Passive Sampling Devices and Shellfish

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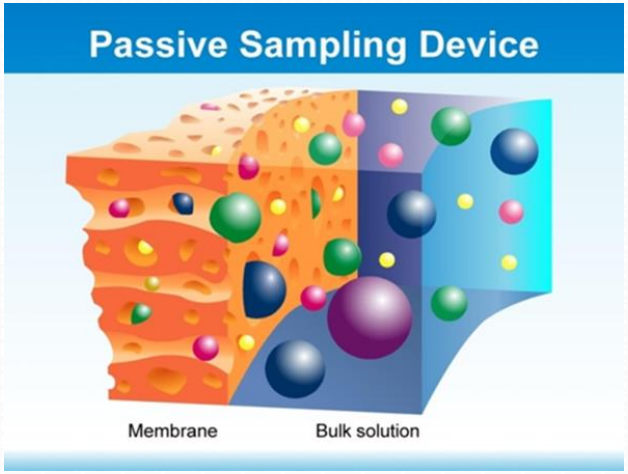
Intro

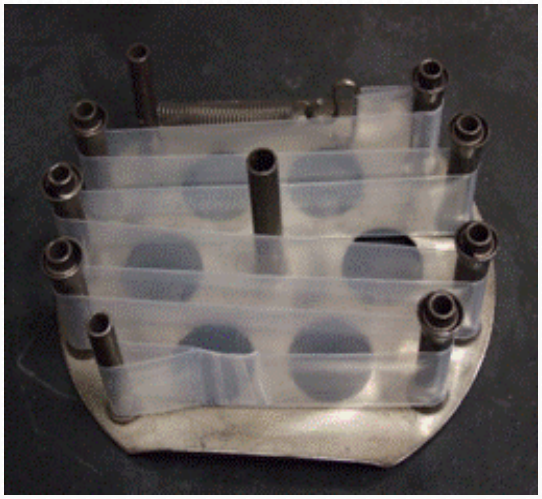
- During remediation, shellfish contamination is a concern
  - Especially for people who rely on eating them
- Collecting shellfish takes a lot of time and money
  - May have negative ecological impacts

http://www.washington.edu/news/2012/03/04/lower-duwamish-waterway-health-study-to-inform-epas-final-cleanup-plan-for-superfund-site/

Passive sampling

- Passive sampling devices (PSD) sample chemicals over time
- Low density polyethylene absorbs the same chemicals as fat
- **Good parallel for organisms**





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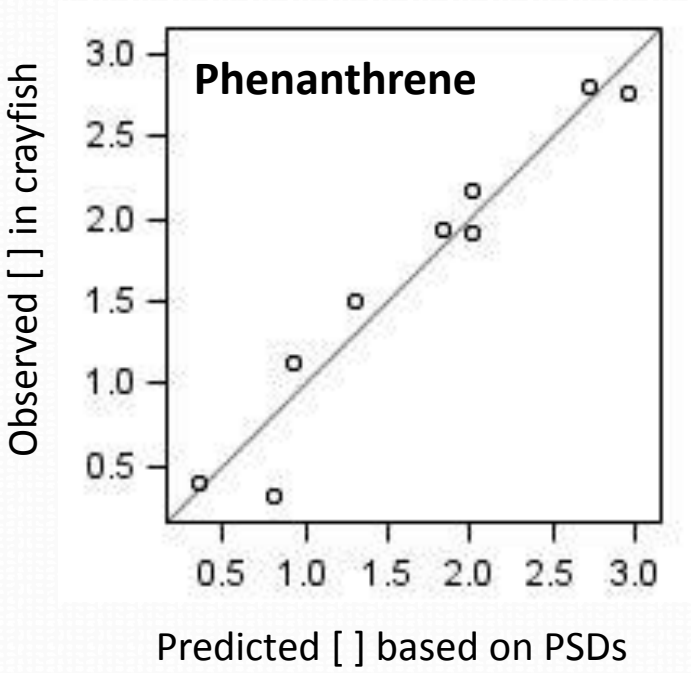
EPA 2010 – New List of Carcinogenic PAHs

- Estimate cancer risk from exposure to polycyclic aromatic hydrocarbon (PAH) mixtures
- List of PAHs is longer than the 16 priority pollutants, some of the 16 were removed
- Gives you a total “potency” of the sample, which can be used to estimate the probability of increased cancer risk

