

# **Hudson River PCBs Superfund Site Fish Data Update**

Community Advisory Group Meeting  
Wednesday, December 4, 2019  
Schuylerville, NY

# Fish Data Update



- Last fish update was included in the five-year review
  - Brief update on 2017 data at the last CAG meeting
- 2017 fish data
  - EPA (spring and fall fish, Aroclor data), as Data Summary Report
  - NYSDEC (fall fish, congener) data (reported in Dec 2018 by NYSDEC)
- 2018 fish analyses, preliminary analyses presented today
  - Delayed due to important long-term quality control improvements – National Institute of Standards and Technology (NIST) Performance Evaluation (PE) standards
  - 2018 Fish Data Summary Report early 2020
- 2019 fish data
  - Includes spring fish (Reaches 1 through 4)
  - Data expected early 2020



# HR Fish Monitoring Species and Stations



- NYS collects additional fish (typically Lower Hudson River, ongoing)
- OM&M work plan is under development (ongoing discussions with NYSDEC and GE)

## Lower Hudson River

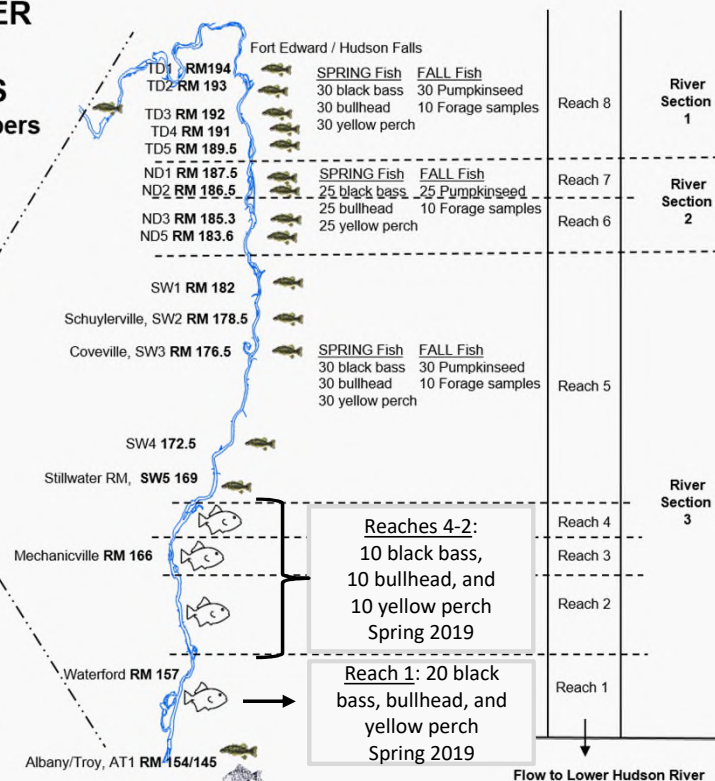


## TYPICAL HUDSON RIVER FISH MONITORING PROGRAM STATIONS With Target Species and Numbers



- Current RAMP Fish Station
- Potential OM&M Fish Monitoring Station
- NYSDEC Fish Monitoring Station

## Upper Hudson River



# Upper Hudson River Fish Collection

## Spring Collection (Fillet):



Largemouth Bass  
(*Micropterus salmoides*)



Smallmouth Bass  
(*Micropterus dolomieu*)

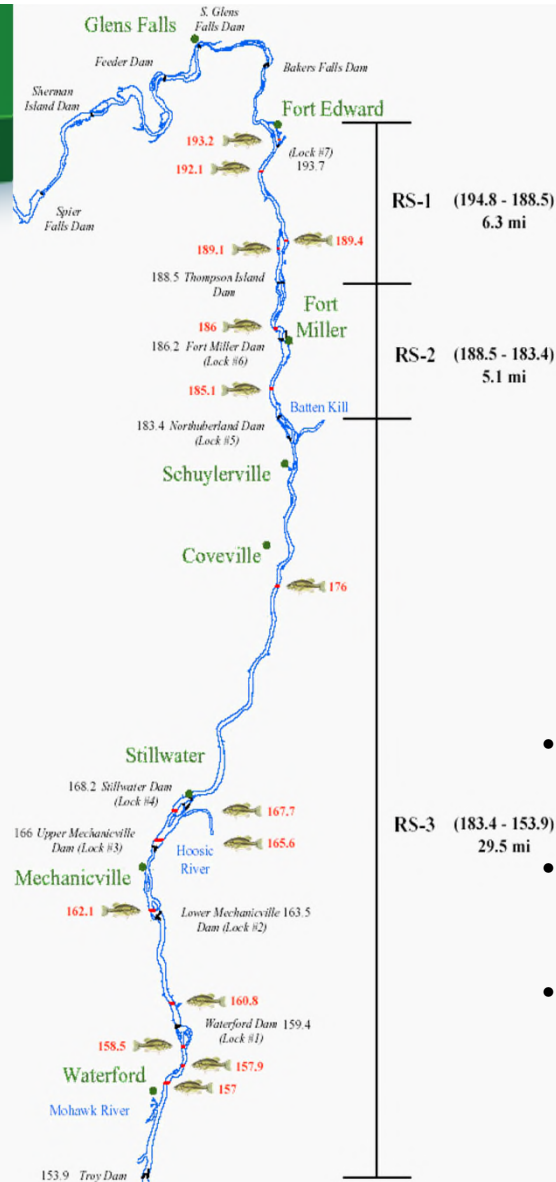


Brown Bullhead  
(*Ictalurus nebulosus*)



Yellow Perch  
(*Perca flavescens*)

- 495 individuals from the 3 species groups collected annually
- In 2019, additional 150 individuals were collected from Reaches 1 through 4 (same species groups)
- Sport fish species represent multiple food web niches and levels, reflect longer-term body burdens



## Fall Collected (Whole Body):



Pumpkinseed  
(*Lepomis gibbosus*)



Spottail Shiner  
(*Notropis hudsonius*)

- 125 individual pumpkinseed and 50 composite forage species samples collected annually
- NYSDEC collected forage fish in 2017 and GE/EPA will also collect these data in fall 2019
- Young of Year "rapid integrator" fish, more likely to reflect recent changes in water column PCB concentrations

# Upper Hudson River Fish Trends: -Wet Weight and Lipid Normalized TPCB-HE data



- Fish analysis considerations:
  - Evaluated as individual species and species weighted average
  - Geographic scale (i.e. station, river reach, river section, entire upper Hudson River)
  - Consistency in Aroclor identification and quantitation - TPCB-HE
  - Wet Weight
    - Used for fish advisories
    - Values associated with ROD metrics
  - Lipid Normalized
    - Accounts for natural variability in lipid concentrations among fish and over time
    - Used for evaluating trends over time



# Upper Hudson River Spring Sport Fish

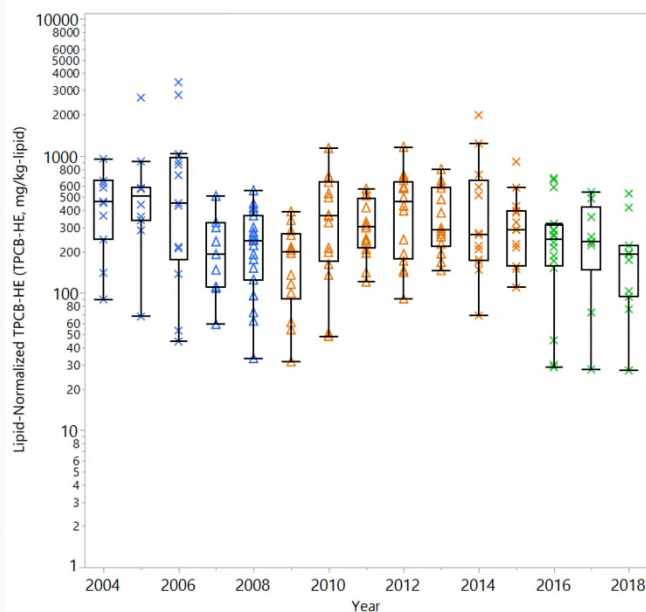
Fish that comprise the species weighted average



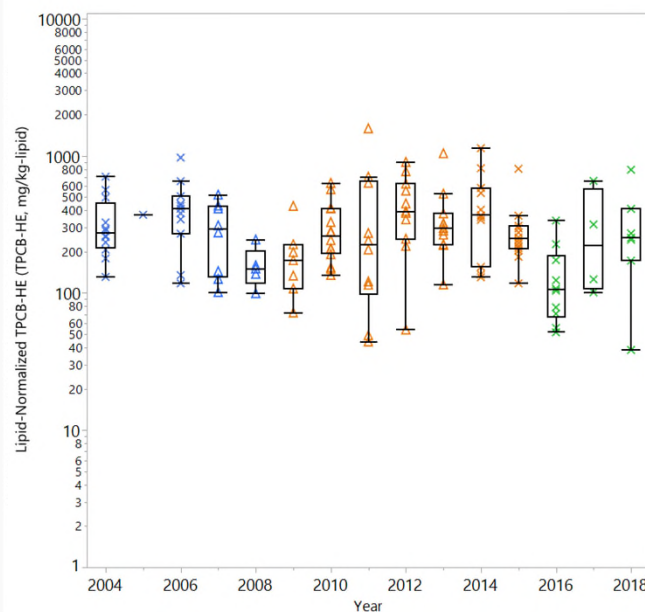
# Upper Hudson Largemouth Bass –Lipid Normalized, LPCB-HE, by River Section



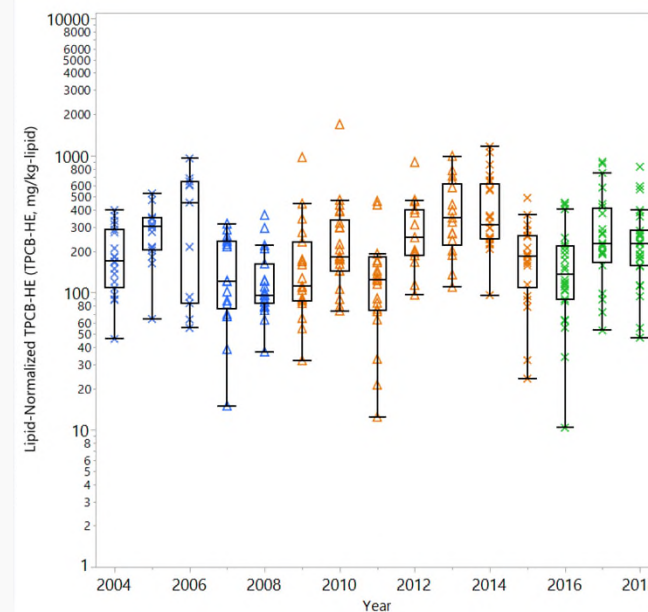
River Section 1



River Section 2



River Section 3

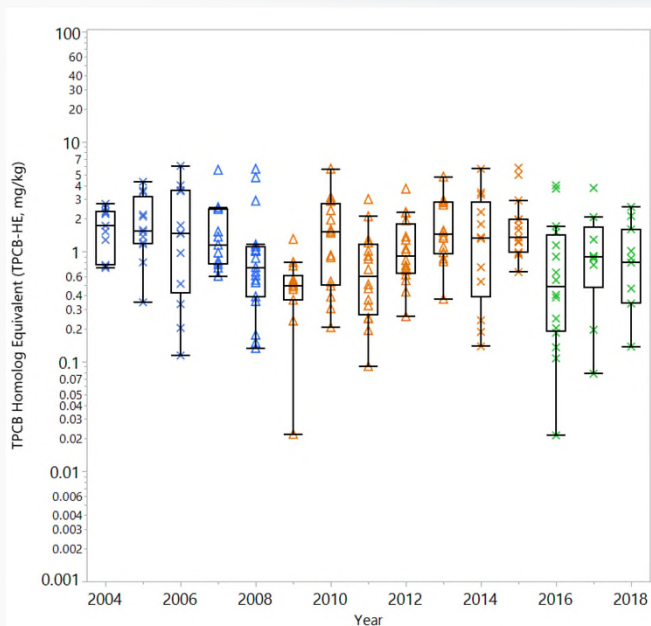


- Before Dredging (2004-2008)
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- After Dredging (2016-2018)
- × Standard Fillet
- Δ Rib-out Fillet

