

Contaminants of Emerging Concern (CECs)

- Thousands of high use chemicals of diverse structure
 - Pharmaceuticals & personal care products (PPCPs)
 - Brominated flame retardants (BFRs)
- Expected increased usage
- Not currently monitored/regulated
- How do we measure? What is their occurrence? Potential impact?

PBDEs in the Southern California Bight

Keith Maruya



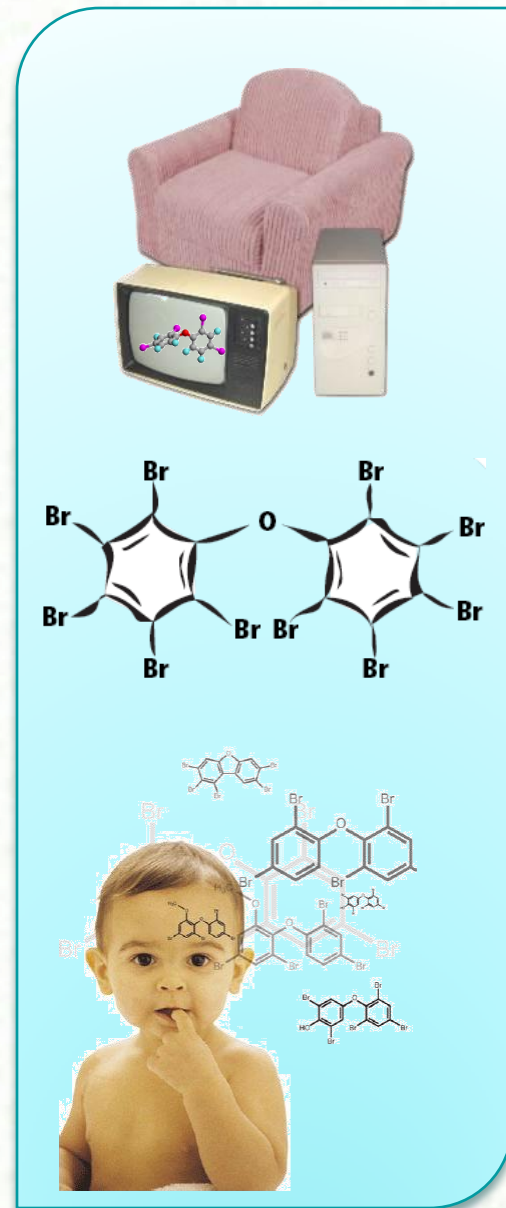
PBDEs are *Everywhere*

Poly**B**rominated **D**iphenyl **E**thers

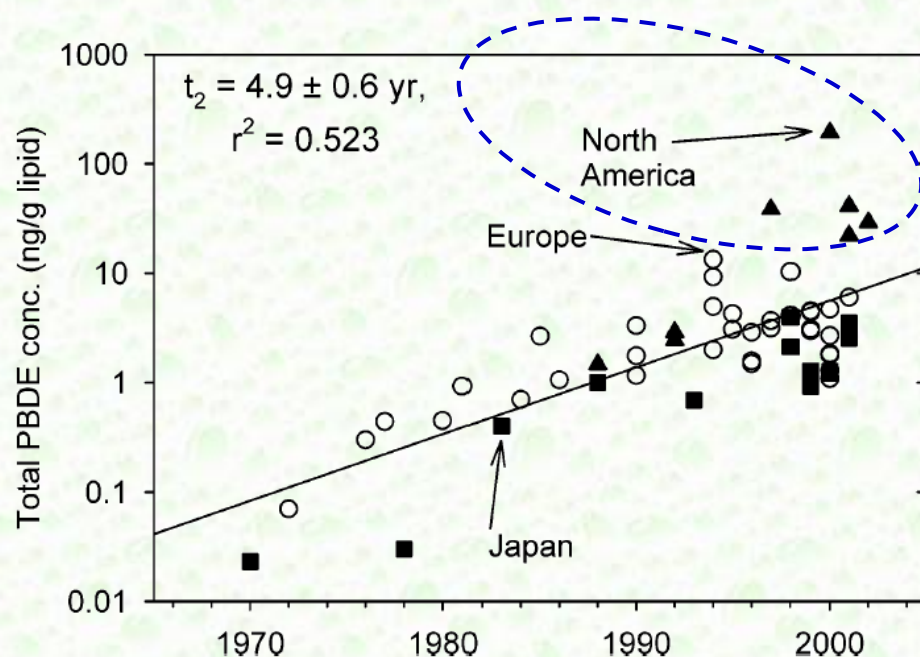
- Fire retardants for consumer products
 - *Up to 30% by weight*
- Persistent and widespread
- Bioaccumulative and biomagnifiable
- Long range transport
- Potentially toxic

Hites *ES&T*, 2004; de Wit *Chemosphere*, 2002

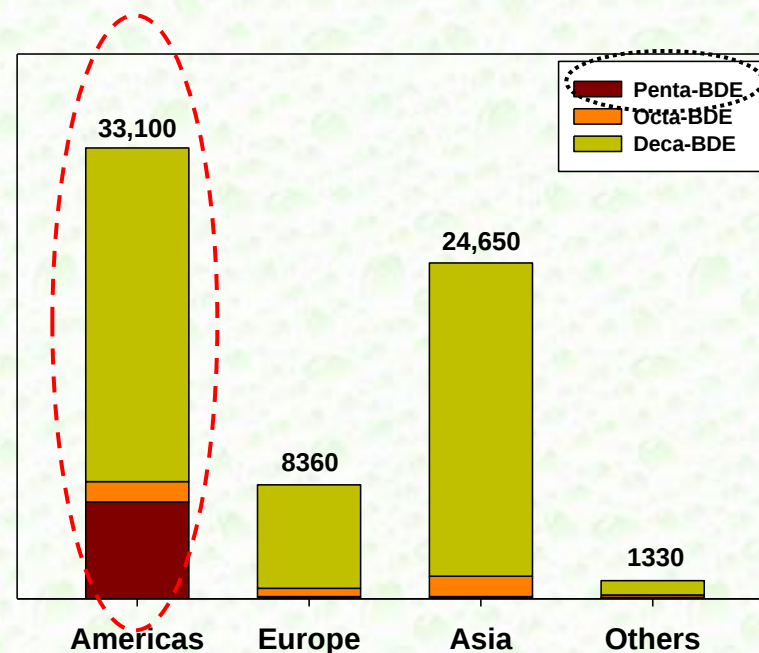
Birnbaum *et al. EHP*, 2004; Muir *et al. ES&T*, 2006



