

Mercury in Fish Tissue on the Ohio River Spatial and Temporal Trends Preliminary Analyses



Rob Tewes
Senior Biologist
&
Jeff Thomas
Biological Programs Manager
The Ohio River Valley Water Sanitation Commission
(ORSANCO)



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Introduction

- A comprehensive analysis of mercury trends in fish tissue is warranted at this time.
- Recent air emission regulations could ultimately be responsible for directing more mercury into waterways.
- Mixing zones for bioaccumulating contaminants of concern, like mercury, are in the process of being eliminated on the Ohio River, potentially affecting permit renewals for many Ohio River dischargers.

Introduction

- ORSANCO Biological Program staff are undertaking a comprehensive mercury analysis and trends project to answer several questions:
 - Is mercury in fish tissue increasing or decreasing spatially and or temporally within the Ohio River?
 - What spatial and temporal trends exist and are they significant?
 - How can we account for any observed trends?

ORSANCO Fish Tissue Program



- **Early 1970's**
ORSANCO began collecting fish contaminant data for monitoring purposes
- **Mid-Late 1980's**
ORSANCO began regularly collecting Ohio River fish contaminant data
- **Late 1980's, early 1990's**
States began issuing "Eat or Don't Eat" advisories based on FDA values
- **Early-Mid 1990's**
States switched to risk-based advisories
- **Late 1990's – Present**
Risk-based advisories are firmly in place and are continually refined.

Literature Review

- An extensive literature review is being conducted
 - Several relevant documents have been identified:
 - Mercury trends in fish from rivers and lakes in the United States, 1969–2005 Ann T. Chalmers · Denise M. Argue · David A. Gay · Mark E. Brigham · Christopher J. Schmitt · David L. Lorenz - USGS, NADP – 2010
 - Contaminants in fish tissue from US lakes and reservoirs: a national probabilistic study Leanne L. Stahl · Blaine D. Snyder · Anthony R. Olsen · Jennifer L. Pitt – USEPA – 2008
 - Spatial and Temporal Assessment of Metal and Metalloid Bioaccumulation Patterns in Fish from the Ohio River – EPRI – 2012
 - Fish Tissue trends 1993 – 2008 Ohio EPA Interoffice Memo - 2008

Literature Review

- Different approaches and trends analyses have yielded different endpoints
 - USGS analyses in 2010 show decreasing Hg trends in Ohio River fish tissue between 1971 and 1987
 - used only Channel Catfish
 - Ohio EPA analyses in 2008 show increasing Hg trends in Ohio River fish tissue between '93 – '00 and '01 – '08 respectively
 - only along state of Ohio border

Unique Challenges and Analysis Factors

- Data qualification
 - Species, TL
 - Size ranges
 - Timeframe, ranges
 - River Miles vs. Segment / Pool
 - Comparable Total Hg Analysis Methodology
- Trend analysis methodology
 - Statistical approach
 - Averages vs. geometric means etc.
 - Introduce a water quality Hg element



Unique Challenges and Analysis Factors

- These analyses will ultimately lead to a multitude of specific endpoints
- It is important to thoroughly vet the analysis approach
 - Incorporate suggestions from the appropriate partners



