

# **Great Salt Lake Wetlands**

## **Preliminary Benthic Index of Biological Integrity (B-IBI )**

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GSL Wetlands Ponds sampled since 2004  
included in the preliminary B-IBI analysis

<b>STORET</b>	<b>SITE</b>
<b>4985320</b>	<b>Ambassador W1 Pond</b>
<b>4985330</b>	<b>Ambassador 100 Pond</b>
<b>4985340</b>	<b>Ambassador W2 Pond</b>
<b>4985350</b>	<b>Ambassador W5 Pond</b>
<b>4985500</b>	<b>FBWMA Unit 2 Outfall</b>
<b>4985515</b>	<b>FBWMA Turpin Unit Culvert 7 Pond</b>
<b>4985520</b>	<b>FBWMA Unit 1 Outfall</b>
<b>4985620</b>	<b>Public Shooting Ground Widgeon Lake 01 Outfall</b>
<b>4985621</b>	<b>Public Shooting Ground Widgeon Lake 02 Inflow</b>
<b>4985630</b>	<b>Public Shooting Ground Pintail Lake Outfall</b>
<b>4985860</b>	<b>Newstate Duck Club Middle Unit</b>
<b>4985870</b>	<b>Newstate Duck Club Pond 47</b>
<b>4985880</b>	<b>Newstate Duck Club Pond 20</b>
<b>4985890</b>	<b>Newstate Duck Club Pond 5-6</b>

# Ephemeroptera (mayflies)



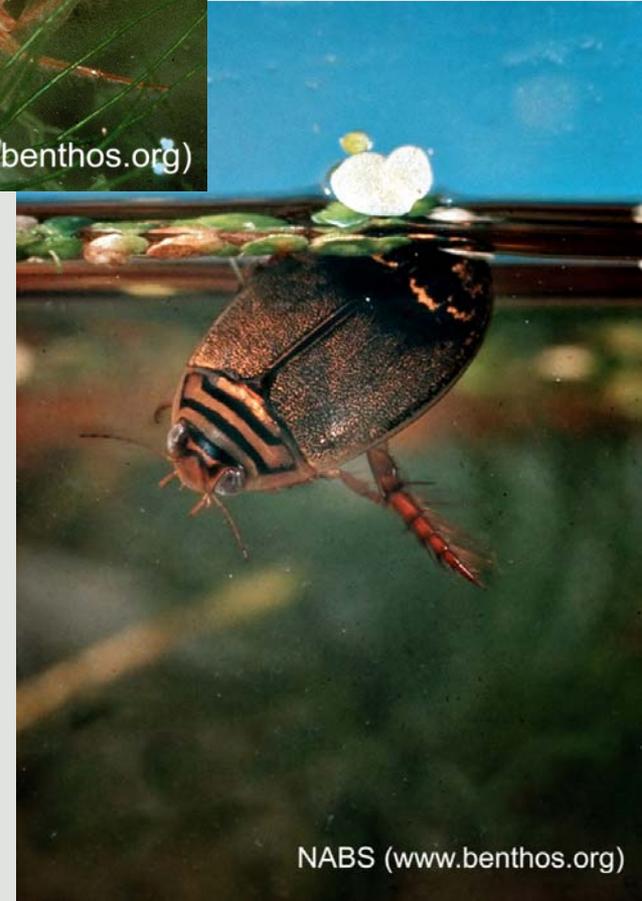
*Callibaetis*



*Caenis*



# Coleoptera (beetles)



# Hemiptera (true bugs)



# Odonata (dragonflies and damselflies)



# Diptera: Chironomidae (midges)



NABS ([www.benthos.org](http://www.benthos.org))

