

Recalibration of the Puget Lowland B-IBI

Joint Aquatic Sciences Meeting

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King County

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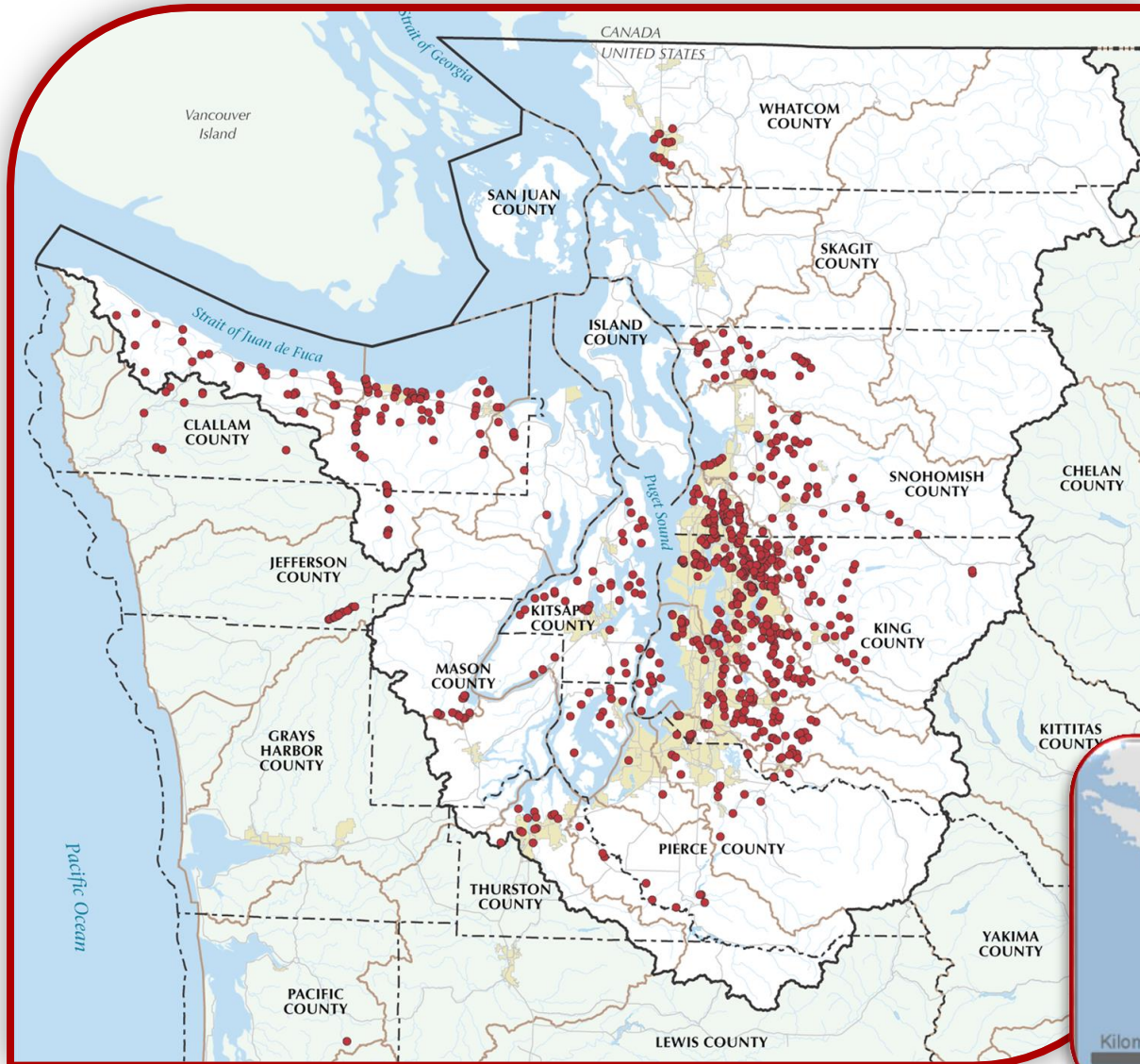
⁴Environmental Protection Agency



Funded by a US EPA Scientific Studies and
Technical Investigation Assistance Program Grant



Puget Sound Location



Regional Benthic Monitoring Issues

2011-2014 EPA Grant: address limitations and meet desired outcomes

Limitations	Desired Outcomes
Differing collection methods	Standardization/NBD
Decentralized data mgmt	Centralized data mgmt
Outdated taxa attributes	Peer-reviewed or Empirically derived attributes
Insufficient B-IBI sensitivity	Re-calibrated scoring
>20 cities, counties, tribes monitoring independently	Collaboration and communication