Data Compilation and Qualification

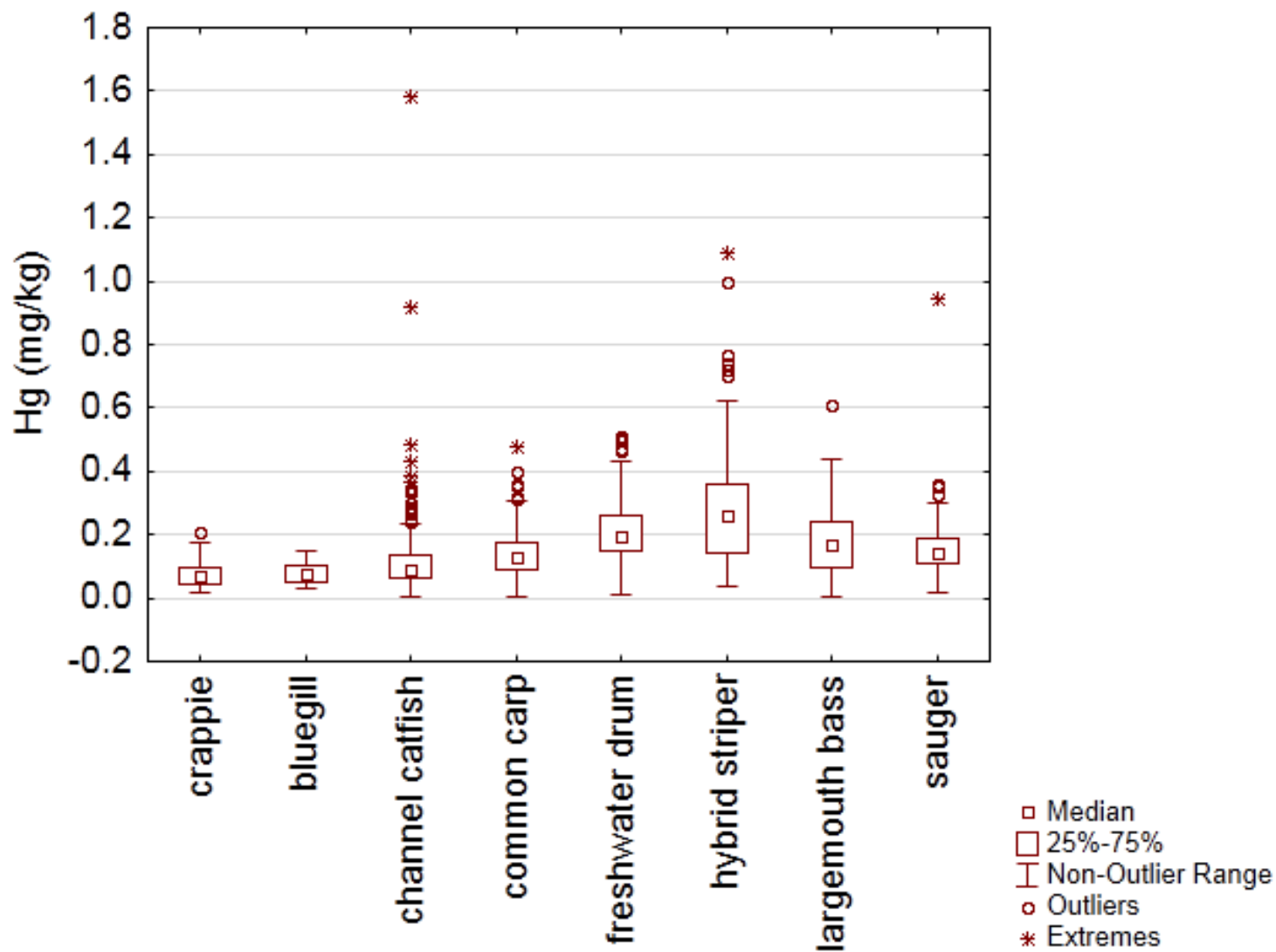
- We compiled all *total mercury* from filleted Ohio River samples in fish tissue data in our inventory, 1969 – 2013
- We will *consider all* data for all species and TLs in the Data Qualification process

