Historical Trends of Polychlorinated Biphenyls in Chesapeake Bay Fish and the Influence of Ongoing Sources

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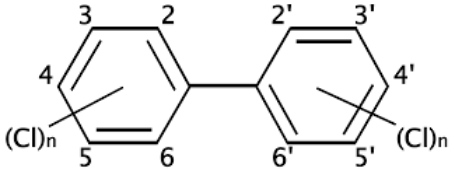
Background

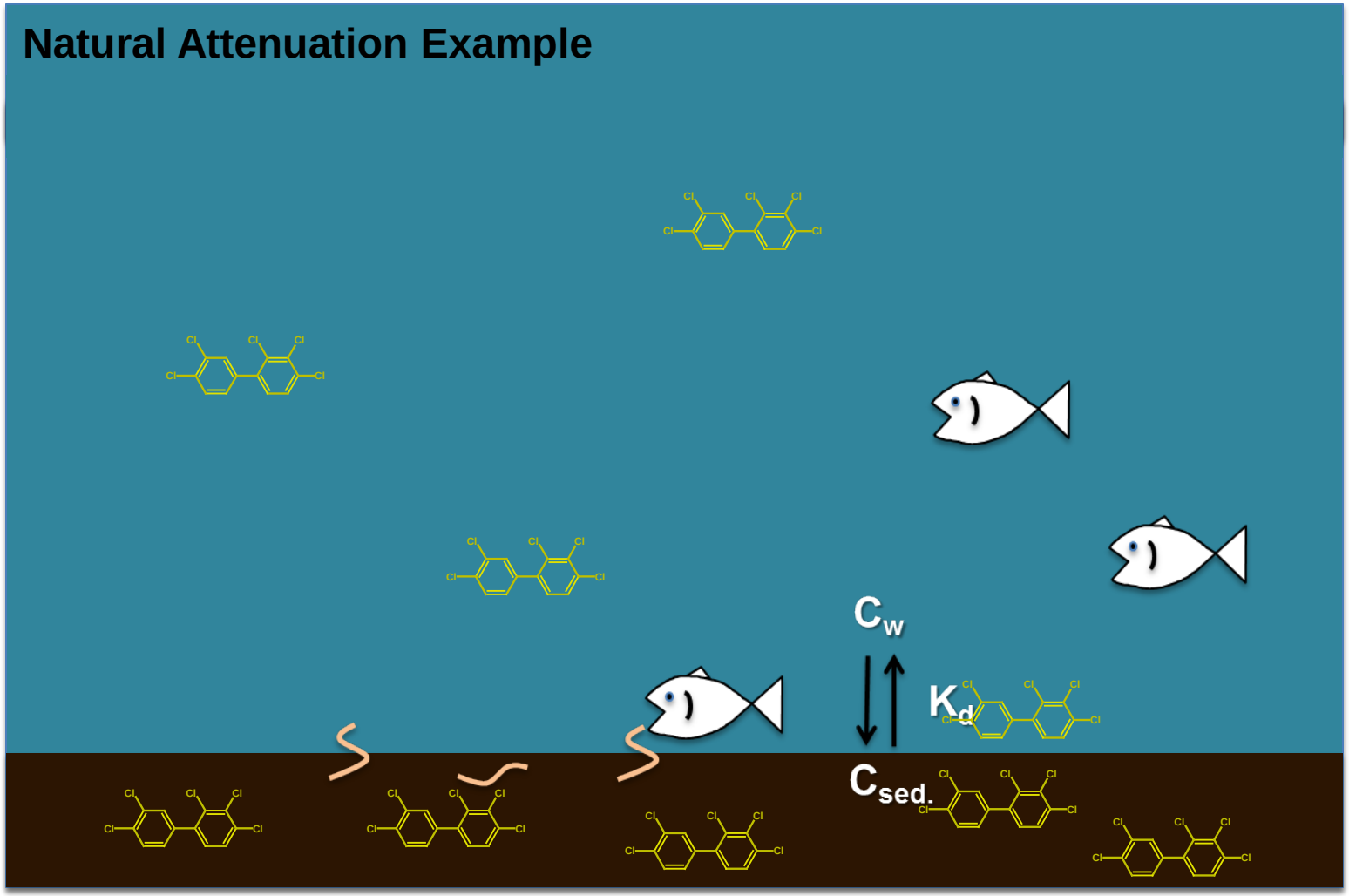
- Data collected part of MDE Fish Monitoring Program from sampling years 1999-2015 representing 1,220 composites
- Samples represent composites of the edible portion of 2-5 fish
- Analysis conducted by UMCES Appalachian Laboratory, Chesapeake Biological Laboratories, and University of Maryland Baltimore County
- White Perch, Channel Catfish, and Striped Bass were selected for comparison within drainage basins due to sampling frequency and popularity as a recreational sport fish
- PCBs were banned from commercial use in in 1979