# Other Diptera

**Culicidae**



**Ephydriidae**



**Stratiomyidae**



**Tabanidae**

# Annelida (worms and leeches)



# Gastropoda (snails)



# Crustacea (amphipods and brine shrimp)



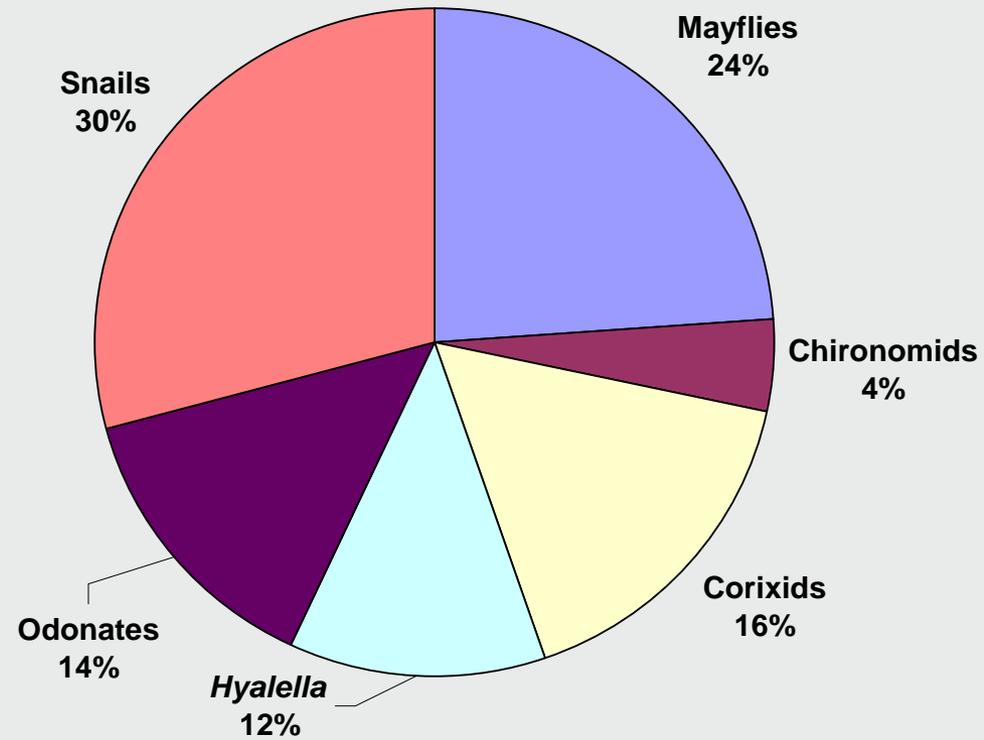
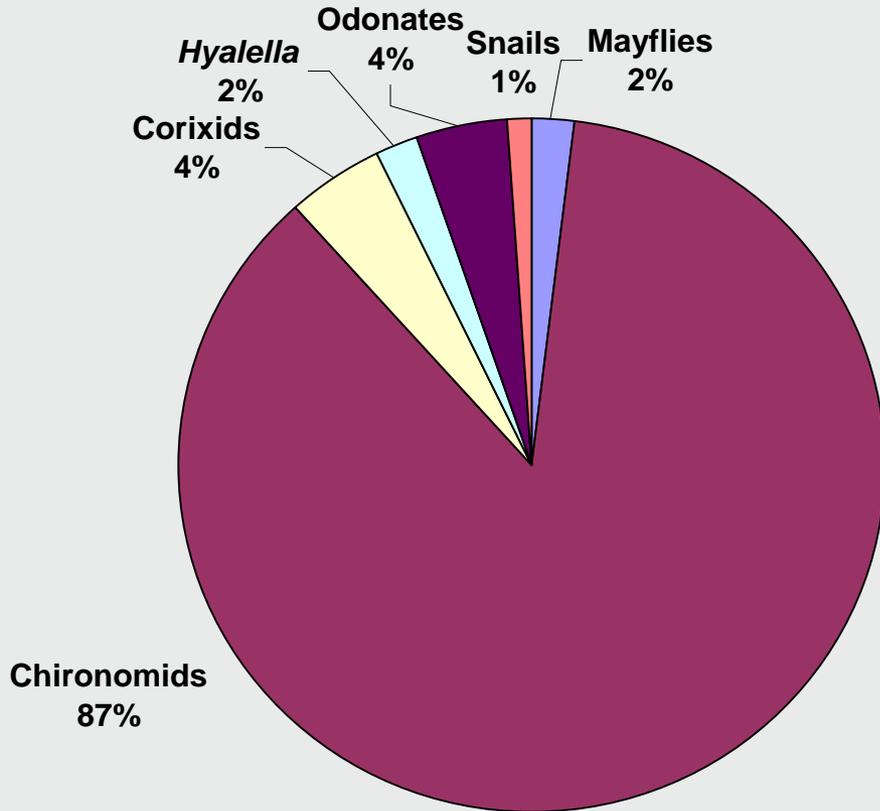
*Hyalella azteca*

*Artemia franciscana*



NABS ([www.benthos.org](http://www.benthos.org))

# Community Composition: High nutrients (left) and low nutrients (right)



# Confounding Factors in previous data sets

1. Salinity: community composition changes dramatically when total salinity exceeds 10 ppt.
2. Spraying for mosquito abatement  
Sprays with Bti affect chironomids (midges); sprays with malathion affect all invertebrates to some extent.
3. Hydrologic regimes, especially draining of ponds and time before refilling.
4. Sampling protocol: when samples were collected and method of collection

More than 20 macroinvertebrate metrics were evaluated, e.g., % composition by taxon, diversity indices, feeding groups.