Data Summary and Overview

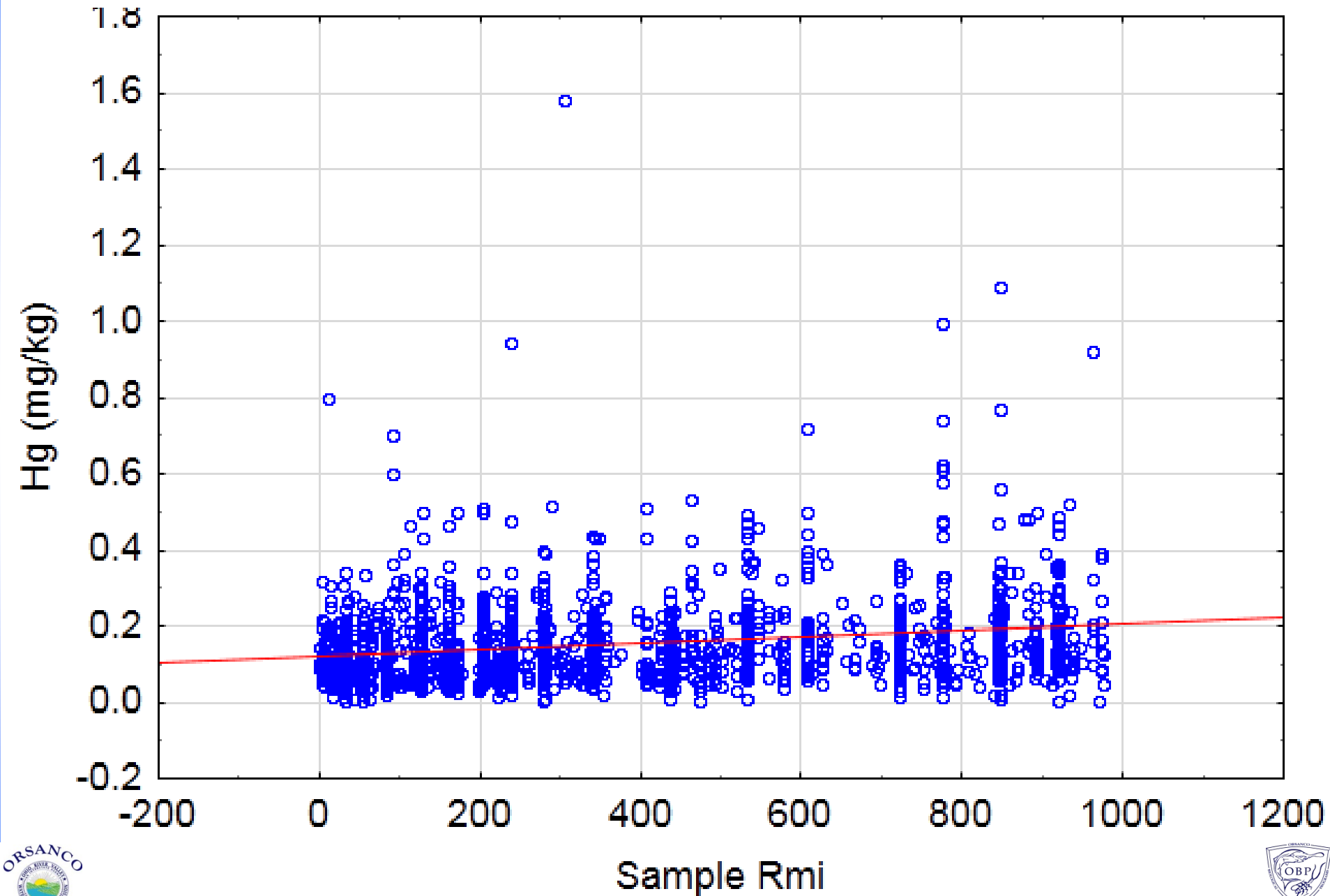
- 3120 samples (1983 – 2013)
- 39 taxa
 - 720 Channel Catfish
 - 379 Common Carp
 - 299 Sauger
- Within our inventory we have identified unique datasets that can be explored:
 - Fixed Station tissue data
 - Sauger and Channel Catfish from 18 river-wide locations when available; 2004 – 2013; fixed sizes
 - TL3 & TL4 tissue data
 - Used in FCA development and 305b Assessment; Ohio River classifications recently refined as per a panel of experts

