



Coeur d'Alene, Idaho
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Recalibrating Florida's Stream Condition Index

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Florida's Stream Condition Index: 1990's Multimetric Approach

- Established reference condition in various sub-ecoregions
 - Best professional judgment
 - Surrounding land use, in-stream habitat
- Sampled known impaired sites
 - Point source discharge studies
 - Toxicity, low DO, poor habitat

Florida's Stream Condition Index: 1990's Multimetric Approach (cont.)

- Selected 7 metrics
 - Box and whisker plots determined discrimination power
- Aggregated by summing metrics
 - 5, 3, 1 point, depending on departure from reference condition

Florida's SCI Index Re-calibration

- Develop human disturbance gradient
 - Test disturbance gradient for each Bioregion
 - Evaluate metric response to disturbance gradient (new thresholds, new metrics)
- Determination of metric variability
- Power analysis for trend detection
- Develop consistency with EPA Tiered Aquatic Life Use Support guidance (TALUS)

Human Disturbance Factor Analysis

- Landscape level
 - Landscape Development Intensity Index
- Habitat alteration
 - Habitat assessment data
- Hydrologic modification
 - Hydrologic scoring process
- Chemical Pollution
 - Ammonia, etc.

**Energy
source**

LDI (Buffer)

**Chemical
variables**

NH₃

**Flow
regime**

Hydrologic
score

**Habitat
structure**

Habitat score

**Biotic
factors**

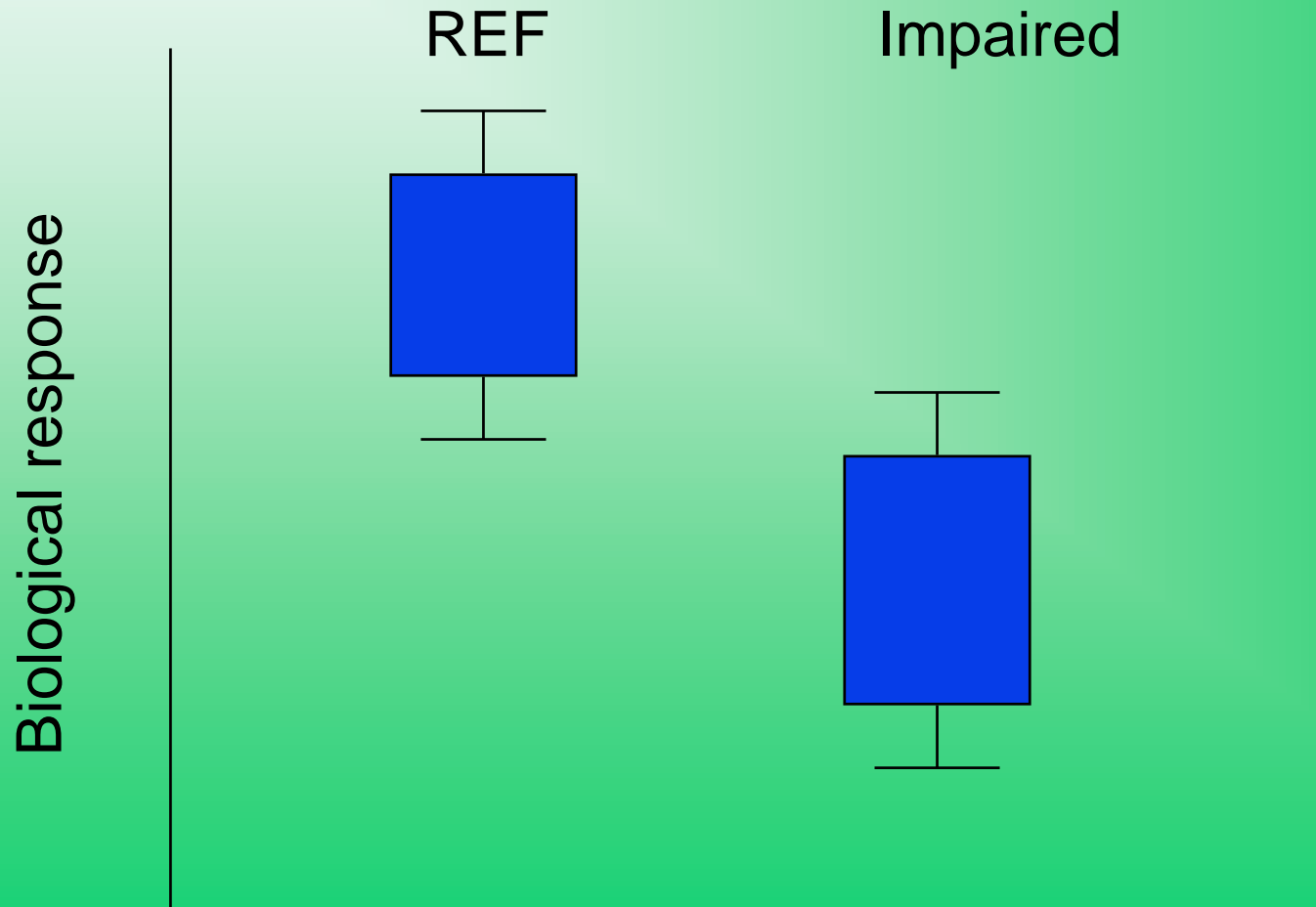


HDG
Human disturbance
gradient

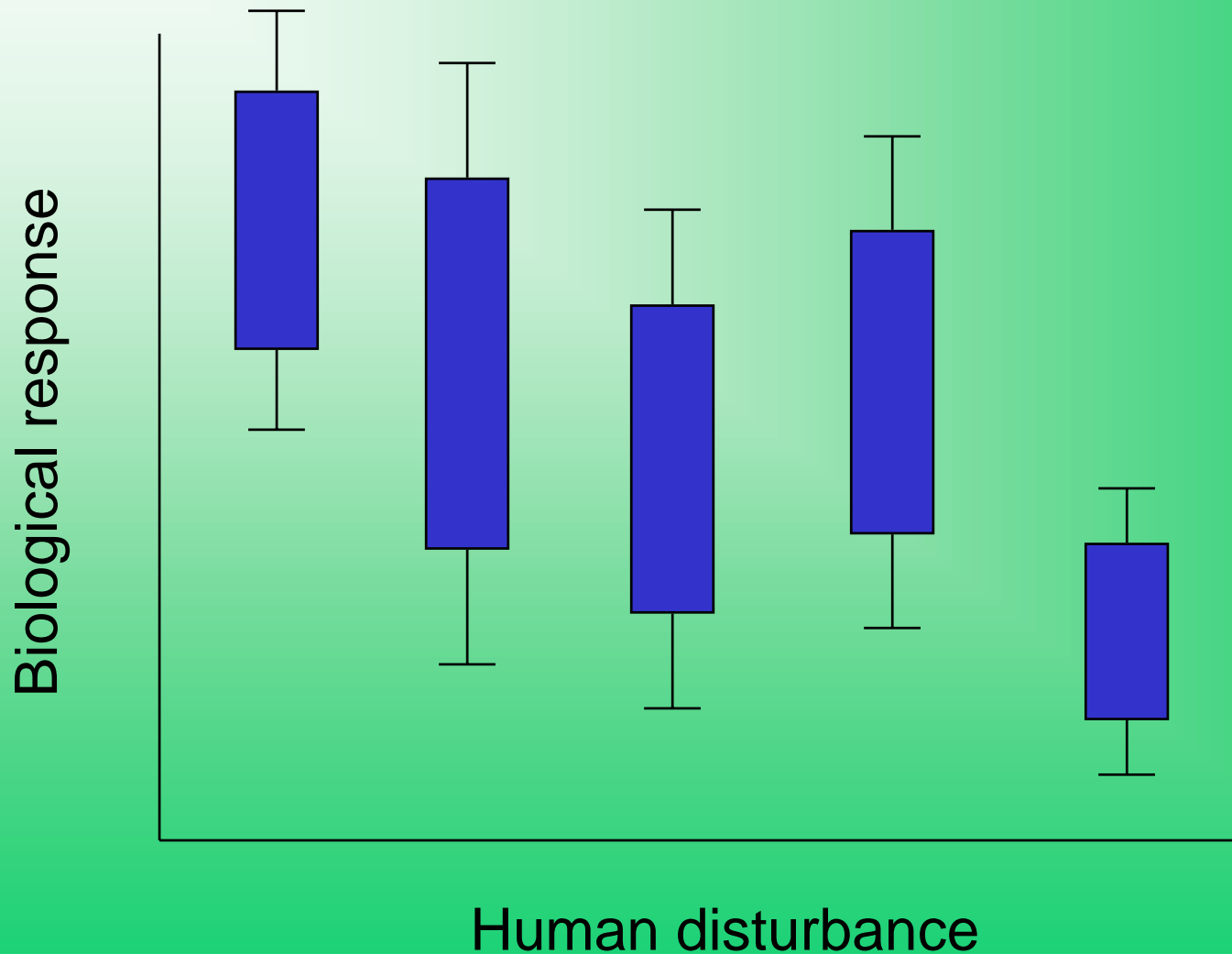
Two Approaches to Assessing Metrics

- Compare extremes
 - reference vs. impaired
- Compare across continuum of disturbance
 - Human Disturbance Gradient