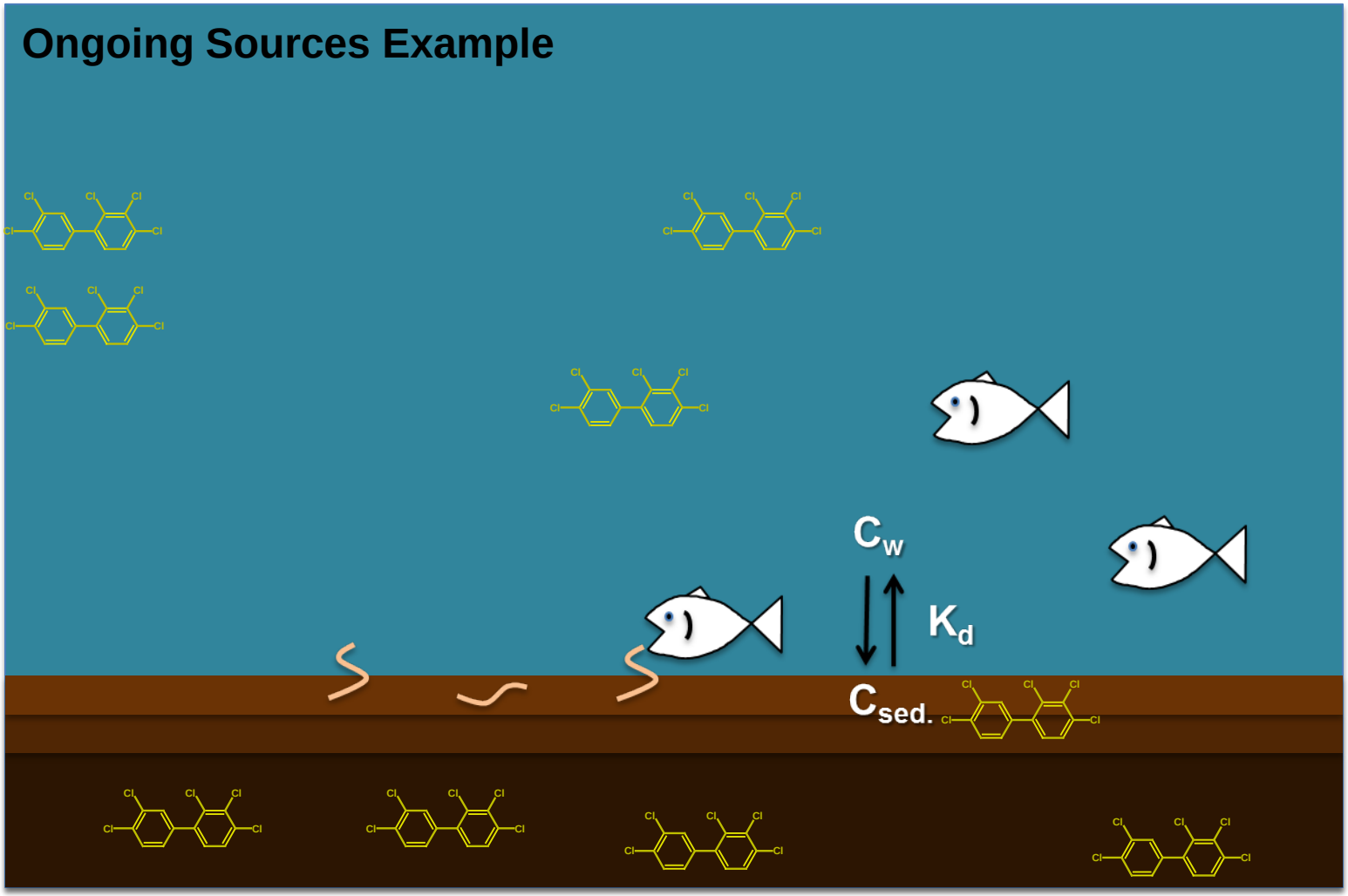
Objectives

1) Provide historical perspective on PCB body burden in fish caught in the Chesapeake Bay watershed
2) Determine whether PCB body burdens in fish decreased over the 16-year sampling period
3) Evaluate the possible impacts to human health through fish consumption from the Chesapeake Bay