Preliminary Investigations

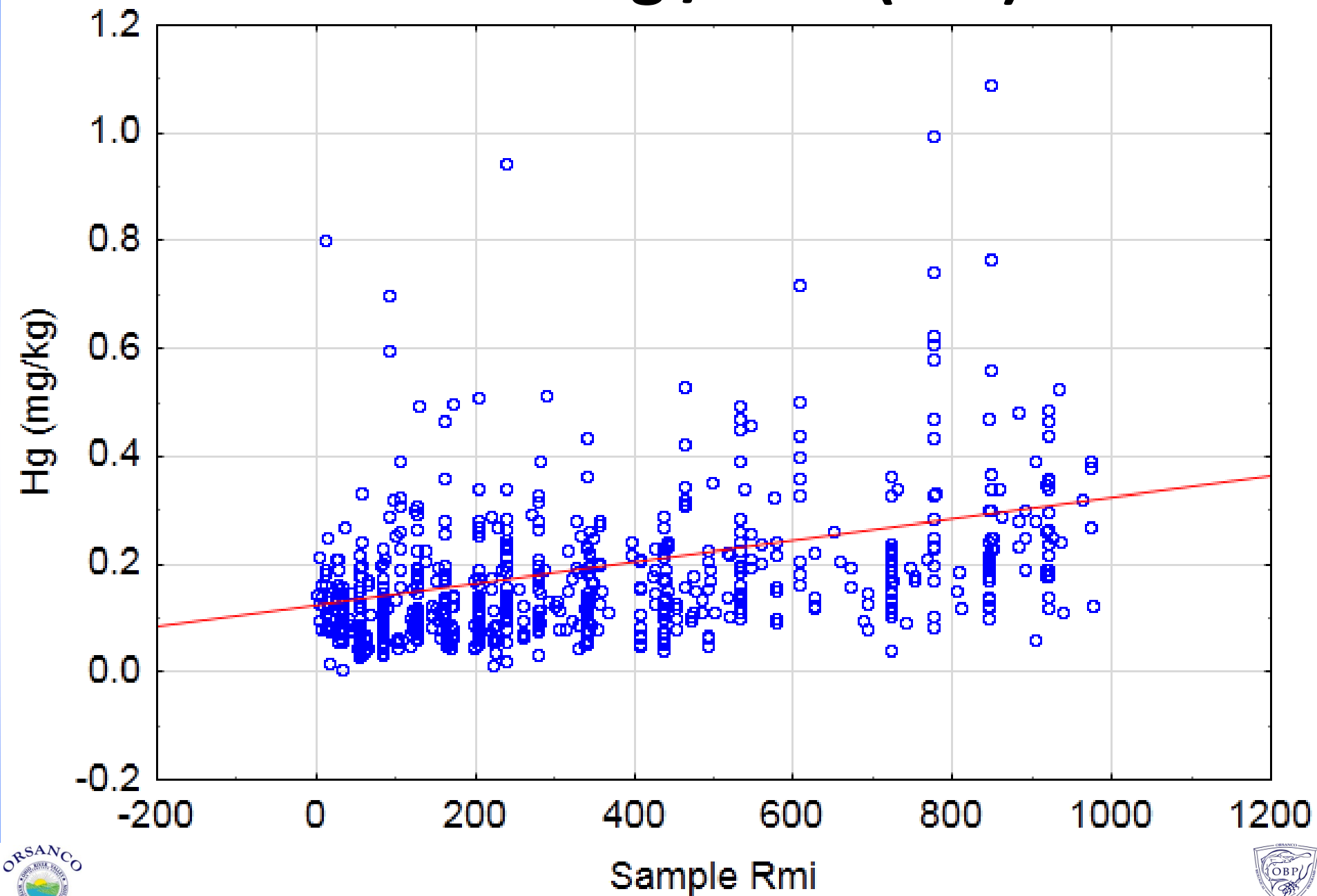