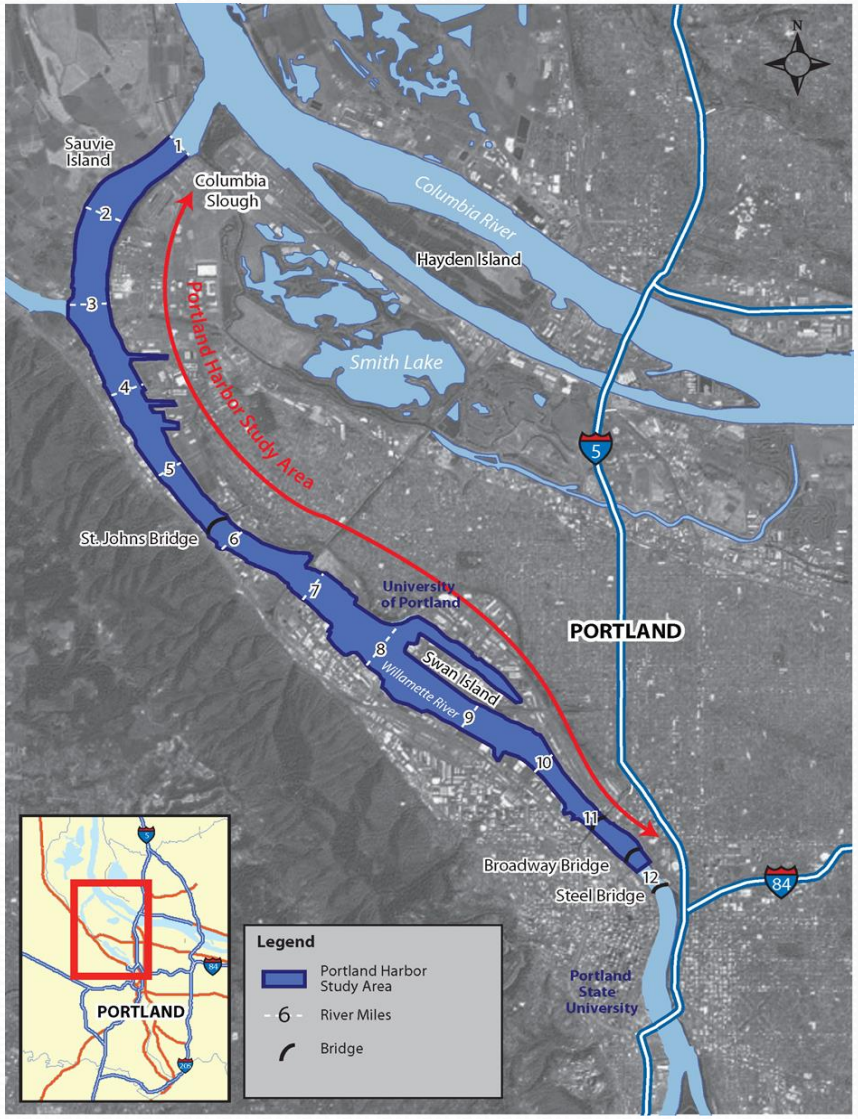
Hypothesis

- PAH levels in passive sampling devices (PSD) correspond with PAH levels in resident organisms
  - Aim 1 – Include PAHs not in routine monitoring
  - Aim 2 - Predict organism concentrations using PSD concentrations
  - Aim 3 - Test predictive models