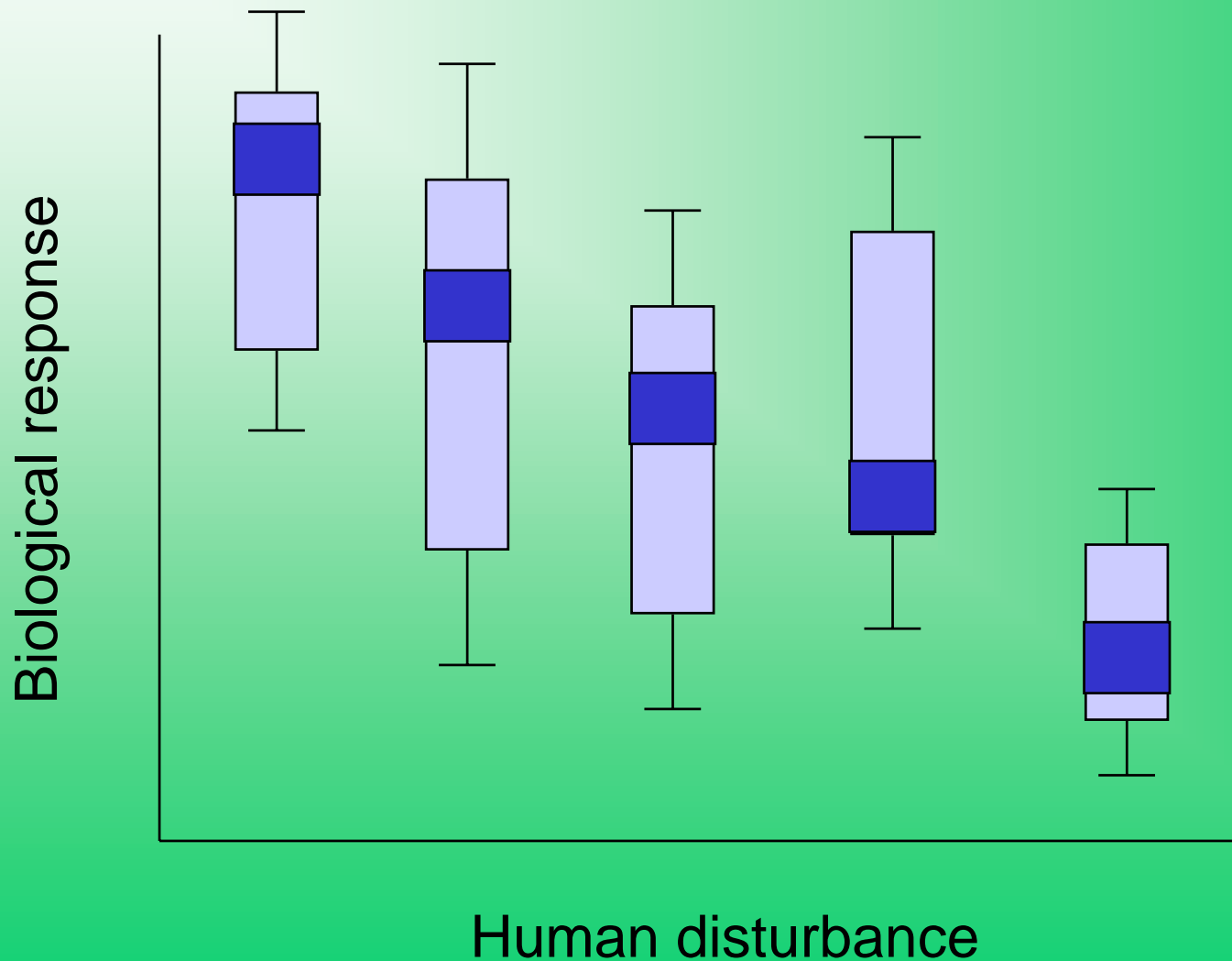
Works for extremes,
but what about TALUS axis?



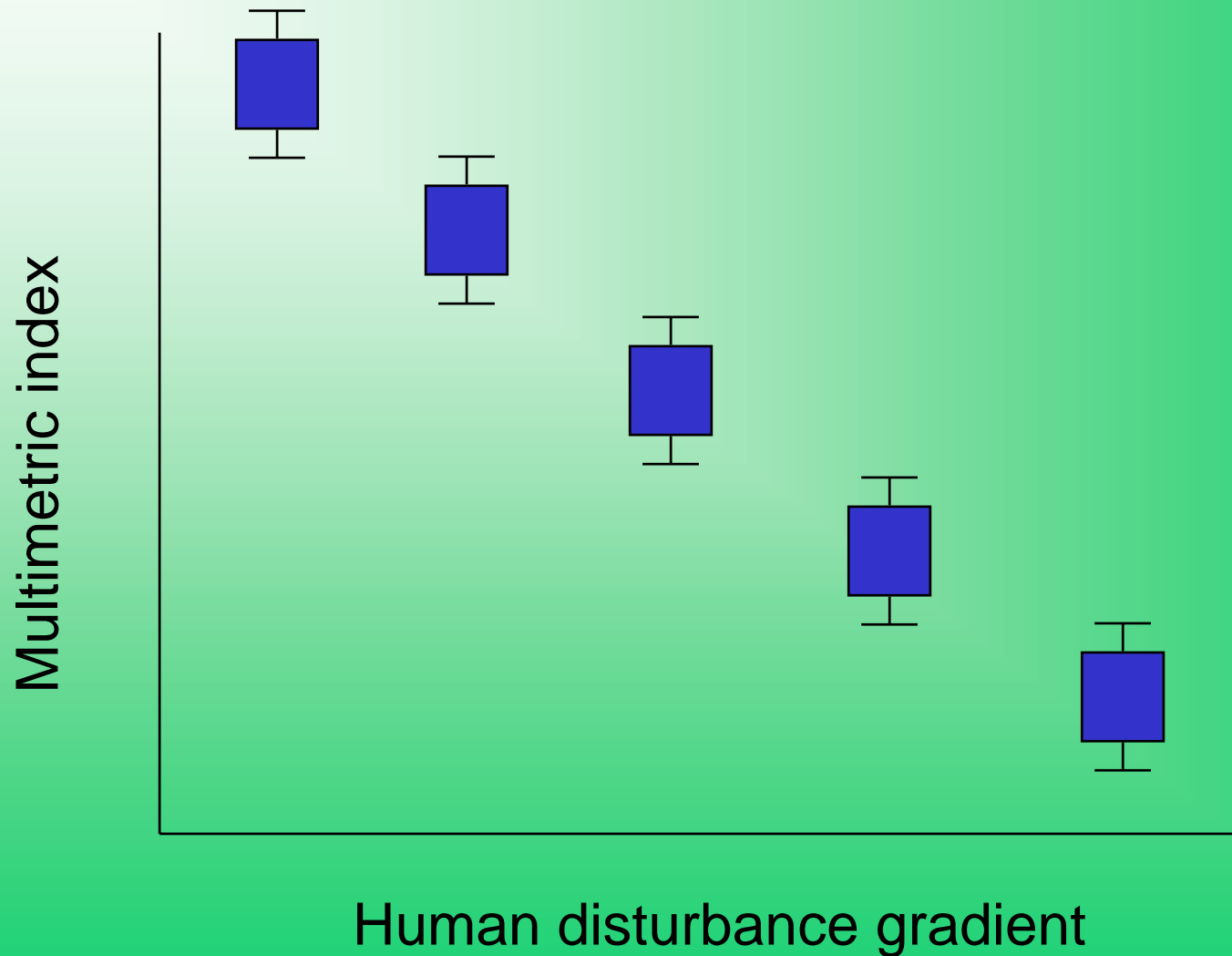
Noise on both axes!



Refine human disturbance scale
(find strongest predictors),
Select only the most robust biological metrics



The (unattainable?) Ideal



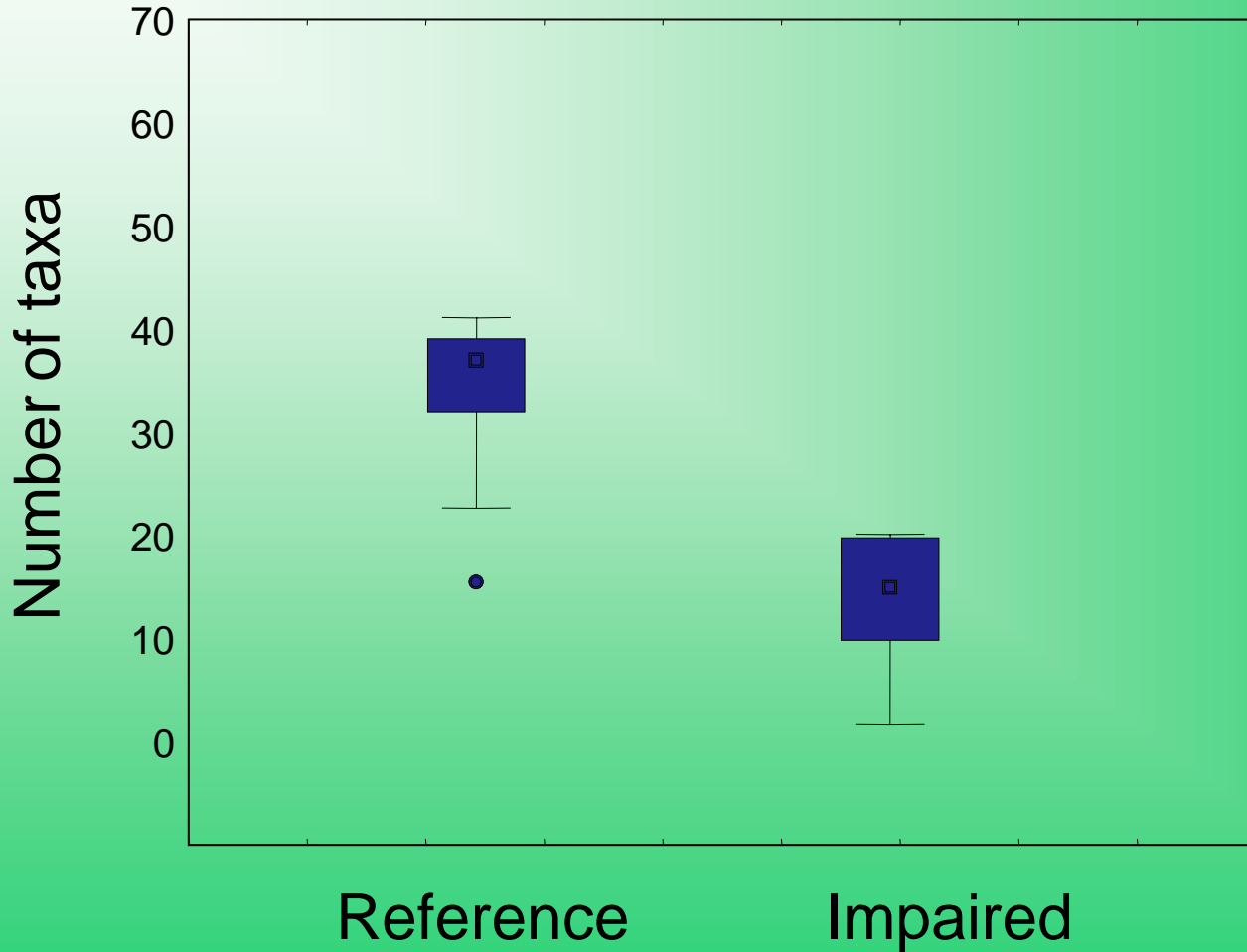
Metric Selection Criteria

- Meaningful measure of ecological structure or function
- Strong and consistent correlation with human disturbance
- Statistically robust, low measurement error
- Represent multiple categories of biological organization
- Not redundant with other metrics
 - Exception: “response signature” metrics