Penta-, octa- mixtures banned in CA (2006)



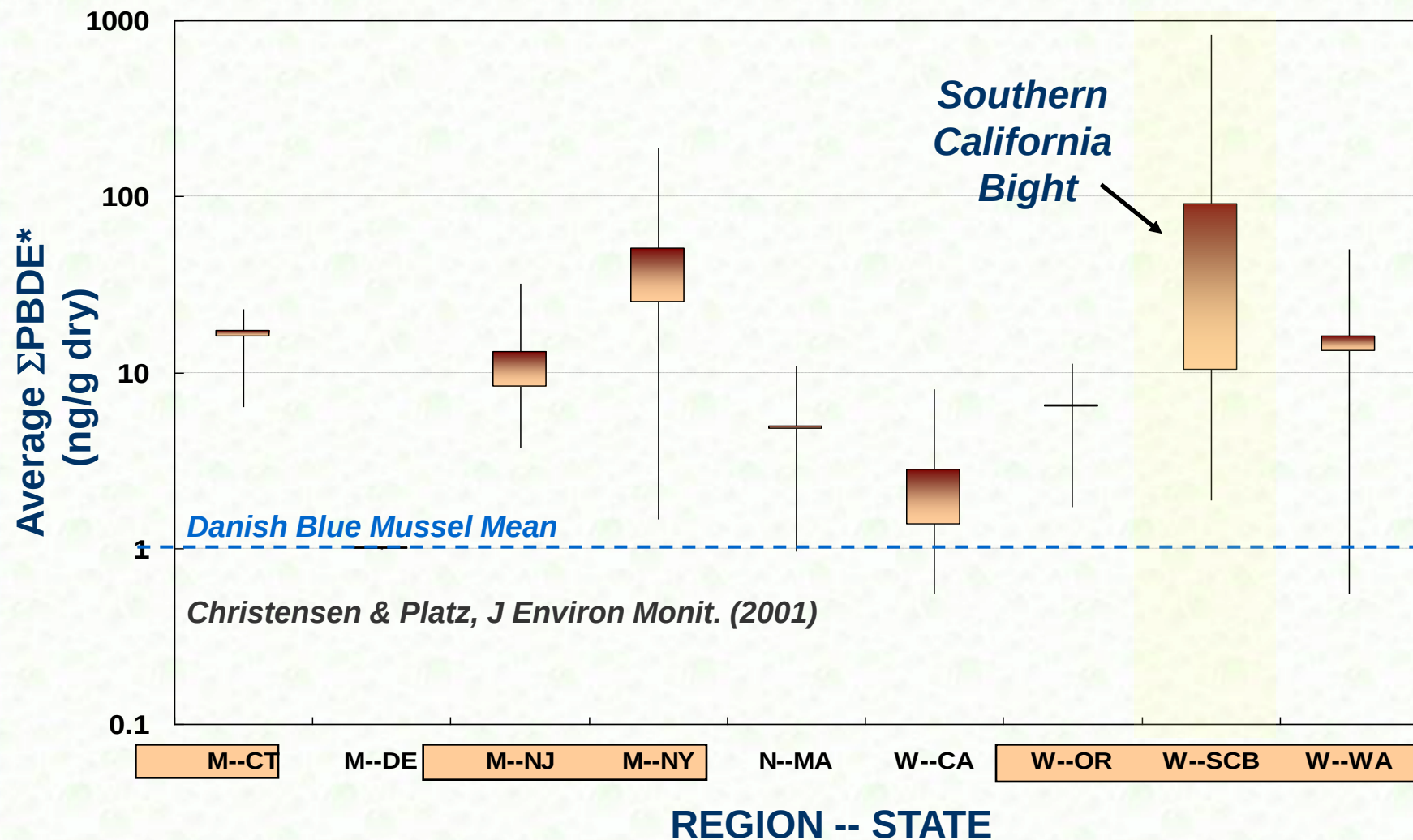
Total PBDE concentration in human tissue



Market demand for PBDEs in 2001 (T)

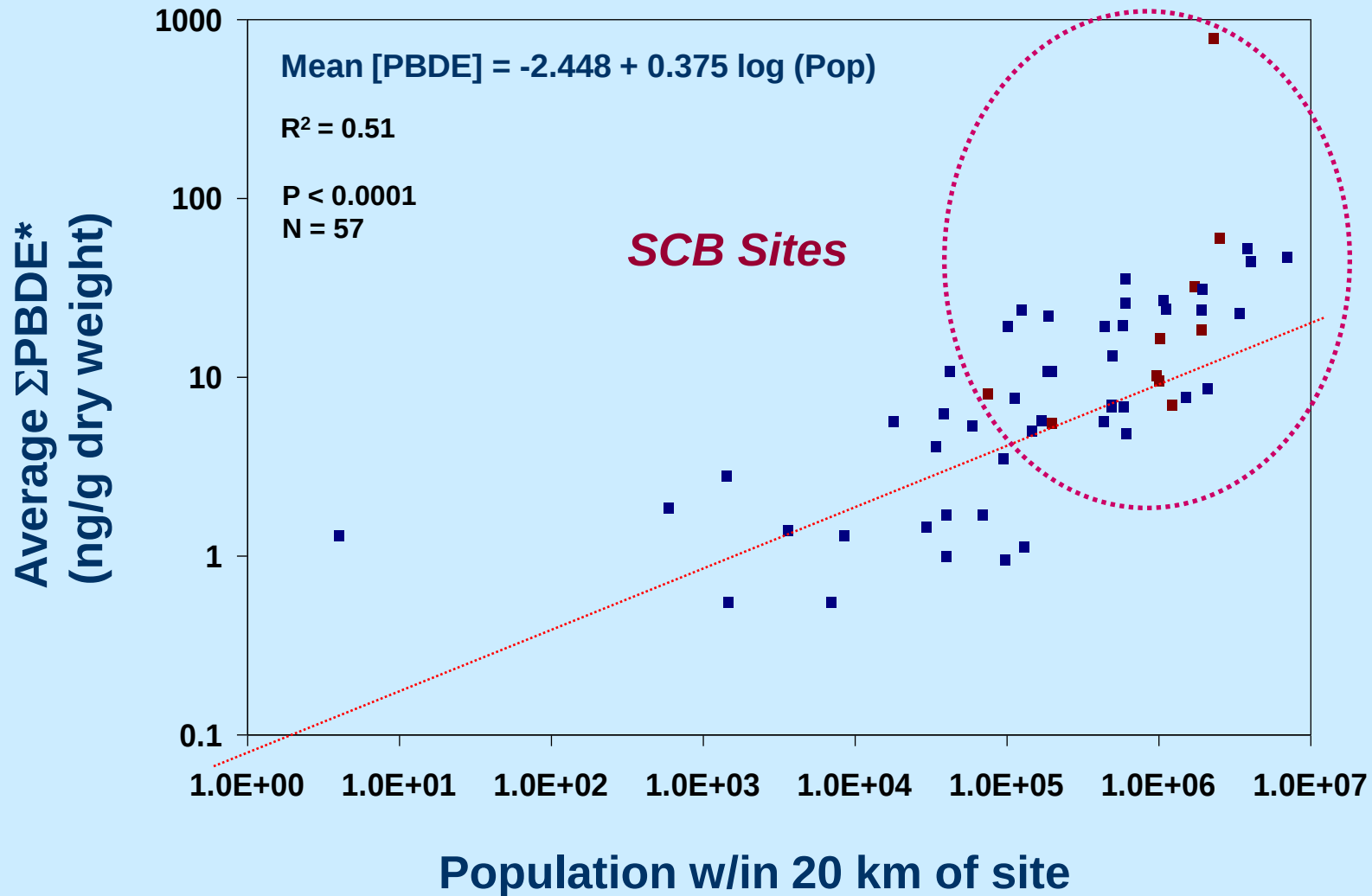
National Status & Trends Program – Mussel Watch