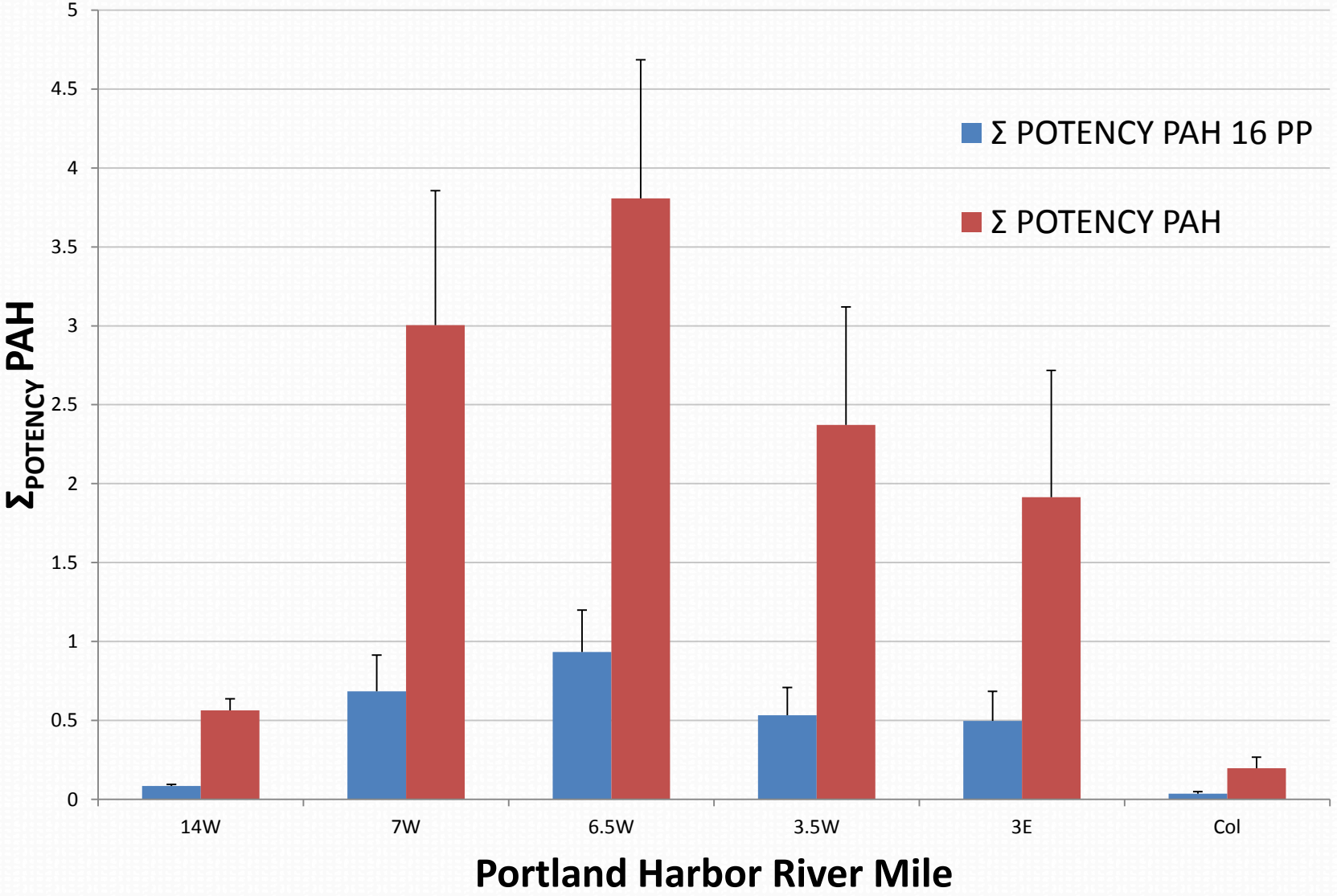
Preliminary Work

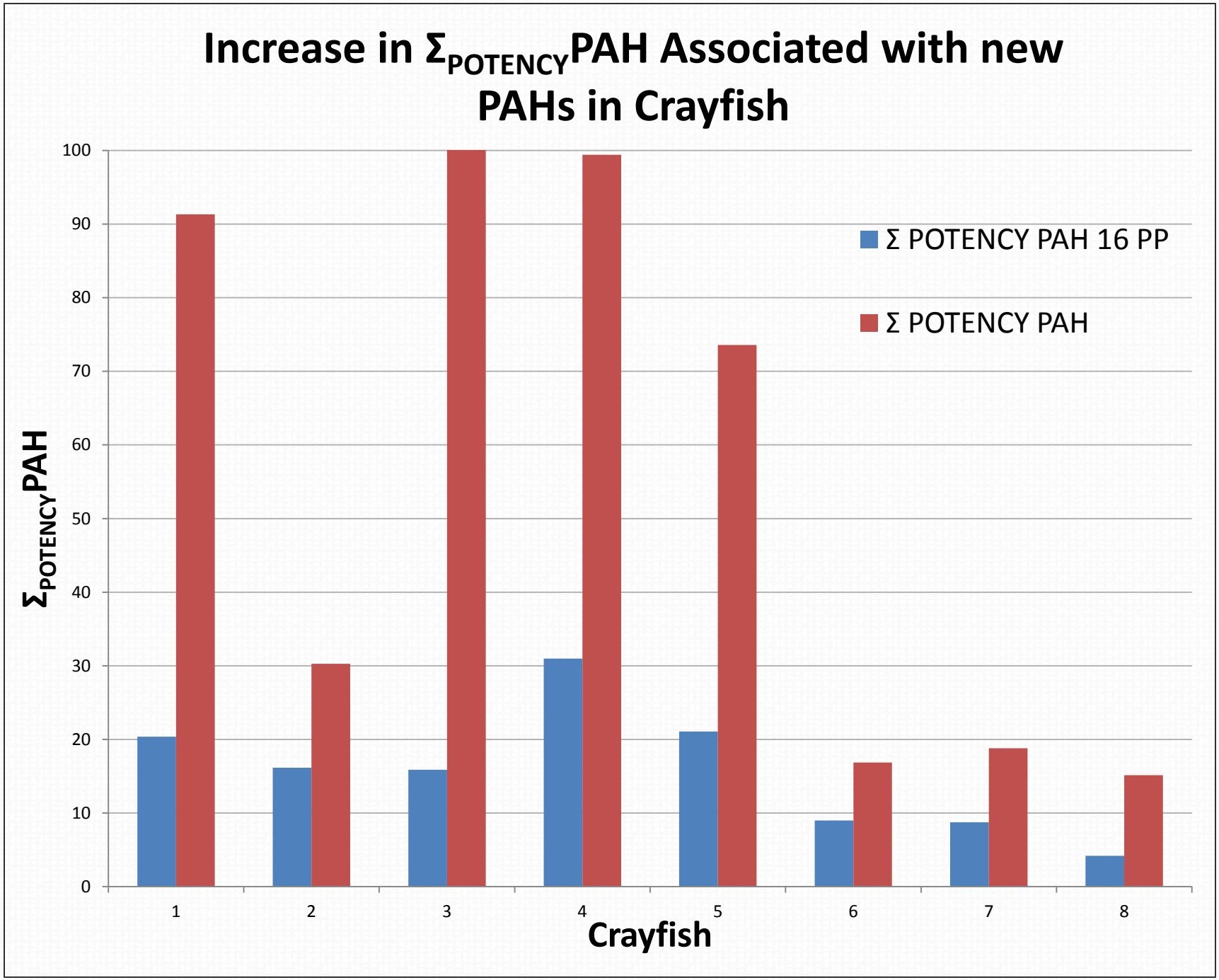
- Analyzed archived crayfish and PSD extracts from the Portland Harbor Superfund site
  - Crayfish collected in 2003
  - PSD deployed in 2011
- 62 PAH GC/MS method with many of PAHs on EPA's new list