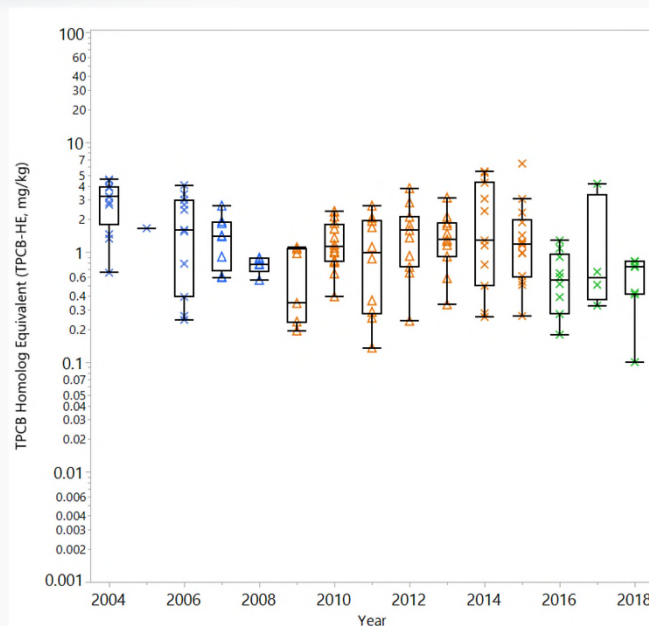
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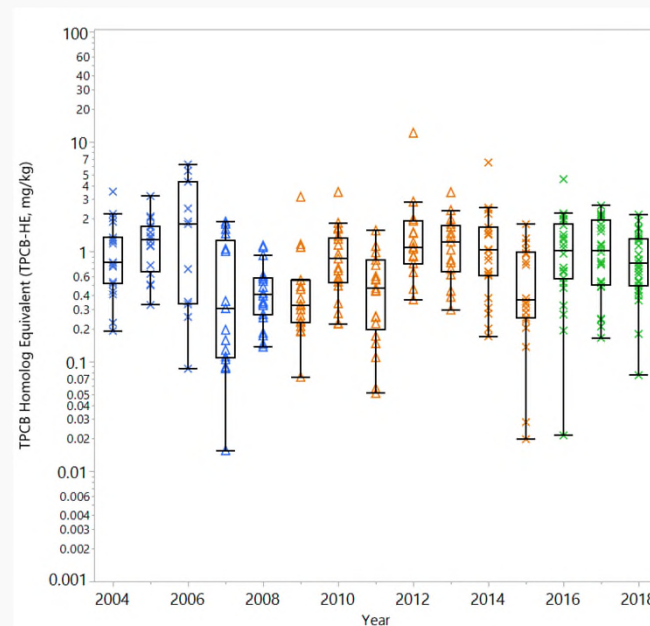
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River Section 2



River Section 3



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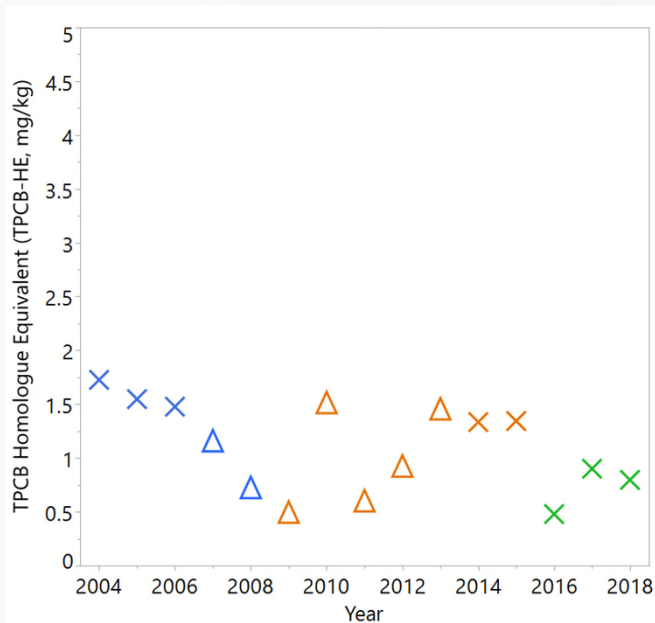


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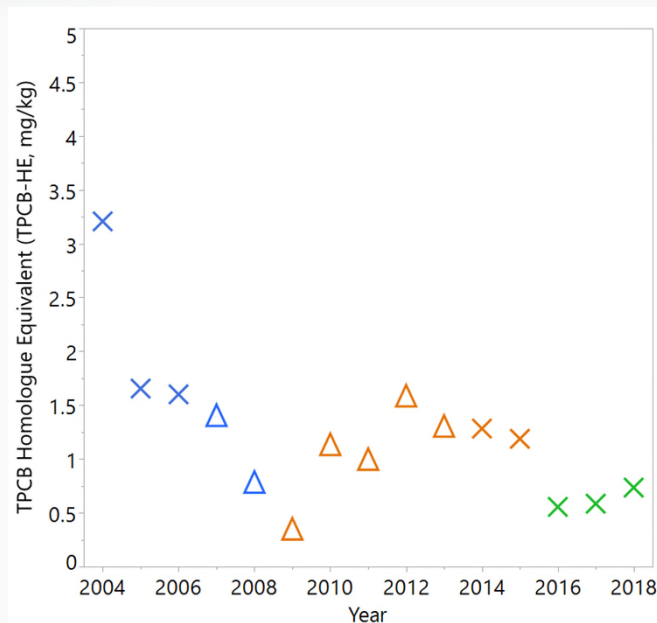
## –Wet Weight, TPCB-HE, Medians by River Section



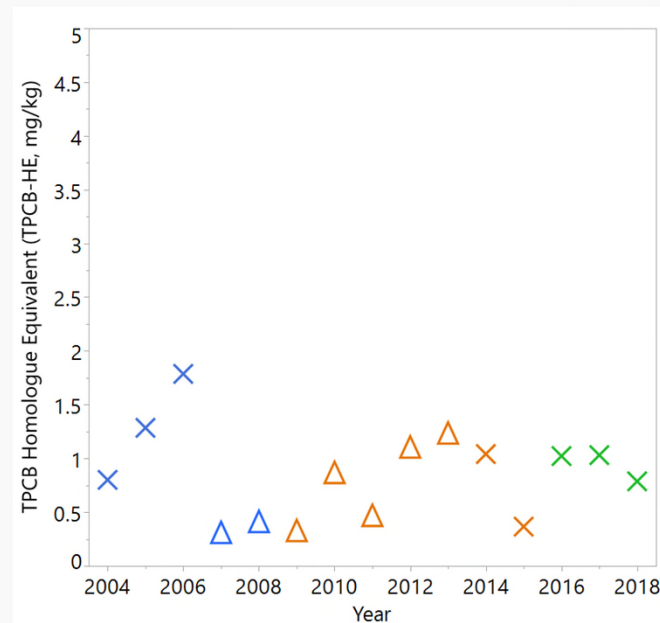
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River Section 2



River Section 3

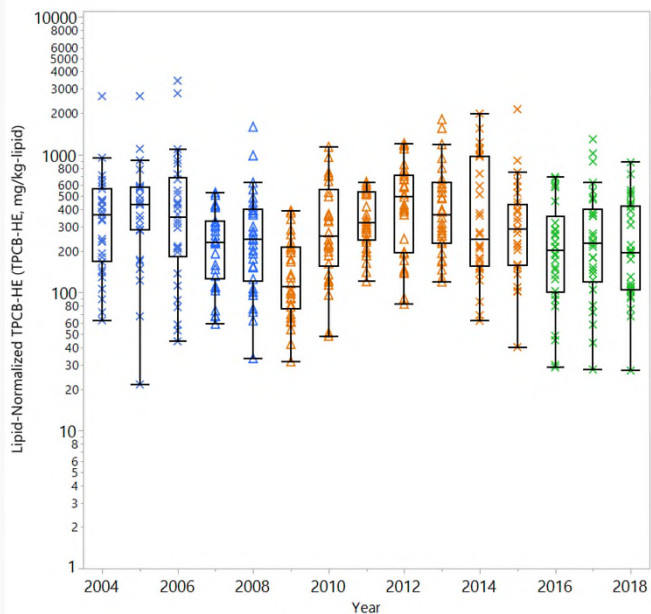


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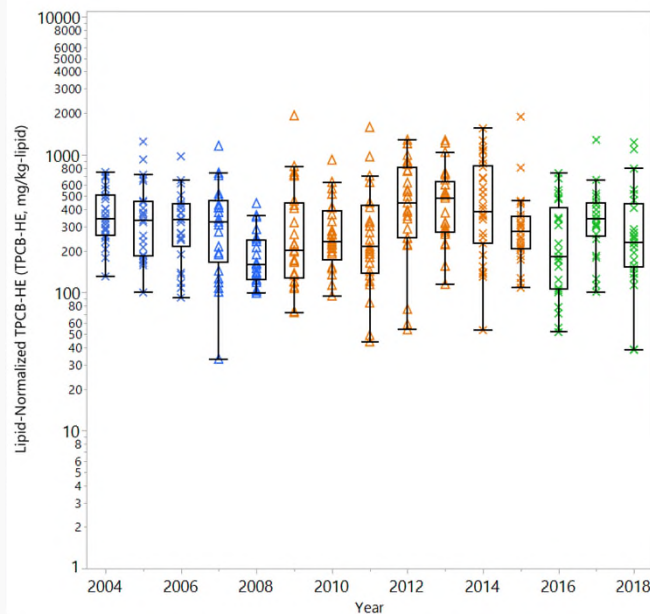
# Upper Hudson Black Bass (Largemouth and Smallmouth) –Lipid Normalized, LPCB-HE, by River Section



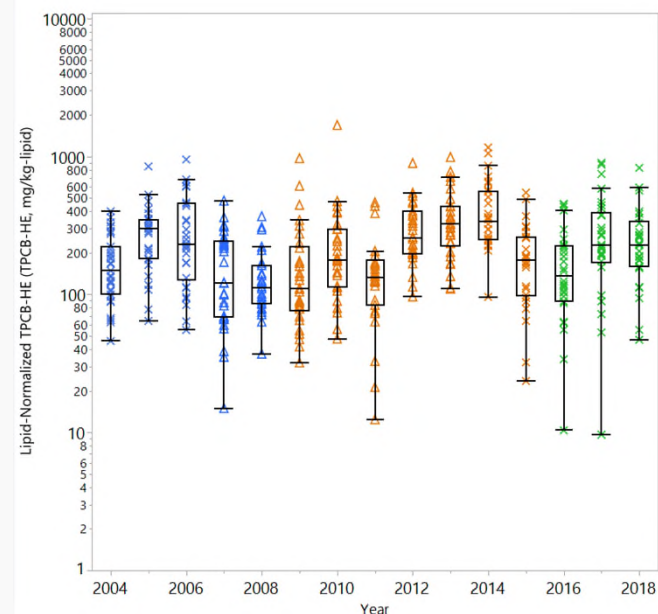
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River Section 2



River Section 3

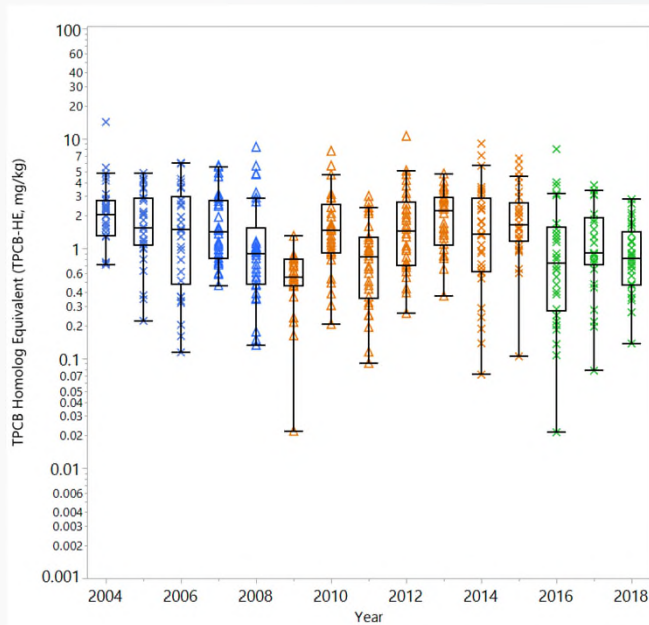


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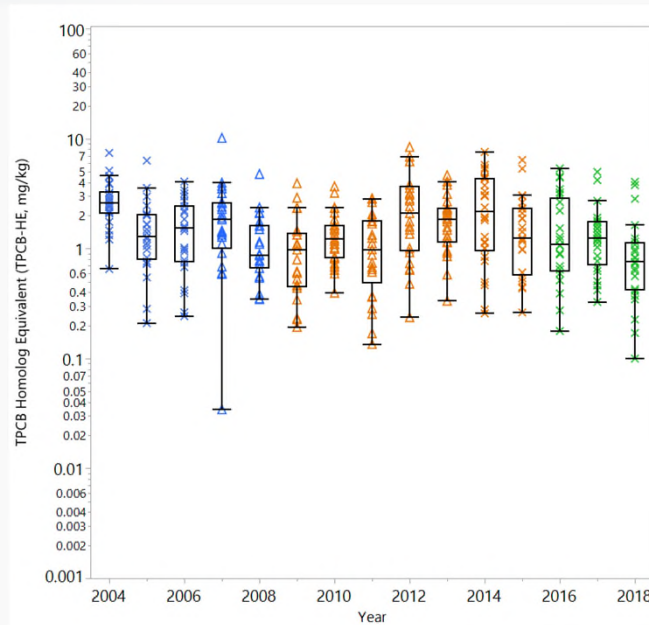
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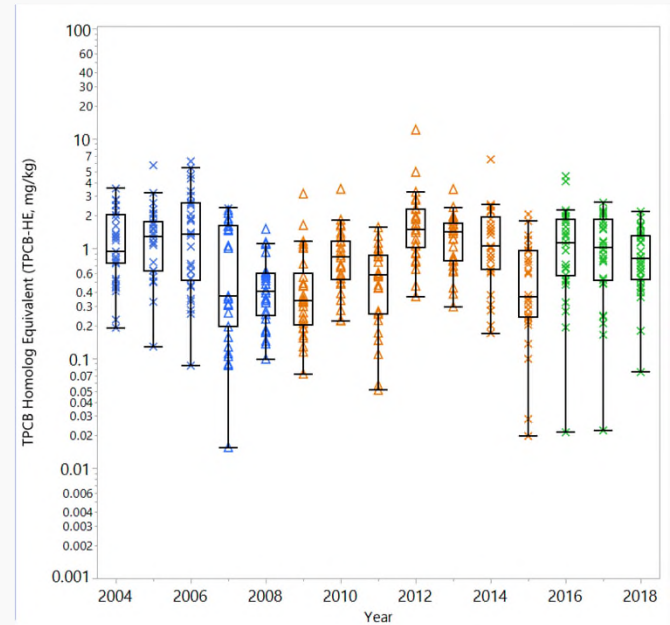
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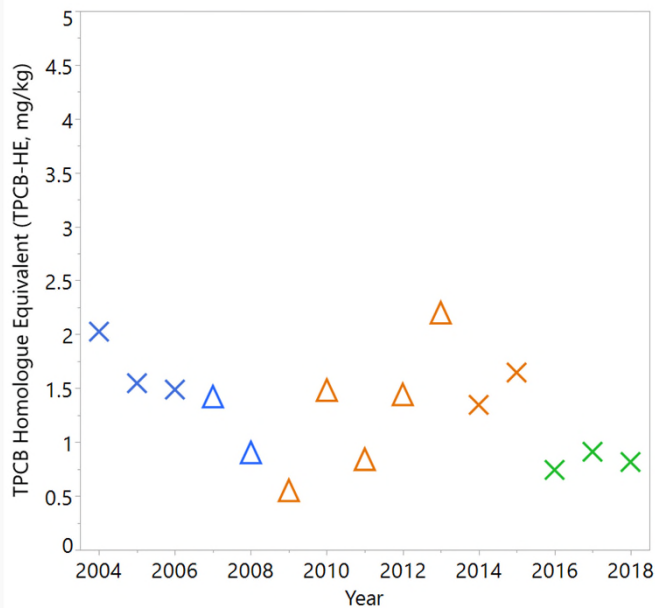