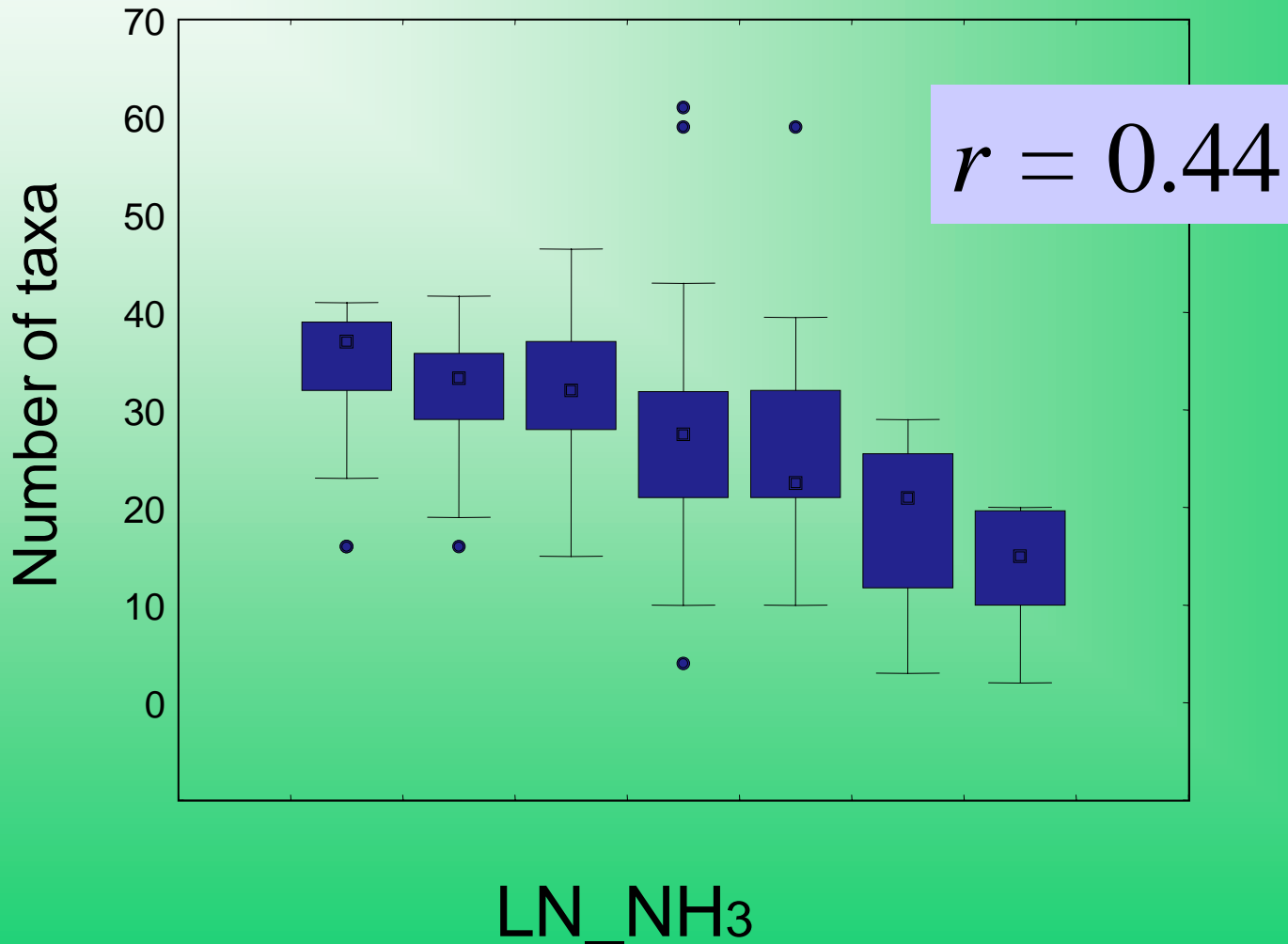
Metric Testing

1. Taxonomic richness & composition
2. Functional feeding groups
3. Life history
4. Tolerance and intolerance

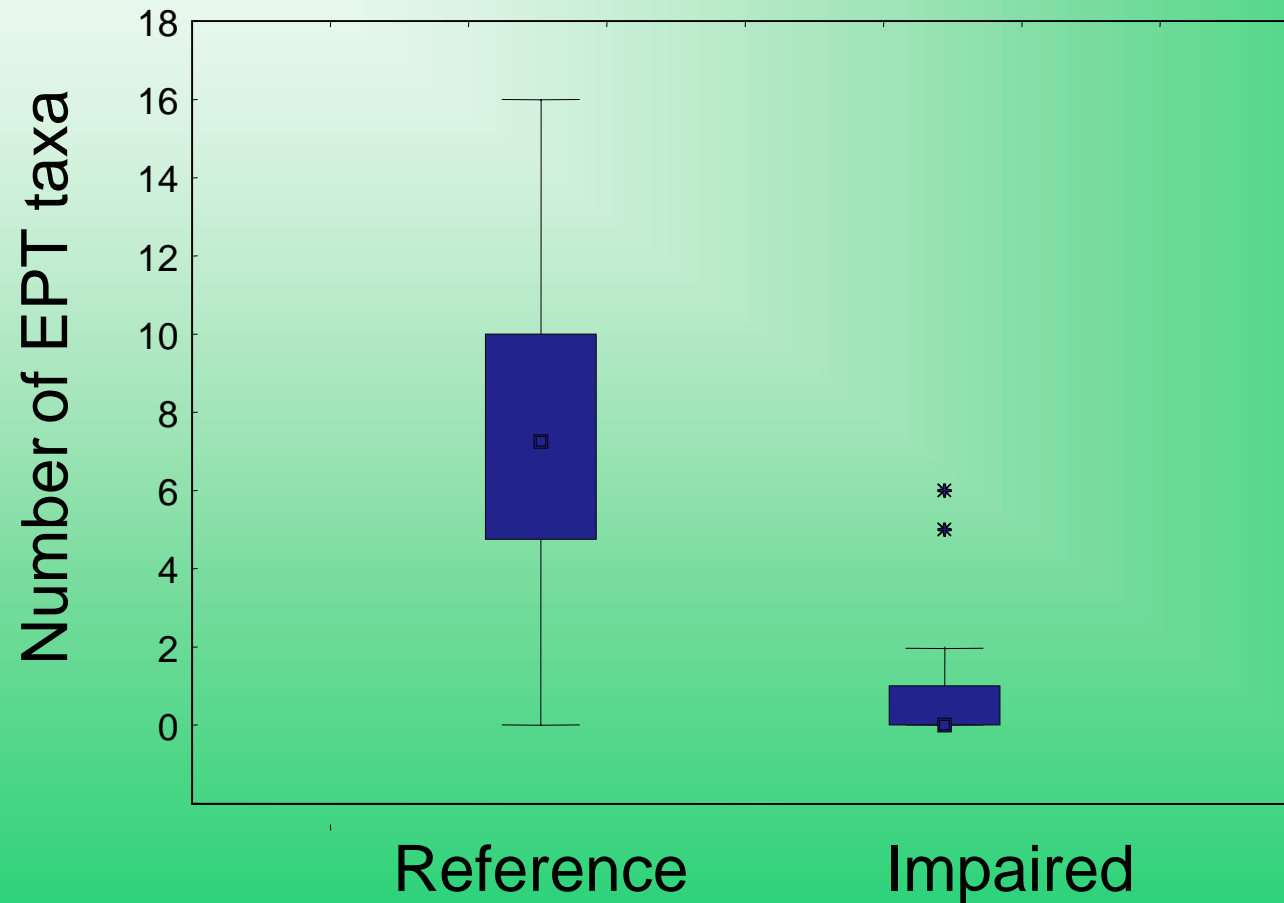
Taxa Richness: Reference vs. Impaired



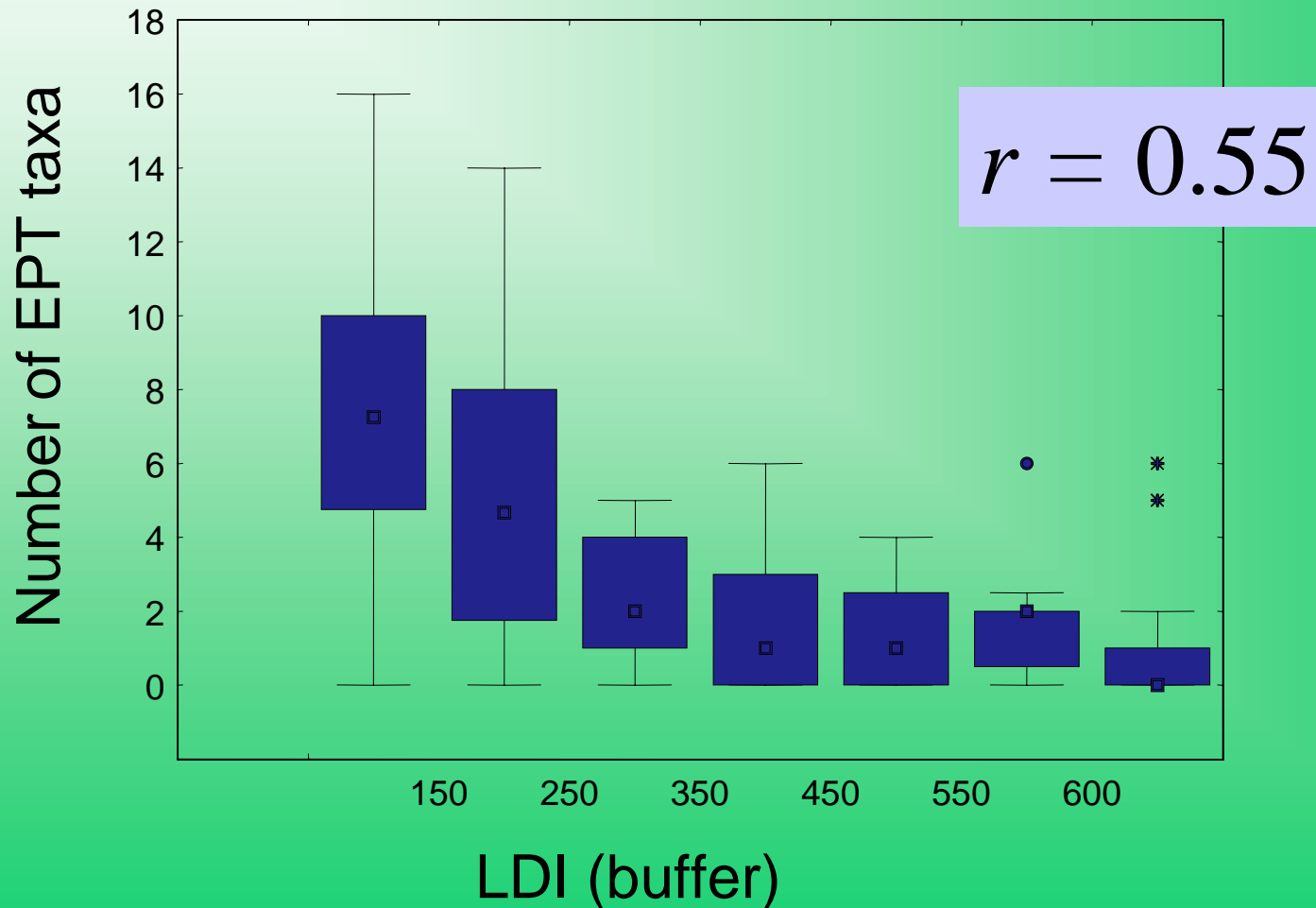
Taxa Richness vs. Water Quality Component of HDG