Total Hg / Species



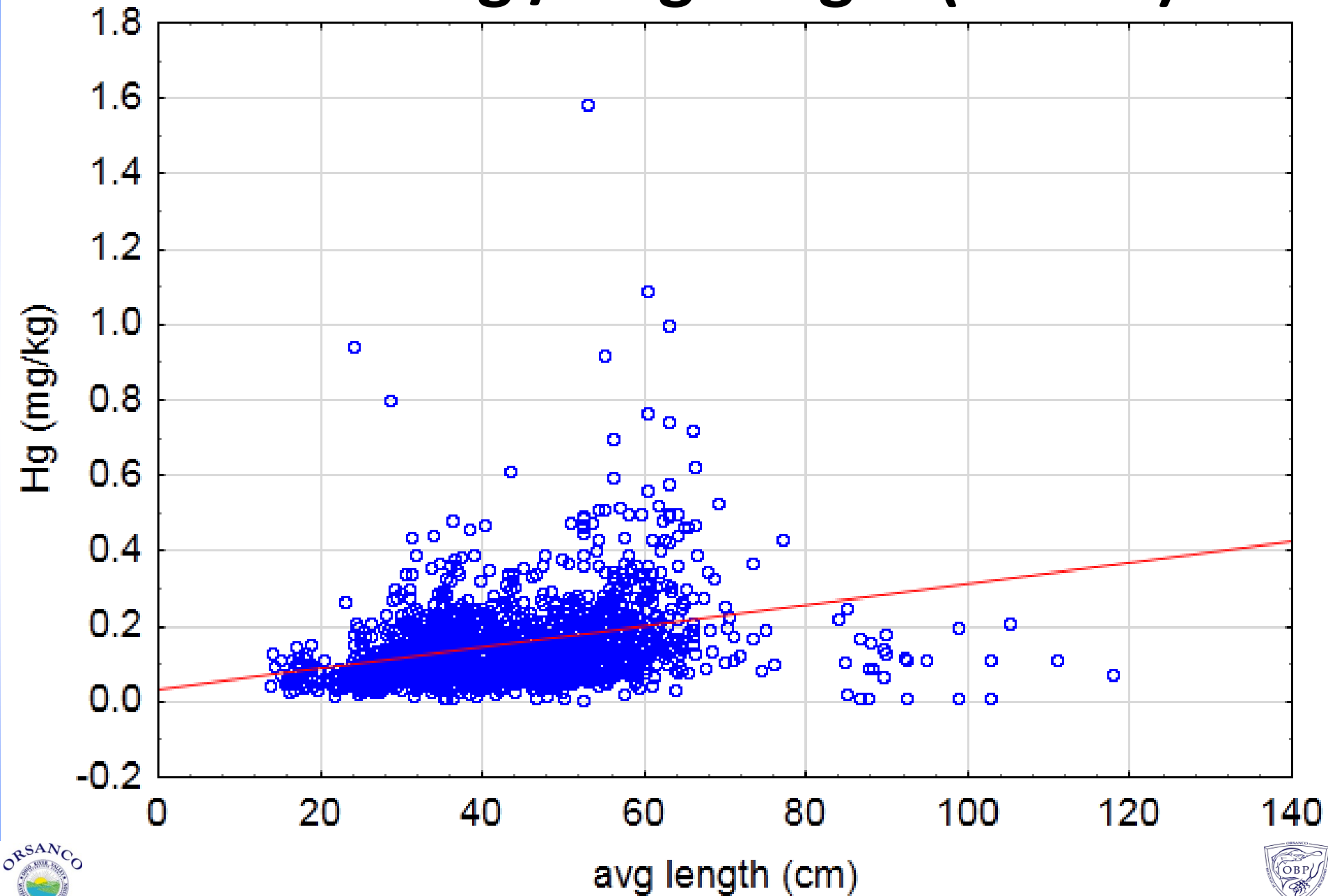
Total Hg / RMI (All TLs)