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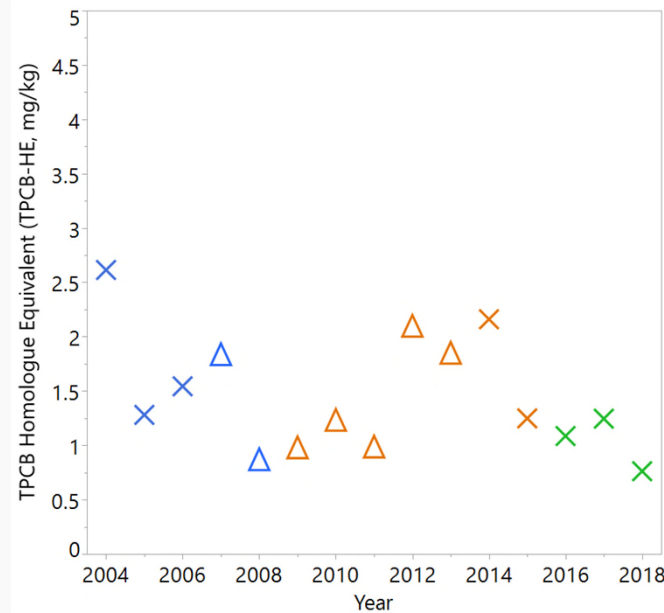
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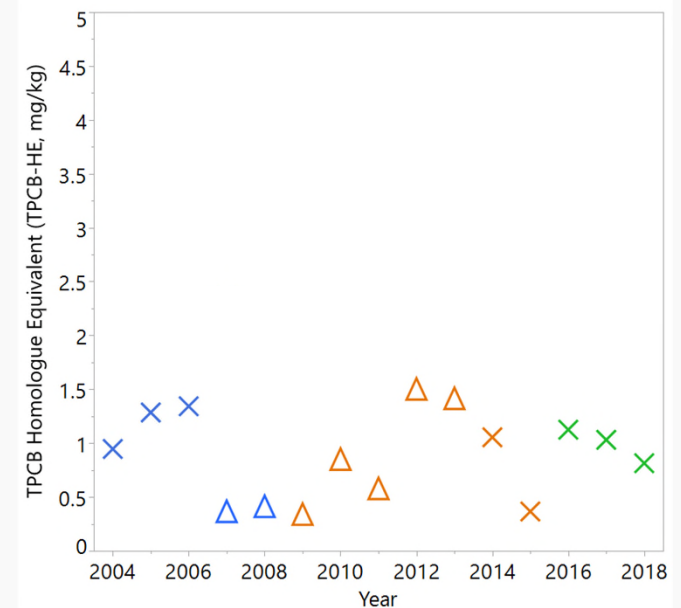
River Section 1



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River Section 3

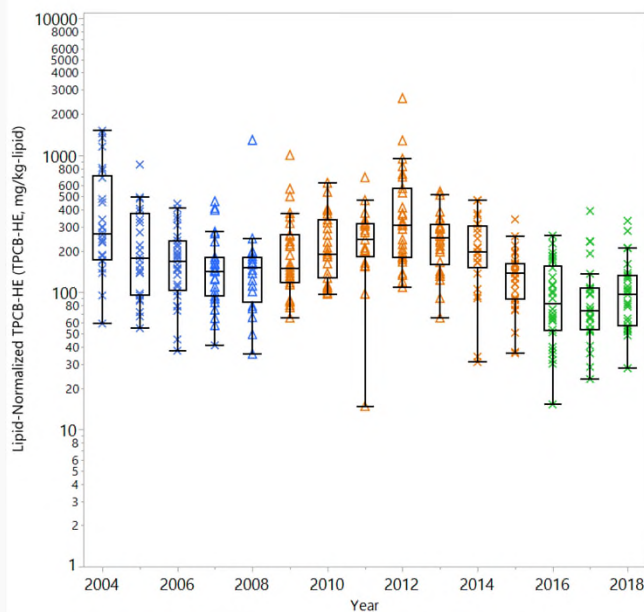


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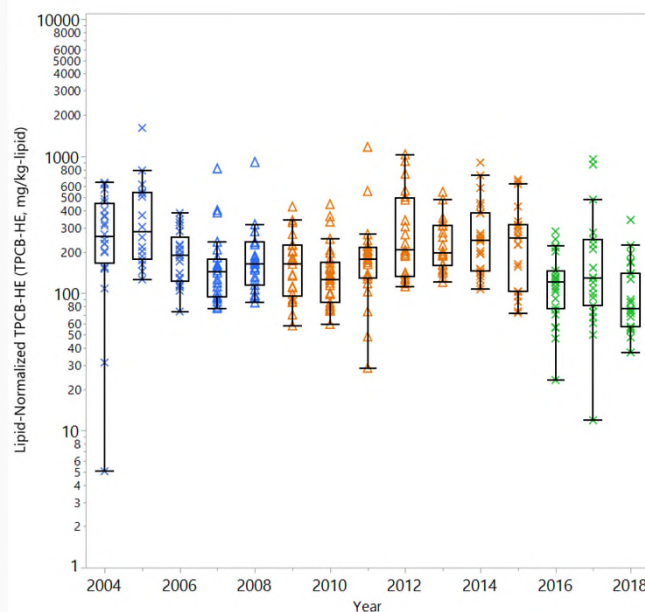
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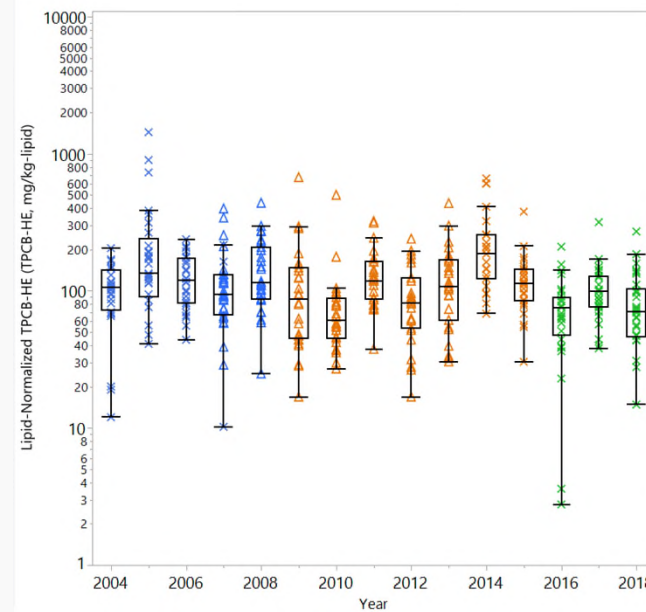
River Section 1



River Section 2



River Section 3



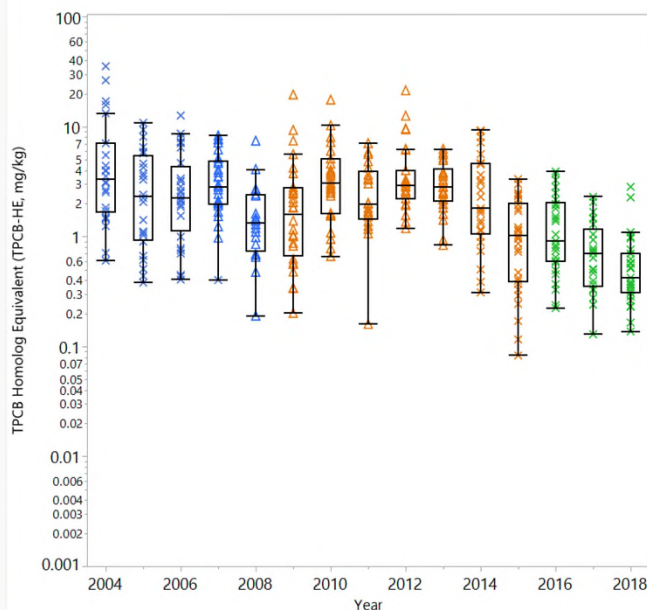
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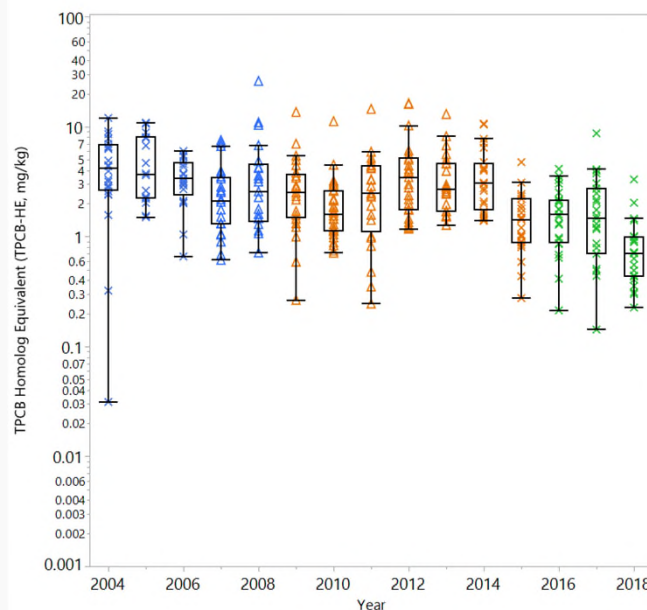
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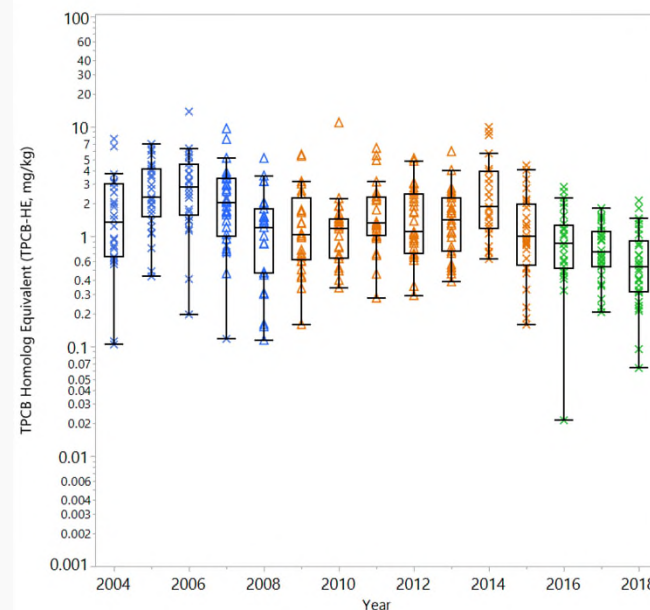
River Section 1