EPT: Reference vs. Impaired



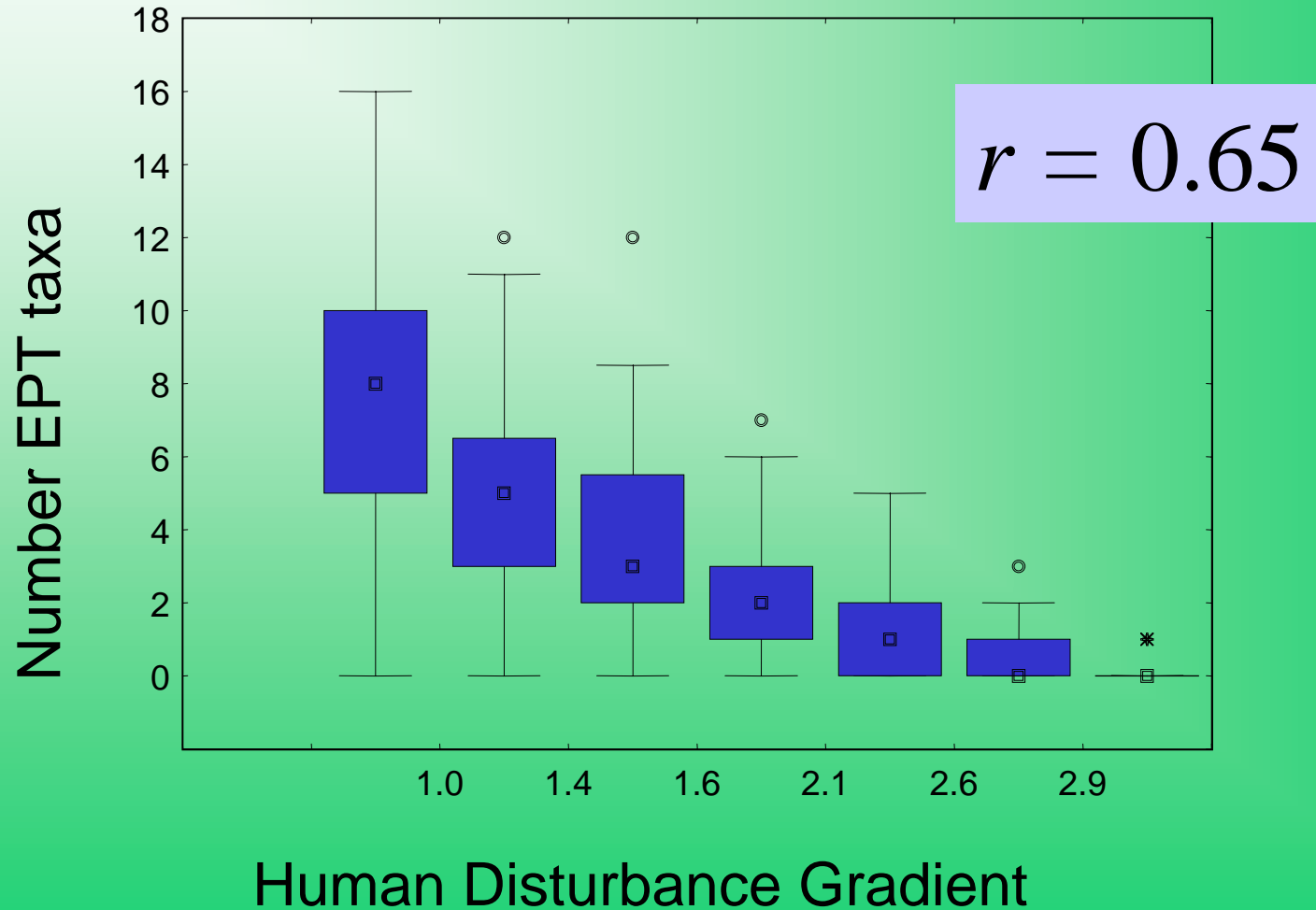
EPT vs. Landscape Development Intensity Index



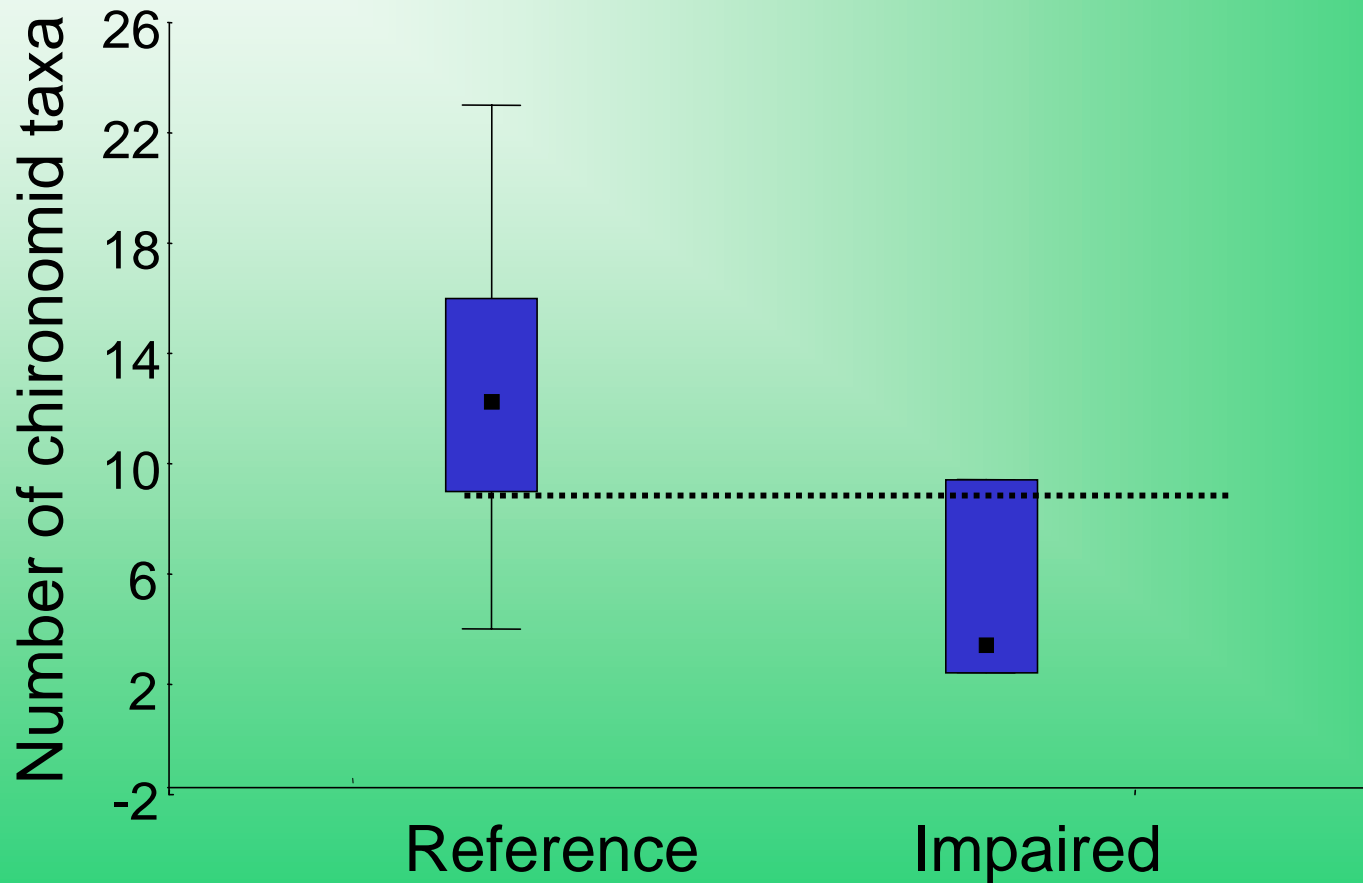
HDG is a combination of other disturbance measures

| Scores Measure | 1 | 2 | 3 | 4 |
|-----------------------|----------|-------------|----------|----------|
| NH3 | <0.1 | >0.1 | >2 | |
| Habitat | >65 | >50 and <65 | <50 | |
| Hydro | <6 | 6-7 | 8-9 | 10 |
| LDI (buffer) | <200 | 200-350 | >350 | |
| LDI (ws) | <200 | 200-350 | >350 | |