► Polybrominated Diphenyl Ethers in *Mytilus* spp.: A National Perspective



NOAA | National Ocean Service | National Centers for Coastal Ocean Science
National Status & Trends Program – Mussel Watch

► Polybrominated Diphenyl Ethers in *Mytilus spp.*

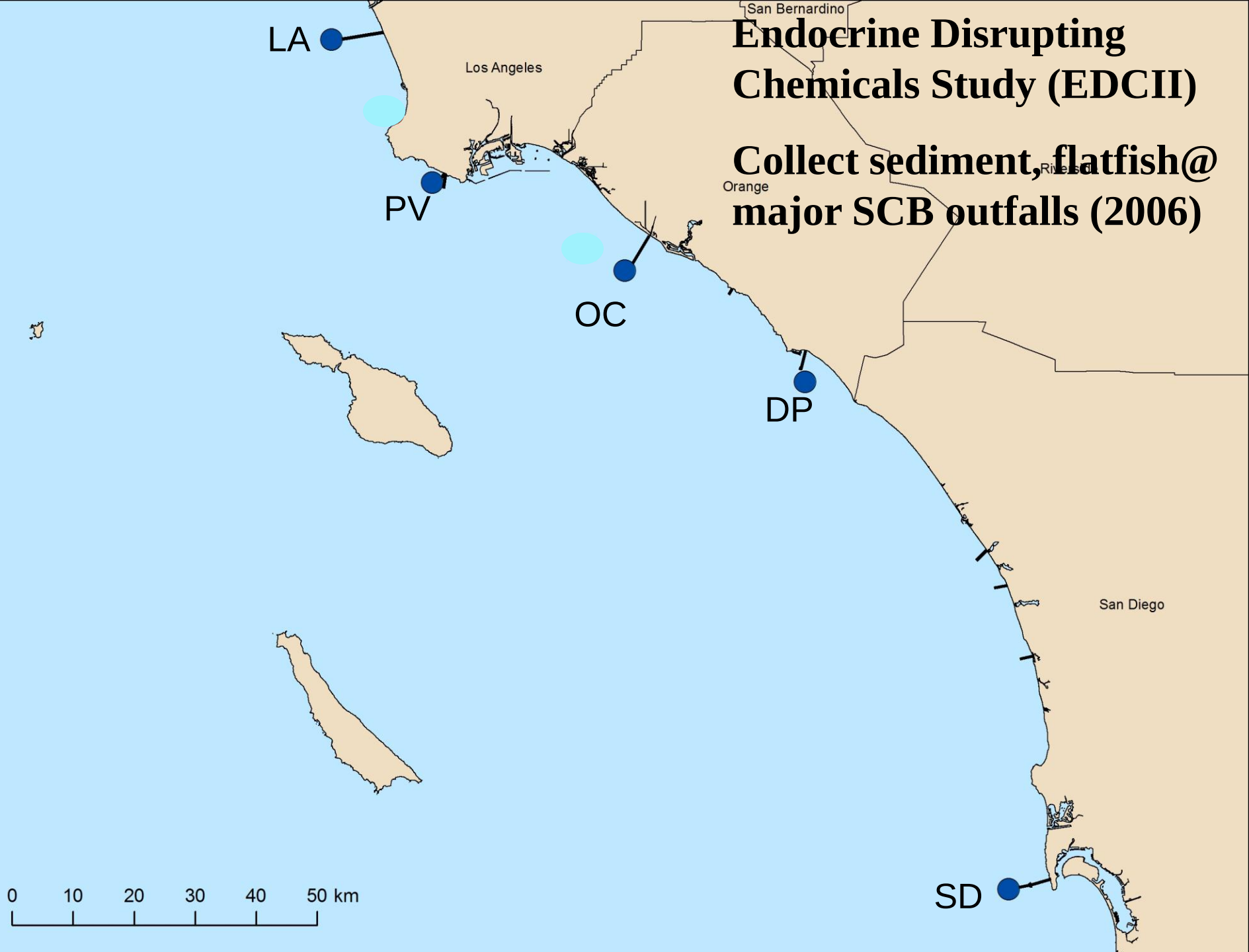


SCCWRP Research & Collaboration

- **Analytical**
 - *PBDEs in sediment, tissue by NCI-MS*
- **Occurrence & Fate**
 - *POTW outfall sediment* (EDCII, Bight 08)*
 - *Organisms/tissue*
 - *bivalves (expanded NS&T)*
 - *fish* (EDC II, Bo8)*
 - *marine mammals**
 - *History of PBDE input (sediment cores)*
- **Impacts**
 - *Seafood safe to eat?*
 - *Role in marine mammal strandings?*