River Section 2



River Section 3



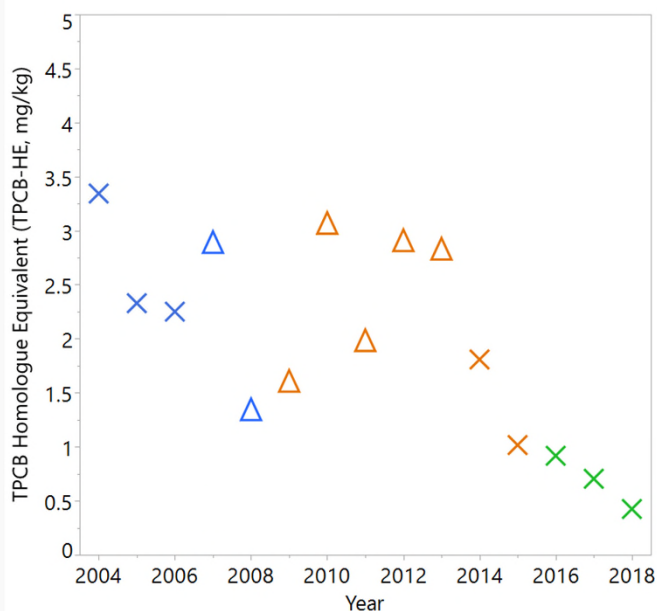
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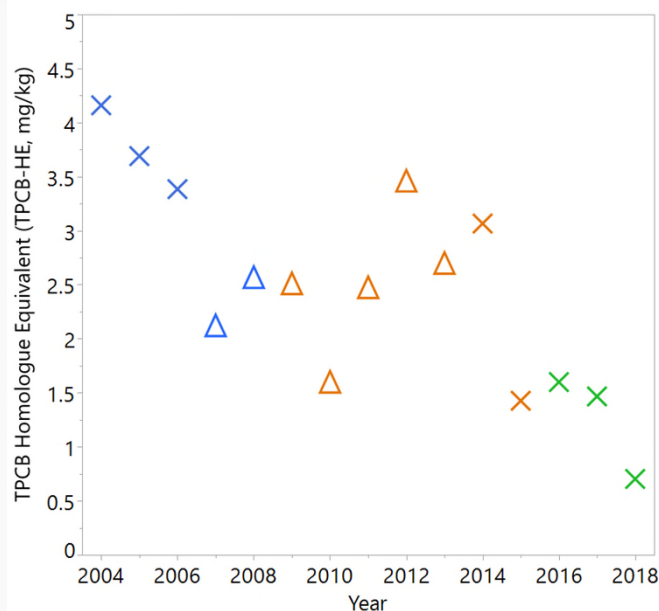
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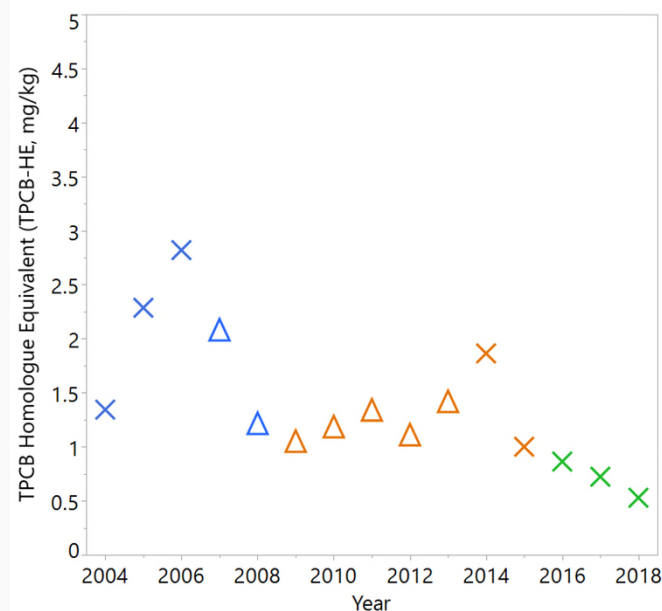
River Section 1



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River Section 3

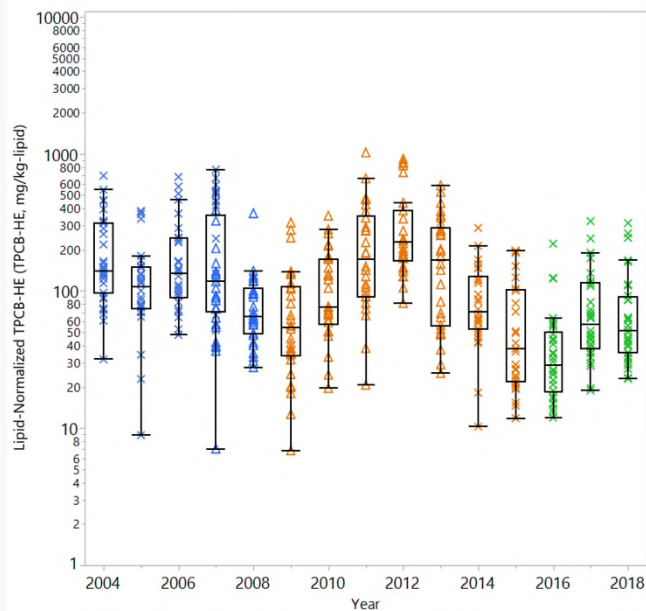


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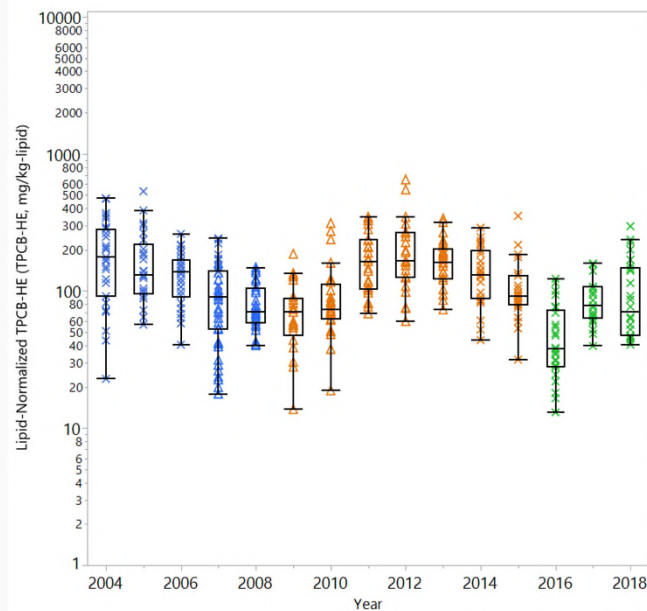
# Upper Hudson Yellow Perch –Lipid Normalized, LPCB-HE, by River Section



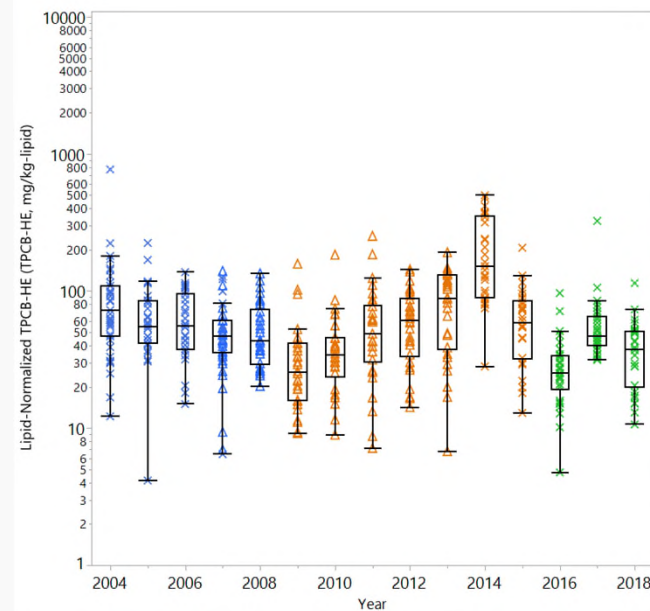
River Section 1



River Section 2



River Section 3

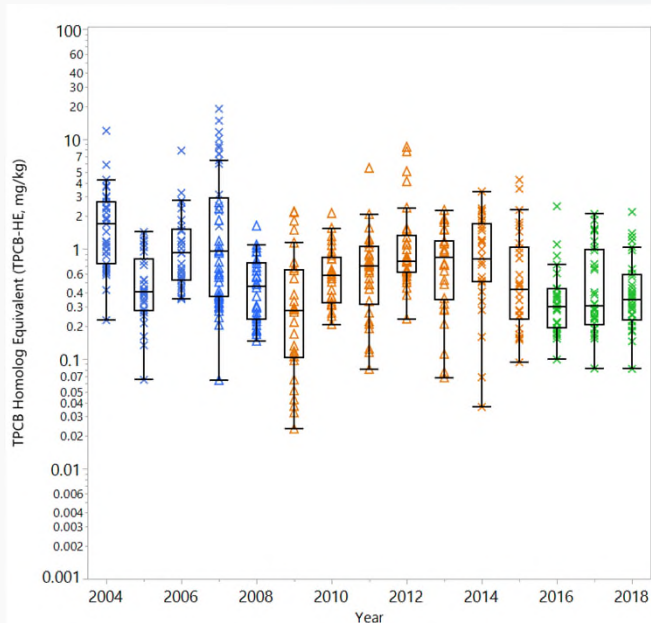


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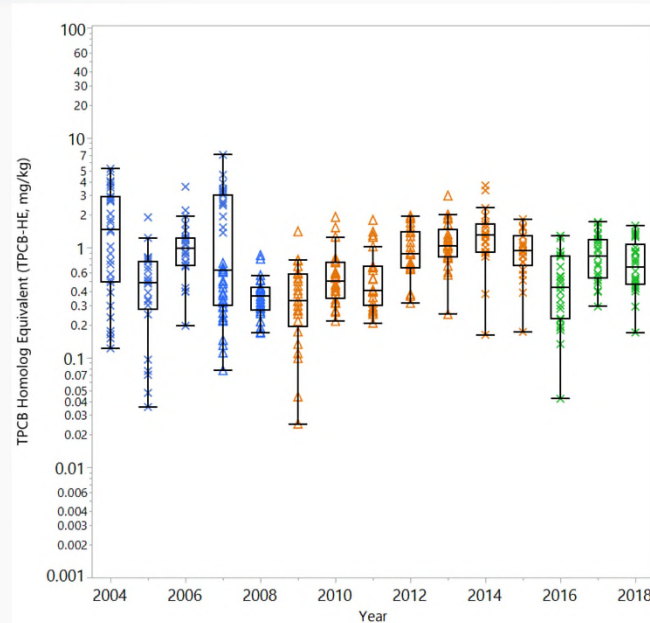
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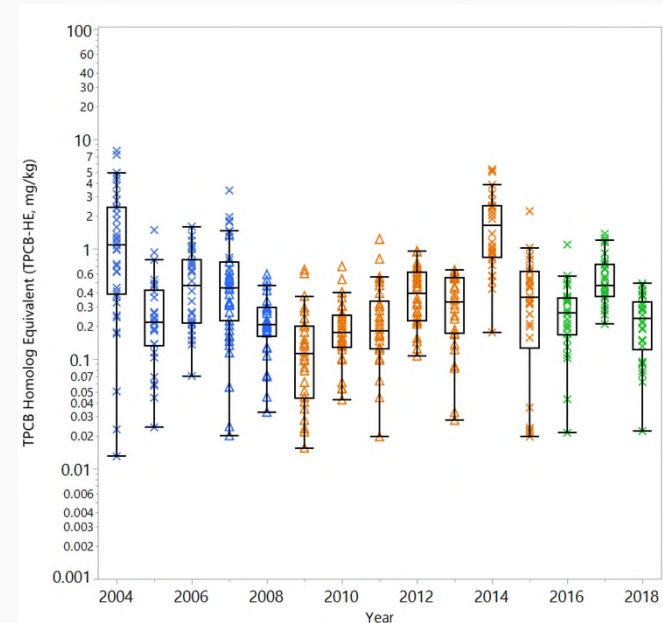
River Section 1



