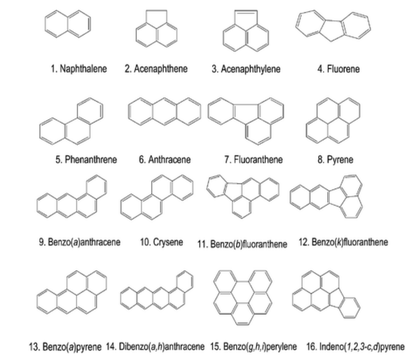


Figure 1: EPA 16 priority pollutant polycyclic aromatic hydrocarbons (PAHs)

INTRODUCTION

- Polycyclic aromatic hydrocarbons (PAHs) are pervasive environmental contaminants[1]
- Benzo[c]fluorene is not currently regulated, but has the third highest relative potency factor (RPF) in the U.S. EPA's 2010 IRIS document[2]
- Sampling aquatic organisms is resource and time-intensive
- Previous research suggests that PAH concentrations in LFT can be used to predict concentrations in crayfish (**Figure 2**)

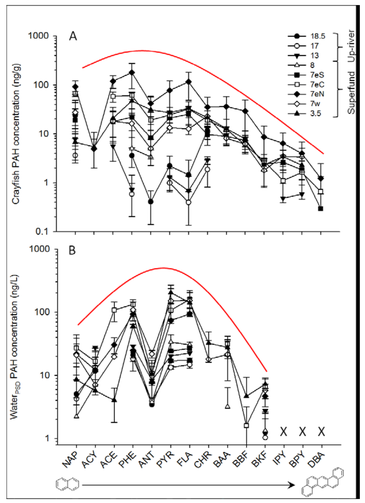


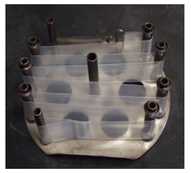
Figure 2: Comparison between individual PAH concentrations in crayfish (top) and LFT (bottom)[1].

HYPOTHESES

- H_1: Contaminant concentrations in lipid-free tubing (LFT) passive sampling devices (PSDs) correspond predictably to concentrations in resident aquatic organisms.
- H_2: Previously unregulated PAHs included in the 2010 EPA IRIS document alter the assessment of risk associated with consuming resident aquatic organisms.

METHODS

- Novel analytical method using GC-MS to quantify over 60 PAHs
- Includes 24 of the 26 PAHs identified in the 2010 IRIS document
- Crayfish and LFT collected in Portland Harbor analyzed



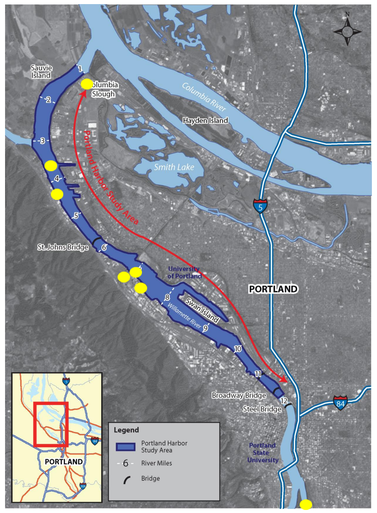
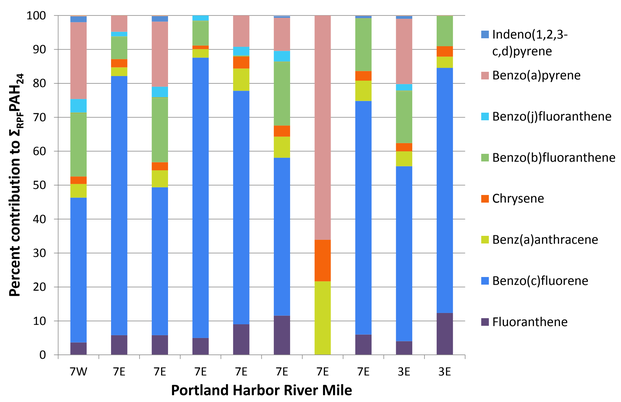