Goal: Improved decision making to restore & protect streams

Strengthen Sensitivity of Taxa Attributes



Puget Lowland B-IBI Metrics

Total Taxa

Mayfly Taxa

Stonefly Taxa

Caddisfly Taxa

Long-lived Taxa

Intolerant Taxa

% Tolerant individuals

% Predator individuals

Clinger Taxa

% Dominance

Update Using
Peer-Reviewed
Literature

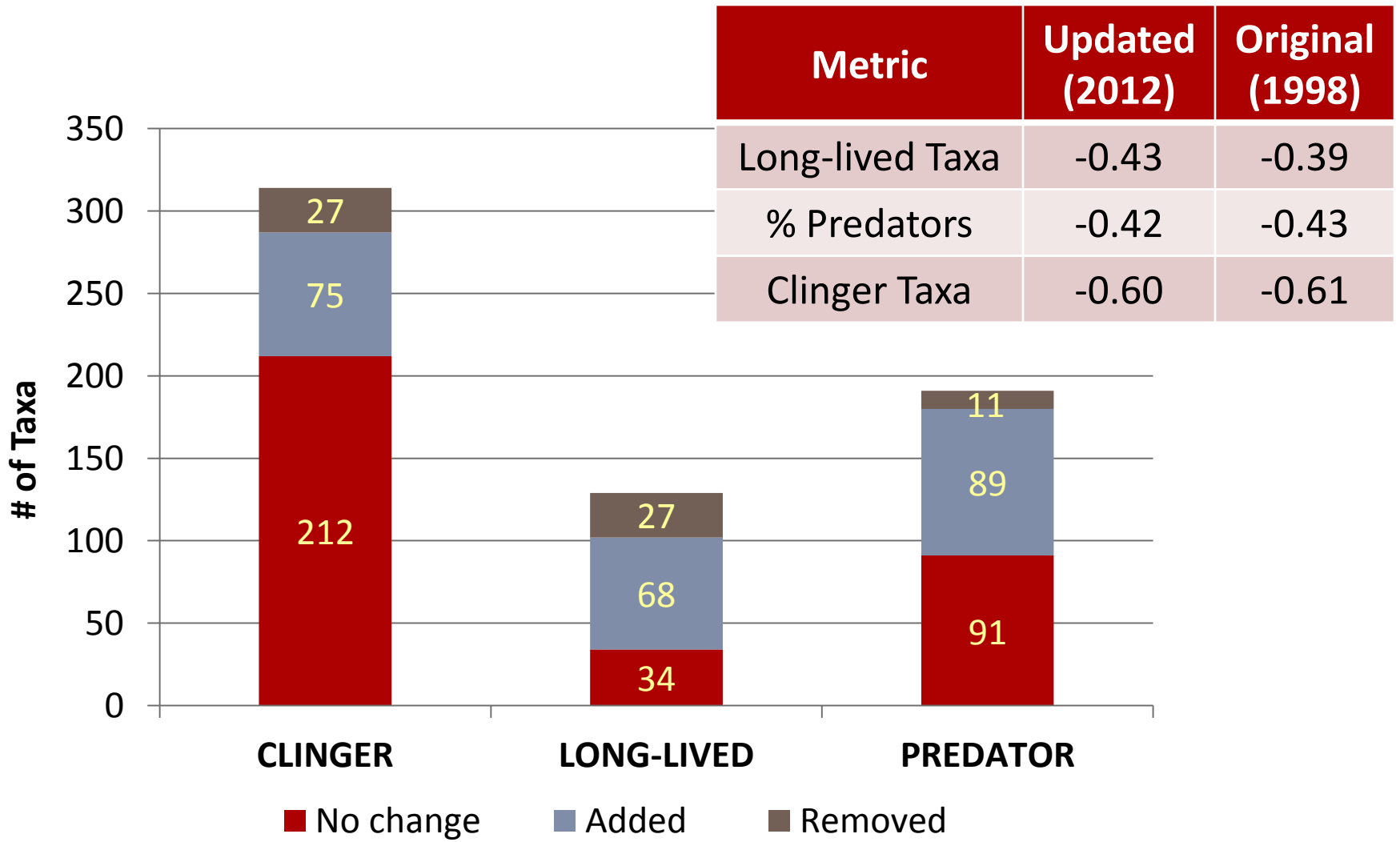


Update with
Existing Data

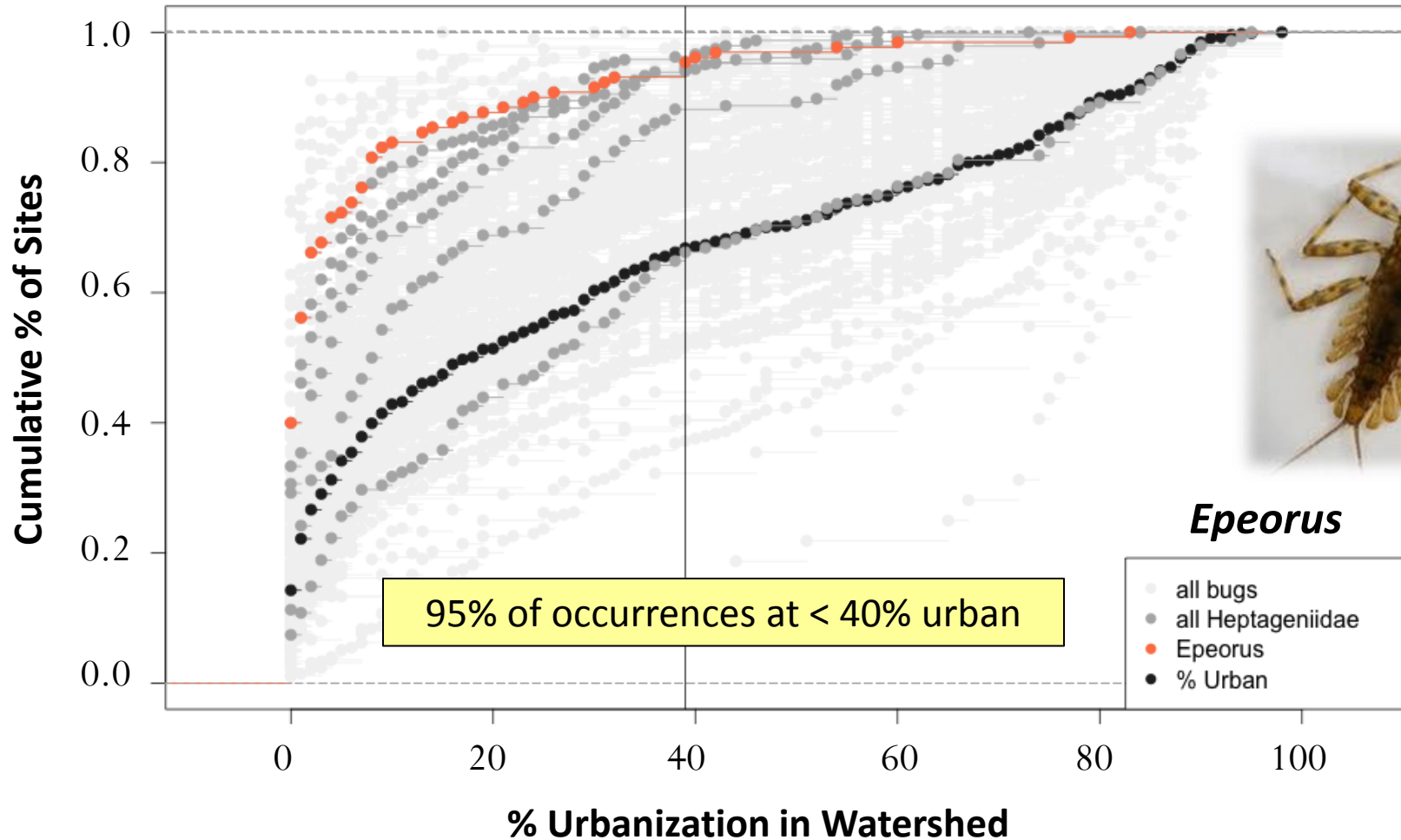
Published Literature Updates

Attribute	Taxa Group	Primary Resources
Long-lived	stoneflies	Stewart and Stark 2002
	caddisflies	Wiggins 1996
	non-insects	Pennak 1989, Thorp and Covich 2001
	clams	Mackie 2007
	other mollusks	Dillon 2000
	other insect taxa	Huryn et al. 2008, Poff et al. 2006
Predator	insects	Merritt et al. 2008
	non-insects	Pennak 1989, Thorp and Covich 2001
Clinger	insects	Merritt et al. 2008
	non-insects	not applicable