River Section 2



River Section 3



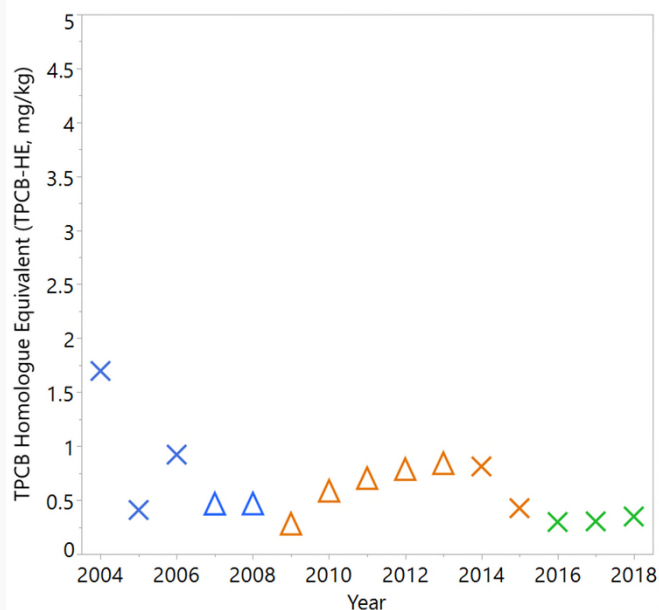
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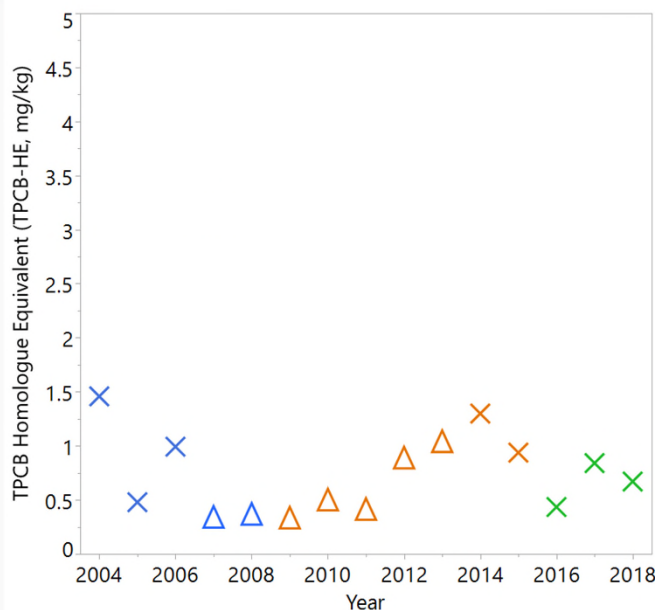
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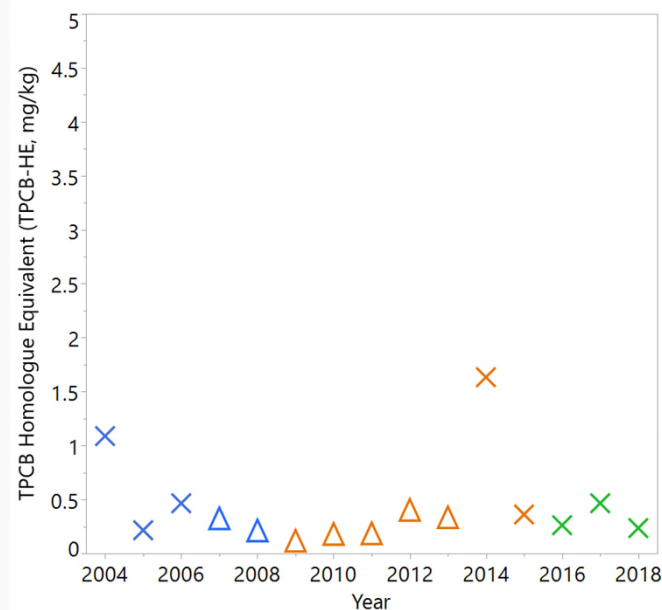
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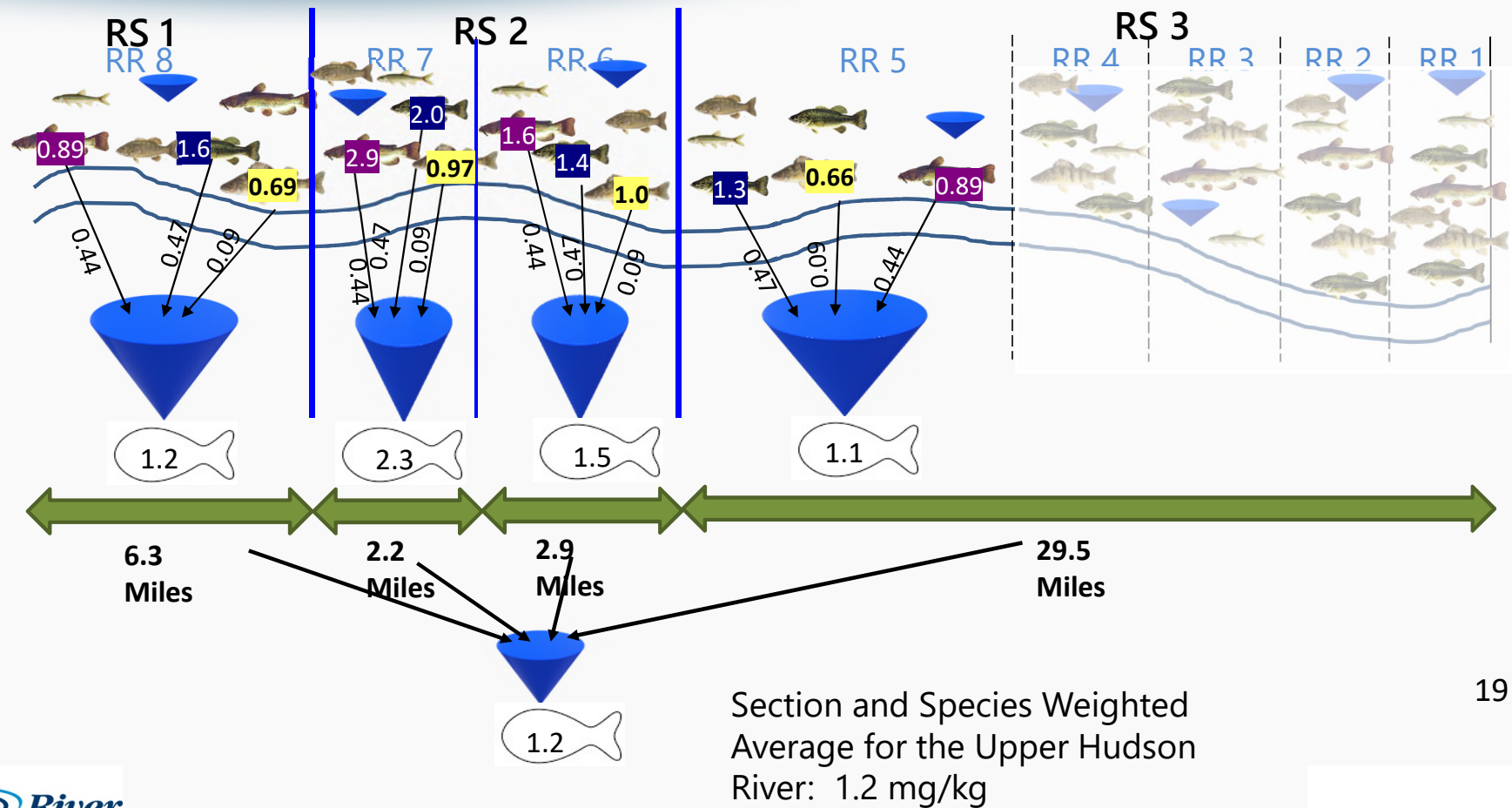
River Section 3



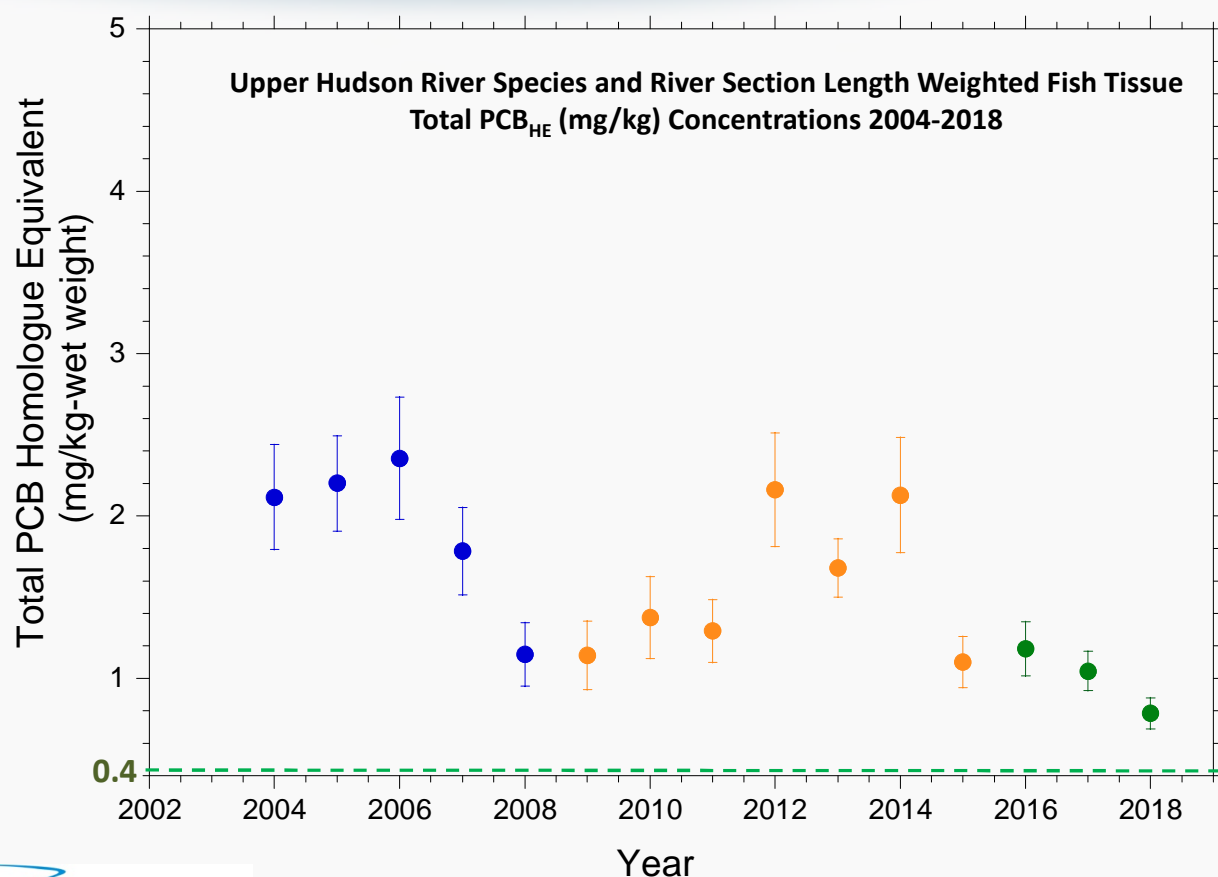
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# Upper Hudson Species-Weighted Average Calculation

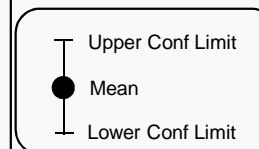


# Upper Hudson River Species and River Section Length Weighted Average



## Legend

- Before Dredging (2004-2008)
- During Dredging (2009-2015)
- After Dredging (2016-2018)



## Notes

1. River Section fish tissue PCB concentrations are weighted by species. Black bass = 47%, bullhead = 44%, yellow perch = 9%.
2. Upper Hudson River average is weighted by both species and river reach length. River Section 1: = 6.3 miles (15.4%); River Section 2= 5.1 miles (12.5%); and River Section 3= 29.5 miles (72.1%). There are not currently fish sampling locations in river reaches 4-1(of River Section 3). Reach 5/River Section 3 is weighted to reflect all 29.5 miles of River Section 3, while the fish monitoring stations representing River Section 3 are all located in Reach 5, which is 14 miles long.
3. Fish data were not available for Reach 7 of River Section 2 in 2008.
4. Dredging was not performed in 2010 so that a planned peer-review of the project could be convened for the purpose of refining the selected remedy.
5. The Confidence Interval is equal to the mean plus or minus 2 Standard Errors on the mean

# TPCB-HE Species-Weighted Average over Time



## Hudson River Fish Species and Length Weighted Averages as Total PCB<sub>HE</sub> (wet weight, mg/kg) 2004-2018

Monitoring Period	Year	Upper River Average		River Section 1		River Section 2		River Section 3	
		River Sections 1-3 Mean	Confidence Interval	River Section 1 Mean	Confidence Interval	River Section 2 Mean	Confidence Interval	River Section 3 Mean	Confidence Interval
Baseline (Pre-Dredge) Monitoring Period (BMP)	2004	2.1	1.8-2.4	4.3	2.9-5.7	3.4	2.8-4.0	1.4	1.1-1.7
	2005	2.2	1.9-2.5	2.3	1.8-2.8	3.5	2.4-4.5	2.0	1.6-2.3
	2006	2.4	2.0-2.7	2.5	2.0-3.1	2.4	2.1-2.8	2.3	1.8-2.8
	2007	1.8	1.5-2.1	2.5	2.0-2.9	2.2	1.7-2.7	1.6	1.2-1.9
	2008	1.1	1.0-1.3	1.5	1.1-1.9	2.5	1.6-3.5	0.8	0.6-1.0
Dredging (2009, 2011-2015) Remedial Action Monitoring Program (RAMP)	2009	1.1	0.9-1.4	1.5	0.9-2.1	1.9	1.4-2.4	0.9	0.7-1.2
	2010	1.4	1.1-1.6	2.6	2.0-3.3	1.6	1.3-1.9	1.1	0.7-1.4
	2011	1.3	1.1-1.5	1.5	1.2-1.9	2.0	1.4-2.5	1.1	0.9-1.4
	2012	2.2	1.8-2.5	3.0	2.2-3.7	3.3	2.5-4.1	1.8	1.4-2.2
	2013	1.7	1.5-1.9	2.4	2.1-2.7	2.6	2.1-3.1	1.4	1.1-1.6
	2014	2.1	1.8-2.5	2.3	1.7-2.8	3.0	2.5-3.6	1.9	1.5-2.4
	2015	1.1	0.9-1.3	1.7	1.3-2.0	1.6	1.2-1.9	0.9	0.7-1.1
OM&M Monitoring (on-going)	2016	1.2	1.0-1.3	1.3	0.9-1.6	1.6	1.3-1.9	1.1	0.9-1.3
	2017	1.0	0.9-1.2	1.0	0.8-1.3	1.6	1.2-2.0	0.9	0.8-1.1
	2018	0.8	0.7-0.9	0.8	0.7-1.0	0.9	0.7-1.1	0.8	0.6-0.9