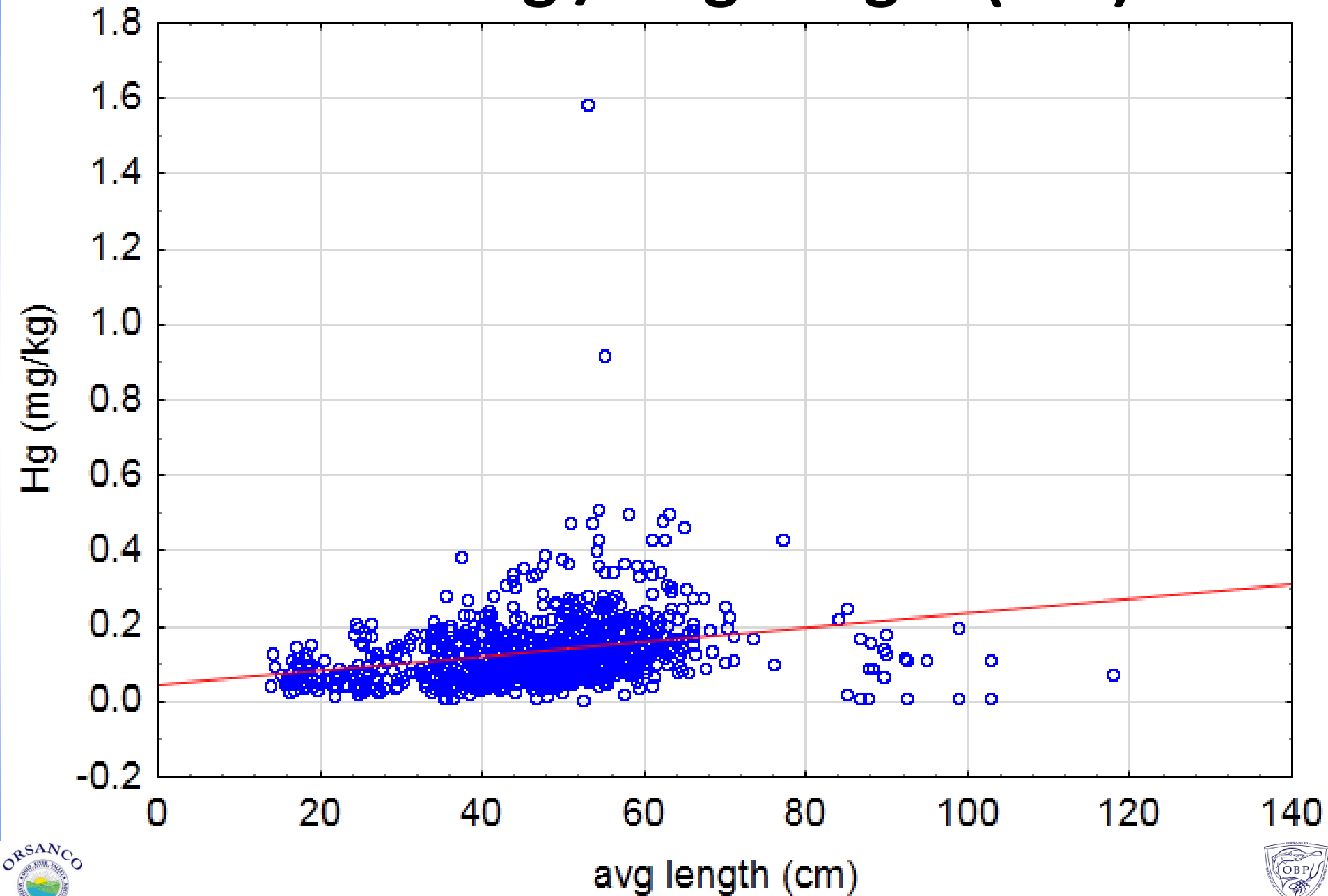
Total Hg / RMI (TL4)