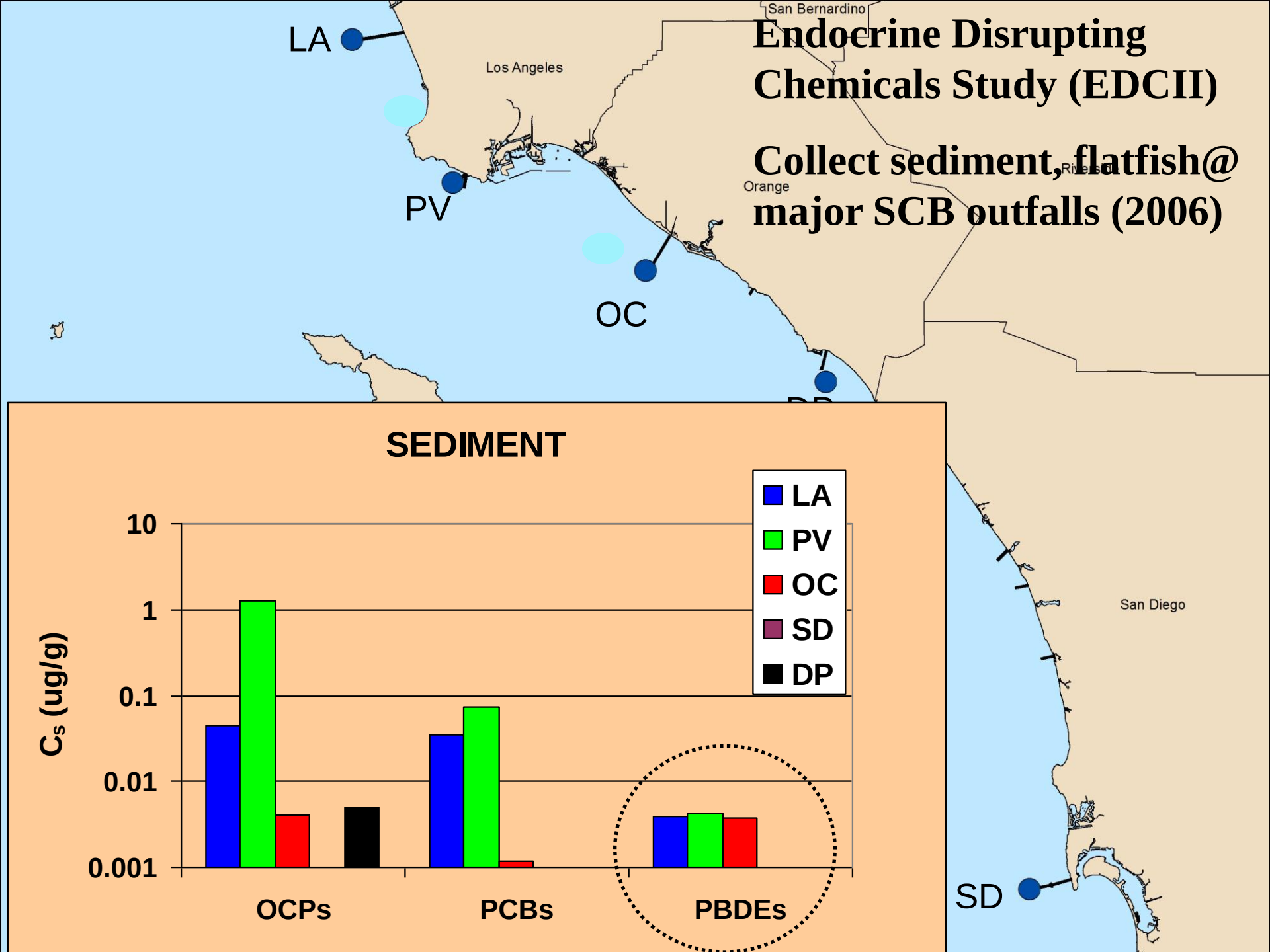
Endocrine Disrupting Chemicals Study (EDCII)

Collect sediment, flatfish@
major SCB outfalls (2006)