### Notes:

1. Reach and River Section fish tissue PCB concentrations are weighted by species. Black bass = 47%, bullhead = 44%, yellow perch = 9%.
2. Upper Hudson River average is weighted by both species and river reach length. Reach 8: = 6.3 miles (15.4%); Reach 7 = 2.2 miles (5.4%); Reach 6 = 2.9 miles (7.1%); and Reach 5 = 29.5 miles (72.1%). There are not currently fish sampling locations in river reaches 4-1. Reach 5/River Section 3 is weighted to reflect all 29.5 miles of River Section 3, while the fish monitoring stations representing River Section 3 are all located in Reach 5, which is 14 miles long.
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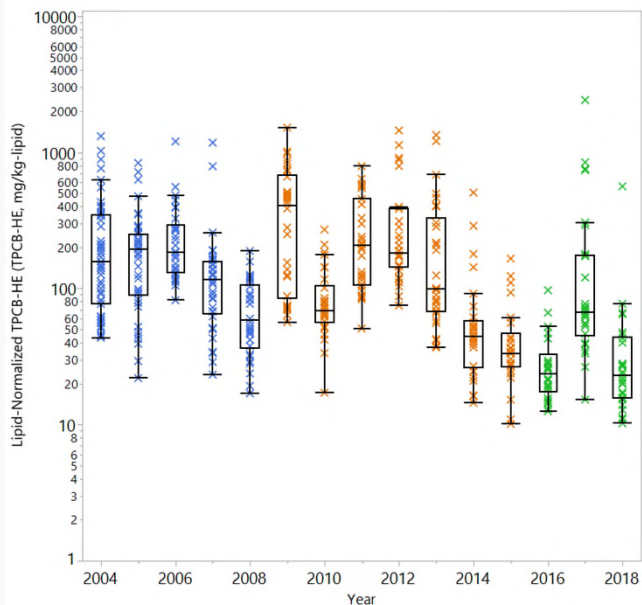
# Upper Hudson River Fall Pumpkinseed

Rapid integrator species

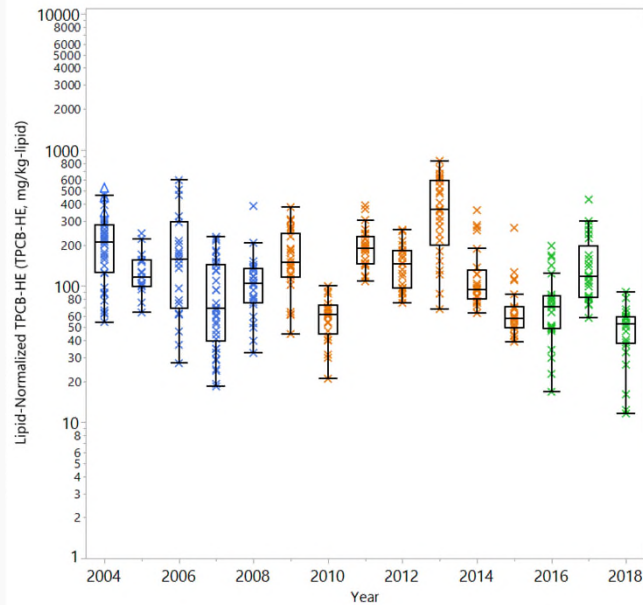
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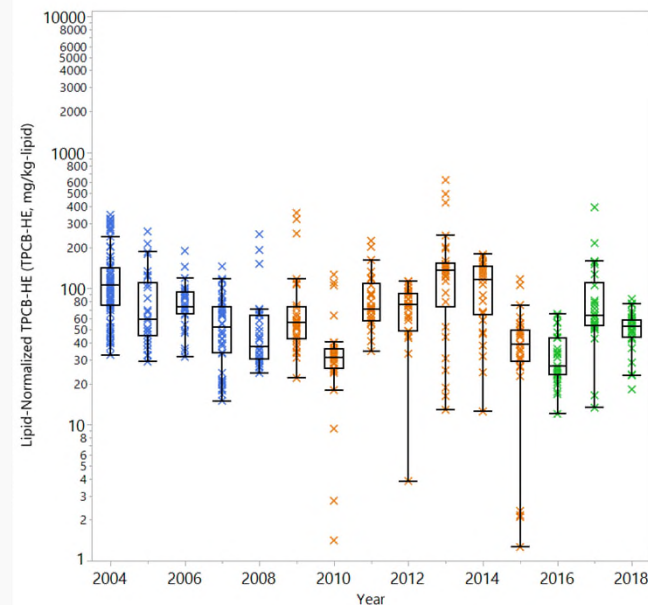
River Section 1



River Section 2



River Section 3



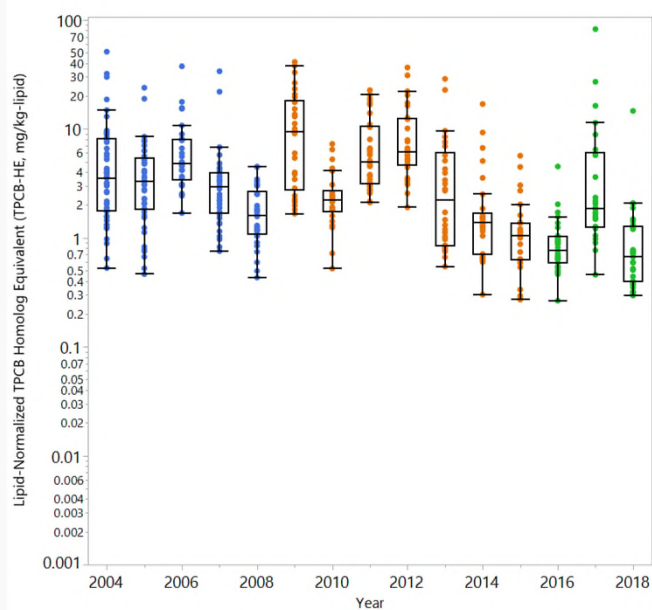
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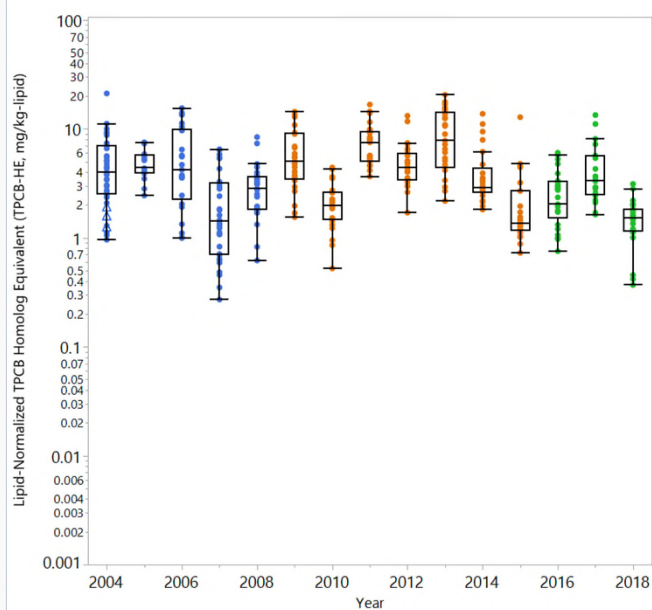
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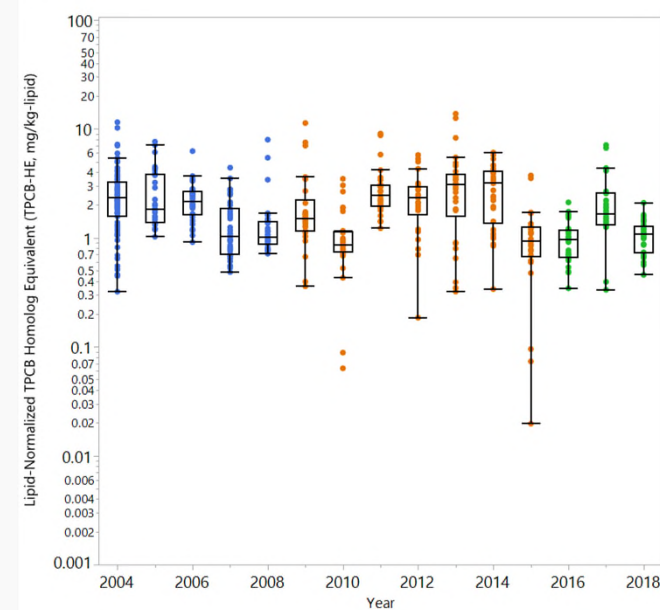
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River Section 3

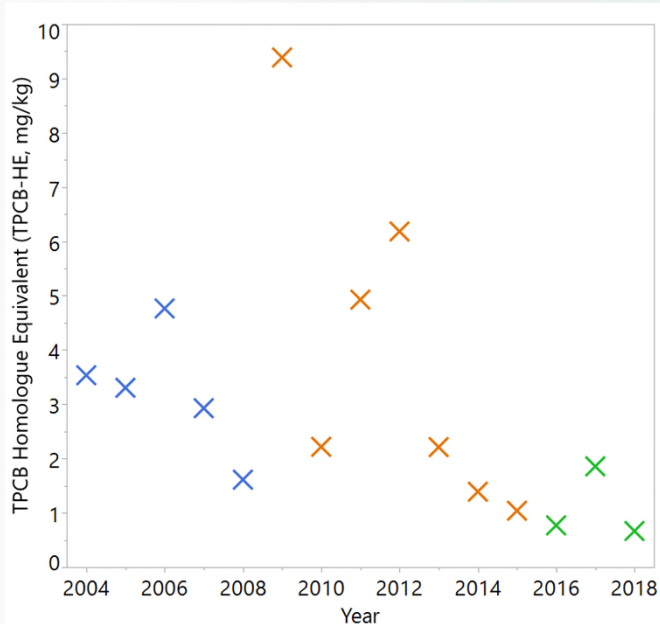


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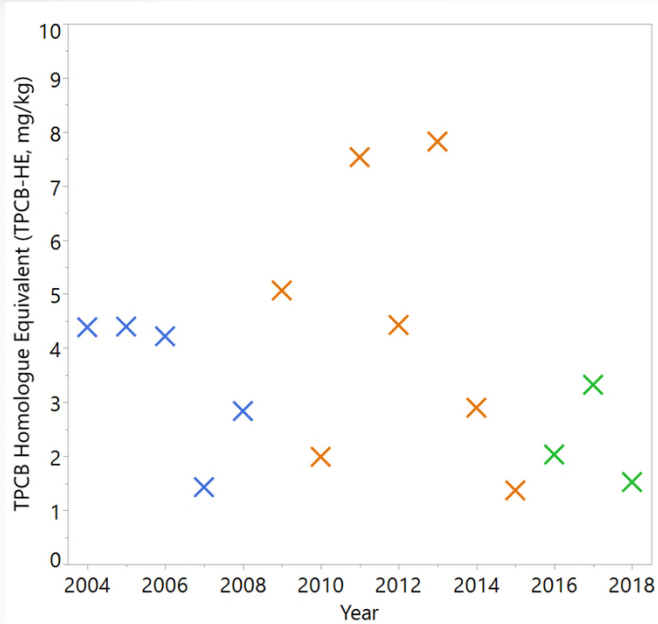
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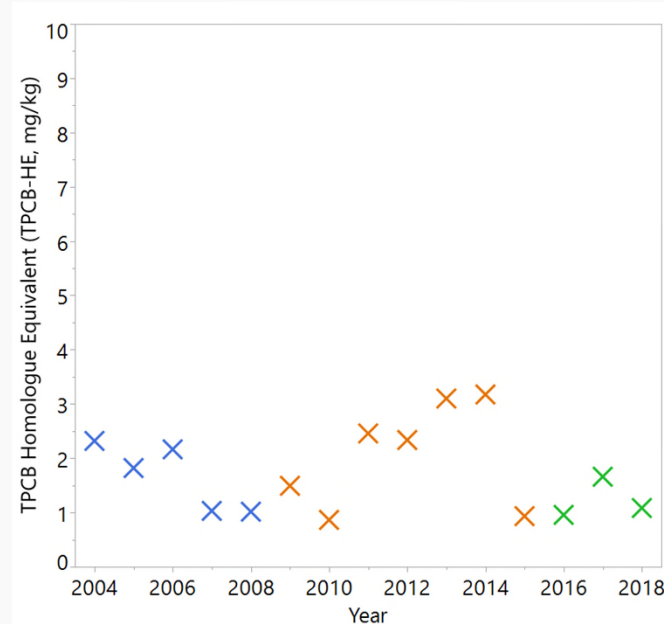
River Section 1



River Section 2



River Section 3



- Before Dredging (2004-2008)
- During Dredging (2009-2015)
- After Dredging (2016-2018)
- × Whole Body Individual Samples

## Upper Hudson River Fish Summary



- Overall, PCB concentrations in fish have largely recovered from dredging impacts and are now observed to be at or trending below baseline conditions
- Data are encouraging but significant variability as expected exists within the data. More years of data collection are needed to assess trends over time
  - As noted in the five-year review, as many as 8 or more years of post-dredging fish data will be needed

# Upper Hudson River Fall 2017 Fish Collection

## - NYSDEC and GE/RAMP Data



### NYSDEC Reaches 8-1

- Data collected 9/11-9/18, 2017
- 143 Centrarchid (pumpkinseed and red breast sunfish)
  - 23 red breast sunfish collected in reaches 7 and 6
- 89 forage fish composite samples collected (golden, spotfin, spottail, and emerald shiners, and fallfish)
- Fish samples analyzed by congener methods



Spottail Shiner  
(*Notropis hudsonius*)