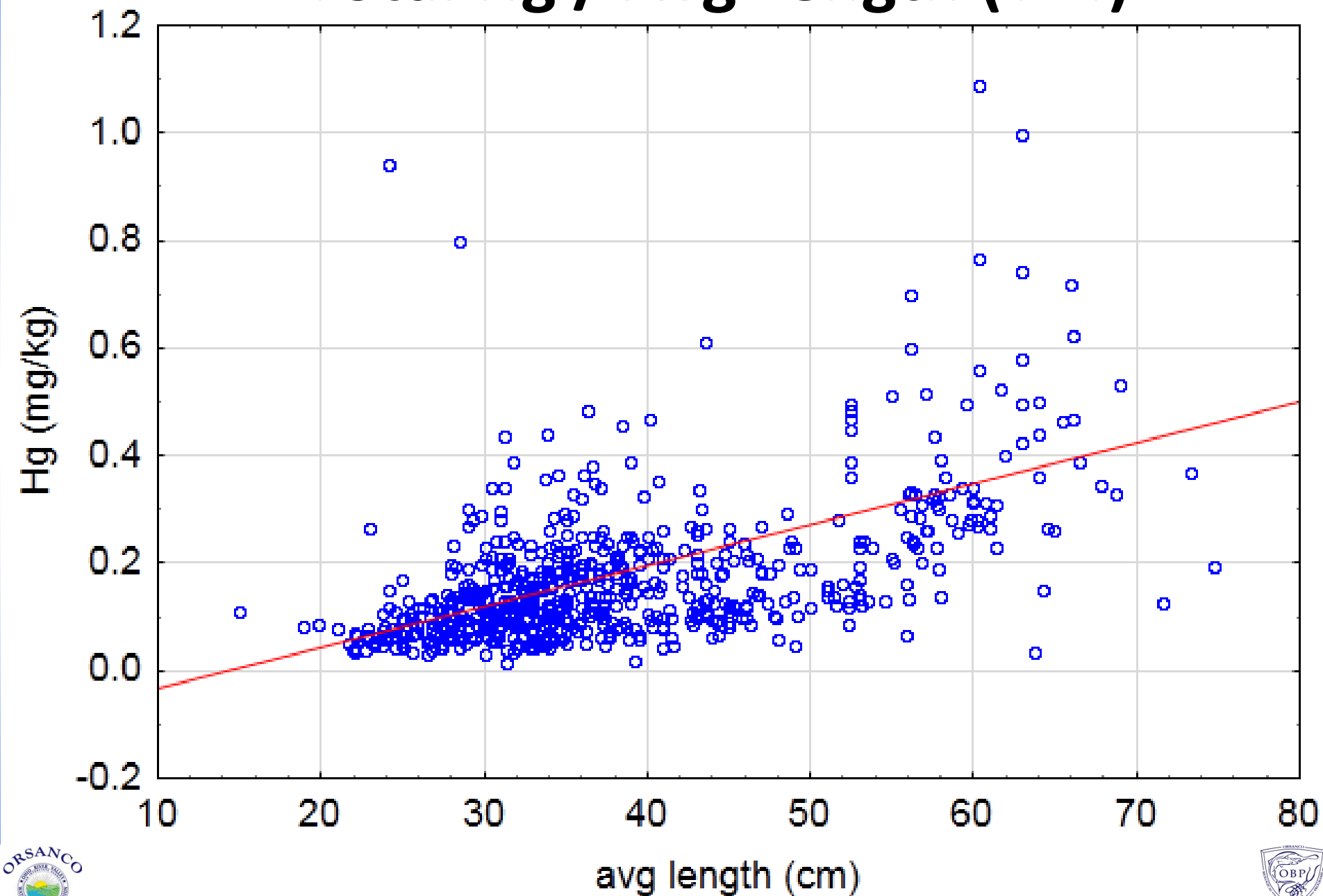
Total Hg / Avg Length (All TLs)