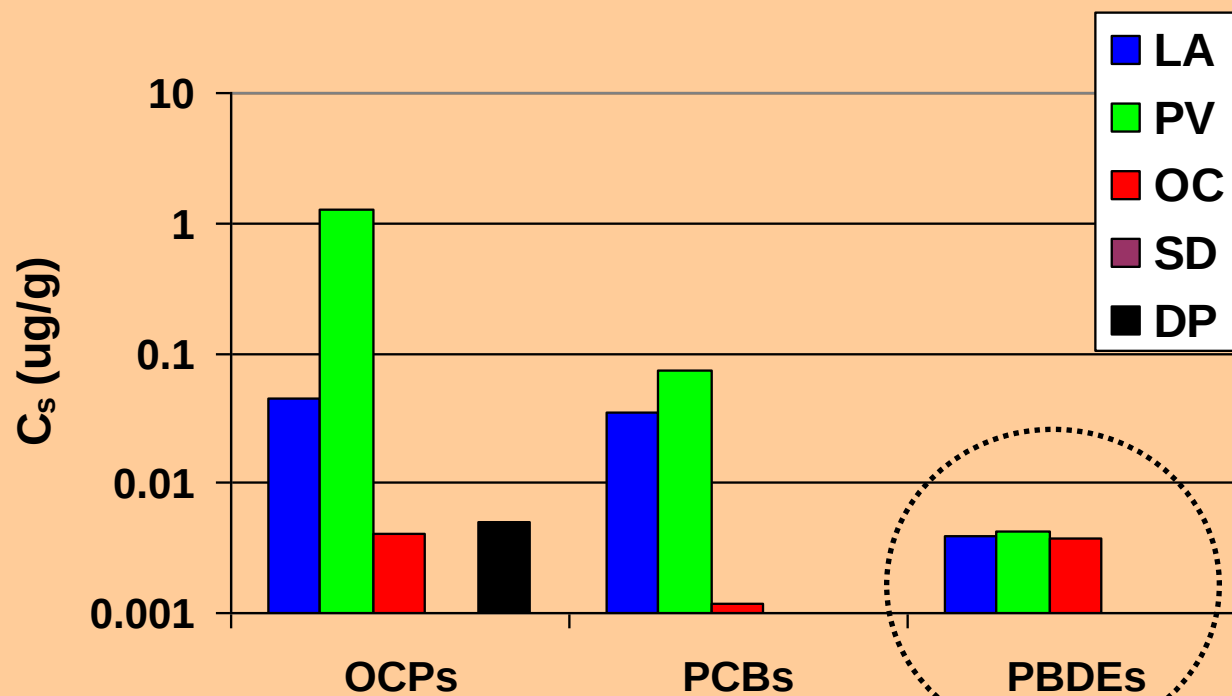


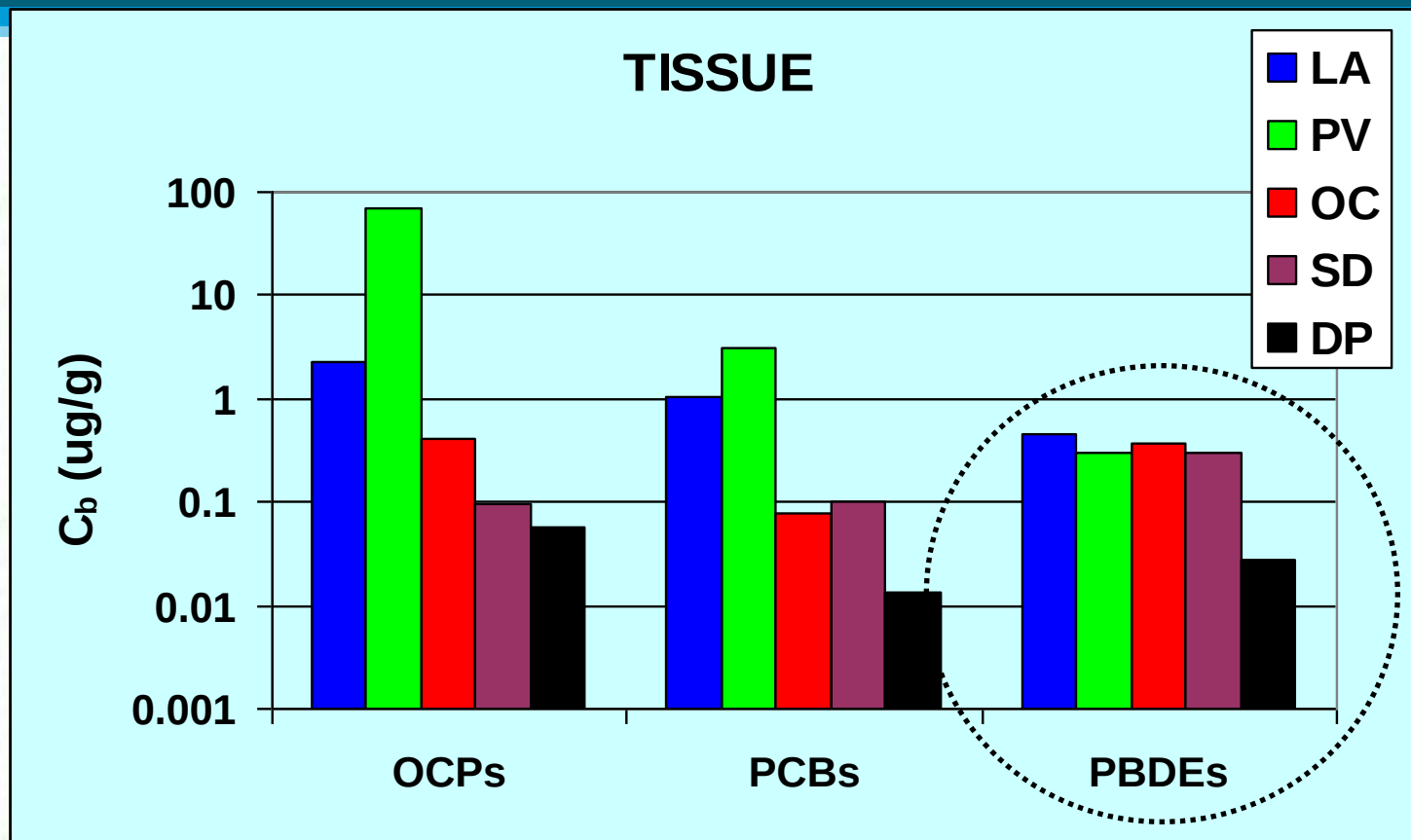
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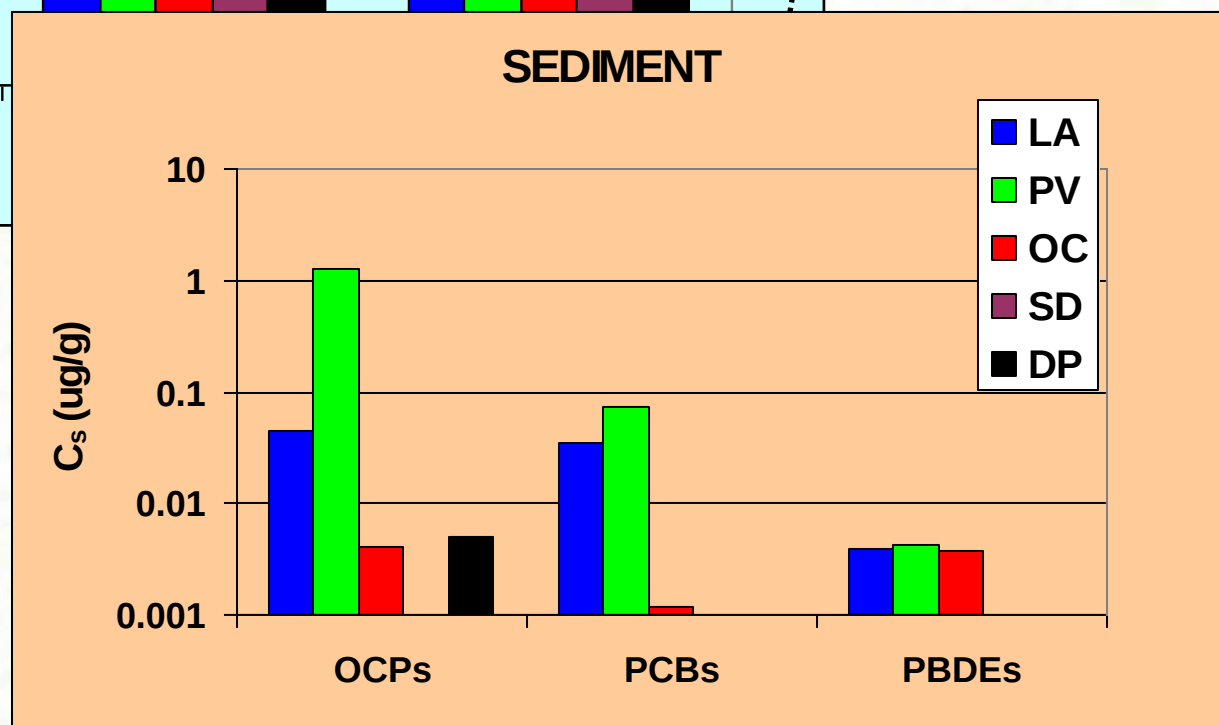