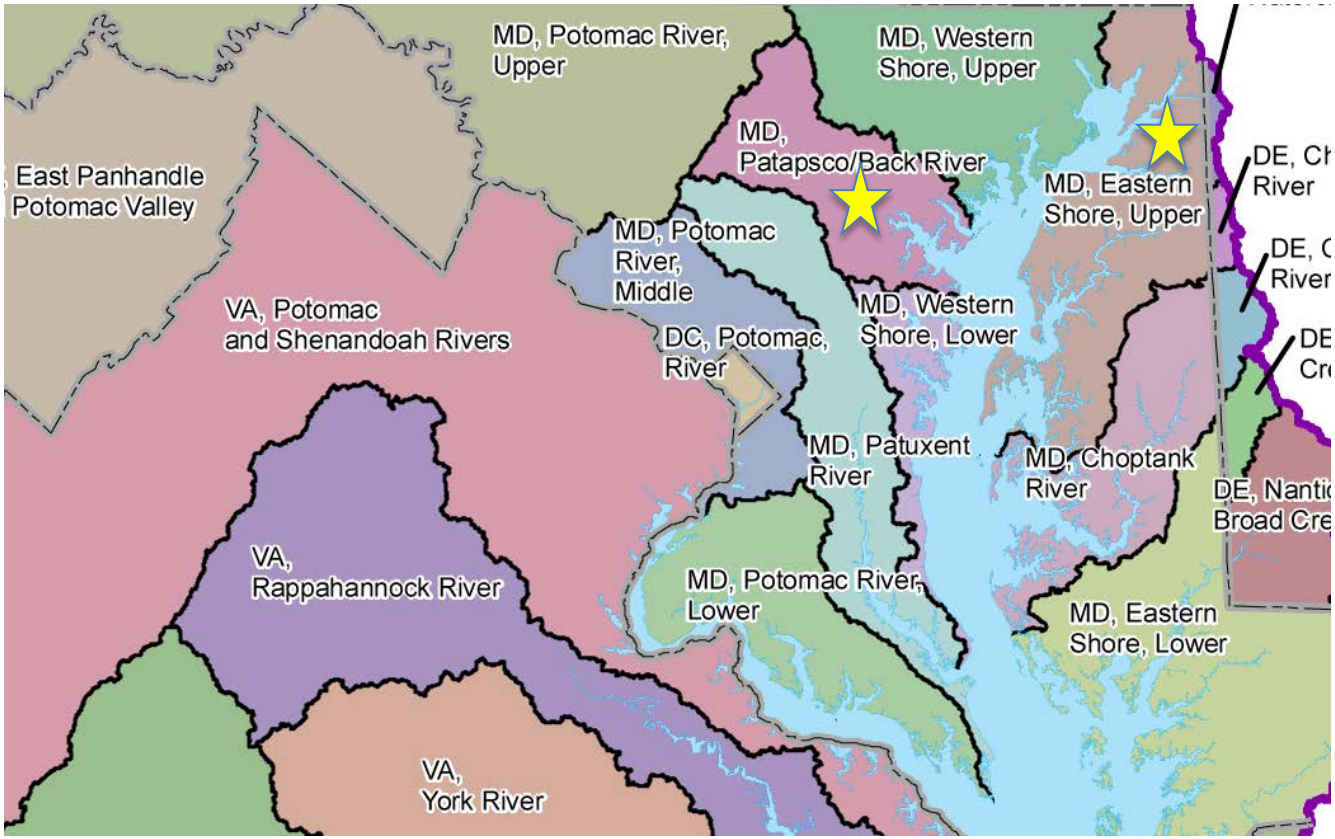
Natural Attenuation vs. Ongoing Sources



Natural Attenuation vs. Ongoing Sources

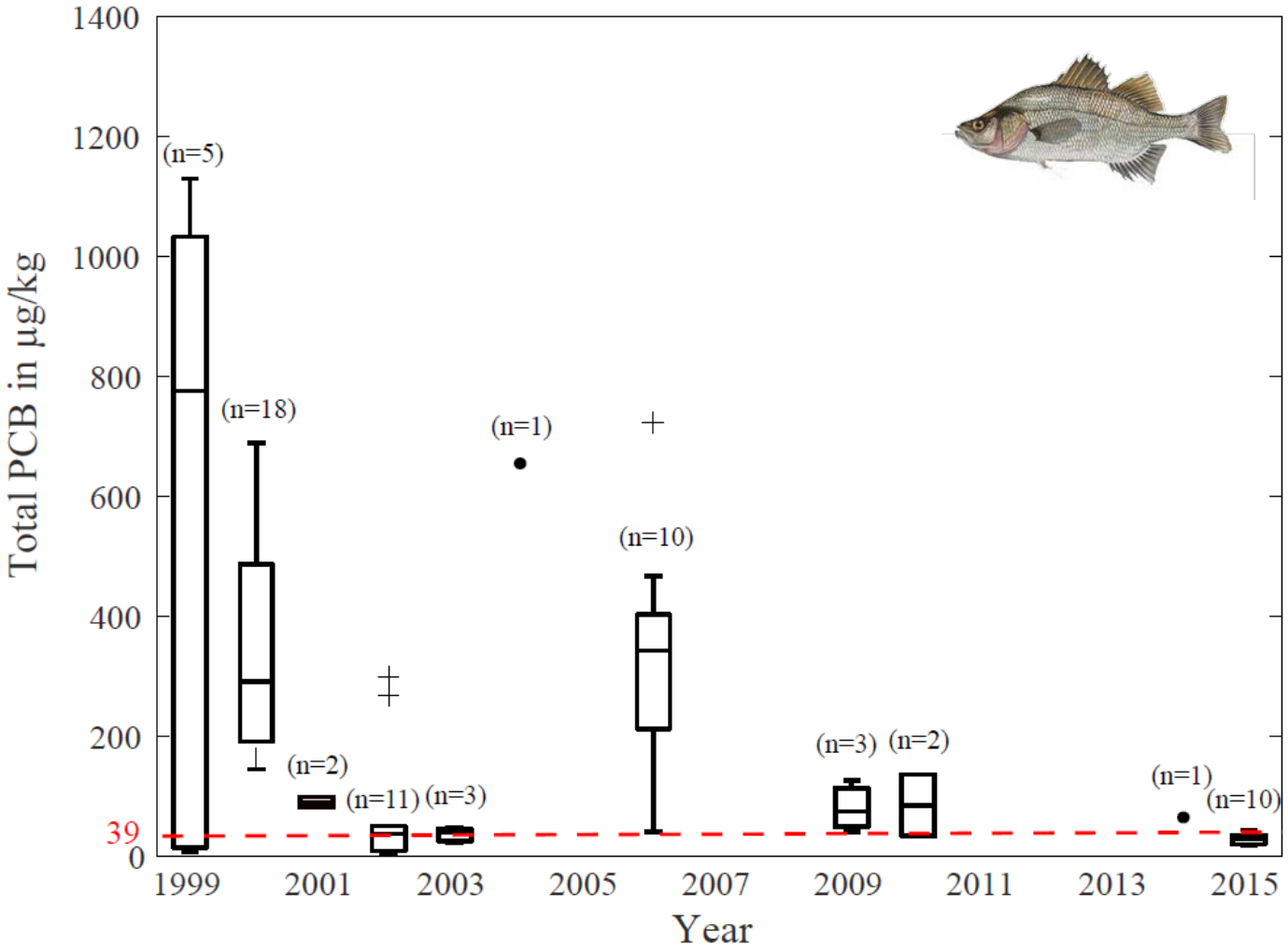


