Toxic contaminants as a stressor in demersal rockfishes (*Sebastes* spp) from Puget Sound

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*Sandie O’Neill*, NOAA Fisheries, Northwest Fisheries Science Center
PSAMP rockfish samples 1989-2006

<table>
<thead>
<tr>
<th>Species</th>
<th>n (age)</th>
<th>n (chemistry)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copper</td>
<td>691</td>
<td>52</td>
</tr>
<tr>
<td>Brown</td>
<td>303</td>
<td>52</td>
</tr>
<tr>
<td>Quillback</td>
<td>1789</td>
<td>285</td>
</tr>
<tr>
<td>Splitnose</td>
<td>37</td>
<td>0</td>
</tr>
<tr>
<td>Yelloweye</td>
<td>28</td>
<td>2</td>
</tr>
<tr>
<td>Idiot</td>
<td>20</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>2868</strong></td>
<td><strong>391</strong></td>
</tr>
</tbody>
</table>

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Risk factors for exposure to persistent bioaccumulative toxic (PBT) chemicals

- **Location**: exposure occurs with proximity to contaminated habitats (or prey)
- **Age**: longer lifespan means greater exposure time
- **Trophic level**: biomagnification
- **Sex**: gender specific accumulation patterns
- **Tissue lipid levels**: many contaminants are lipophilic

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Trophic level effects (using PCBs in fish from Elliott Bay as an example)

- **62 ng/g**
  - English sole (*Parophrys vetulus*)

- **121 ng/g**
  - Quillback rockfish (*Sebastes maliger*)

- **270 ng/g**
  - Lingcod (*Ophiodon elongatus*)

Photos by T. Quinn

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Trophic status of demersal/benthic finfish from the Puget Sound Central Basin

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Effects of fish age on mercury in quillback rockfish from Elliott Bay
Effects of age on PCBs in quillback rockfish from Elliott Bay

Age (years)
0 5 10 15 20 25 30
TPCB (ng/g wet wt.)
100
200
300

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...effects of age and gender

TPCB (ng/g wet wt.)

Age

0 5 10 15 20 25 30

p<0.0001

$\text{r}^2 = 0.28$

p=0.045

$\text{r}^2 = 0.12$

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Quillback rockfish from Elliott Bay

Meador et al. (2002) threshold of deleterious effects
Quillbacks from non-urban Central Puget Sound habitats

Meador et al. (2002) deleterious effects threshold

TPCB (ng/g wet wt)

Age

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Evidence for Maternal Transfer of PCBs in 3 species of Rockfish

PCBs in Muscle (ng/g lipid)

PCBs in Ovary ng/g lipid

Meador et al. (2002) deleterious effects threshold

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So what?

Most of Puget Sound is not urban....
(1789 quillbacks over a 10 year period)
Conclusions

• Demersal rockfish in Puget Sound are exposed to chemical contaminants in concentrations great enough to cause deleterious effects

• Urban bays may serve as a *de facto* “protected areas” for *Sebastes*

• If so, recovery potential may be impacted
What about other chemicals?

- PCBs
- Metals
- Flame retardants (PBDEs)
- PAHs
- Endocrine disrupting compounds
Feminization of male fish: abnormal production of vitellogenin in male English sole (frequency of occurrence)

Elliott Bay (Seattle)


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