Endocrine Disruption in Hornyhead Turbot

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Background: CECs  
Contaminants of Emerging Concern

• Great number of unmonitored chemicals
  – Present in environment from multiple sources

• Cannot assess environmental significance with chemistry alone

• Need to determine if organisms are affected
Previous Studies

• Exposure to near outfall sediment induced vitellogenin in farmed male California halibut (*Paralichthys californicus*)
  – Estradiol & alkylphenols in sediments

• Vitellogenin & testis-ova present in English sole (*Pleuronectes vetulus*) & hornyhead turbot (*Pleuronichthys verticalis*) males
  – Males with testis-ova collected near POTW discharges
• Compared 4 POTW discharge areas to reference

• Hornyhead turbot
  – Sampled summer 2006
  – 50 per station: similar size
  – Multiple tissues collected
Systems Evaluated

1. Reproductive: VTG & testis-ova (investigated in previous studies)
   - Vitellogenin (VTG) / female egg yolk protein
     • Produced in males when exposed to estrogen like compounds
   - Testis-ova / eggs in male testis
     • Feminization effect which alters gonad structure
2. Glucocorticoid: **Cortisol** / metabolic regulator
   - Baseline concentrations changes used to assess responses to different stressors
   - Prior data for other flatfish species

3. Thyroid: **Thyroxine (T4)** / metabolic regulator
   - Baseline concentration changes used to assess potential effects in development
   - Known to be affected by CECs (e.g. PBDEs)
Results: VTG

- VTG detected in males from all sites
  - Male VTG concentrations 100 times lower than females
- No apparent effect from POTW discharge areas
Results: Testis-ova

- Low occurrence (1/145)
- No apparent association with POTW discharges
- Potential exposure (VTG presence) but virtually no gonad effects
Results: Cortisol

- Similar concentrations at DP & POTW discharge areas
- Cortisol concentrations do not appear to be affected by POTW discharges
Results: Thyroxine (T4)

- T4 concentrations higher at DP
- Lower T4 concentrations could be associated with POTW discharges
Summary

- Little indication of endocrine disruption
- Very little association between responses & POTW discharges
Next Steps

• Determine baseline conditions
  – Sampling remote areas with fewer wastewater discharge inputs
  – Channel Islands & Northern SCB

• Investigate potential causes
  – Lab exposures to effluent & individual CECs