Cheapeake Bay Tributary Basins



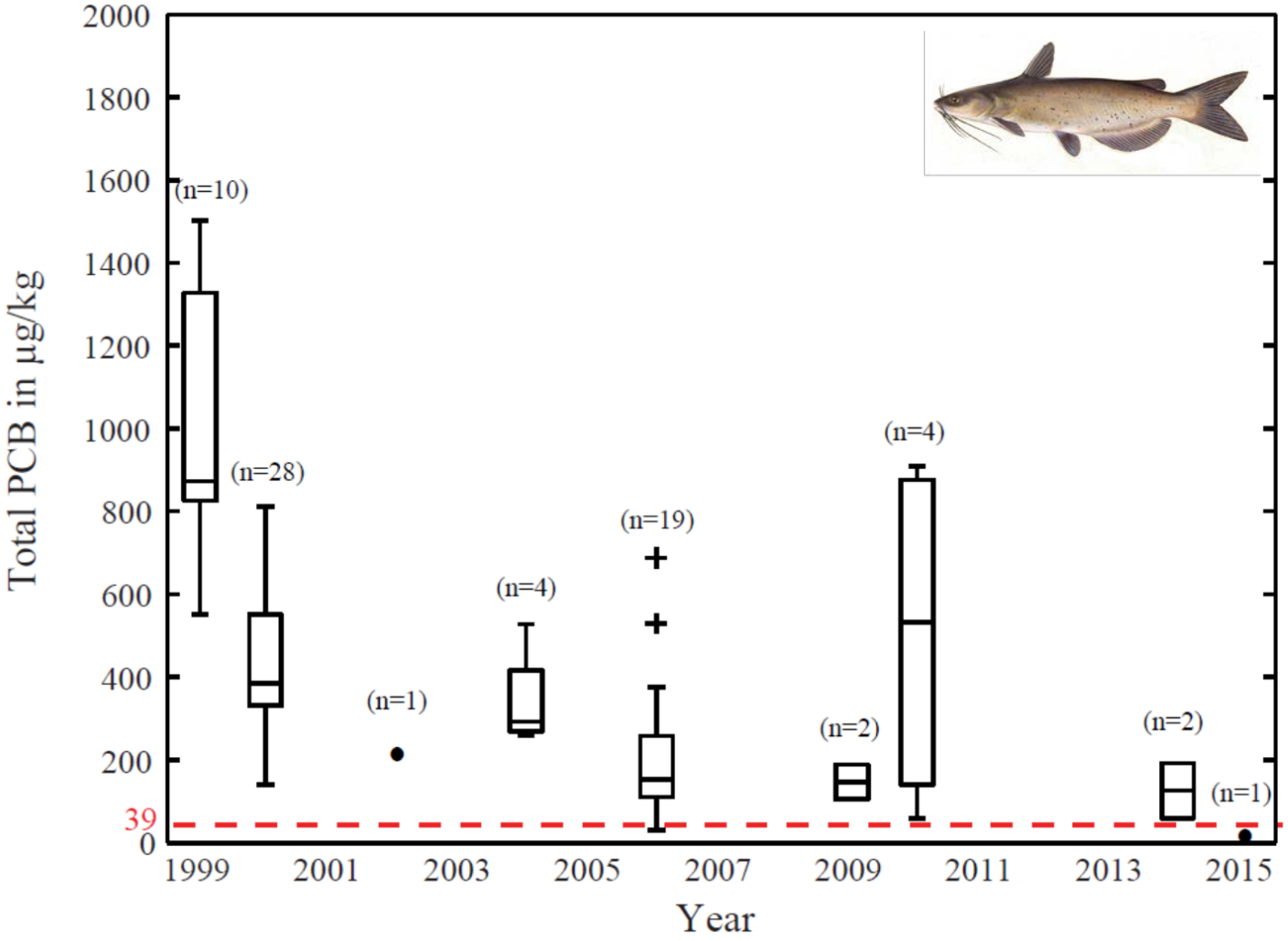
http://www.cbf.org/about-the-bay/maps/sub-watersheds, accessed on 4/13/2017