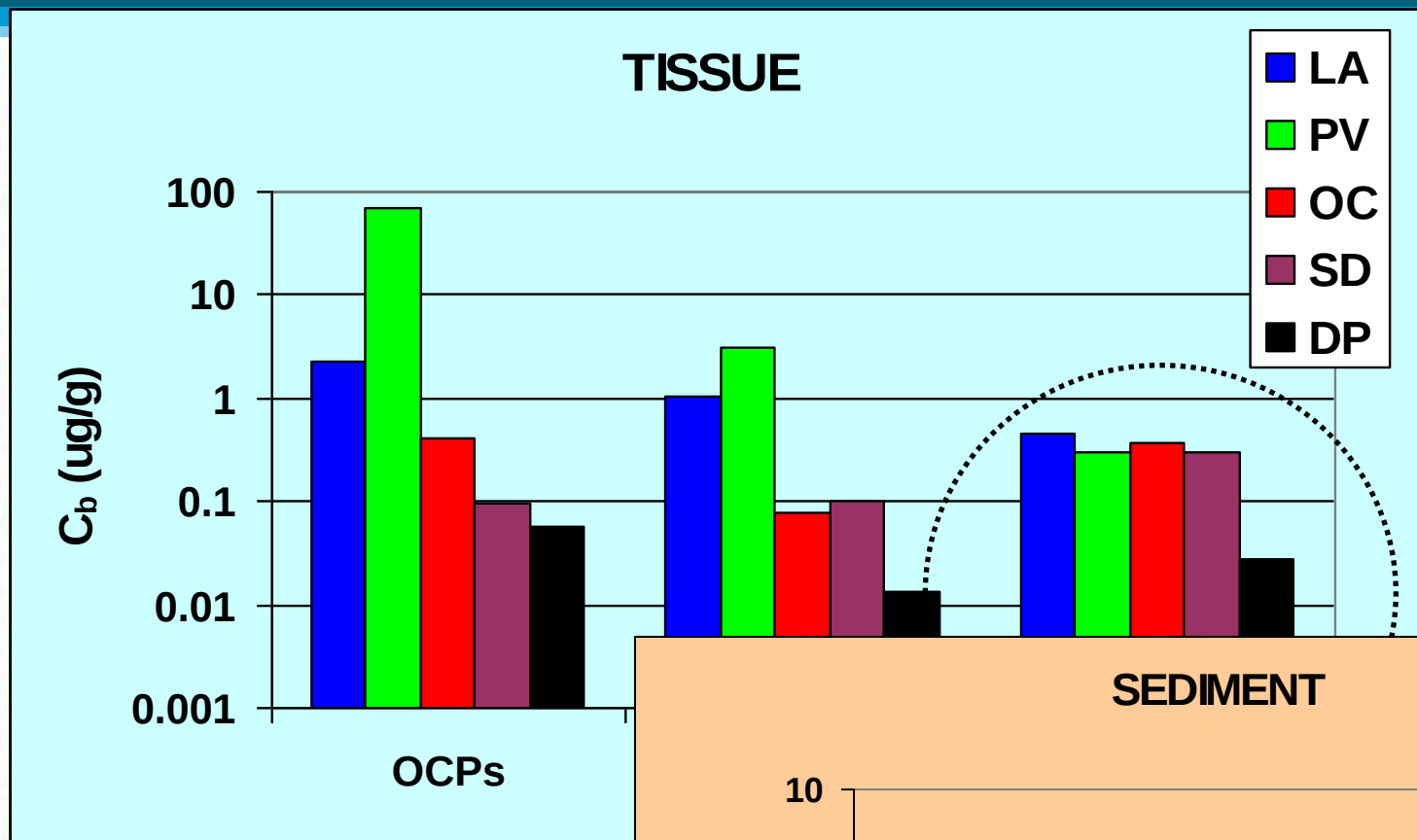
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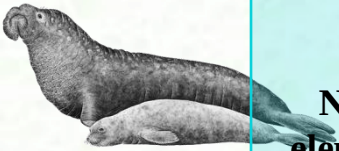
SEDIMENT