Stressors were the concentrations of nutrients (phosphorus, ammonium, and nitrate+nitrite).

Concentrations of the three nutrients were combined into a single variable using principal components analysis for statistical analysis.

## **Preliminary Benthic Index of Biological Integrity (B-IBI)**

A multimetric index based on 5 metrics correlated with nutrient concentrations. The range of values for each included metric was divided into 3 parts with each part assigned a score of 5, 3, or 1, respectively.

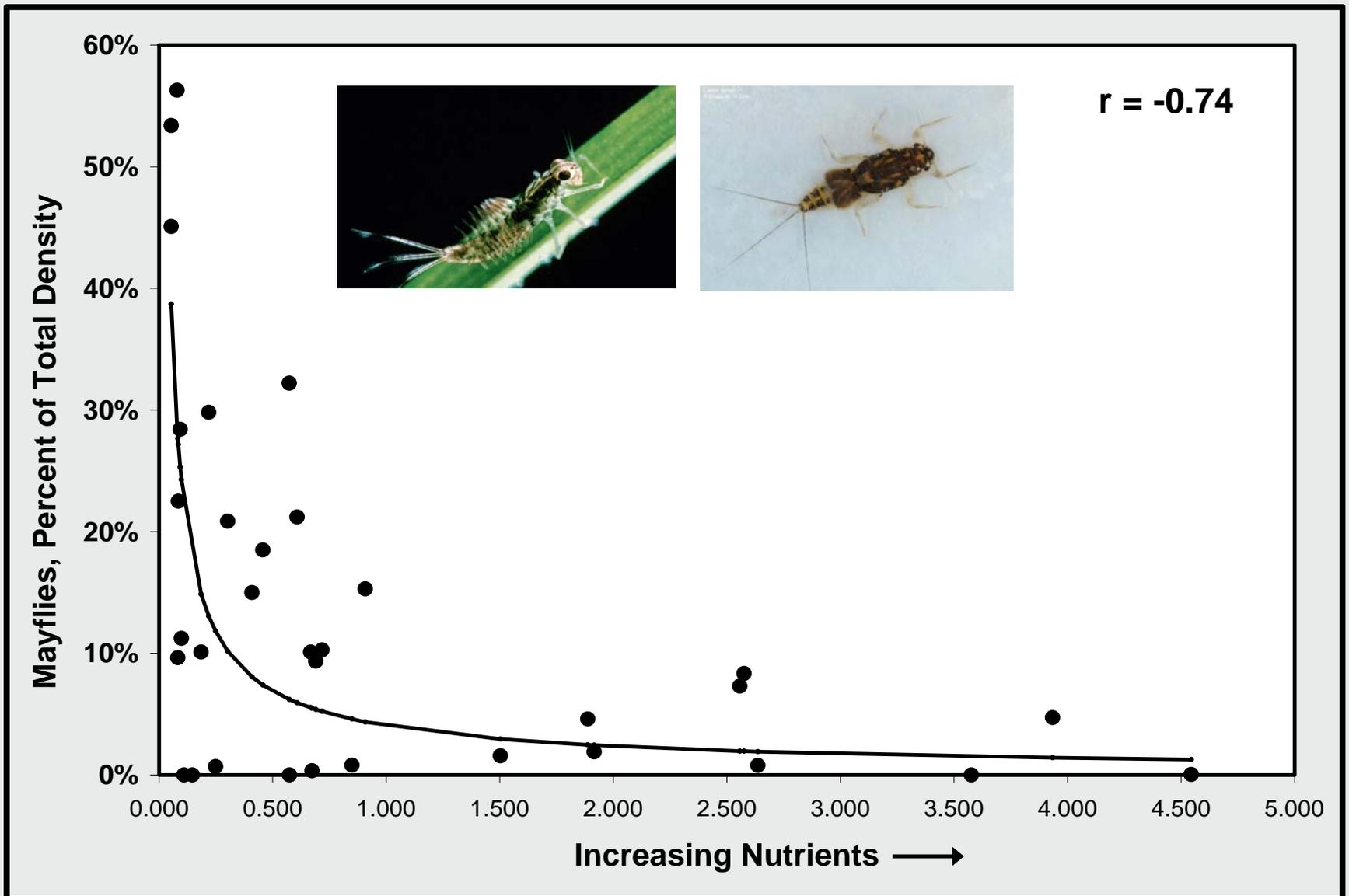
The total B-IBI score for a particular site equaled the sum of scores for all 5 metrics. Values of the B-IBI score ranged from a minimum of 5 (all 5 metrics in the lower part of their respective ranges) to a maximum of 25 (all 5 metrics in the upper part of their respective ranges).