Eastern Shore Upper White Perch Body Burden



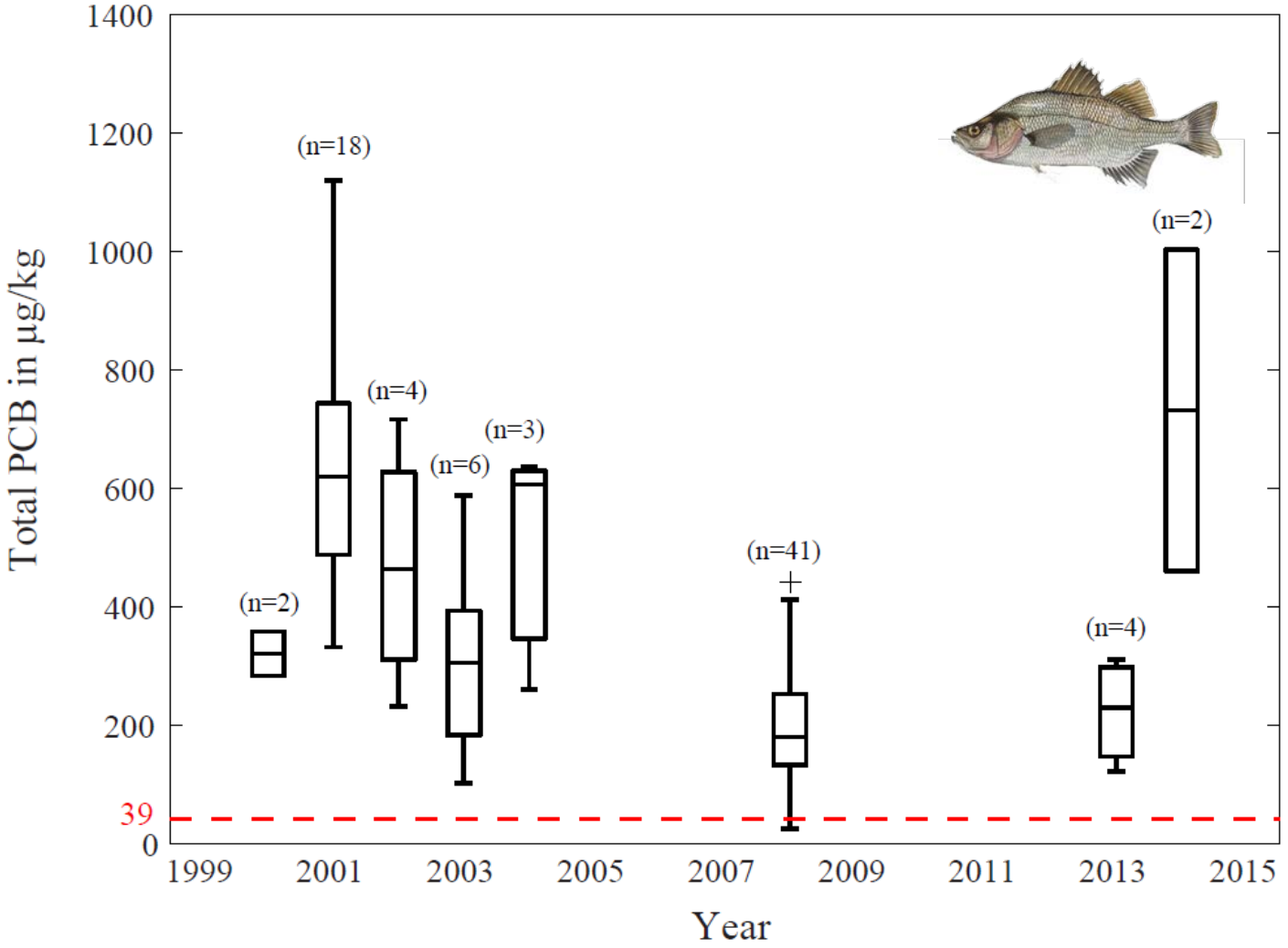
http://dnr2.maryland.gov/Fisheries/Pages/Fish-Facts.aspx?fishname=White%20Perch