### GE/RAMP Reaches 8-5

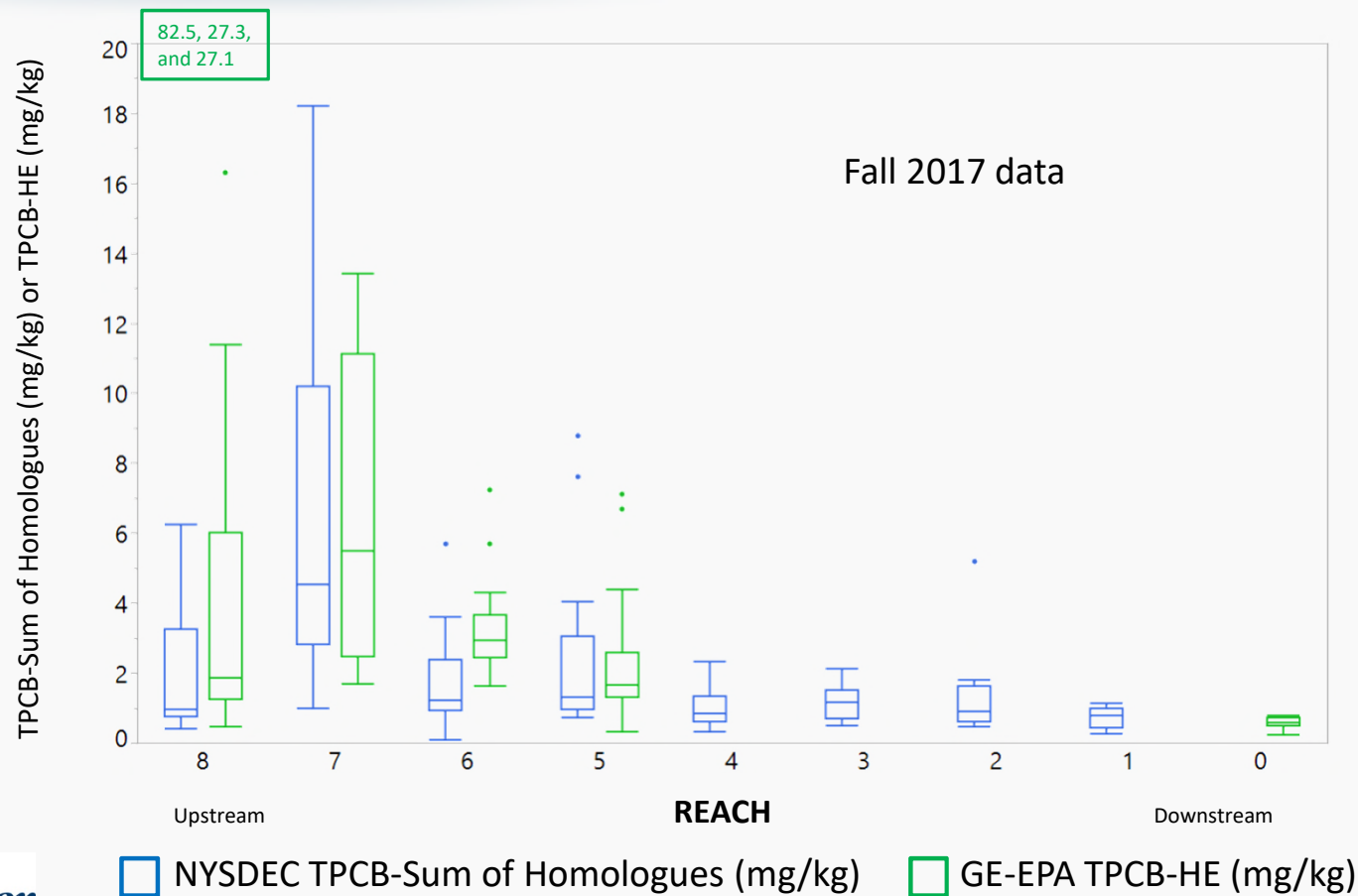
- Data collected 8/28-8/30, 2017
- 125 pumpkinseed collected
- 50 forage composite samples collected (spottail, golden, and spotfin shiners, fallfish, and bluntnose minnow)
- Fish samples analyzed by Aroclor methods



Pumpkinseed  
(*Lepomis gibbosus*)



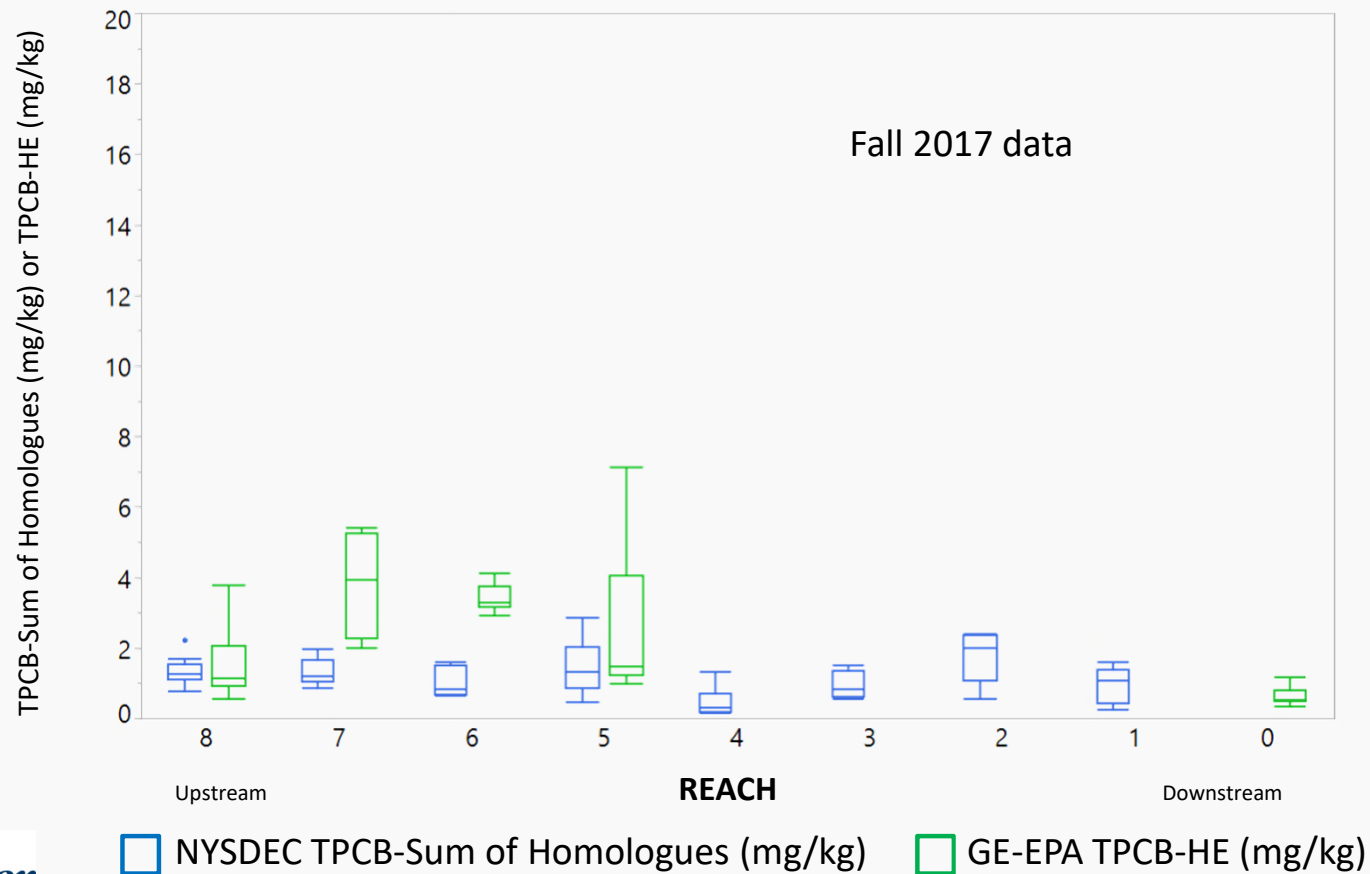
# NYSDEC Pumpkinseed and Red Breast Sunfish (TPCB-Sum of Homologues) GE-EPA Pumpkinseed (TPCB-HE) by Reach







# NYSDEC Forage Composite Samples (TPCB-Sum of Homologues), GE-EPA Forage Composite Samples (TPCB-HE), by Reach



# Upper Hudson River Reaches 1-4 –Fall 2017 Fish Comparison and 2019 Data



## Reaches 1-4 Fall Collected Fish Summary

- Reaches previously not sampled
- Fall fish collection in Reaches 1 - 4 consistent with EPAs understanding that Reach 5 is appropriate representation for River Section 3

## Reaches 1-4 Spring Collection: Next Steps

- Spring fish sampling completed in June 2019
  - 10 fish each black bass, bullhead, and yellow perch in Reaches 3-1 (not all yellow perch collected from reach 2).
  - 20 fish each of these species in Reach 1 (Waterford Pool)
- EPA evaluating the need for additional fish collection



## Lower Hudson River Fish

# Lower Hudson River Fish Collection

## Spring Collection (Fillet):



Striped Bass (*Morone saxatilis*)



White Perch (*Morone americana*)

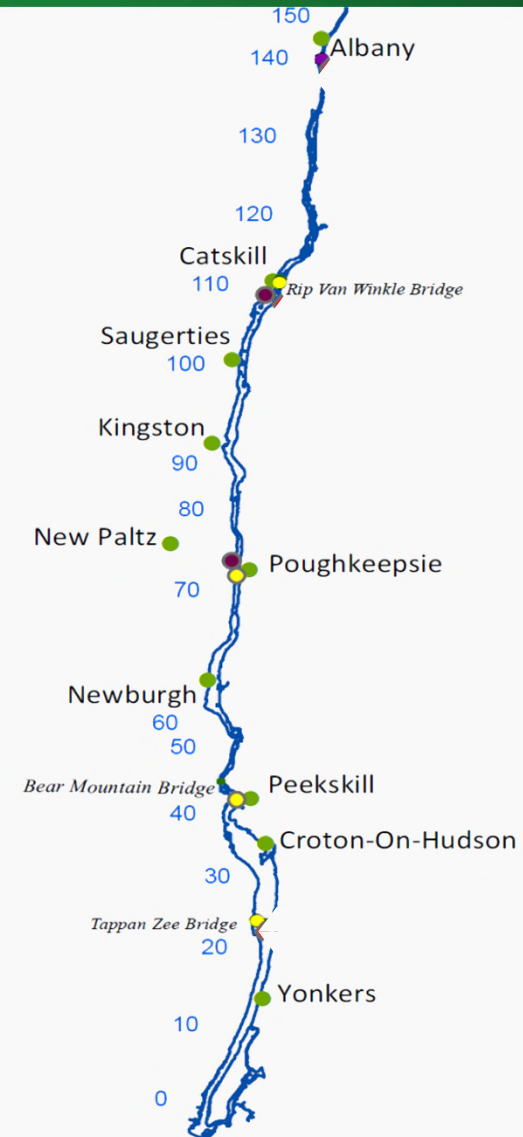


Smallmouth Bass (*Micropterus dolomieu*)



White Catfish (*Ictalurus catus*)

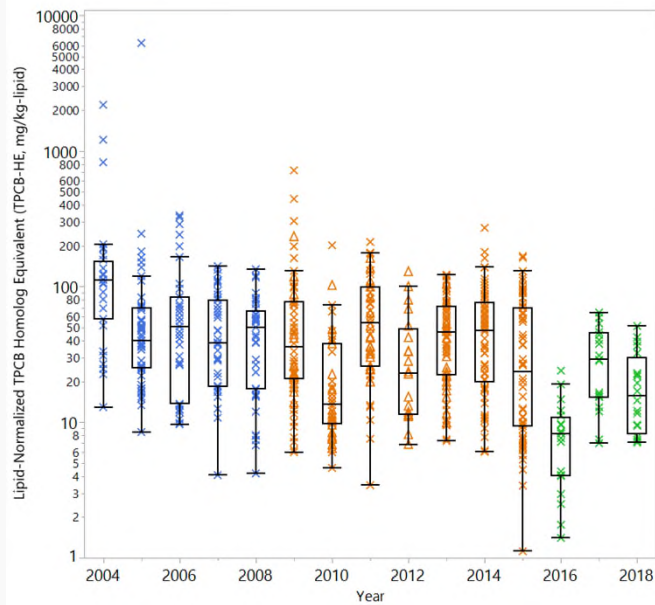
- 180 individuals from the 4 species groups collected annually
- Sport fish species represent multiple food web niches and levels, reflect longer-term body burdens
- Supplemental fish collection under discussion