# Preliminary Benthic Index of Biological Integrity (B-IBI)

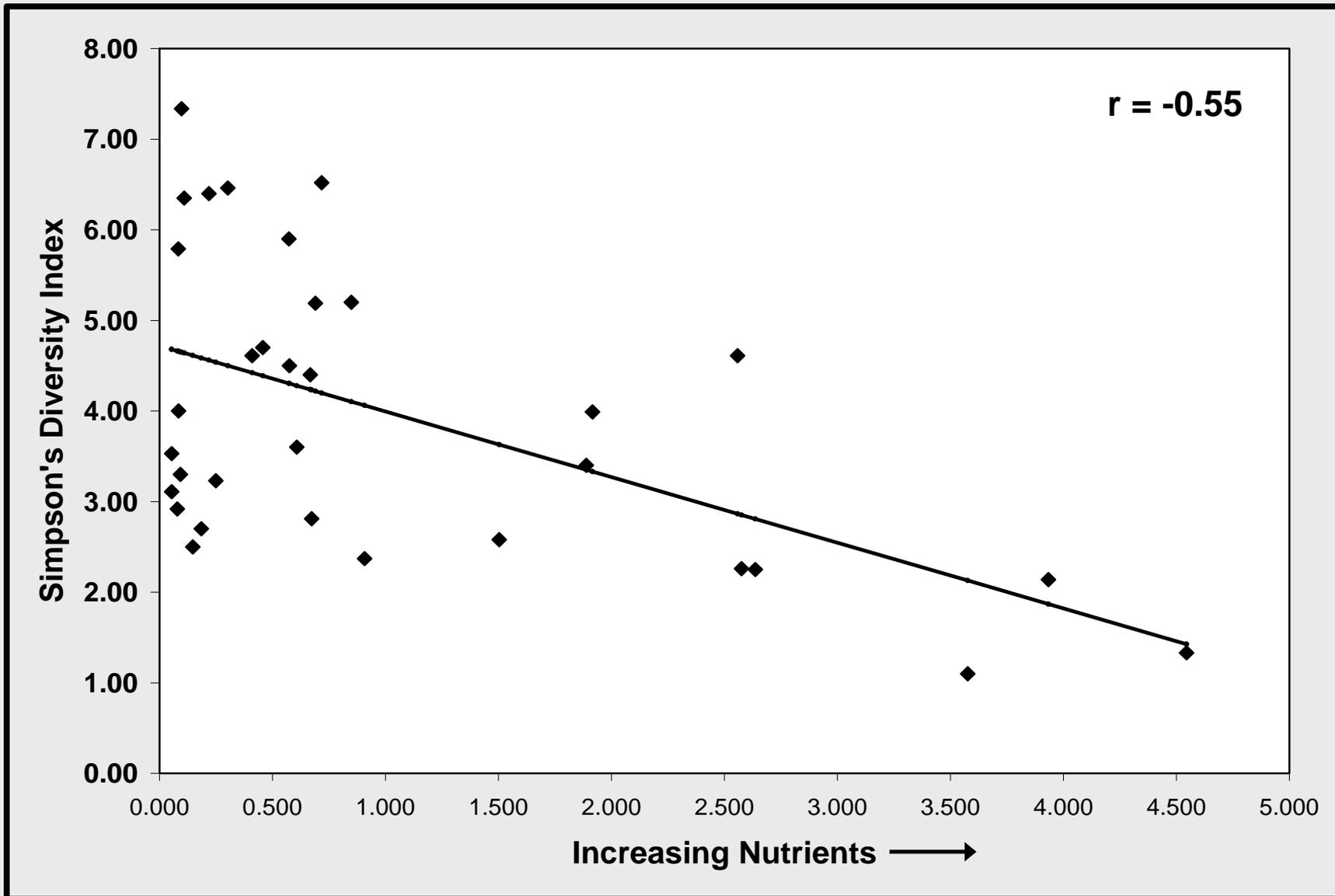
Based on data collected since 2004 from  
FBWMA, Newstate, Ambassador, and PSG ponds.