http://yosemite.epa.gov/R10/CLEANUP.NSF/sites/ptldharbor

Increase in $\Sigma_{POTENCY}$ PAH Associated with new PAHs in Water



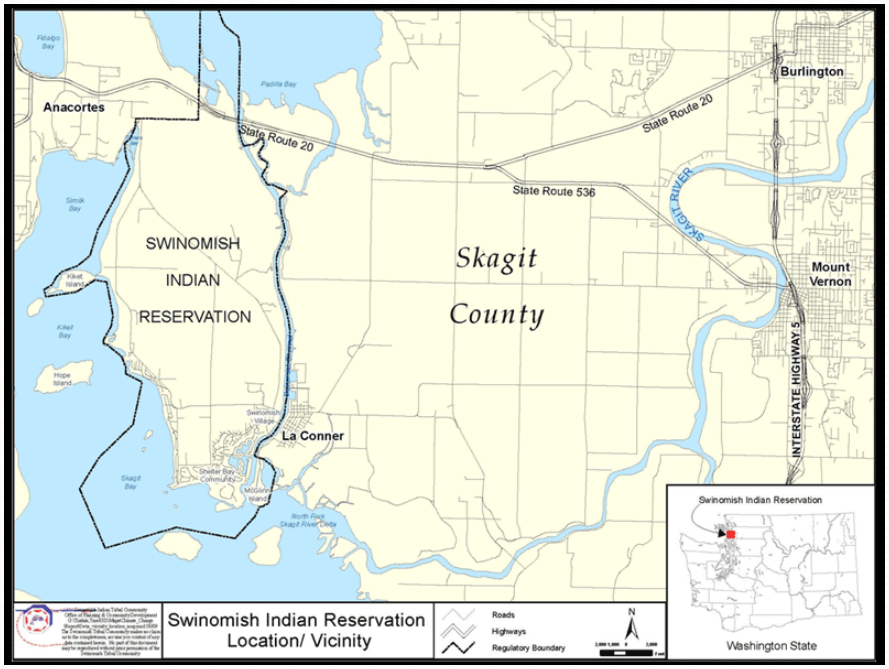

Increase in $\Sigma_{POTENCY}$PAH Associated with new PAHs in Crayfish
$\Sigma_{POTENCY}$PAH
100
90
80
70
60
50
40
30
20
10
0
1
2
3
4
5
6
7
8
Crayfish
Σ POTENCY PAH 16 PP
Σ POTENCY PAH