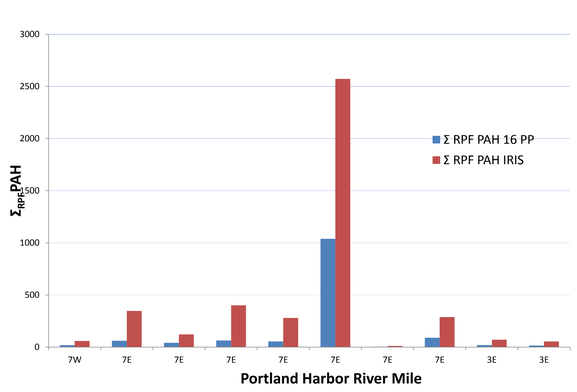
Figure 3: Top left: Signal crayfish, *Pasifasticus leniusculus*[3]; Middle left: LFT in spider; Bottom left: LFT cages ready for deployment; Right: Map of Portland Harbor Superfund site[4]. Yellow dots represent sampling sites.

RESULTS

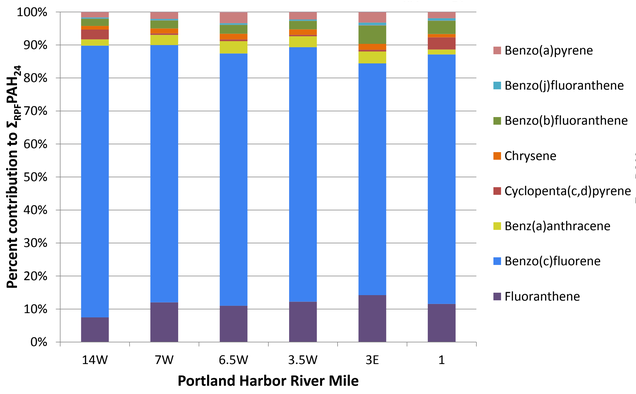
Contribution of Individual PAHs to $\Sigma_{RPF}PAH_{24}$ in Crayfish



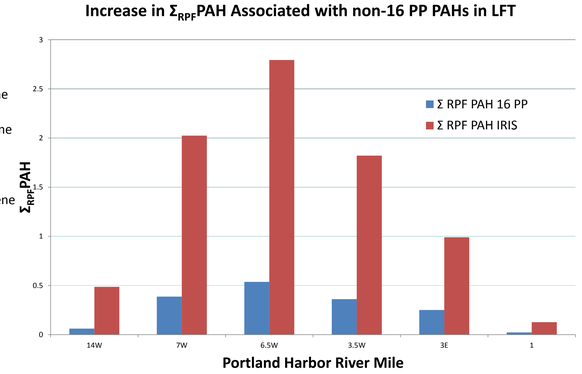
Increase in $\Sigma_{RPF}PAH$ Associated with non-16 PP PAHs in Crayfish



Contribution of Individual PAHs to $\Sigma_{RPF}PAH_{24}$ in LFT

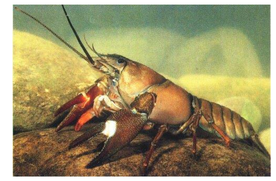


Increase in $\Sigma_{RPF}PAH$ Associated with non-16 PP PAHs in LFT



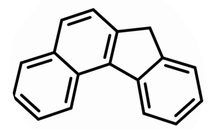
CONCLUSIONS

- Benzo(c)fluorene is present in crayfish collected in the Portland Harbor Superfund site
- Benzo(c)fluorene and cyclopenta(c,d)pyrene are present in LFT deployed in the Portland Harbor Superfund site

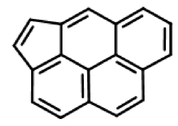


Signal crayfish, *Pasifasticus leniusculus*[5]

- New IRIS compounds alter the total RPF of PAHs in both crayfish and LFT
- This knowledge could change the risk associated with consuming resident crayfish



Benzo(c)fluorene



Cyclopenta(c,d)pyrene

FUTURE WORK

- Pair sampling organisms directly with deploying LFT
- Expand sampling to other contaminated sites
  - Swinomish and Samish tribal areas
  - Lower Duwamish Waterway
- Compare PAH concentrations in organisms and LFT
- Generate and test PSD-bioaccumulation models

Swinomish Indian Tribal Community

Figure 4: From left to right: Swinomish Indian Tribal Community logo[6], Samish Nation logo[7], and the Lower Duwamish River[8].

ACKNOWLEDGEMENTS

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