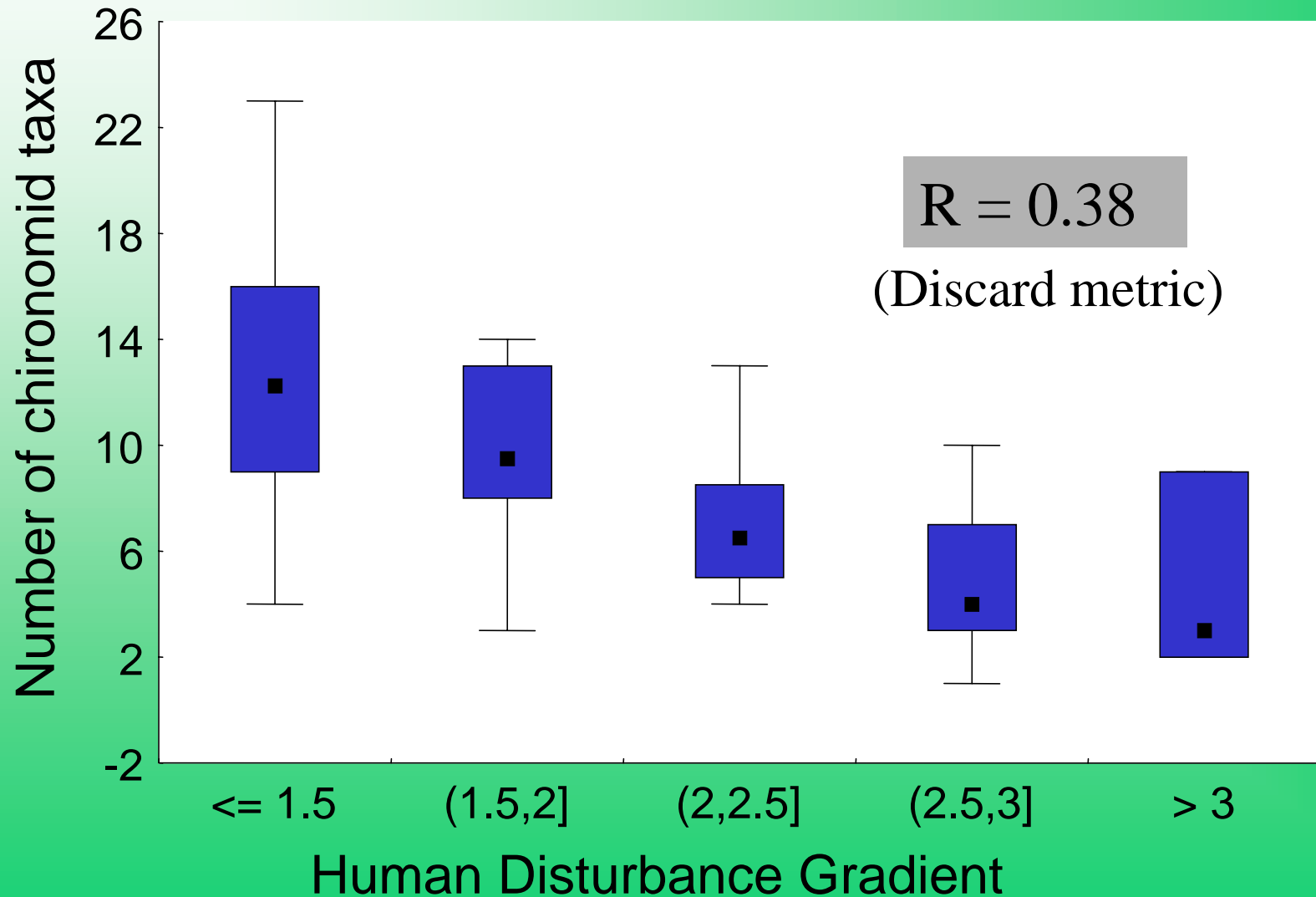
EPT vs. Human Disturbance Gradient



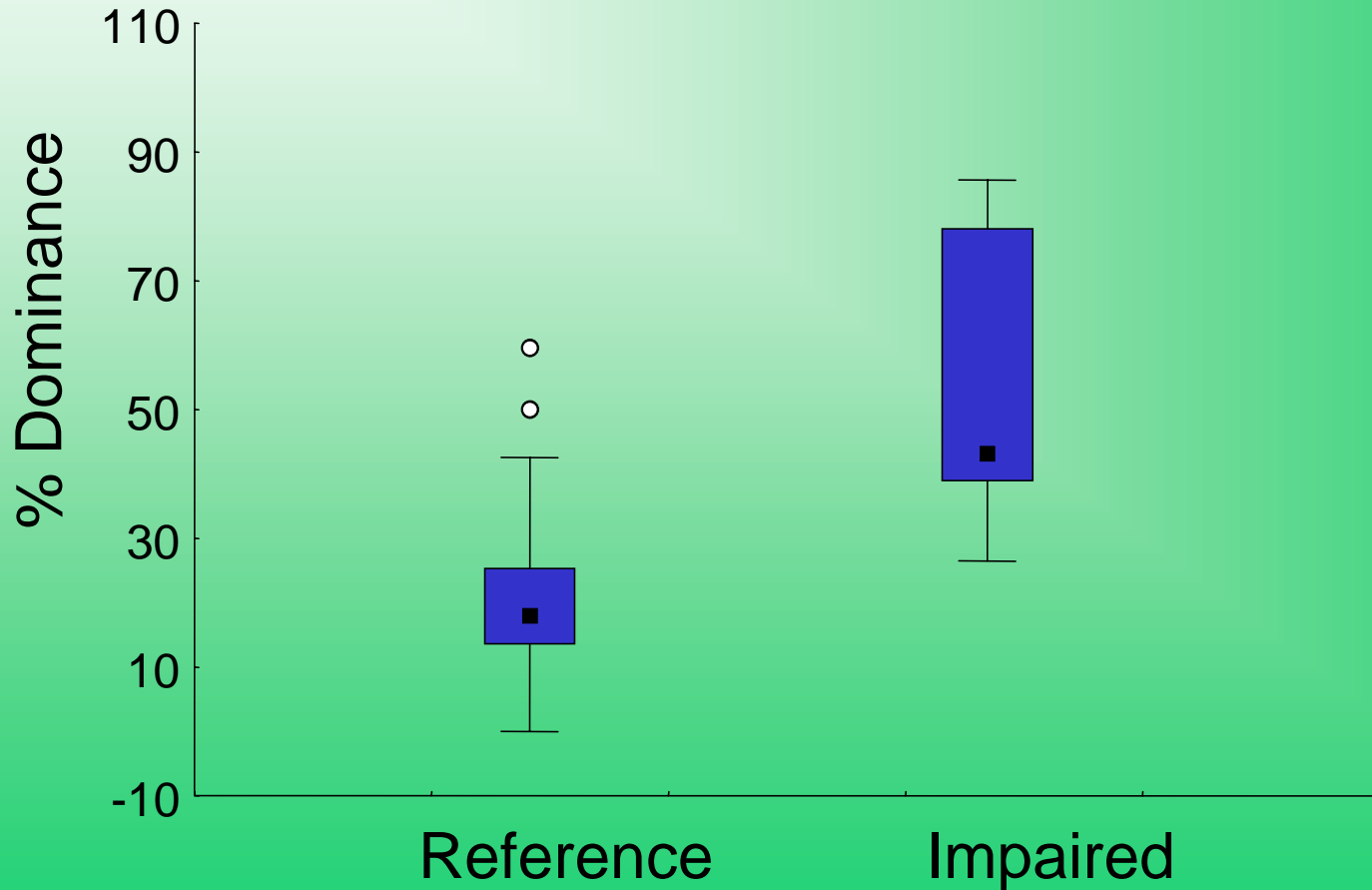
Chironomid taxa: Reference vs. Impaired



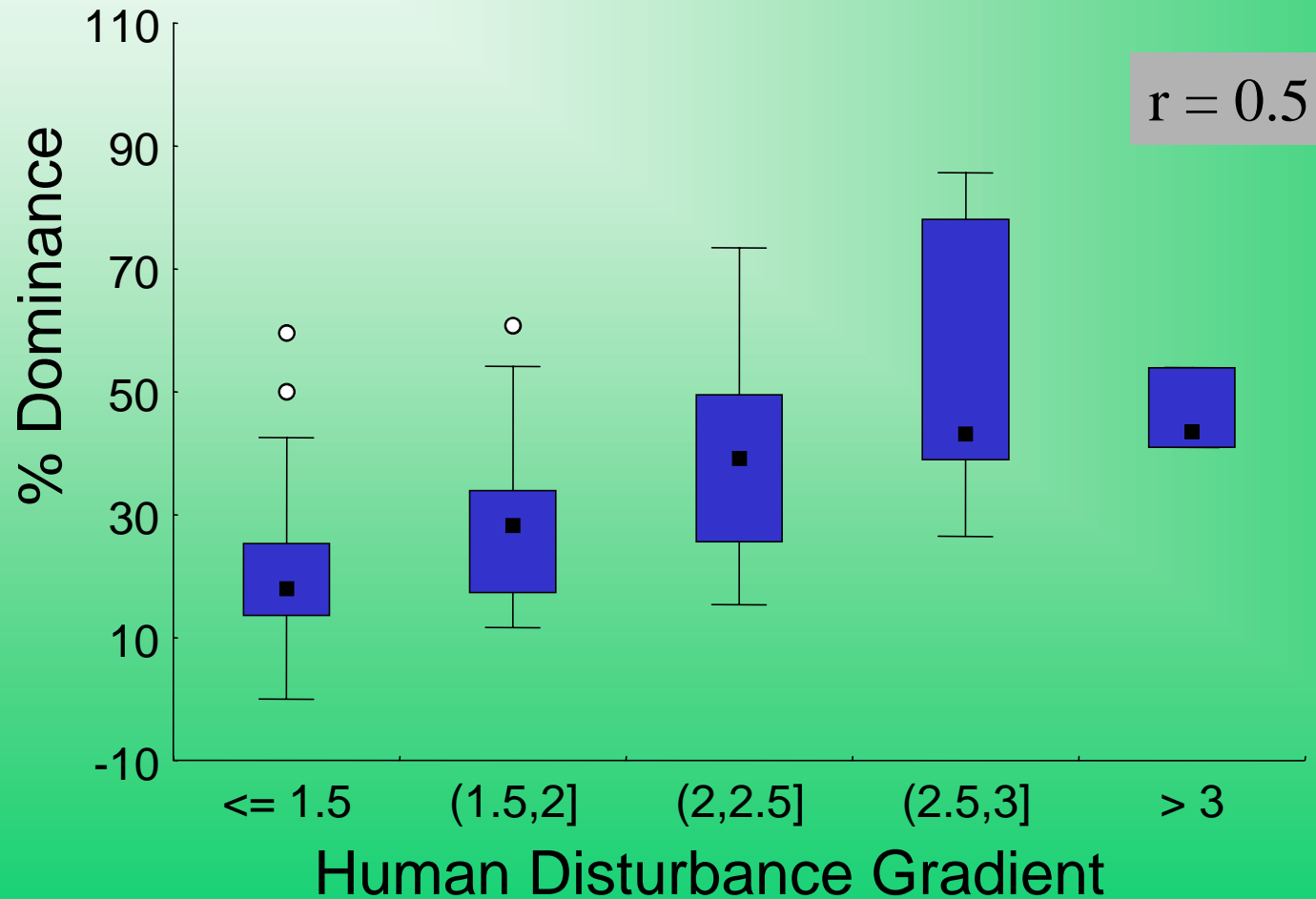
Chironomid taxa vs. HDG



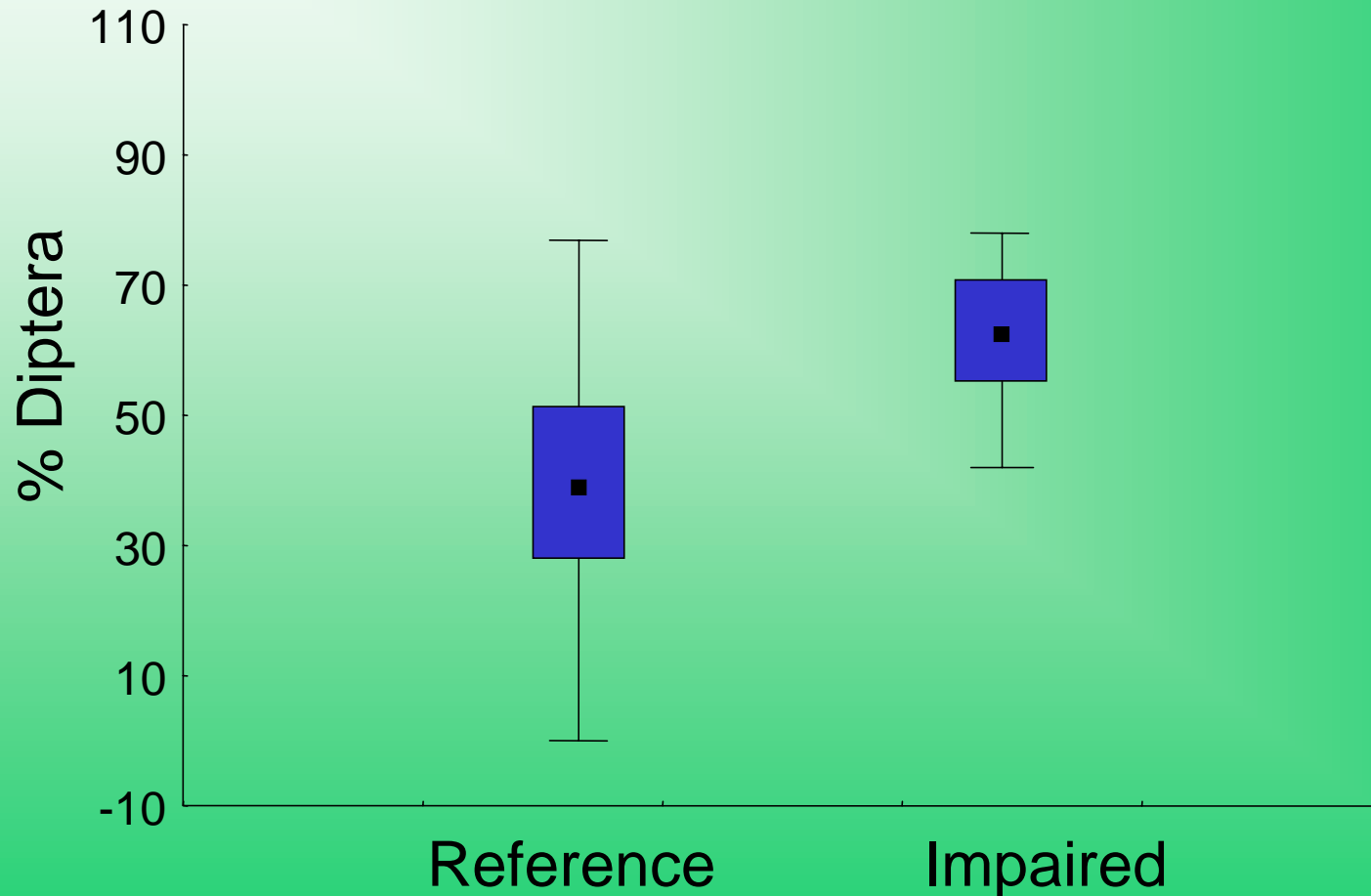
% Dominance: Reference vs. Impaired



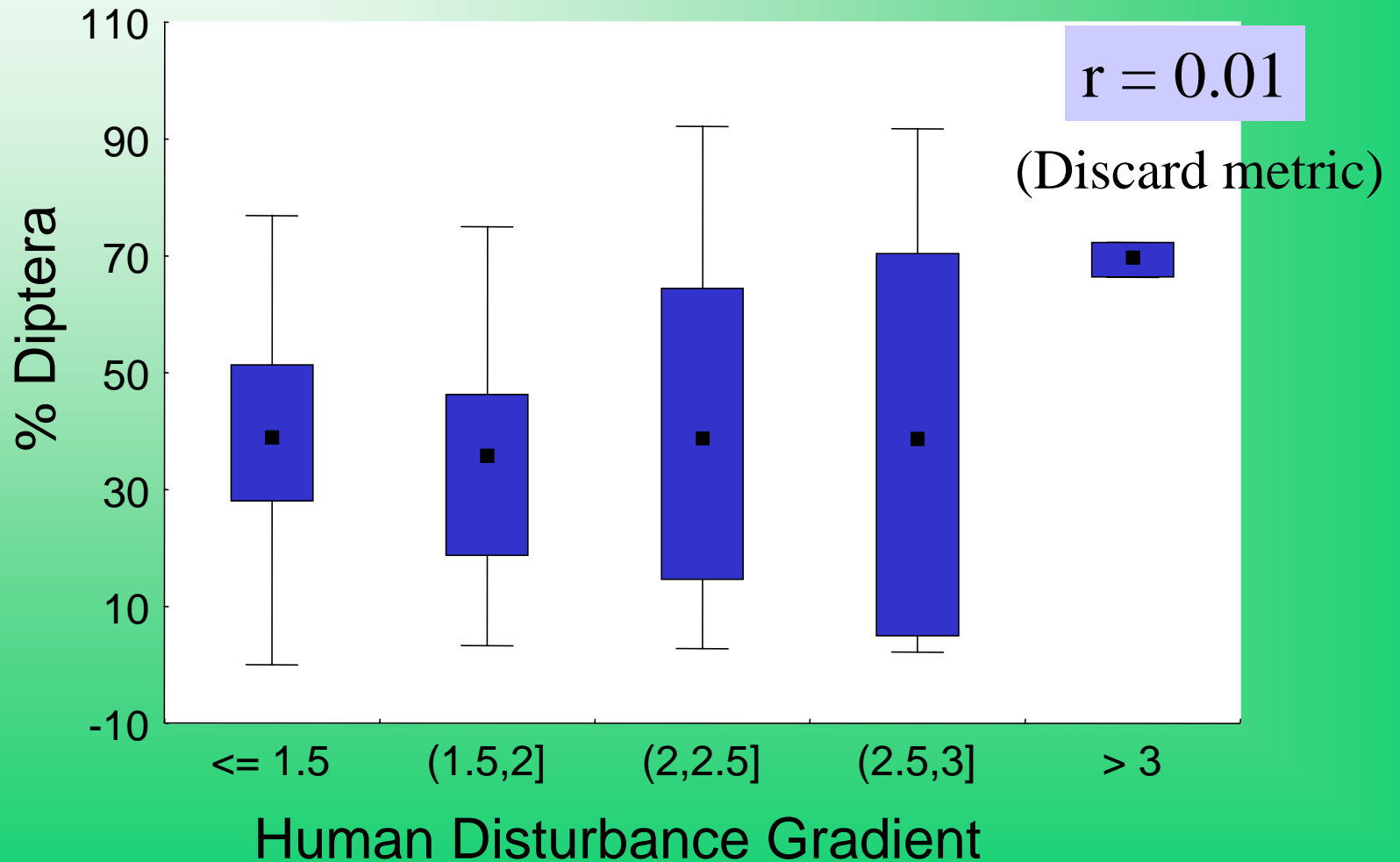
% Dominance vs. HDG



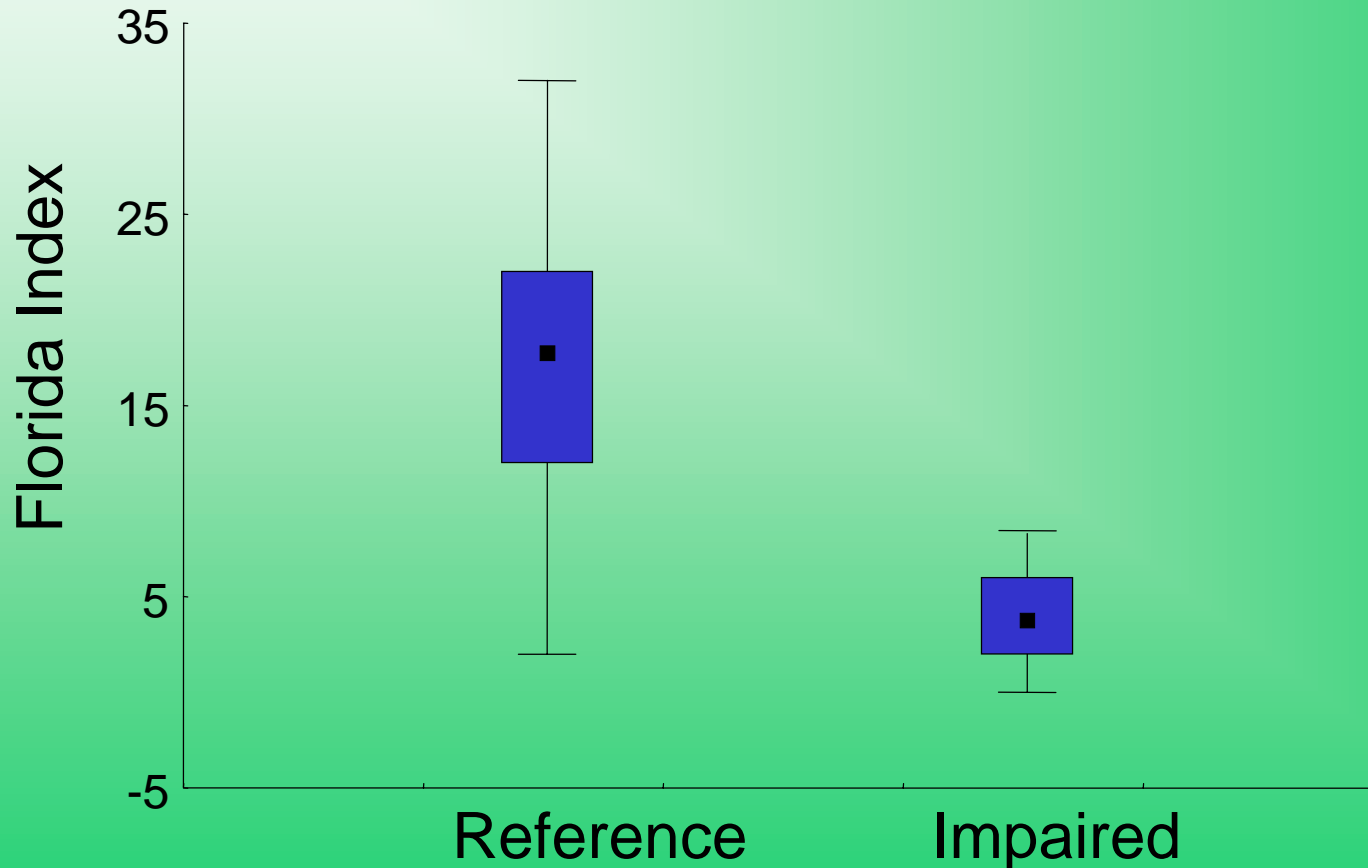
% Diptera : Reference vs. Impaired