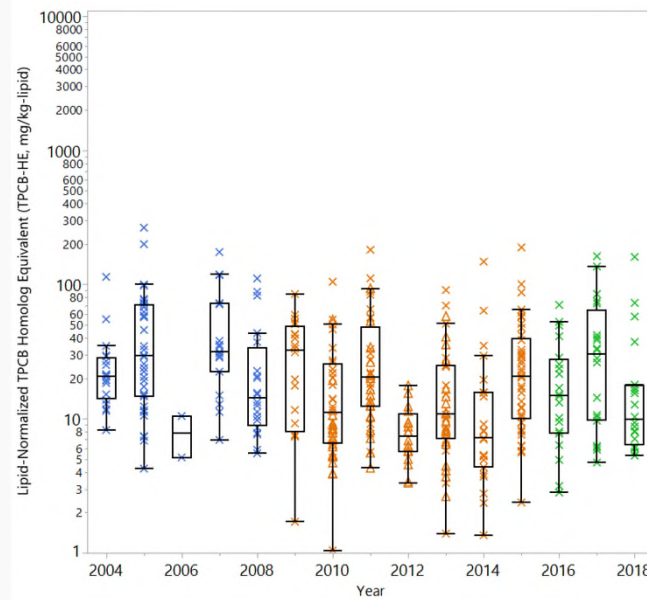
# Lower Hudson Striped Bass –Lipid Normalized, LPCB-HE, by Station



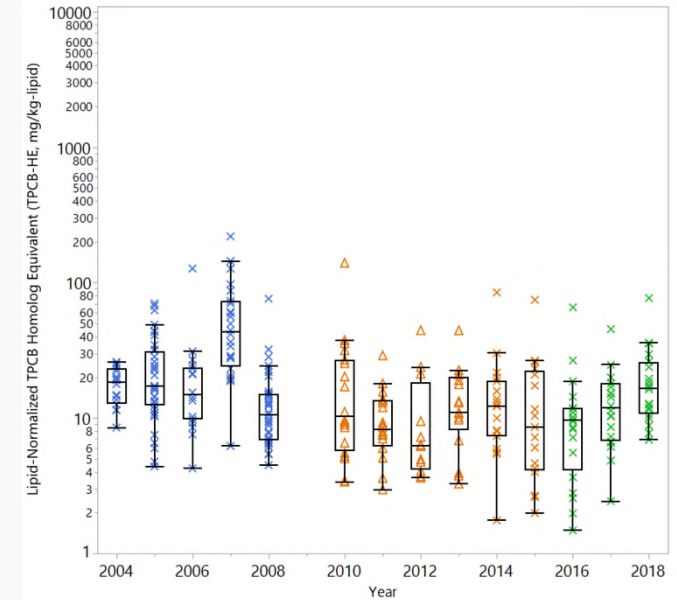
Albany/Troy (RM154)



Catskill (RM113)



Tappan Zee (RM27)

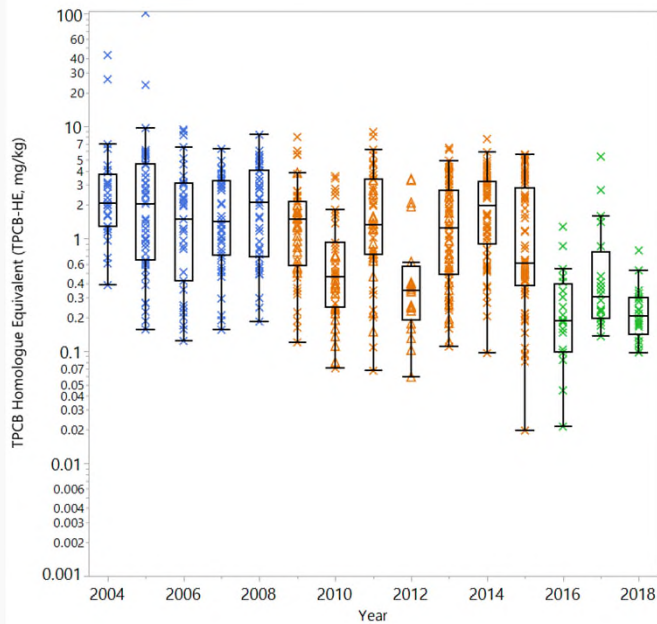


- Before Dredging (2004-2008)
- During Dredging (2009-2015)
- After Dredging (2016-2018)
- × Standard Fillet
- Δ Rib-out Fillet

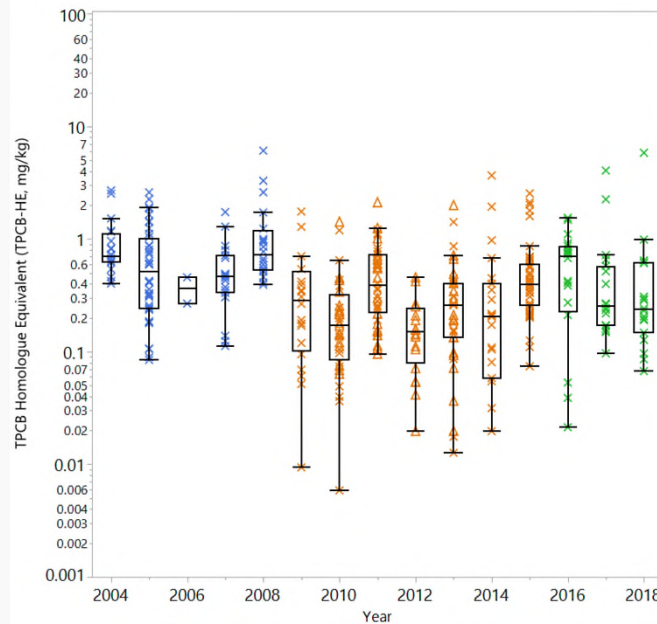
# Lower Hudson Striped Bass –Wet Weight, TPCB-HE, by Station



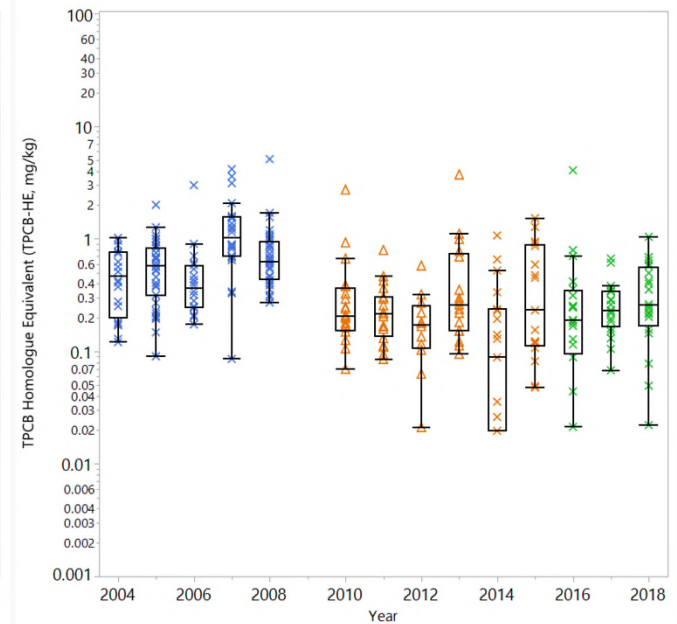
Albany/Troy (RM154)



Catskill (RM113)



Tappan Zee (RM27)



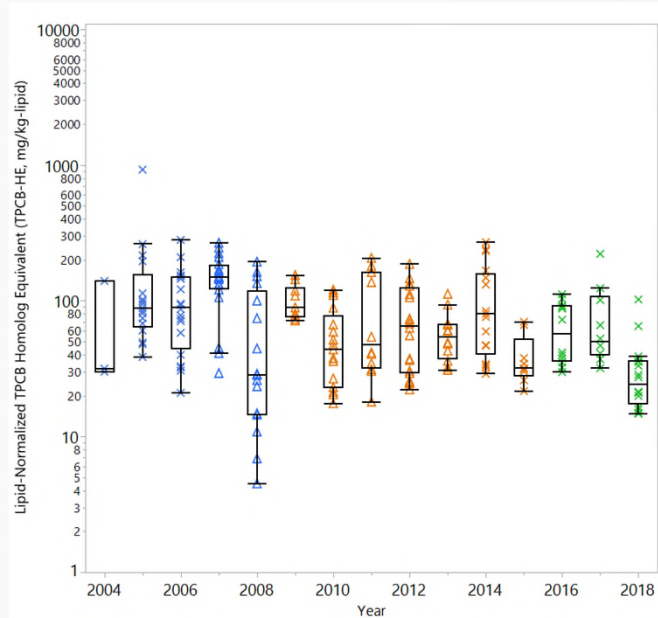
- Before Dredging (2004-2008)
- During Dredging (2009-2015)
- After Dredging (2016-2018)
- × Standard Fillet
- Δ Rib-out Fillet



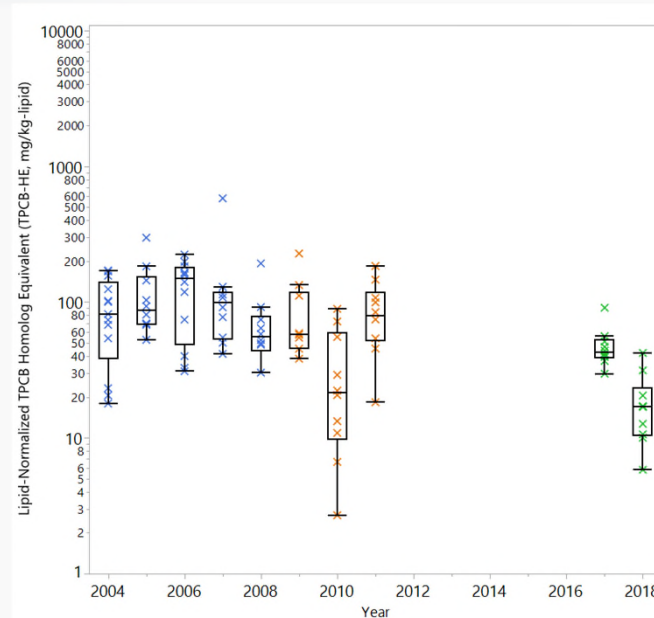
# Lower Hudson White Perch –Lipid Normalized, LPCB-HE, by Station



Albany/Troy (RM154)



Catskill (RM113)

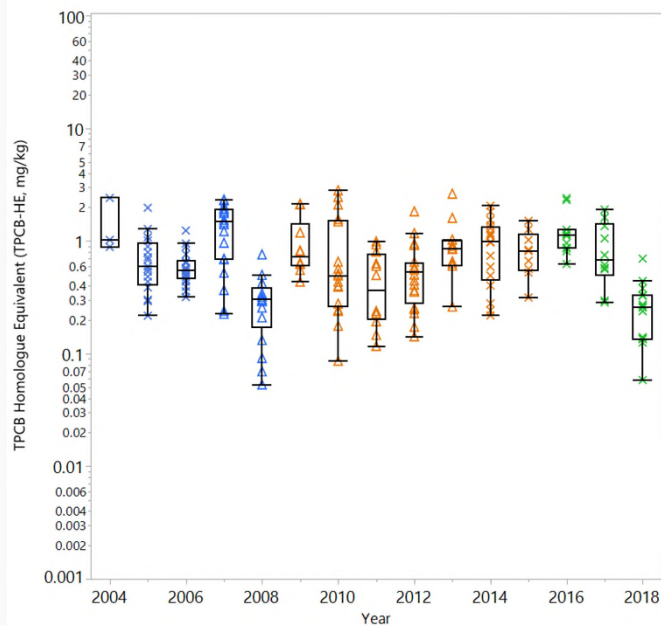


- Before Dredging (2004-2008)
- During Dredging (2009-2015)
- After Dredging (2016-2018)
- × Standard Fillet
- △ Rib-out Fillet

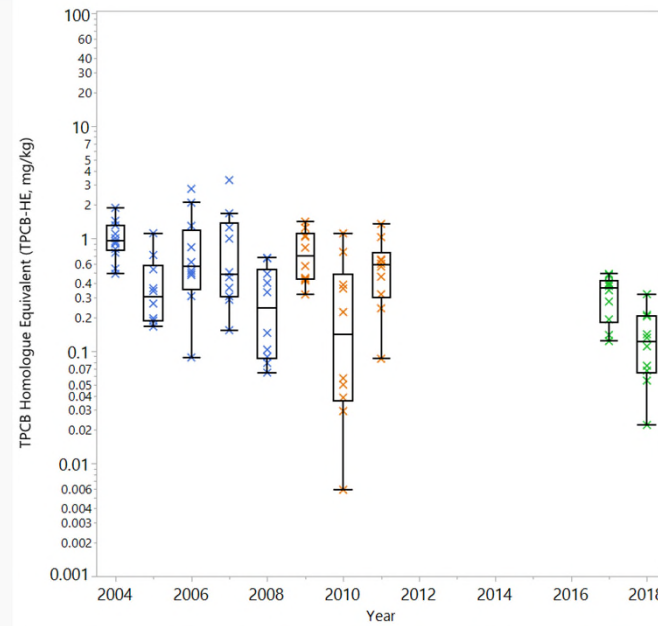
# Lower Hudson White Perch –Wet Weight, TPCB-HE, by Station



Albany/Troy (RM154)



Catskill (RM113)



- Before Dredging (2004-2008)
- During Dredging (2009-2015)
- After Dredging (2016-2018)
- × Standard Fillet
- △ Rib-out Fillet



# Conclusions and Summary



- Both NY State and GE have historically collected data from the Lower Hudson River
- Historical data show Lower Hudson River fish are recovering more slowly than Upper Hudson River fish and recovery decreases with distance downstream in the Lower Hudson
- Lower Hudson River fish do not appear to have been impacted by dredging operations
- The impact of Upper Hudson improvements on Lower Hudson is continuing to be evaluated
- Lower Hudson Supplemental Studies/further investigation are planned

# Questions?



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