Eastern Shore Upper Channel Catfish Body Burden



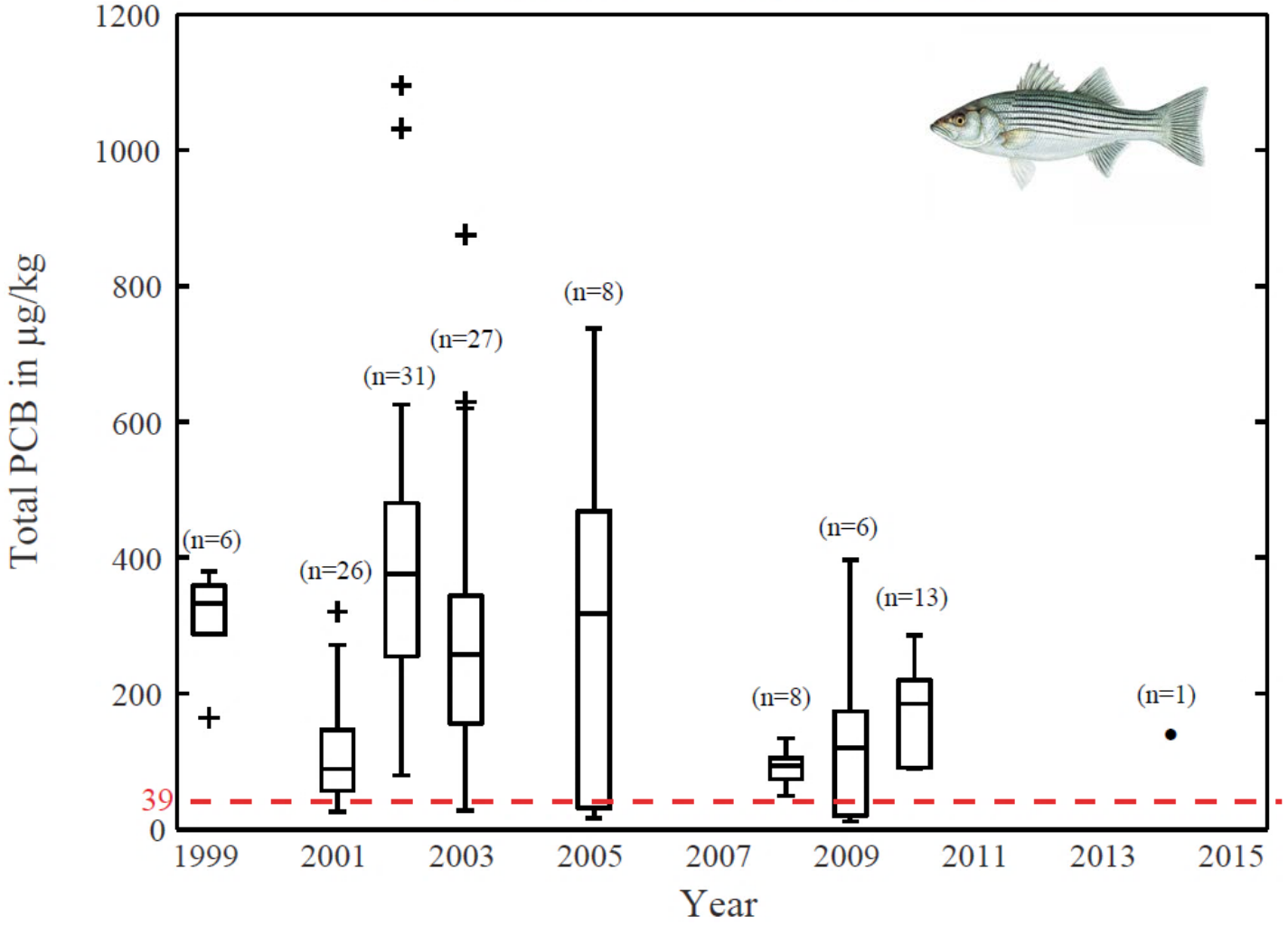
http://www.iowadnr.gov/Fishing/Iowa-Fish-Species/Fish-Details/SpeciesCode/CCF