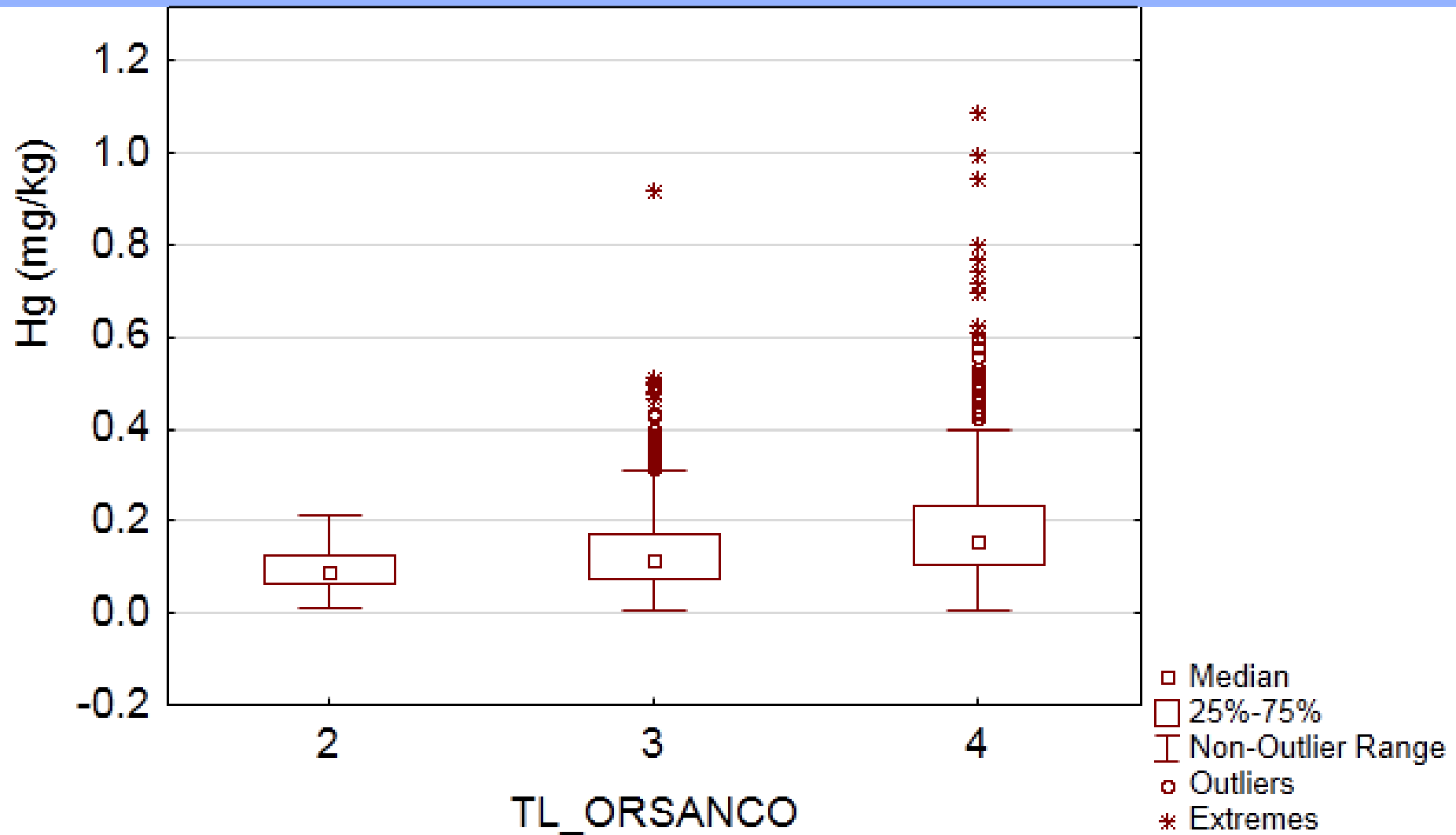
Total Hg / Avg Length (TL3)



Total Hg / Avg Length (TL4)



Total Hg / Trophic Level



Questions, Comments, Suggestions