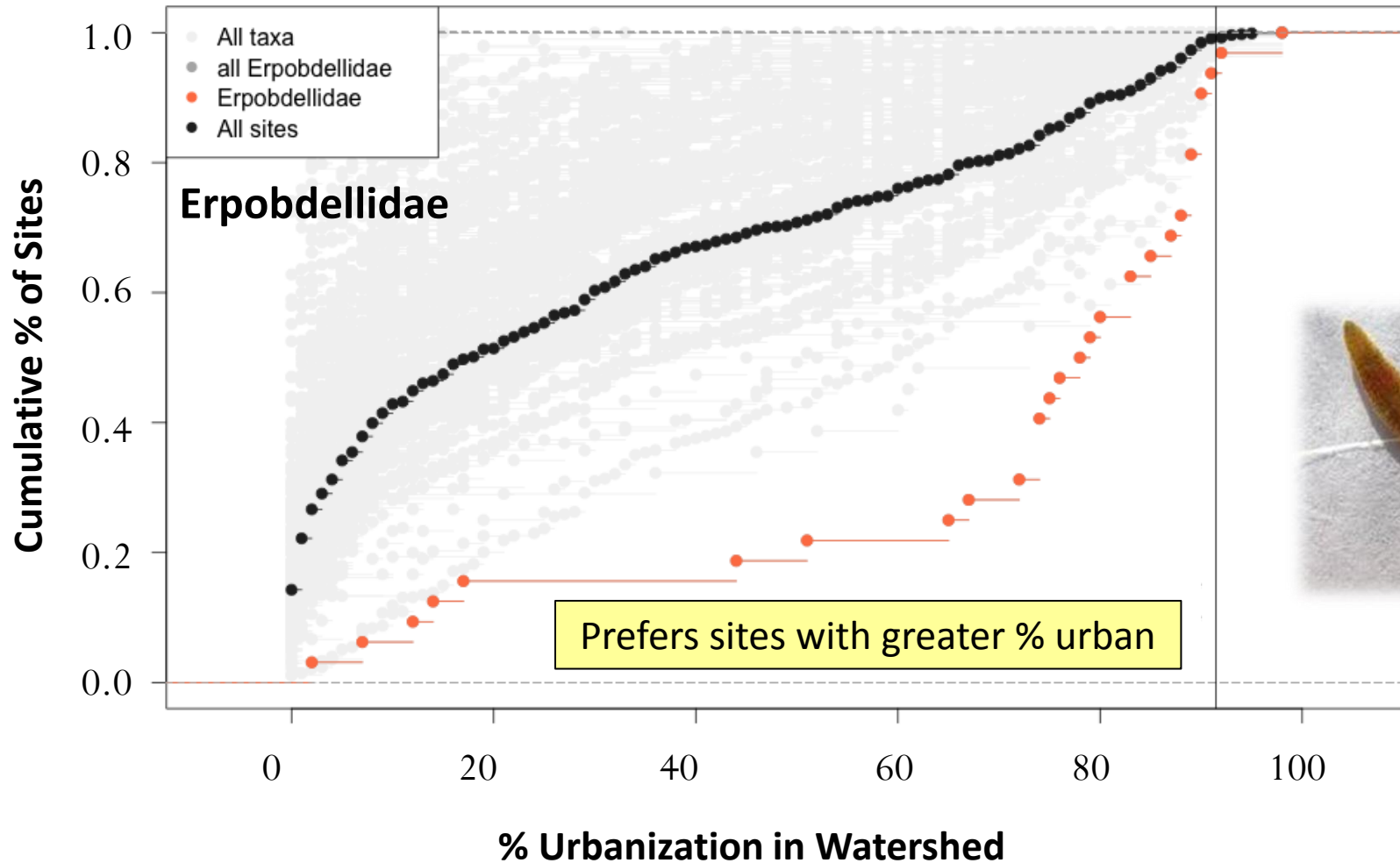
Attribute Changes: 1998 vs. 2012



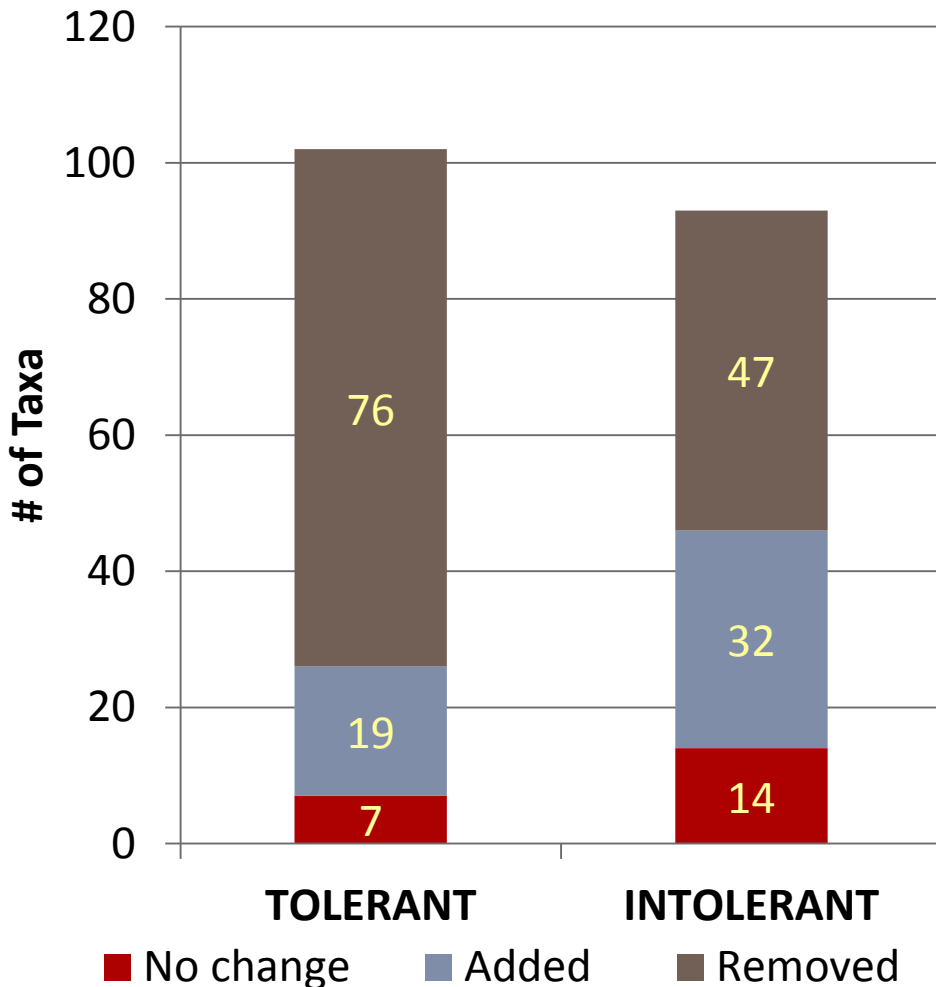
Example of an Intolerant Taxon



Example of a Tolerant Taxon

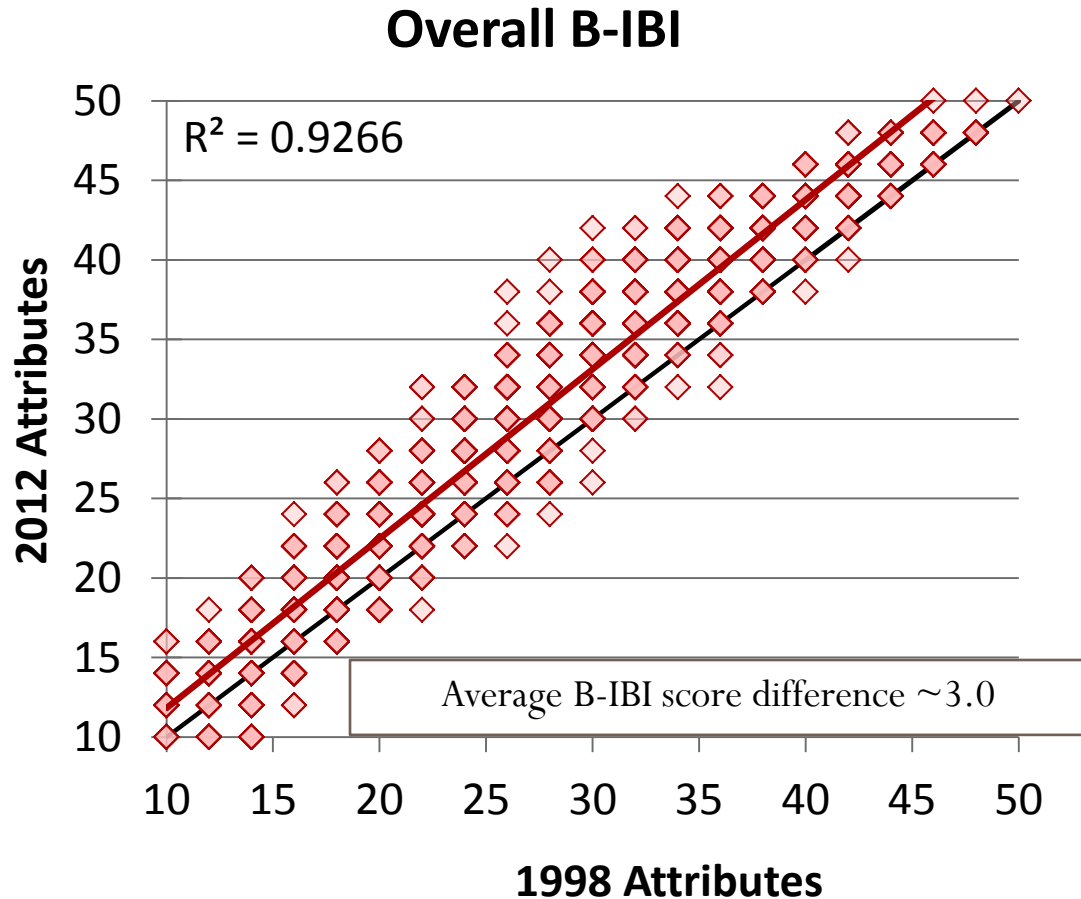


Attribute Changes: 1998 vs. 2012



Metric	Updated (2012)	Original (1998)
Tolerant	0.62	0.47
Intolerant	-0.75	-0.52

B-IBI Scores: Attributes Compared