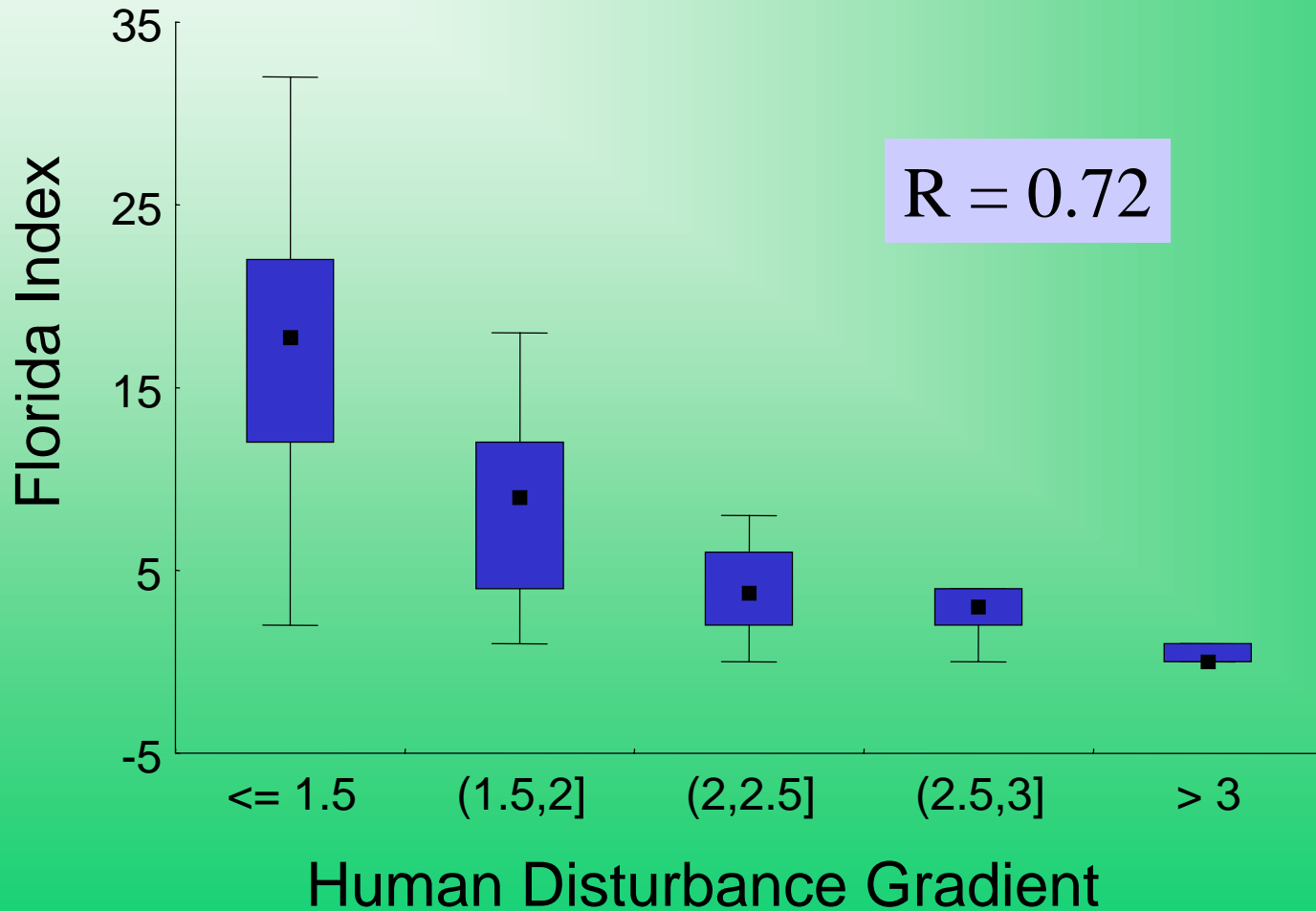
% Diptera vs. HDG



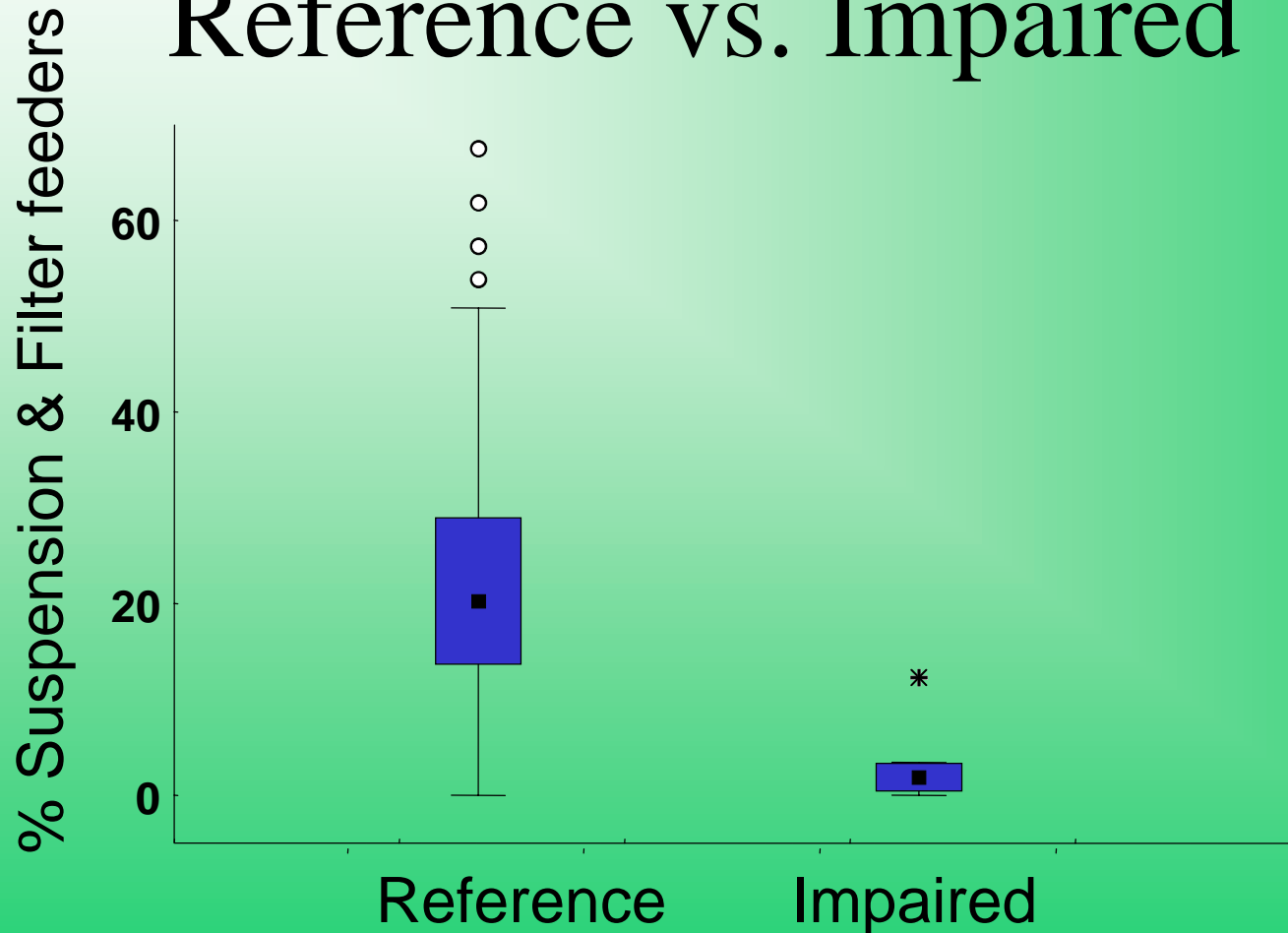
Florida Index: Reference vs. Impaired



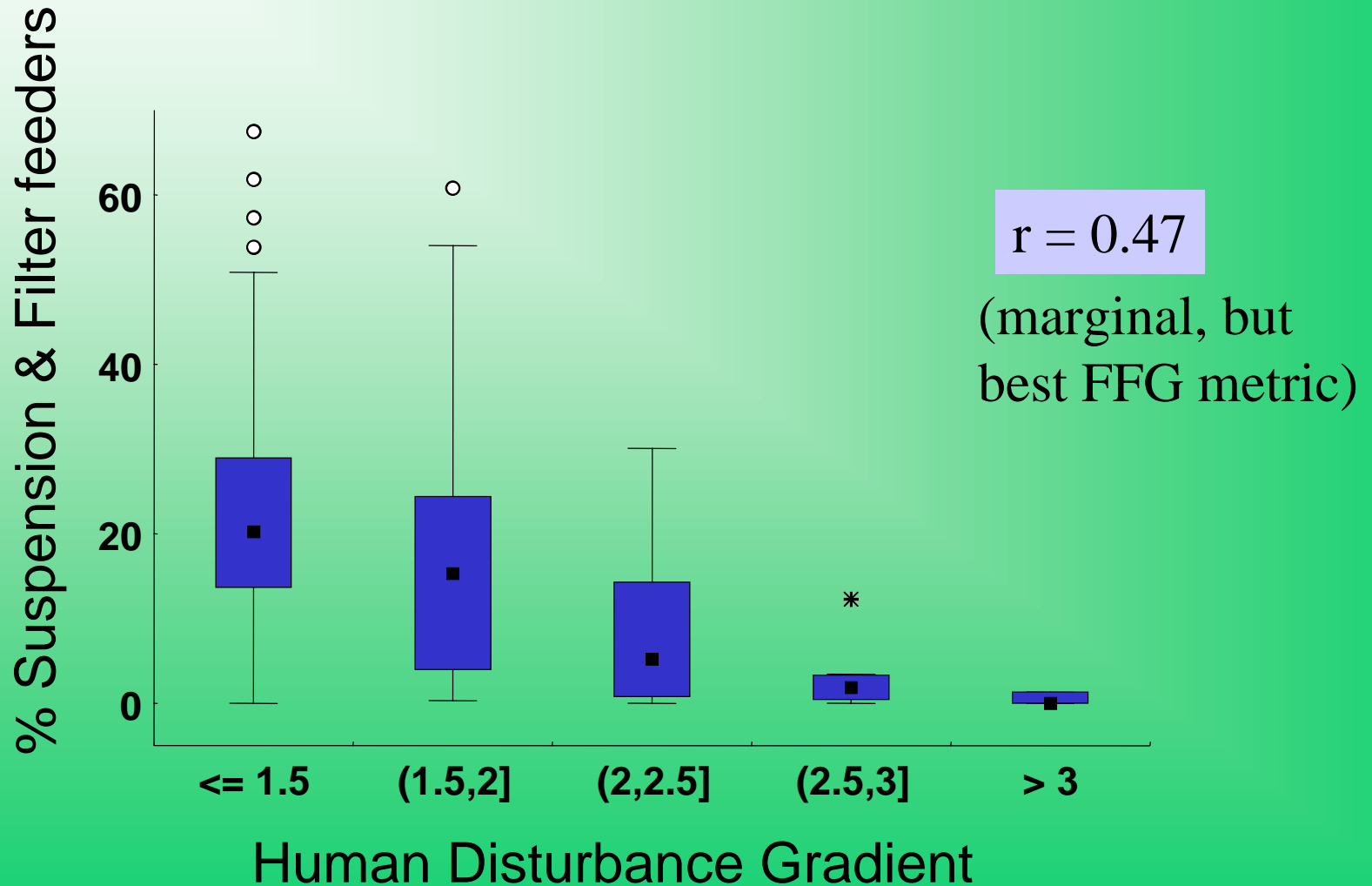
Florida Index vs. HDG



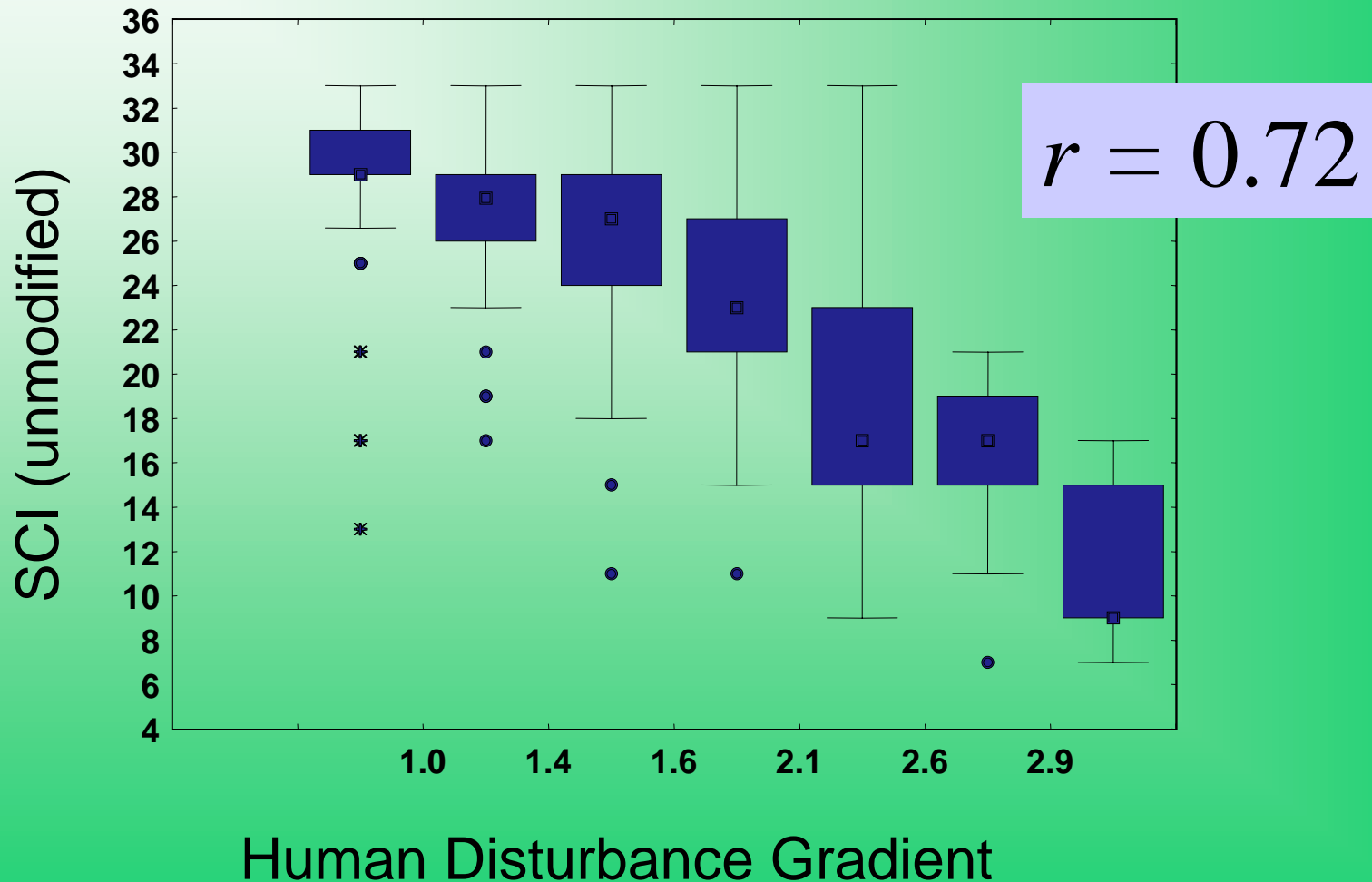
Filter-feeders: Reference vs. Impaired



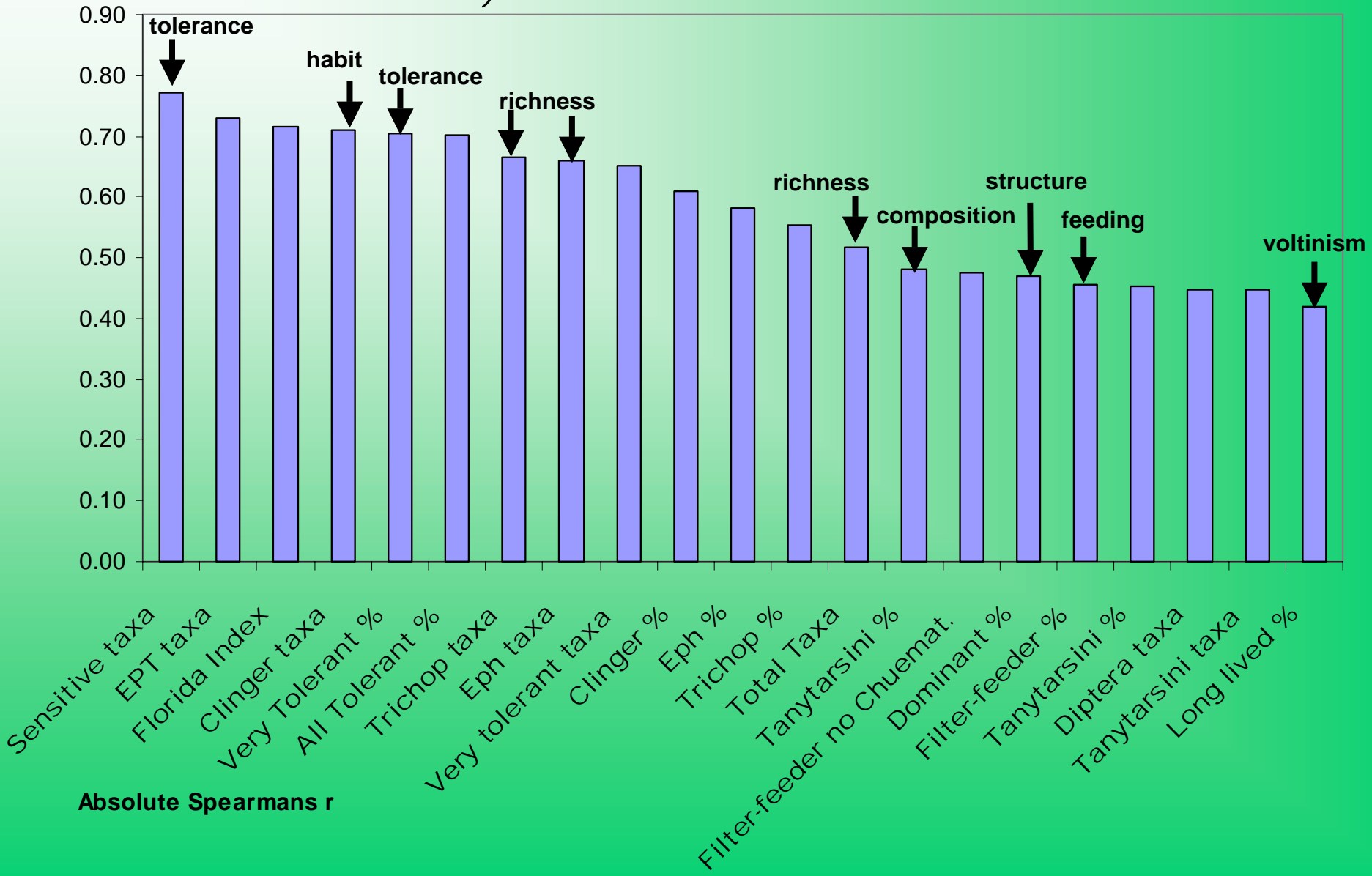
Filter-feeders vs. HDG



Unmodified SCI vs. Human Disturbance Gradient



Correlation Values for Metrics and HDG, Florida Selections



| | SCI | New Index |
|-------------------------|---|--|
| Taxonomic richness | Total taxa EPT taxa Chironomid taxa | Total taxa Mayfly taxa Caddisfly taxa % Tanytarsini |
| Feeding group | Collector-filterers | Collector-filterers |
| Life history | | % Long-lived Clinger taxa |
| Community structure | % Dominance % Diptera | % Dominance |
| Tolerance & Intolerance | Florida Index | Intolerant taxa % Very tolerant |

Existing Applications of SCI

- Ambient Monitoring
- Impaired Waters Rule (TMDLs)
- Point Source Permitting
- Watershed (NPS) Studies
- BMP Effectiveness Studies

Conclusions

- Multimetric Indexes are effective in a regulatory sense
- Discriminatory power of metrics
 - Comparing extremes identifies strong metrics, but includes some “noisy” metrics
 - Human Disturbance Gradient improves metric selection and provides an independent measure for comparing biological response