<b>Metric</b>	<b>Score = 1</b>	<b>Score = 3</b>	<b>Score = 5</b>
<b>Ephemeroptera (mayflies), % of total sample number</b>	<b>&lt; 5%</b>	<b>5% - 10%</b>	<b>&gt;10%</b>
<b>Simpson's Diversity Index</b>	<b>&lt;1.9</b>	<b>1.9 - 3.4</b>	<b>&gt;3.4</b>
<b><i>Hyalella</i> (amphipods), % of total sample number</b>	<b>&lt; 5%</b>	<b>5% - 10%</b>	<b>&gt;10%</b>
<b>Total Taxa</b>	<b>8 or less</b>	<b>9 - 11</b>	<b>12 or more</b>
<b>Number of Coleoptera (beetle) taxa</b>	<b>0</b>	<b>1</b>	<b>2+</b>

# % mayflies

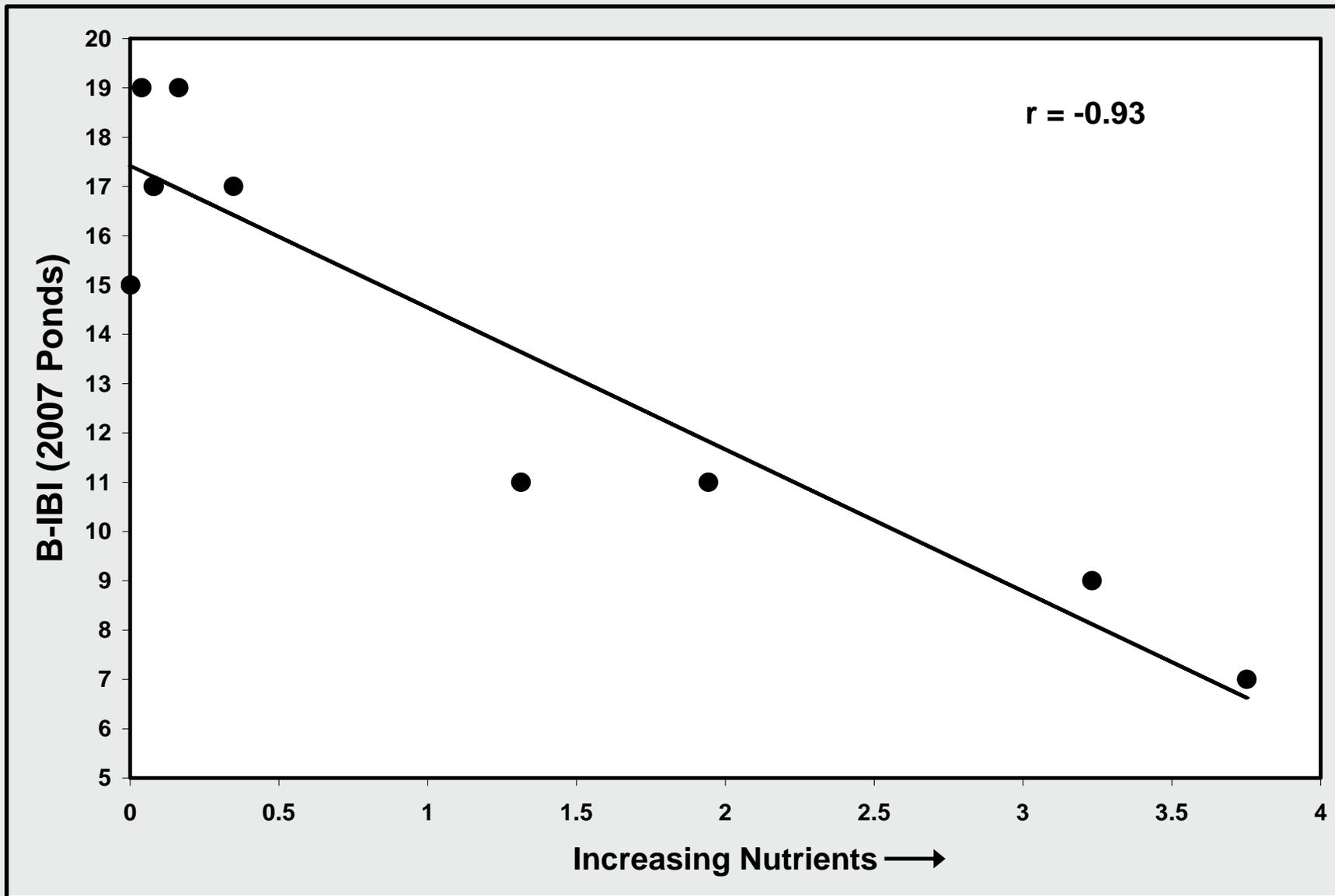


# Simpson's Diversity Index

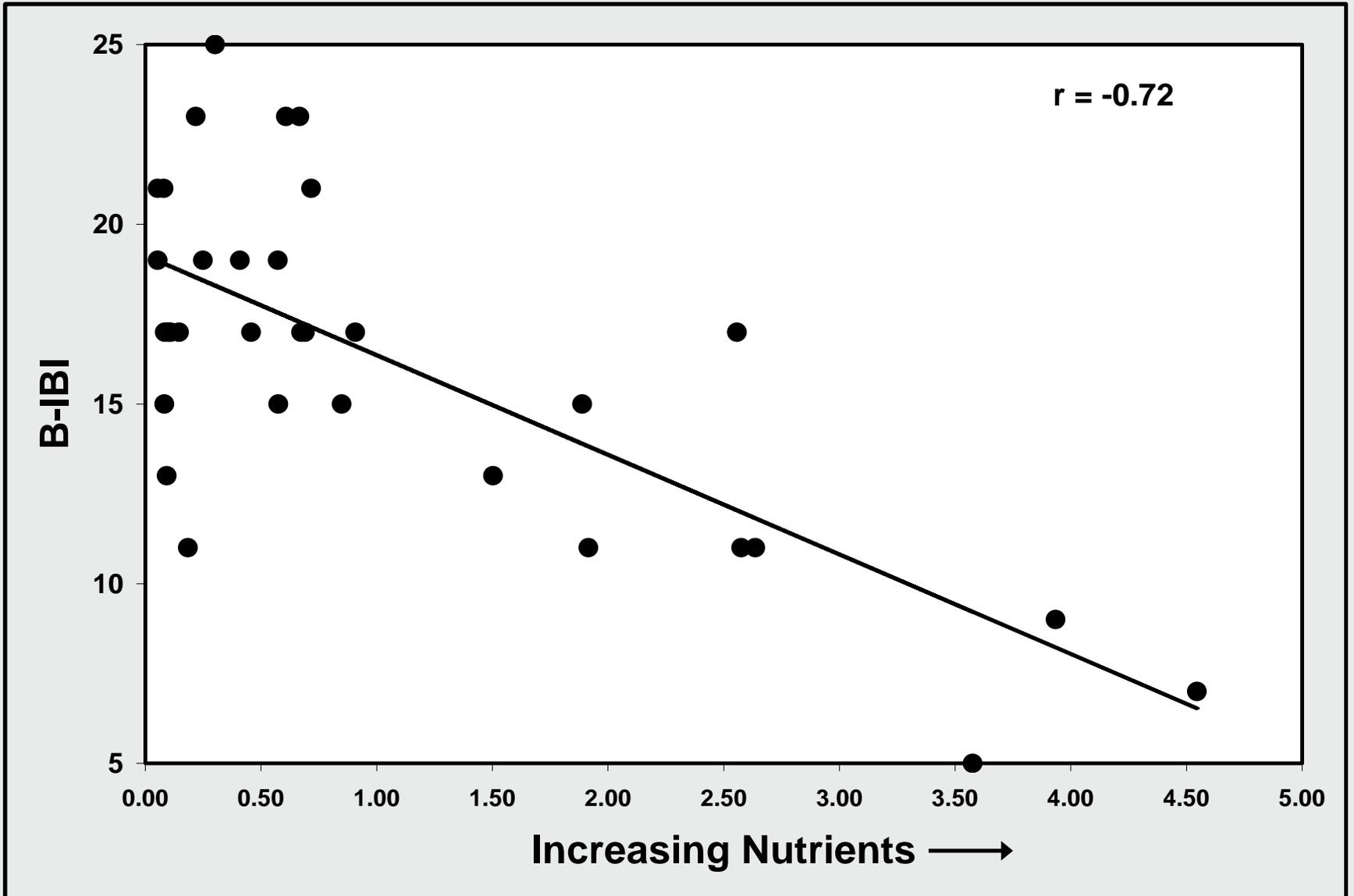


<b>Examples of B-IBI Calculations</b>	<b>Total Taxa</b>	<b>Simpson's Diversity Index</b>	<b>No. of beetle taxa</b>	<b>% Hyalella</b>	<b>% mayflies</b>	<b>B-IBI</b>	<b>TP, mg/L</b>	<b>TN, mg/L</b>
<b>Newstate Pond 47 (Nov. 2007)</b>	<b>Value</b>	<b>11</b>	<b>1.33</b>	<b>0</b>	<b>&lt;1%</b>	<b>0%</b>	<b>0.5</b>	<b>4.9</b>
	<b>Score</b>	<b>3</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>7</b>	
<b>FBWMA Unit 2 Pond (Nov. 2007)</b>	<b>Value</b>	<b>10</b>	<b>5.90</b>	<b>0</b>	<b>22%</b>	<b>32%</b>	<b>&lt;0.1</b>	<b>0.6</b>
	<b>Score</b>	<b>3</b>	<b>5</b>	<b>1</b>	<b>5</b>	<b>5</b>	<b>19</b>	