Metric	R ²	Mean Residual*
Long-lived Taxa	0.41	3.2
Intolerant Taxa	0.49	1.35
Clinger Taxa	0.95	1.21
% Tolerant	0.07	-1.96%
% Predator	0.96	0.46%
Overall B-IBI	0.93	2.98

* All mean residuals significantly different than 0 ($p < 0.05$)

B-IBI Recalibration

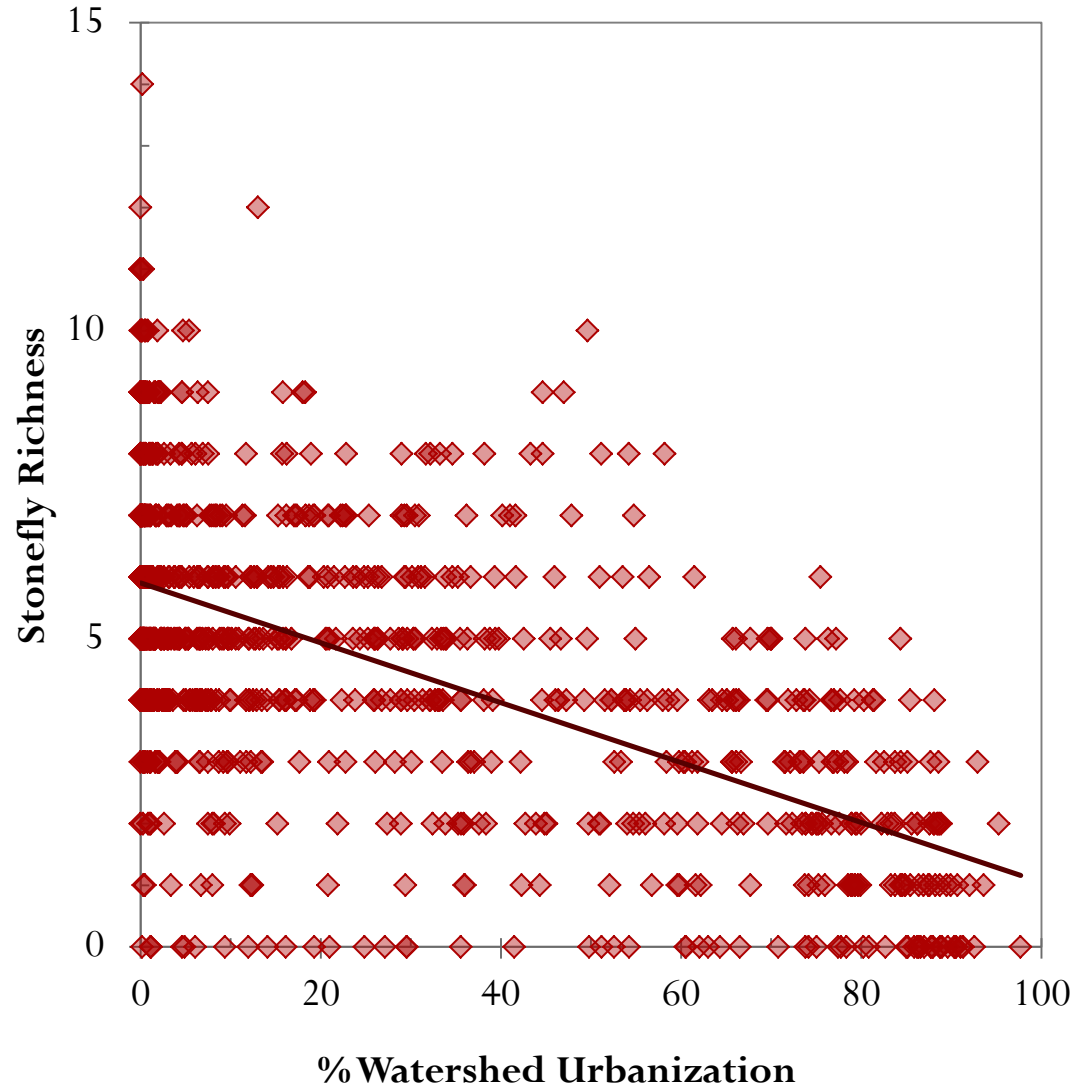
Goal: better precision and sensitivity with reduced variance