Patapsco-Back River White Perch Body Burden



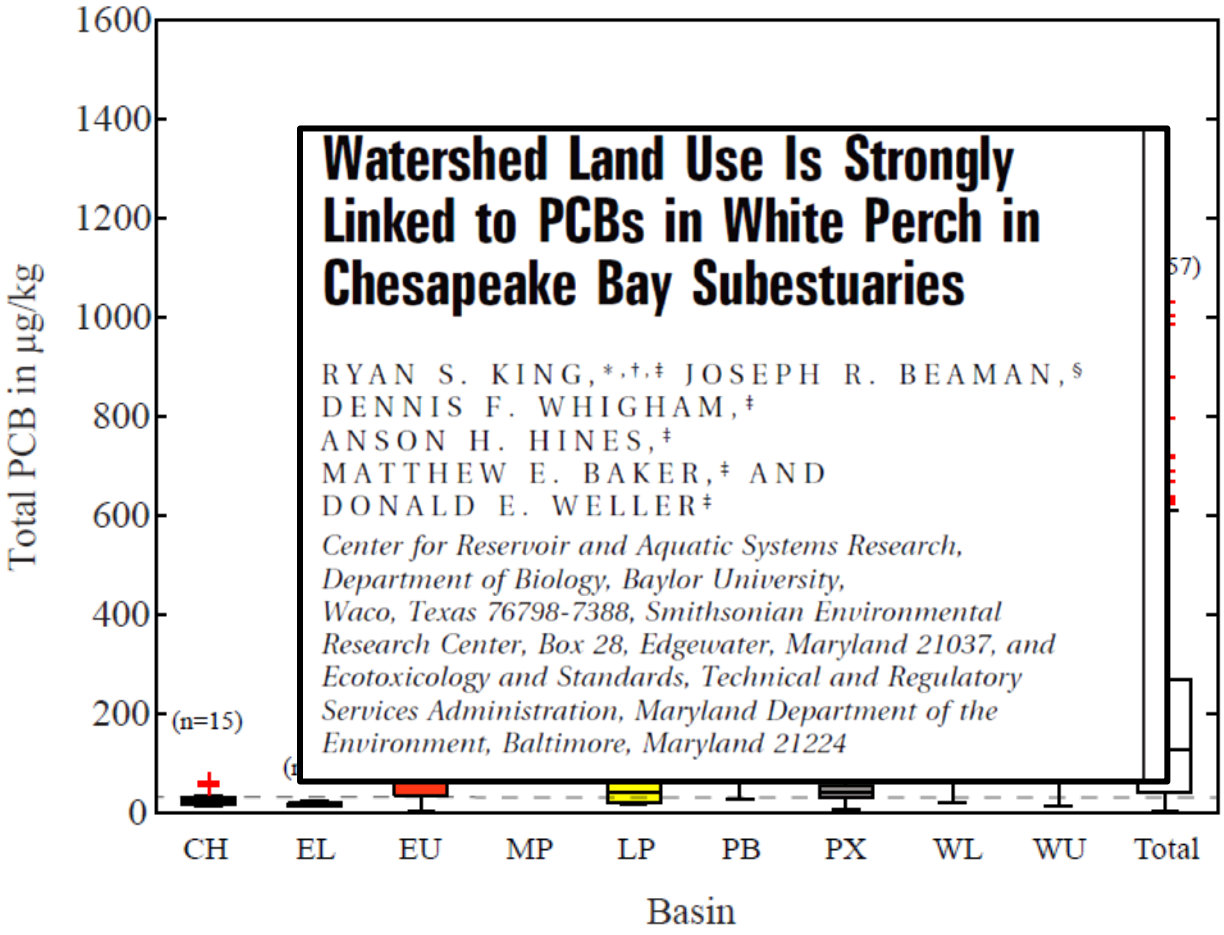
http://dnr2.maryland.gov/Fisheries/Pages/Fish-Facts.aspx?fishname=White%20Perch

Striped Bass Body Burden



https://nature.mdc.mo.gov/discover-nature/field-guide/striped-bass

White Perch by Basin



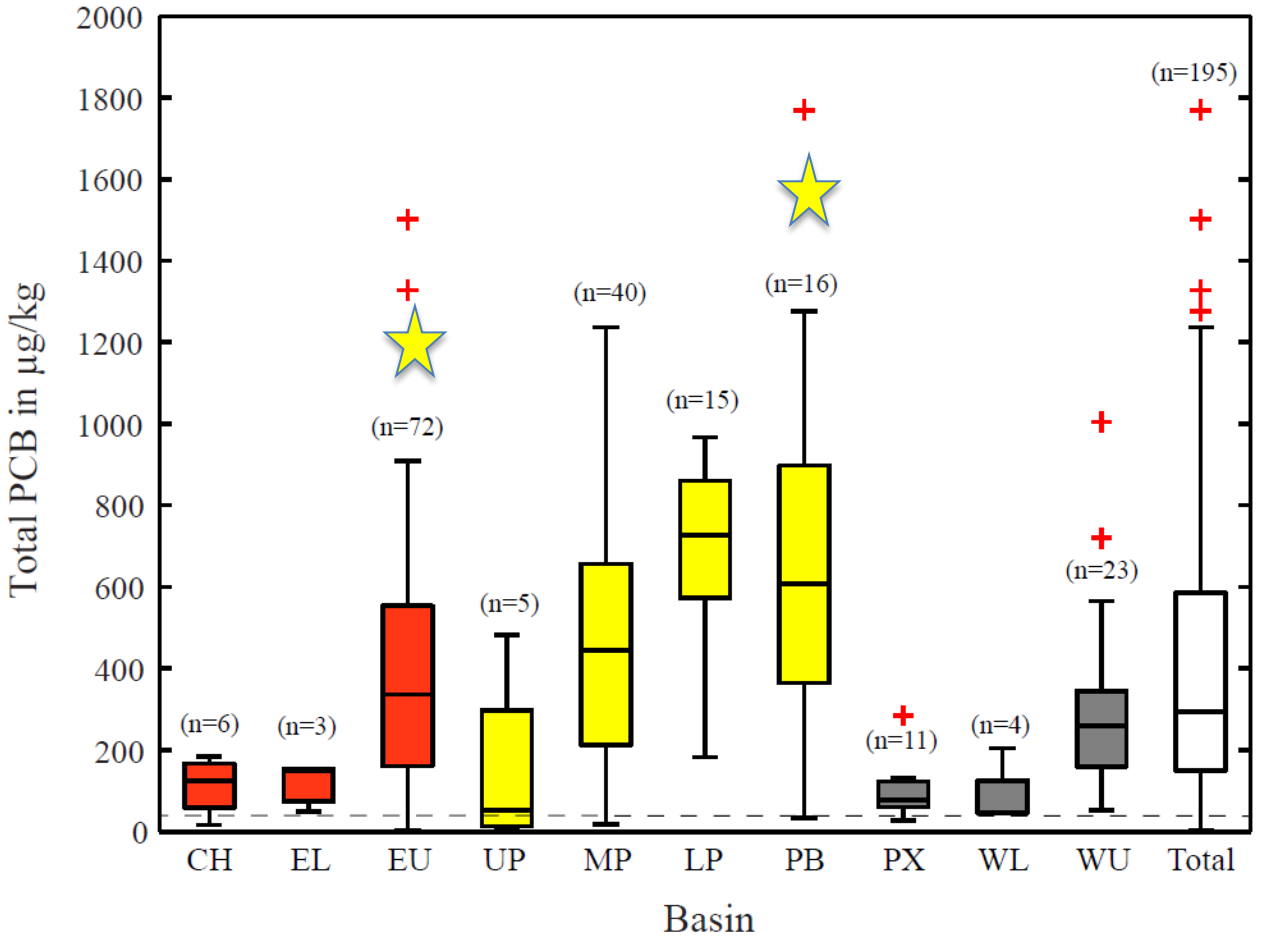
CH-Choptank
EL-Eastern Lower
EU-Eastern Upper
MP-Eastern Potomac
LP-Lower Potomac
PB-Patapsco-Back River
PX-Patuxent River
WL-Western Lower
WU-Western Upper