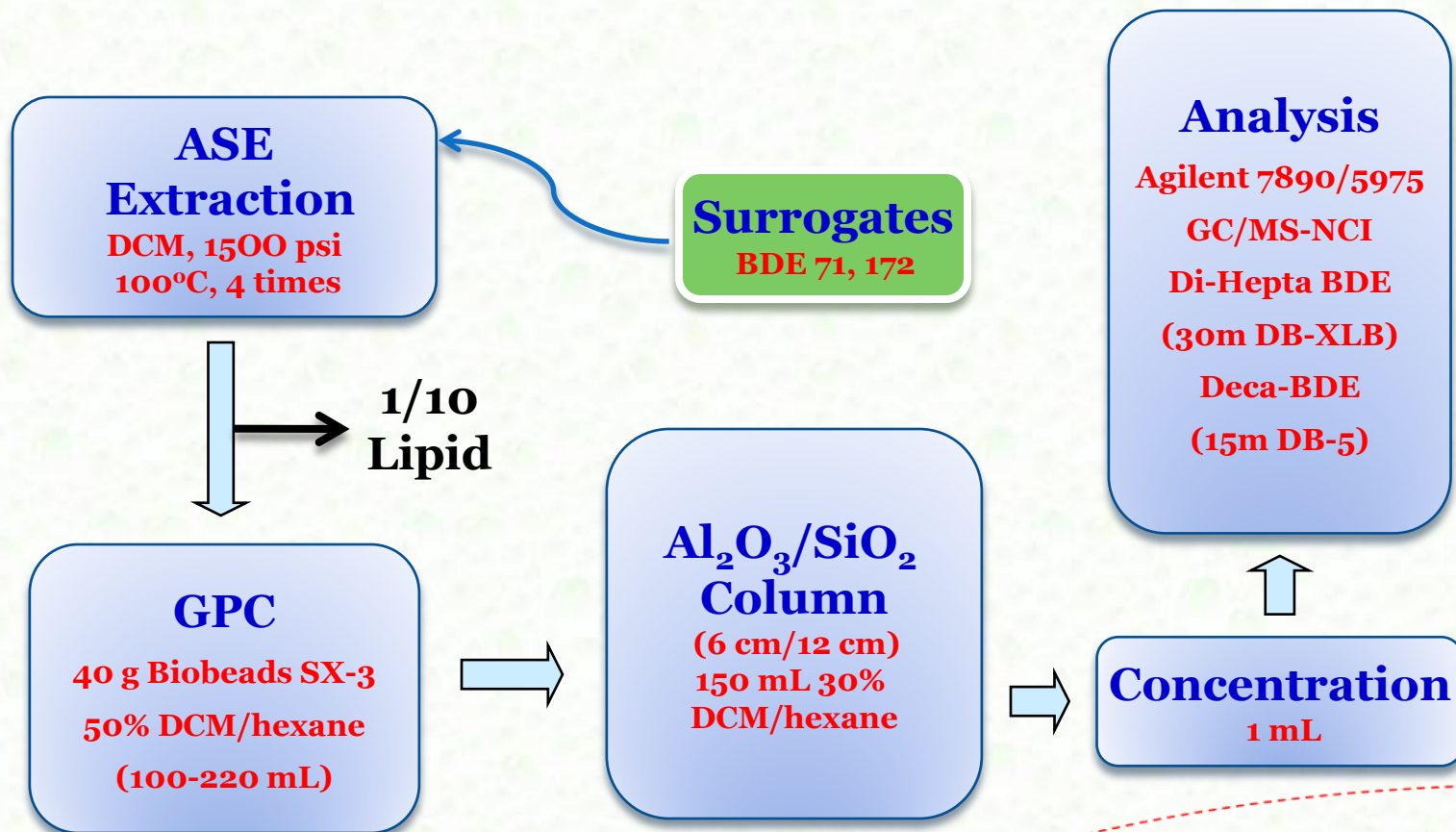




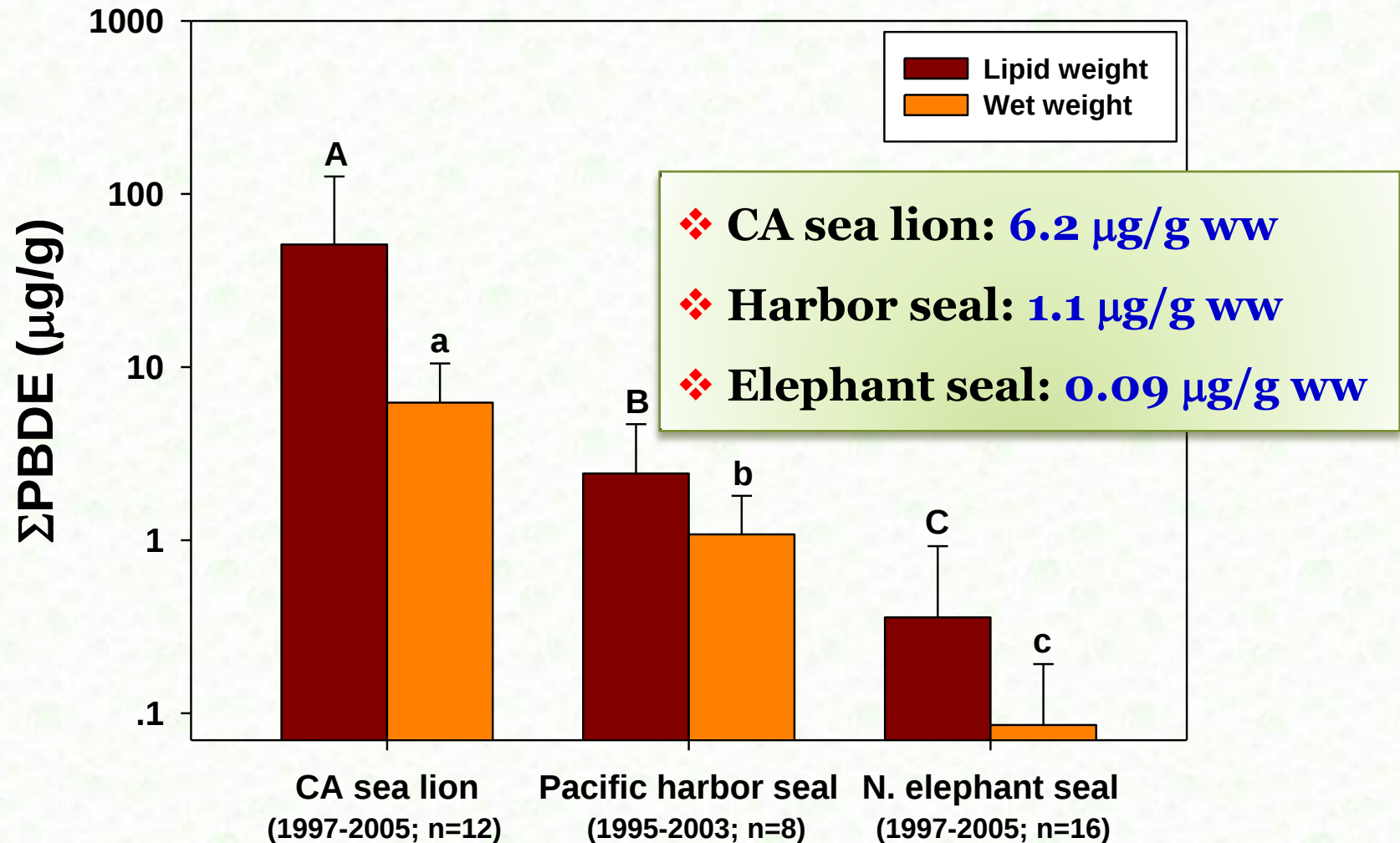
Status/trends in higher trophic levels?