- Incorporate new attributes & data (856 sites)
- No change to B-IBI structure (same metrics)
- New scoring scheme: continuous vs. bin
- Apply taxa adjustments




B-IBI Recalibration: Scoring

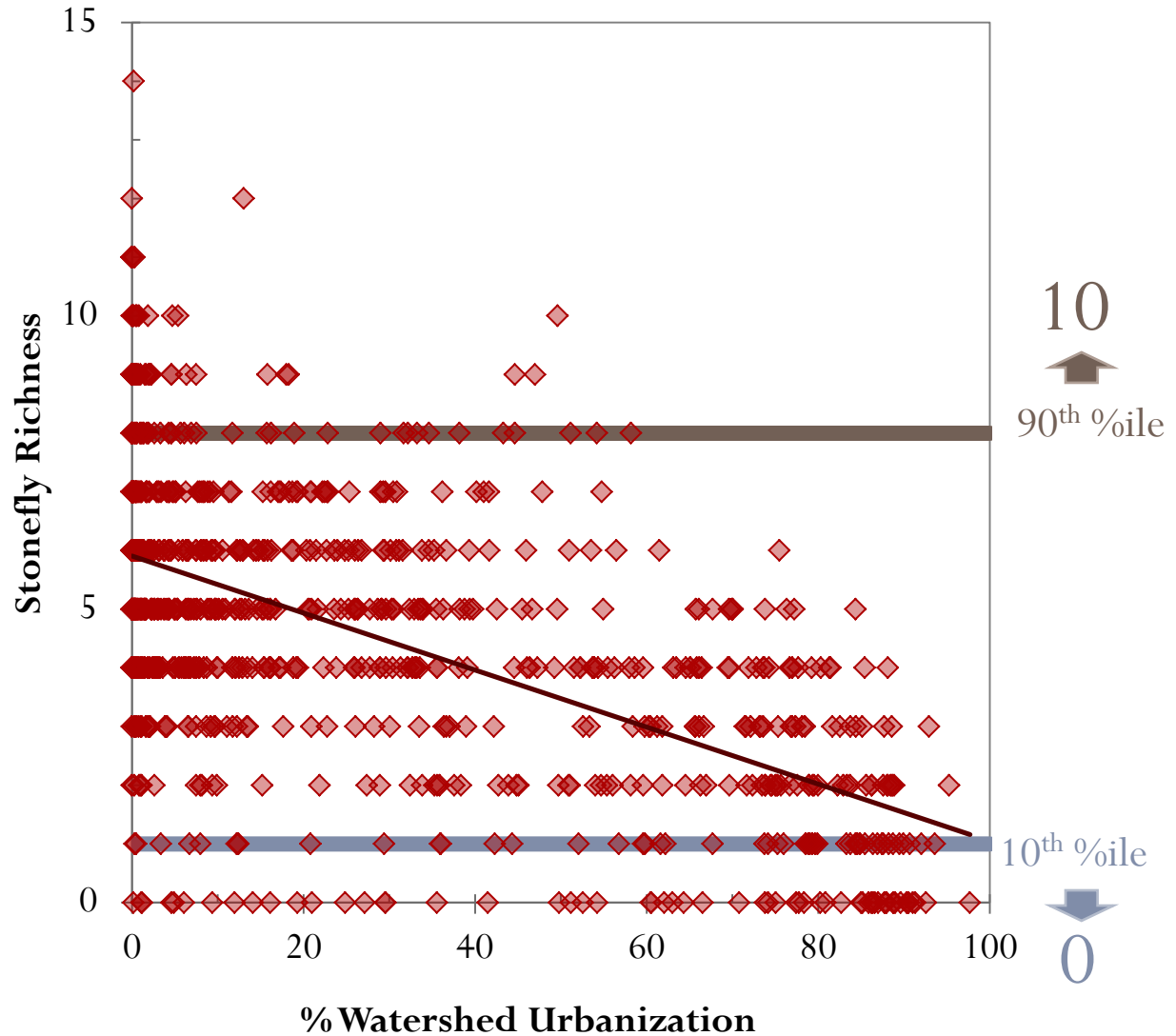
 Metrics well behaved



B-IBI Recalibration: Scoring

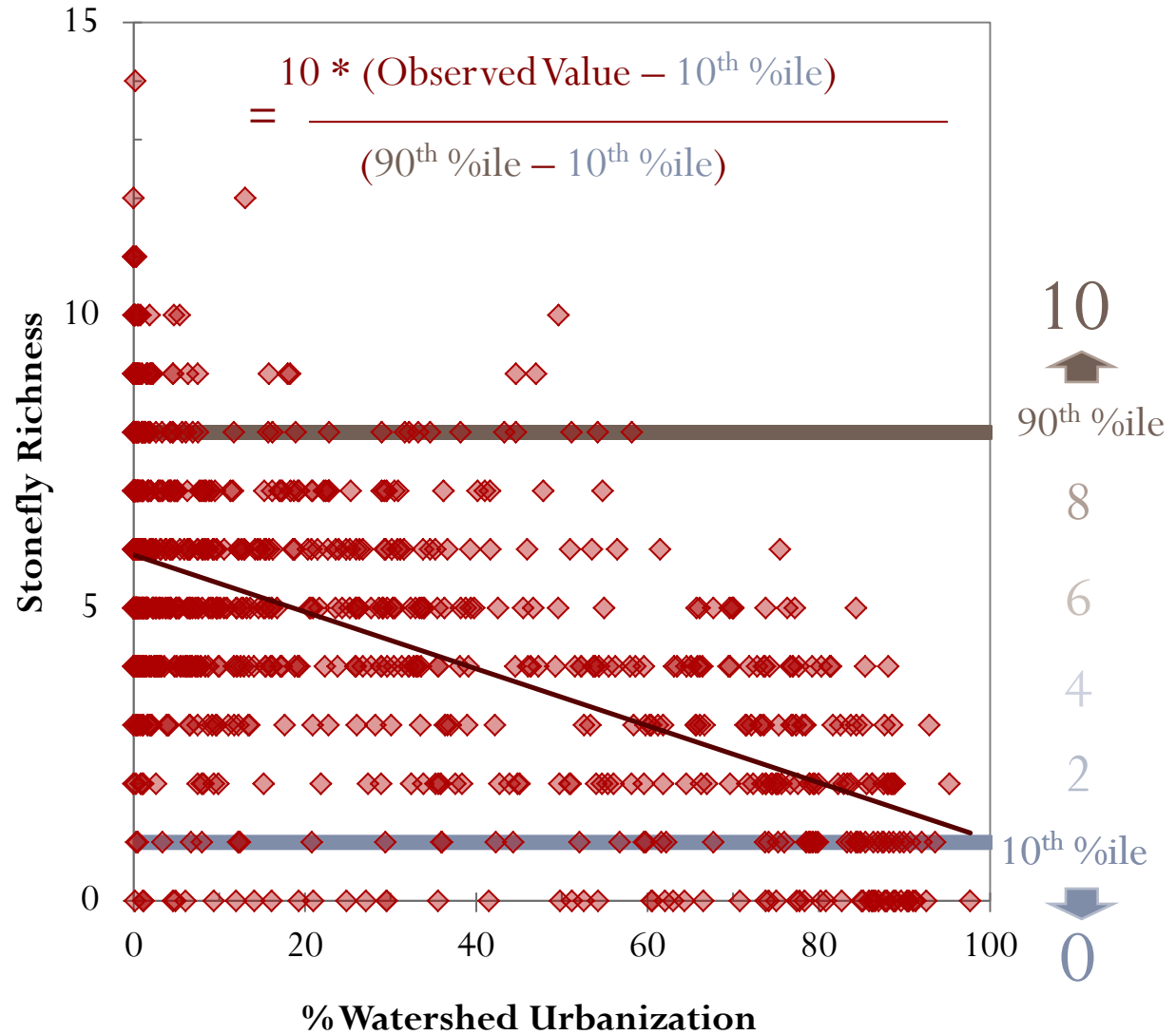
 Metrics well behaved

 Percentiles set upper & lower bounds



B-IBI Recalibration: Scoring

- Metrics well behaved
- Percentiles set upper & lower bounds
- Continuous scoring 0 to 10