Red= Rural
Yellow=Urban
Grey= Suburban
White= Total

http://dnr2.maryland.gov/Fisheries/Pages/Fish-Facts.aspx?fishname=White%20Perch

Environ. Sci. Technol. **2004**, *38*, 6546−6552

Channel Catfish by Basin



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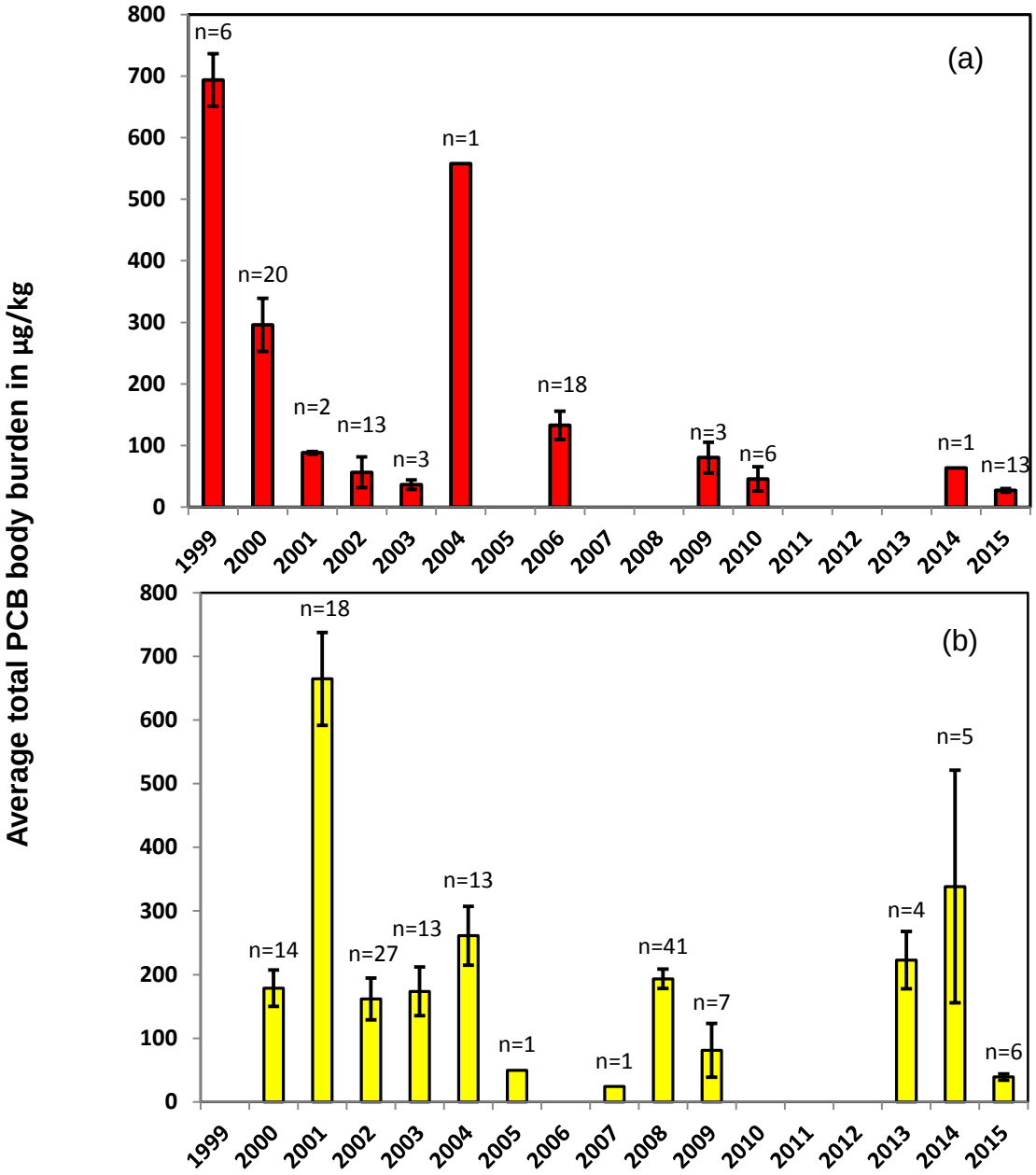
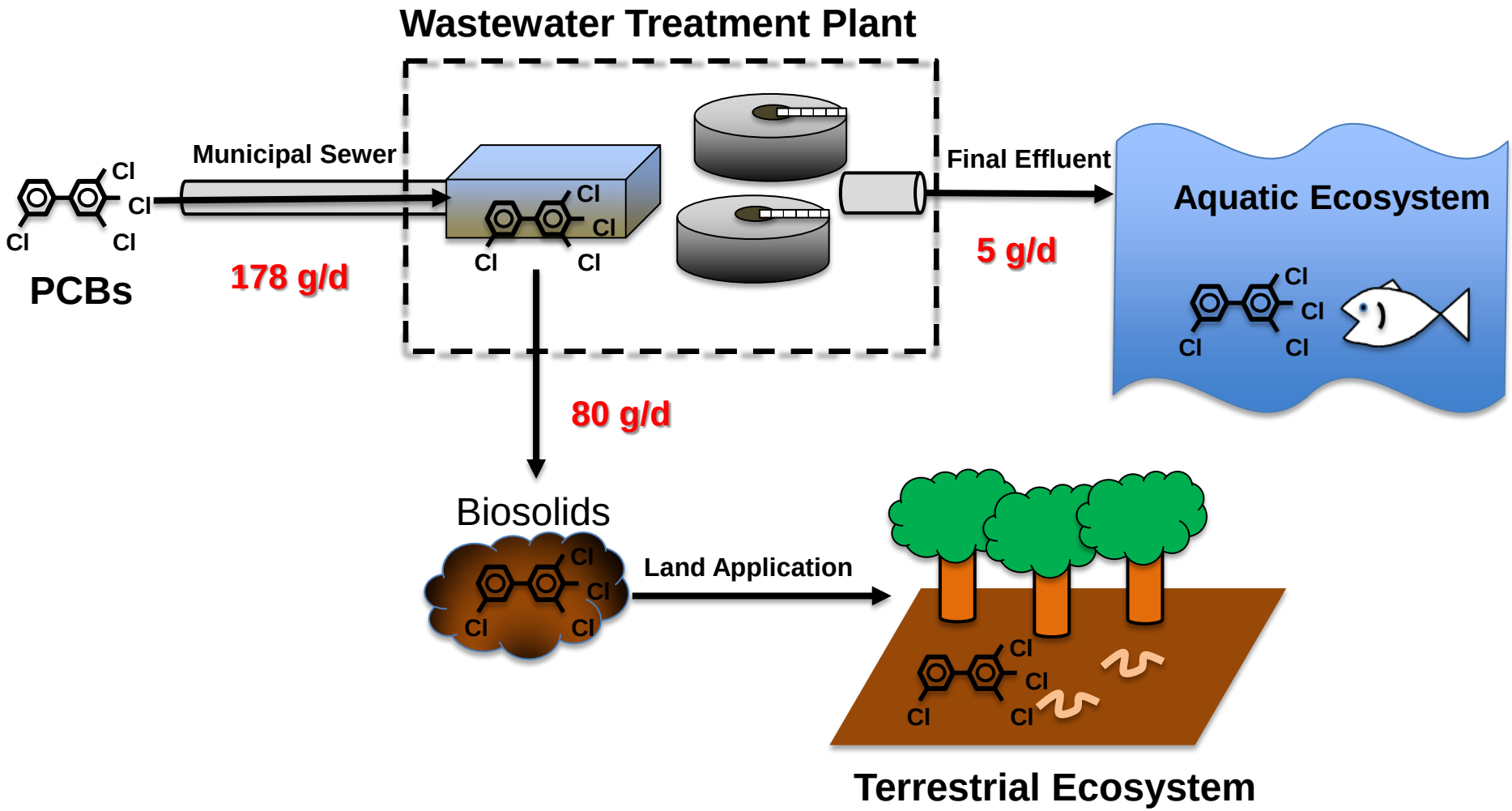


(a) Eastern Shore Average White Perch Body Burden

(b) Western Shore Average White Perch Body Burden

http://dnr2.maryland.gov/Fisheries/Pages/Fish-Facts.aspx?fishname=White%20Perch

Tracking PCB Fate in an Urban WWTP



Influence of Ongoing Sources

Fish Body Burden (µg/kg)

Brown Bullhead

White Perch

http://www.iowadnr.gov/Fishing/Iowa-Fish-Species/Fish-Details/SpeciesCode/CCF
http://dnr2.maryland.gov/Fisheries/Pages/Fish-Facts.aspx?fishname=White%20Perch

Population Cancer Risk per 100,000

	15 year adult exposure		
	1 Meal per month	4 meals per month	2 meals per week
Eastern Shore	0.6	2	5
Western Shore	1.3	5	12

	Average Adult Lifetime Risk		
	1 Meal per month	4 meals per month	2 meals per week
Eastern Shore	2	10	22
Western Shore	4	17	40
Whole Bay	4	15	34

	Average Lifetime Risk		
	1 Meal per month	4 meals per month	2 meals per week
Eastern Shore	12	48	133
Western Shore	22	87	203
Whole Bay	19	74	174

What about crabs?

https://www.facebook.com/pg/oldbay/photos/?ref=page_internal

Conclusion

- Do not see universal decline in PCB body burden in fish sampled from the Chesapeake Bay from 1999-2015.
- Statistically significant decrease in PCB body burden was only observed in the Eastern Upper Basin of the Chesapeake Bay.
- Ongoing sources will continue to be a problem for natural attenuation of PCBs.
- Recreational fishing from the Chesapeake Bay increases individual cancer risk above $1X10^{-5}$.

Acknowledgements

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Questions

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