	Pup (M&F)	Yearling (M&F)	Subadult (M&F)	Adult (F)	Adult (M)
 California sea lion (n = 63)	1997 (n = 1) 1998 (n = 1) 2000 (n = 3) 2001 (n = 1) 2003 (n = 3) 2004 (n = 2) 2005 (n = 1)	1996 (n = 1) 1997 (n = 3) 1998 (n = 1) 2000 (n = 1) 2001 (n = 1) 2003 (n = 3) 2004 (n = 3) 2005 (n = 3)	1997 (n = 2) 1998 (n = 3) 2000 (n = 3) 2001 (n = 1) 2003 (n = 1) 2004 (n = 3) 2005 (n = 2)	1997 (n = 3) 2000 (n = 3) 2001 (n = 3) 2003 (n = 2) 2004 (n = 3) 2005 (n = 1)	1994 (n = 2) 1998 (n = 1) 2004 (n = 1) 2006 (n = 1)
 Pacific harbor seal (n = 9)	1995 (n = 3) 1997 (n = 1) 2001 (n = 2) 2003 (n = 2)	1998 (n = 1)	Collaborators: CSULB N= 88 (extracts)		
 Northern elephant seal (n = 16)	1997 (n = 2) 1998 (n = 1) 1999 (n = 1) 2000 (n = 3) 2001 (n = 3) 2004 (n = 3) 2005 (n = 3)	Strandings blubber -- Fort MacArthur (LA) & Pacific (OC) Marine Mammal Centers			

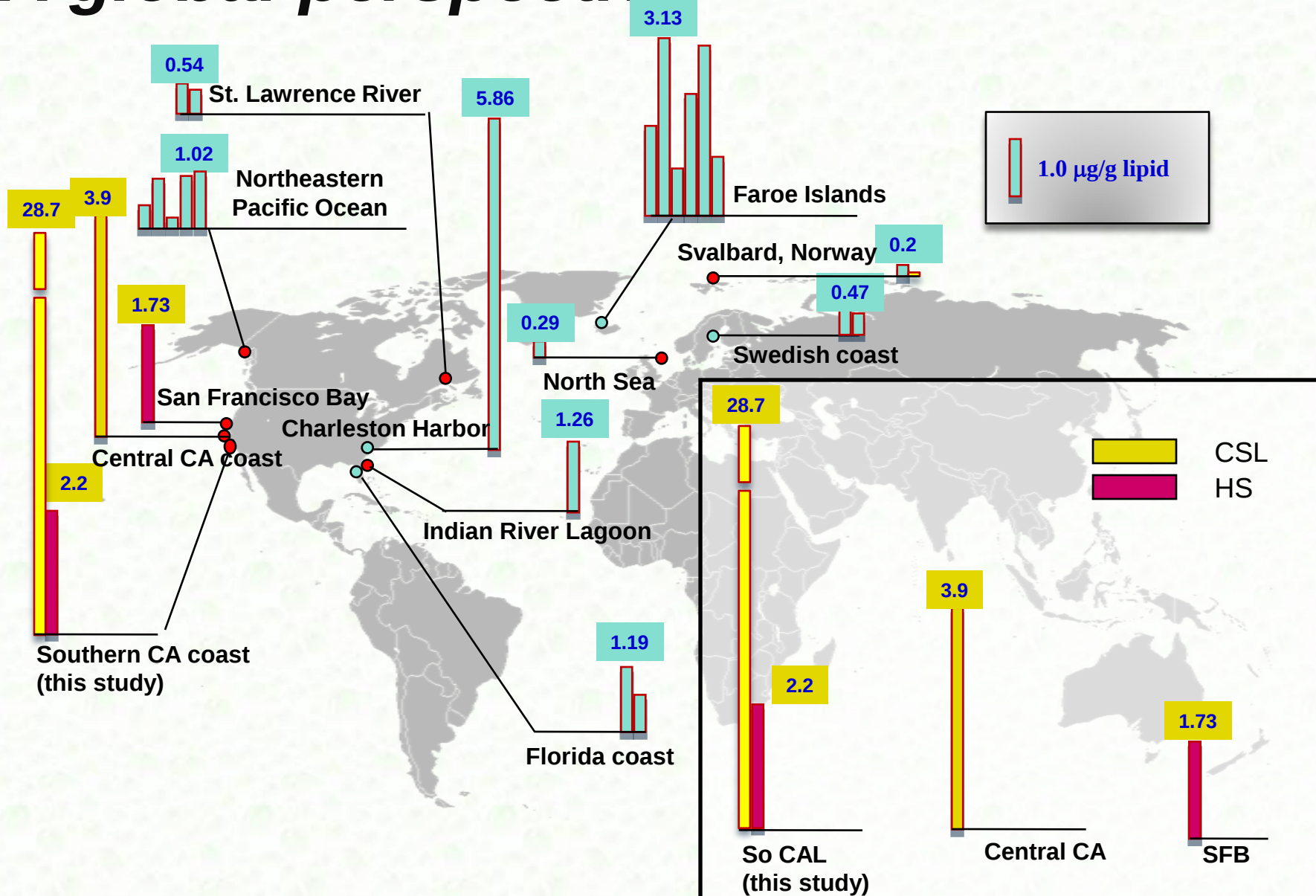
Analytical methodology similar to legacy POPs



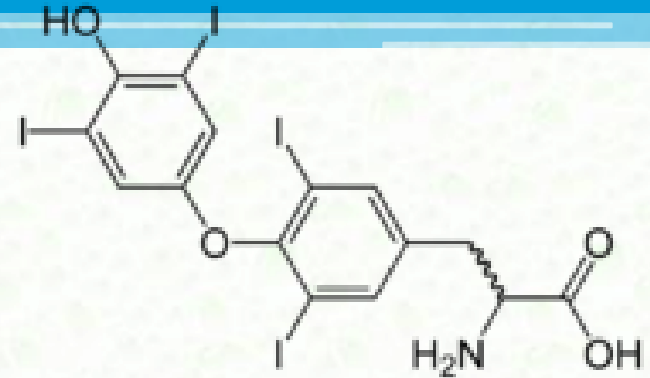
PBDE levels by *species* (*juveniles only*)



A global perspective



Toxic impacts -- ???



- **Very little known** on PBDE effects thresholds
 - Blood thyroid hormones vs. PBDEs in grey seal (Hall et al. 2003)
 - Evidence of immunosuppression in European porpoises (Beineke et al. 2007)
 - “No data on critical effects levels in wildlife” (Elliott et al. 2005)
- **No concentration thresholds available**

Implications and future studies

- *Elevated levels & fingerprint implicating*
 - penta-BDE
 - debromination of octa or deca?
- *Sources/pathways for biomagnification?*
 - Sediment levels & distribution (Bo8)
 - Occurrence in prey species (Bo3/o8 fish)
 - Examine pinniped diet, life history
- *Are levels increasing?*
 - Reconstruct input history (PV sed cores)
 - Initiate longer term monitoring
- *Can we establish credible toxic thresholds?*
 - Immunosuppression? Neurotoxicity? thyroid dysfunction?