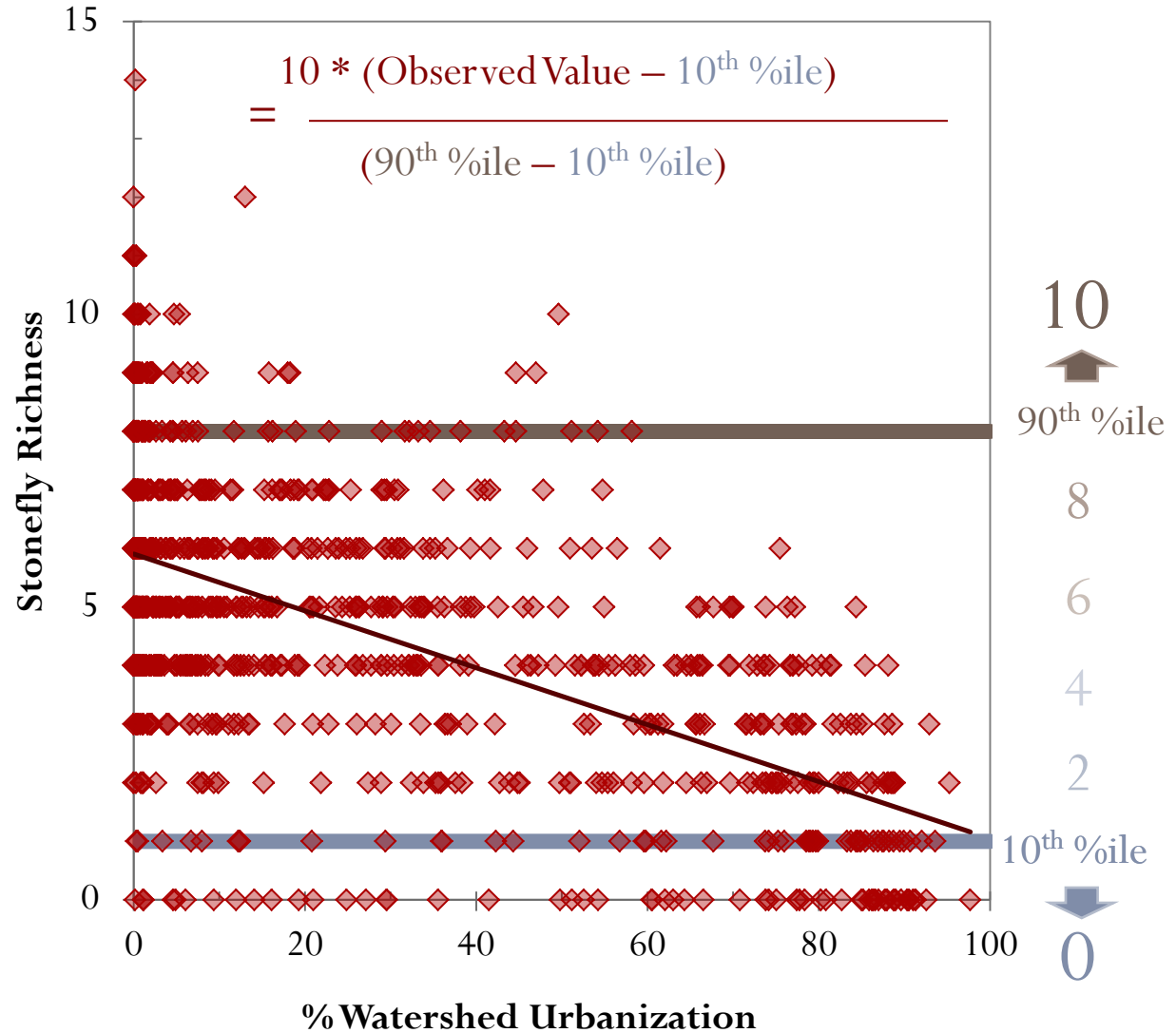
B-IBI Recalibration: Scoring

Metrics well behaved

Percentiles set upper & lower bounds


Continuous scoring 0 to 10

Sum metrics: Overall 0 to 100

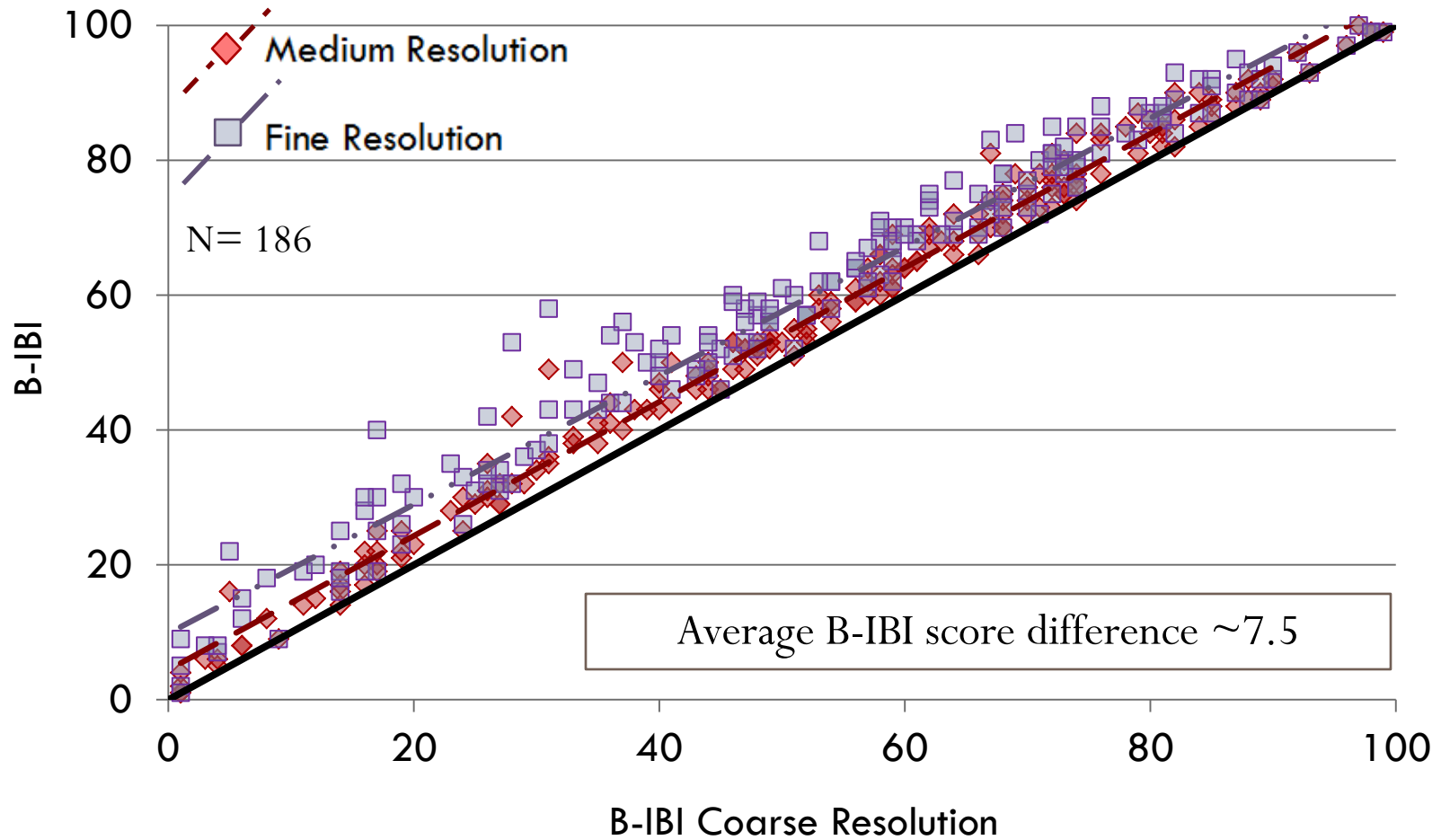


Taxa Effort: 3 Levels of Resolution

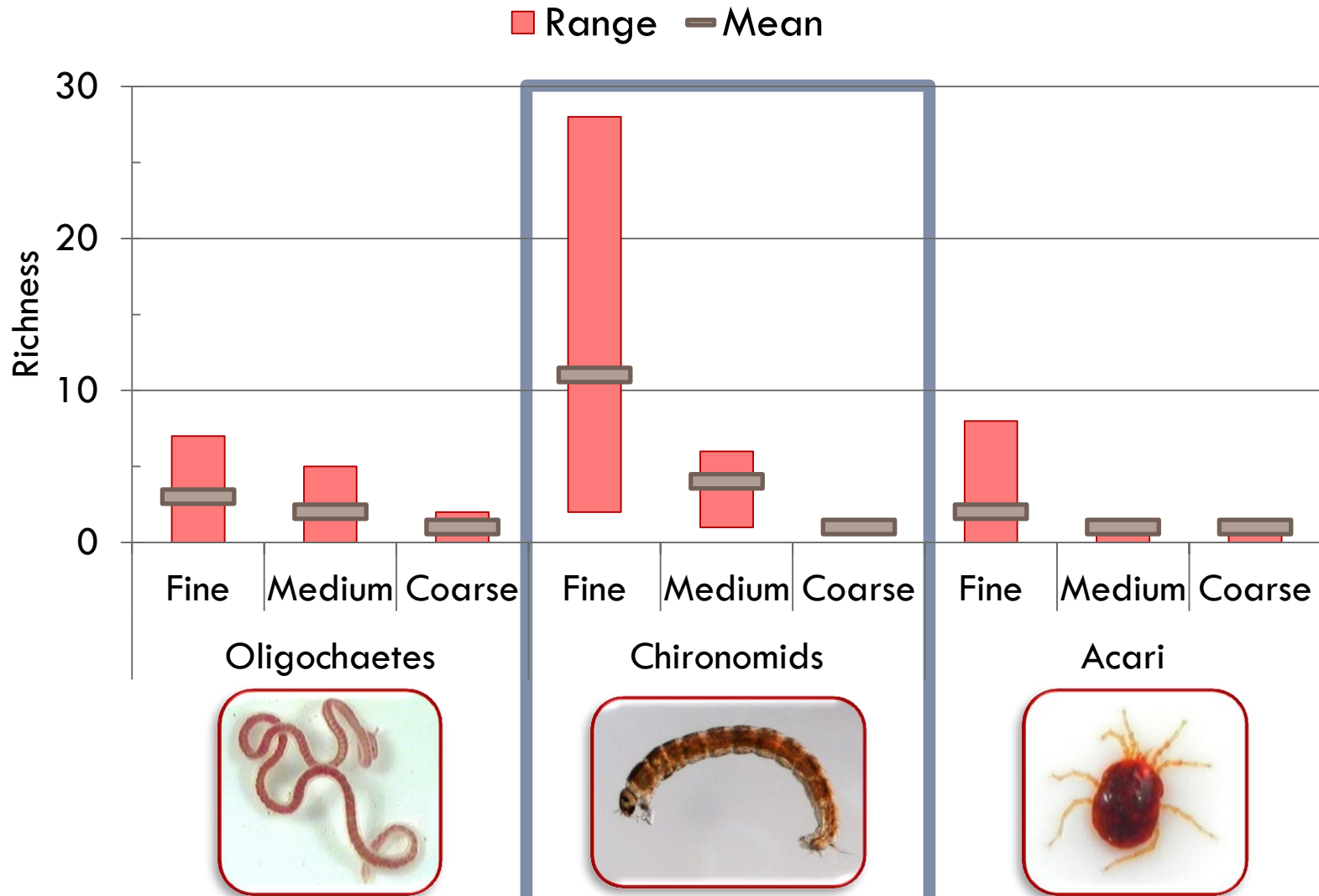
Taxa	Fine	Medium	Coarse
Oligochaetes	Subfamily/Genus	Family	Subclass
Acari	Genus	Subclass	Subclass
Gastropods	Genus	Genus	Family
Dytiscids	Genus	Genus (adults) Family (larvae)	Family
Simulids	Genus	Genus (larvae) Family (pupae)	Family
Chironomids	Genus/Sp/Sp grp	Subfamily/tribe	Family
Trichoptera (Pupae only)	Genus/Sp/Sp grp	Family	Order