Effect of new PAHs on Cancer Risk – Portland Harbor crayfish

- Estimated lifetime cancer risk changes from **1 in 700,000 to 1 in 200,000**
  - Least contaminated crayfish
  - "National average" ingestion rate
- Estimated lifetime cancer risk changes from **1 in 17,000 to 1 in 5,000**
  - Most contaminated crayfish
  - 95th % ingestion rate

Collaboration

- Collaborating with Swinomish and Samish tribes
  - Sampling spring 2014
    - Material Data Sharing Agreements approved

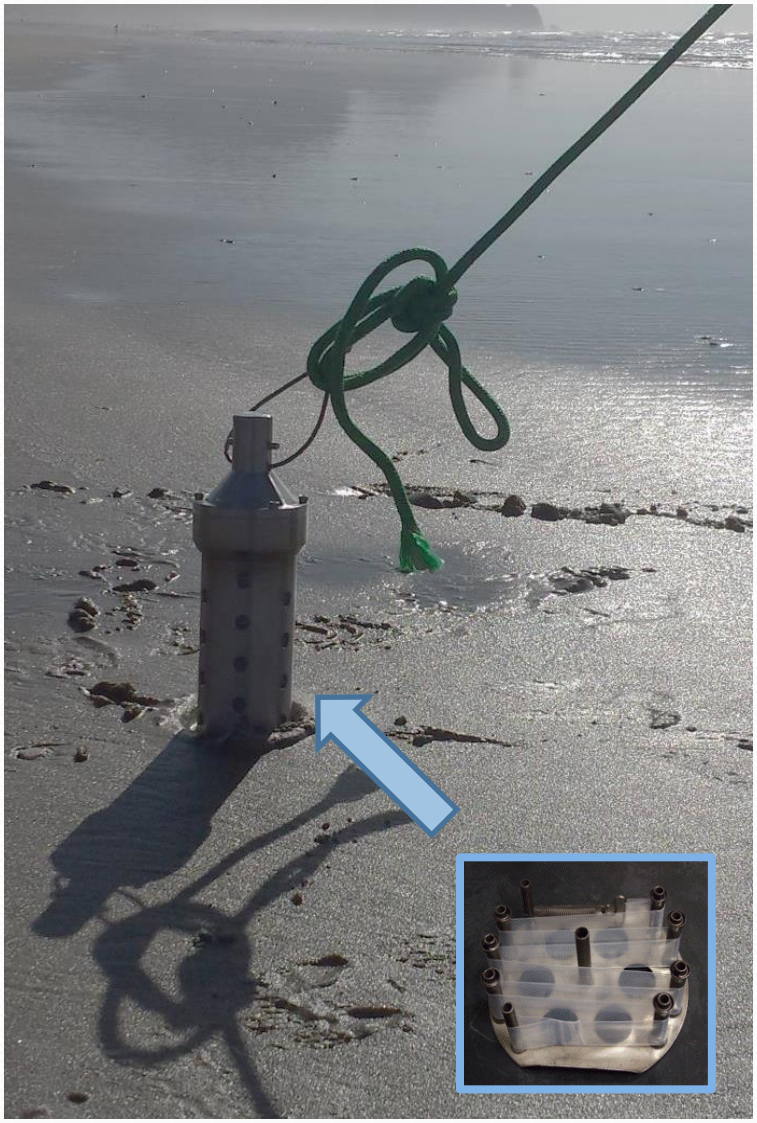


Swinomish Indian Tribal Community

http://www.eopugetsound.org/articles/photos-swinomish-shellfish-harvesting-and-research, http://www.swinomish-nsn.gov/, http://www.samishtribe.nsn.us/, http://www4.nau.edu/tribalclimatechange/tribes/northwest_swinomish.asp

Collaboration

- Collect butter clams and deploy PSDs in porewater (sediment)
- Sample in Turners Bay and Fidalgo Bay
- GOAL: Collect less clams in the long run



Thank you

- **Feedback?**

References

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