 *Other groups = lowest practical level (Genus/sp)*

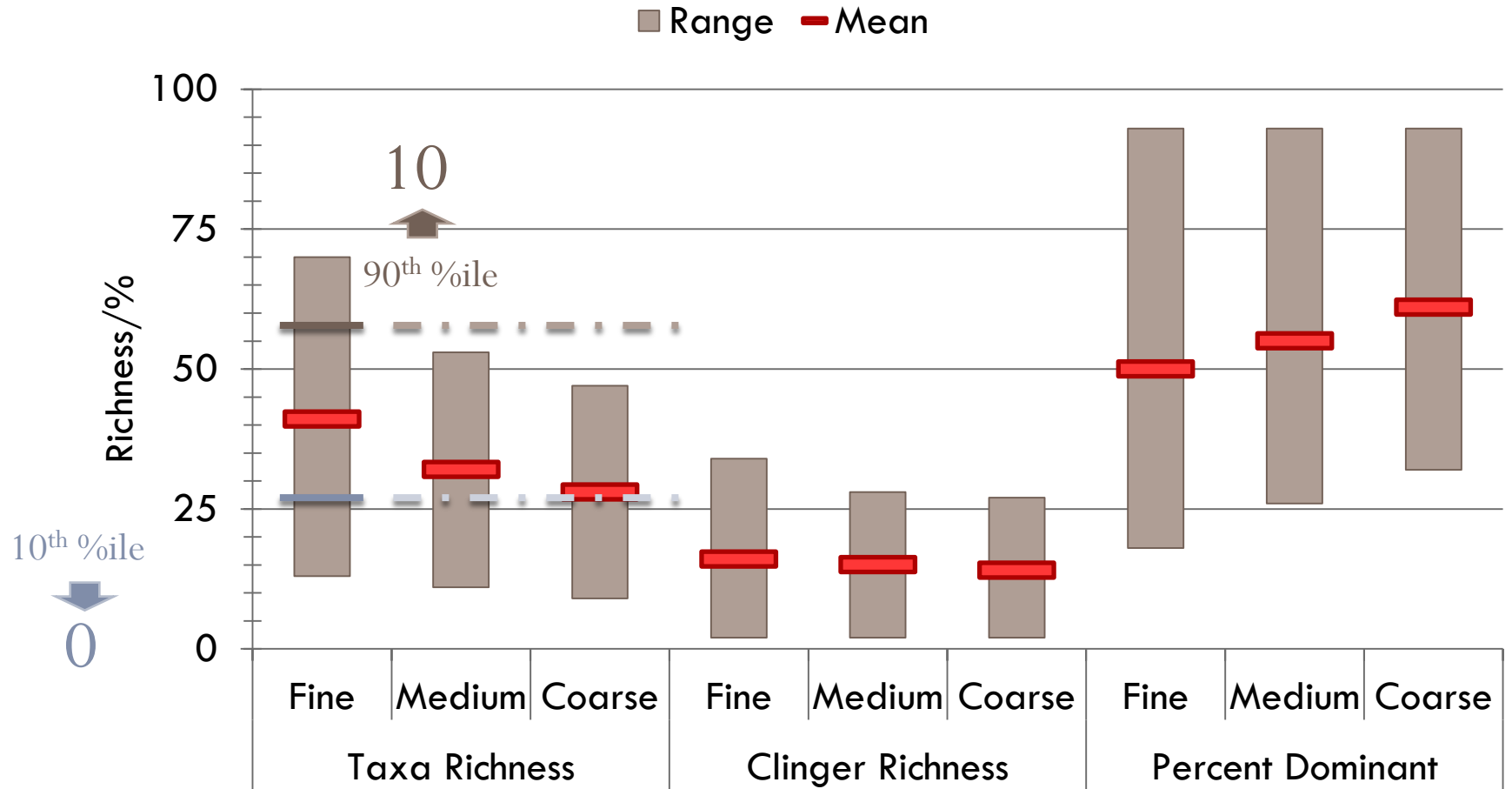
B-IBI: No Taxa Adjustments



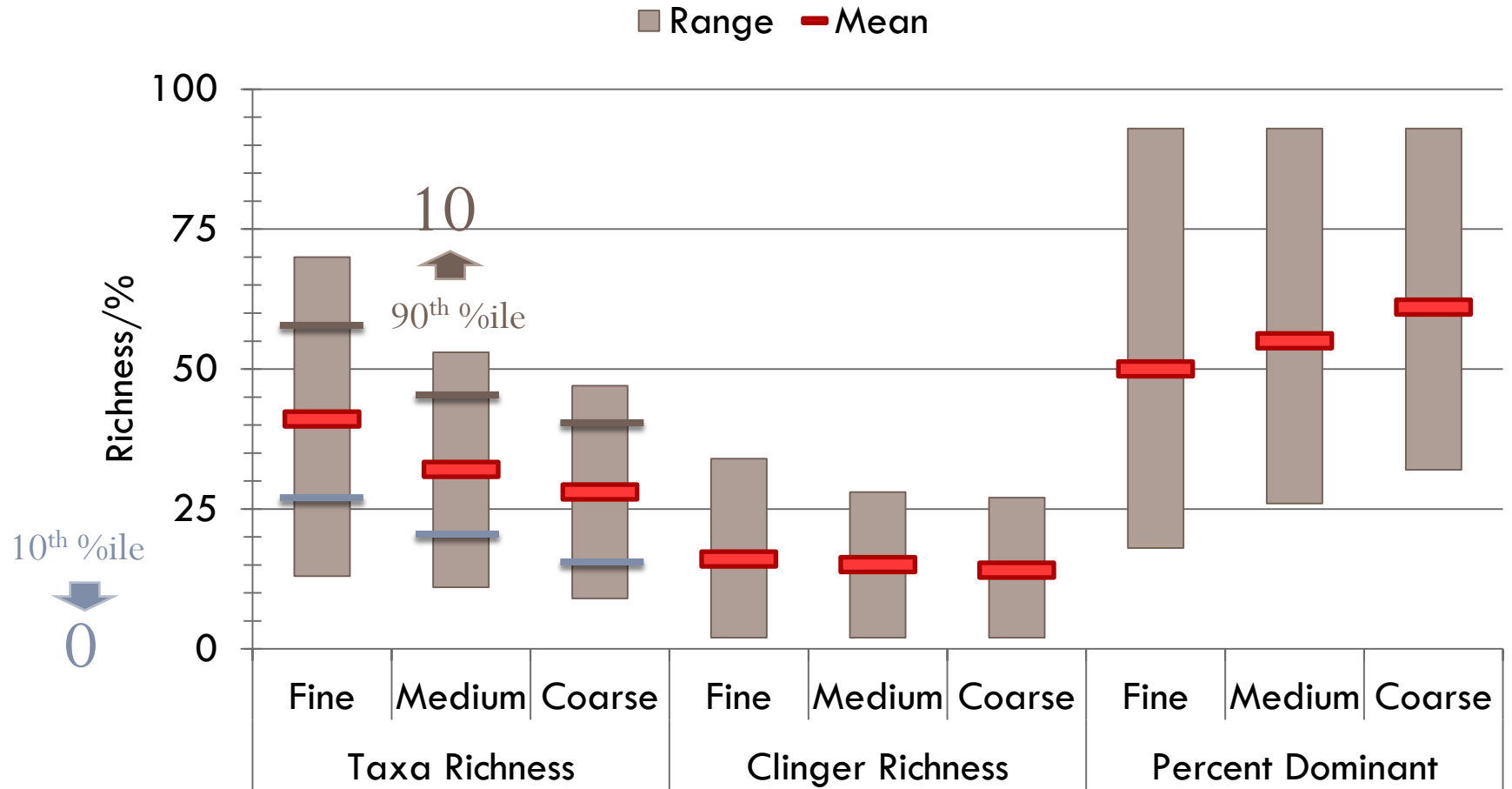
Taxa Effort: Chironomids Matter



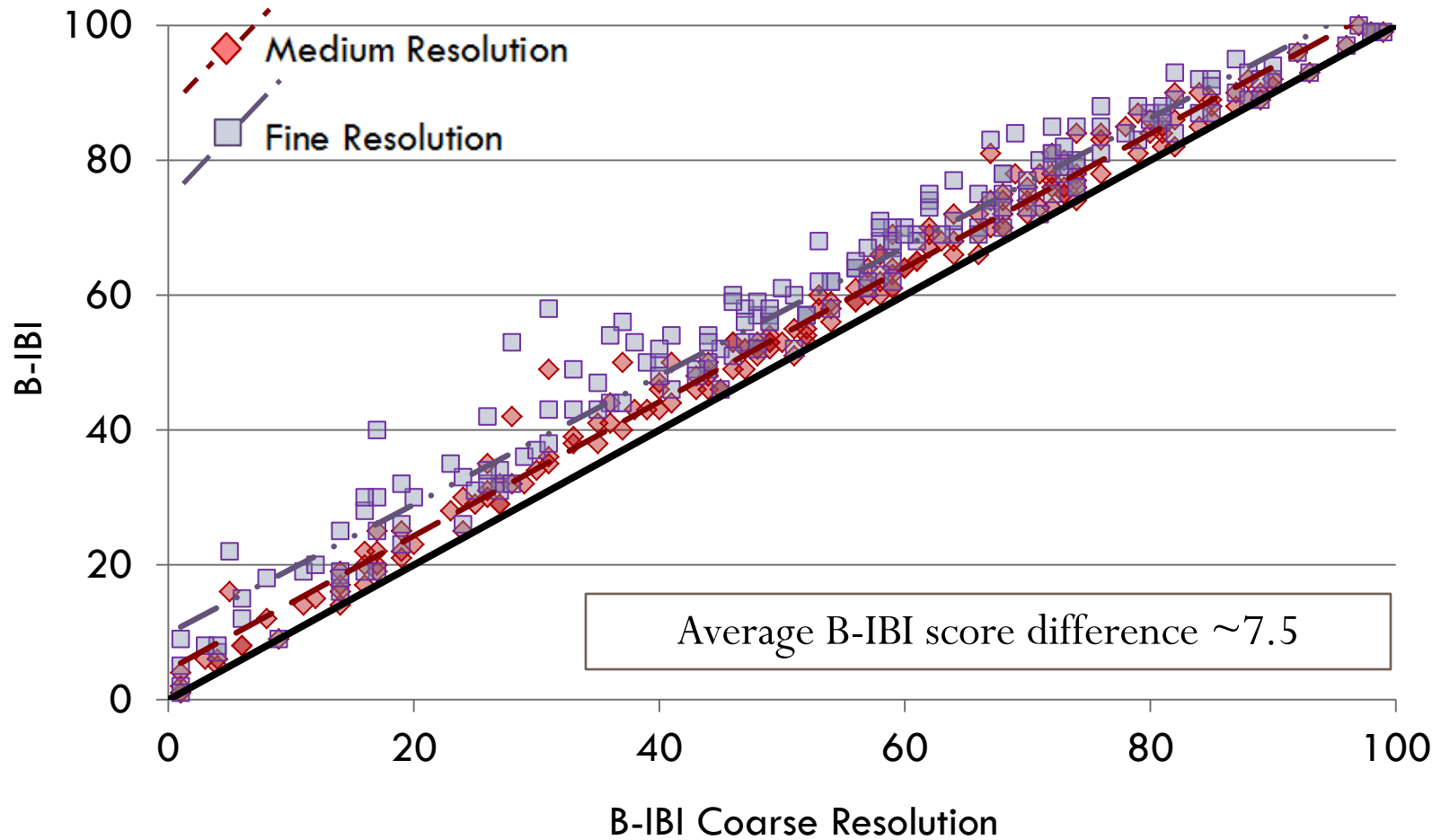
Taxa Effort: 3 Metrics Influenced



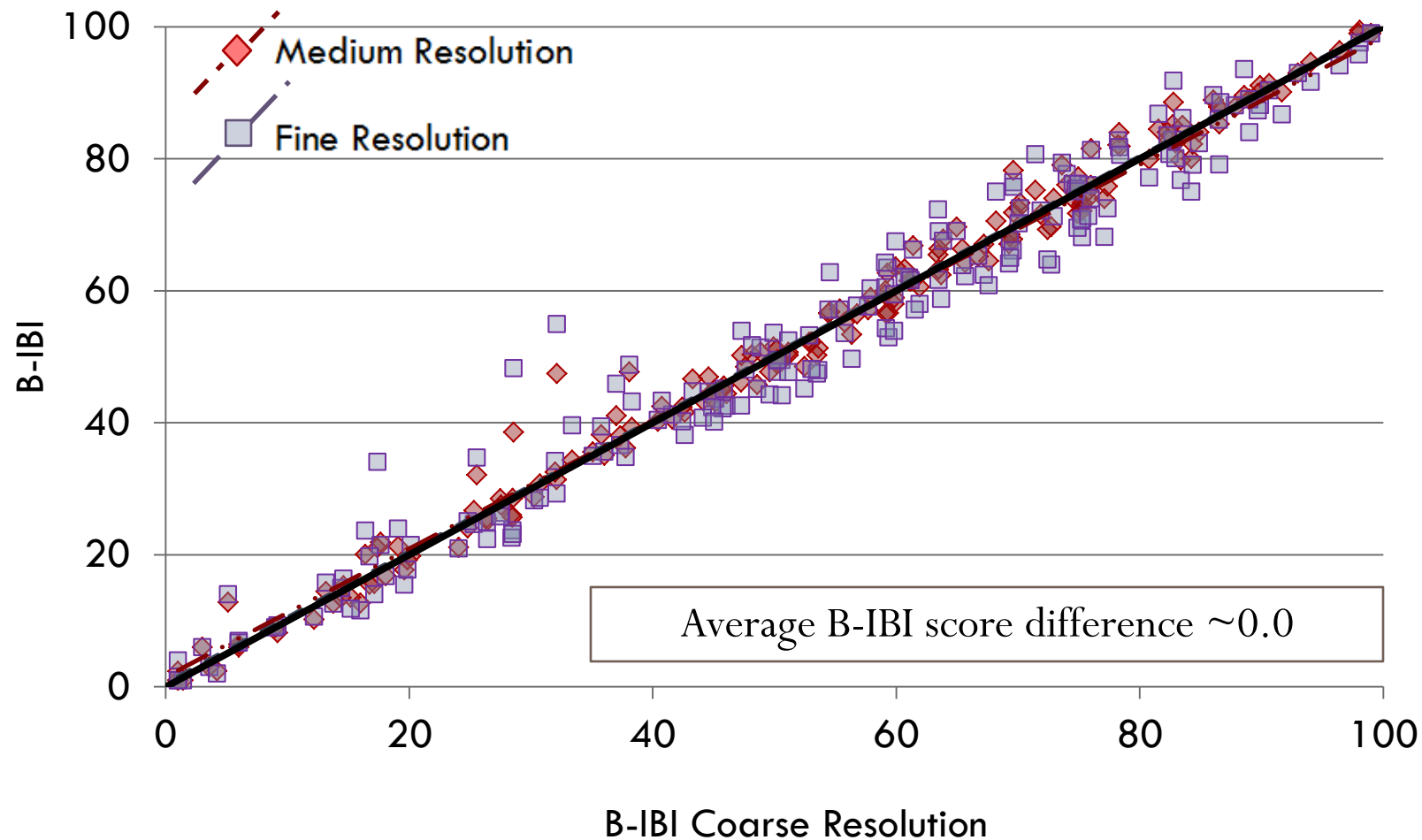
Taxa Effort: 3 Metrics Influenced



B-IBI: No Taxa Adjustments



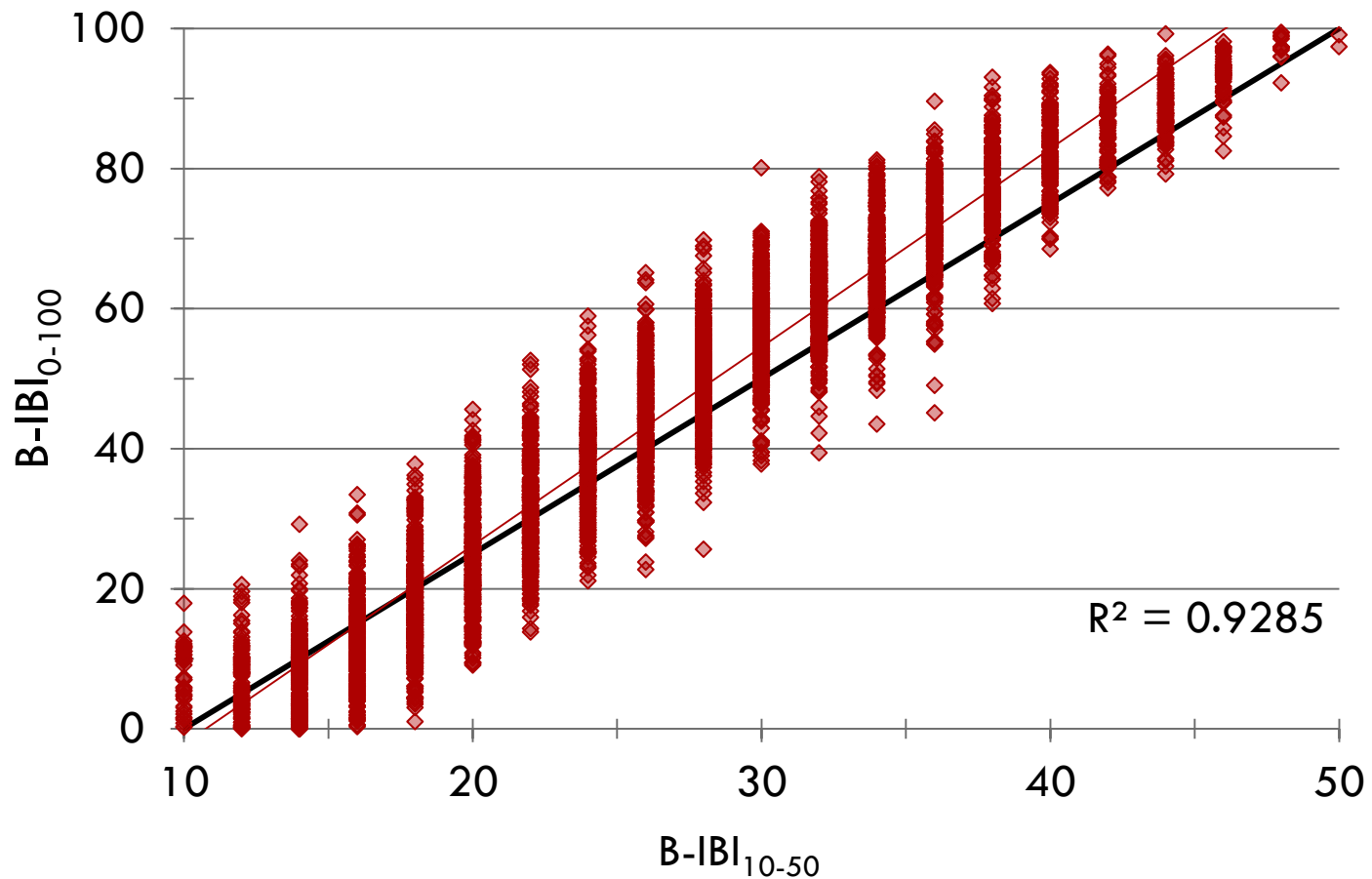
B-IBI: Adjusted for Taxa Effort



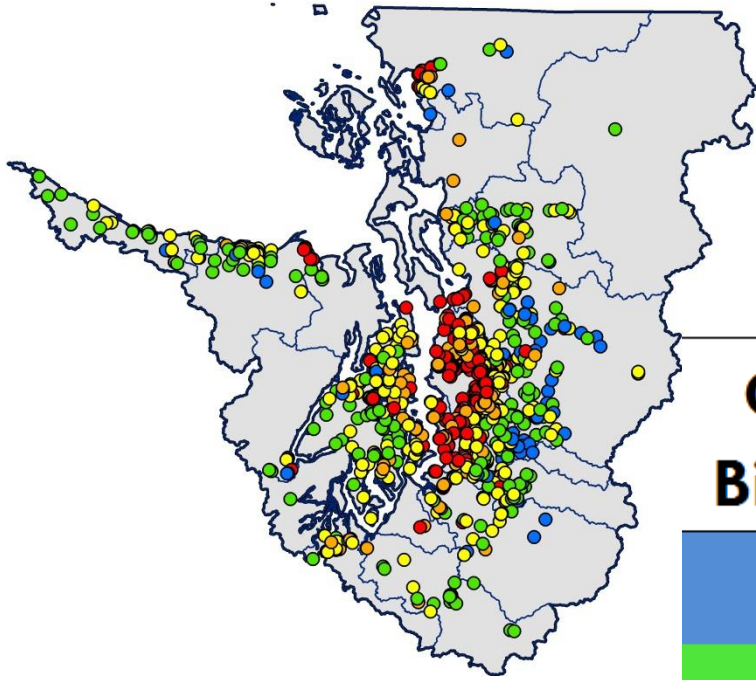
B-IBI Recalibration: Comparison

Variance (MS Error): $B-IBI_{0-100}=5.9$; $B-IBI_{10-50}=10.0$

41% increase in precision



B-IBI Condition Categories



Condition of Biotic Integrity	B-IBI ₁₀₋₅₀ Score	B-IBI ₀₋₁₀₀ Score
Excellent	46-50	80-100
Good	38-44	60-80
Fair	28-36	40-60
Poor	18-26	20-40
Very Poor	10-16	0-20

B-IBI Recalibration: Now Available!

Puget Sound Stream Benthos

Home Analysis ▸ Monitoring Projects ▸ Login About Us Site Map

Analysis: [Benthic Index of Biotic Integrity](#)

Show Criteria

Clear & Use Default Options Show Fewer Options

Area	Project	Location or Keyword
All Streams	All Projects	
Aggregation	Score Type	Metric
Don't Aggregate	0-100 B-IBI	Overall Score
Replicate Handling	Taxonomic Resolution/STE (See lists)	Taxa at Visit Metrics
Combine replicates, then calculate	As Defined by Metadata	...
Taxa Attributes (See lists)	Taxa Exclusions	Taxa at Visit Filter
Fore, Wisseman, 2012 (recommended for 0-100 B-IBI)	See the list	...
Number of Organisms <input type="radio"/> Count per Sample <input checked="" type="radio"/> Count per Visit		Year <input checked="" type="radio"/> Latest per Site in Range <input type="radio"/> All in Range
Min: <input type="text"/> Max: 500 <input type="radio"/> Flag <input type="radio"/> Omit <input checked="" type="radio"/> Omit/Subsample		Range from <input type="text"/> Earliest through <input type="text"/> Latest

Open in new tab Plot on Map Tabulate Tabulate Trend Chart Trend Show Samples Download...

www.pugetsoundstreambenthos.org

Take Home Messages: B-IBI₀₋₁₀₀

- Attributes keyed to literature & empirical data
- 0-100 scale in line with national indices
- Increased precision



Acknowledgements



all grant materials can be found at:
www.pugetsoundstreambenthos.org

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