# 2007 Pond data

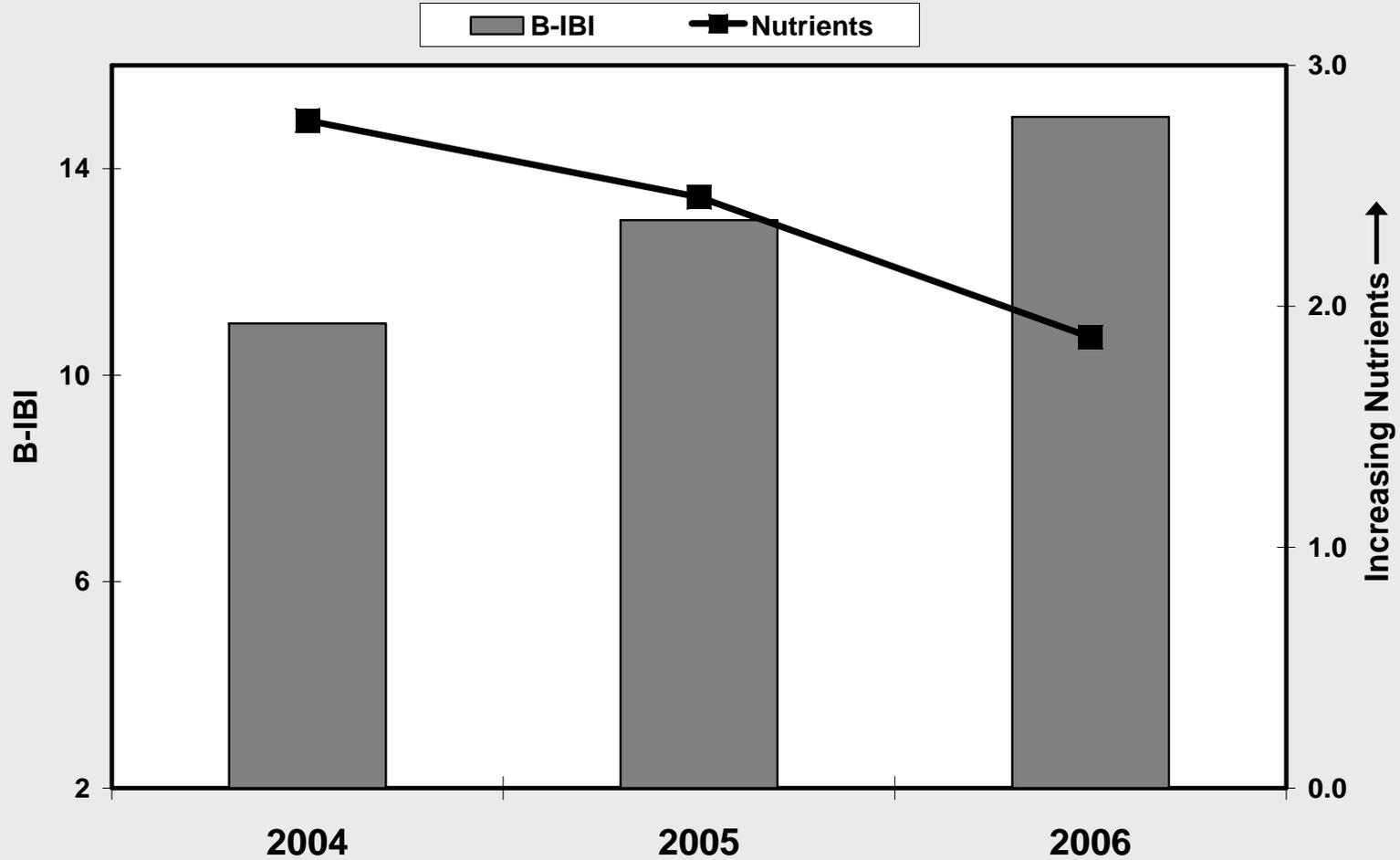


Combined Pond data: 2004-2007

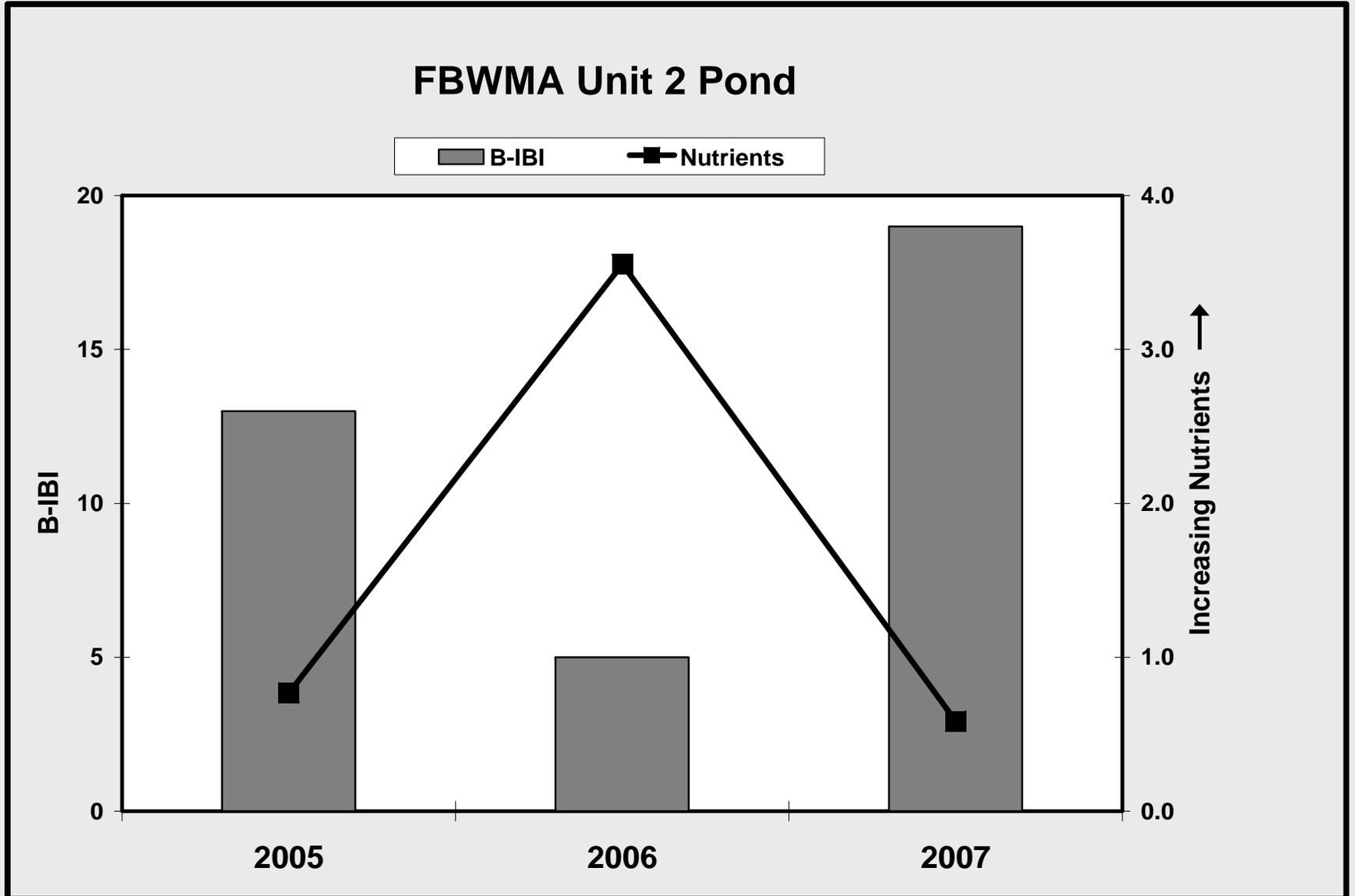


# B-IBI index at individual sites

## Ambassador Pond W1



# B-IBI index at individual sites



# Summary

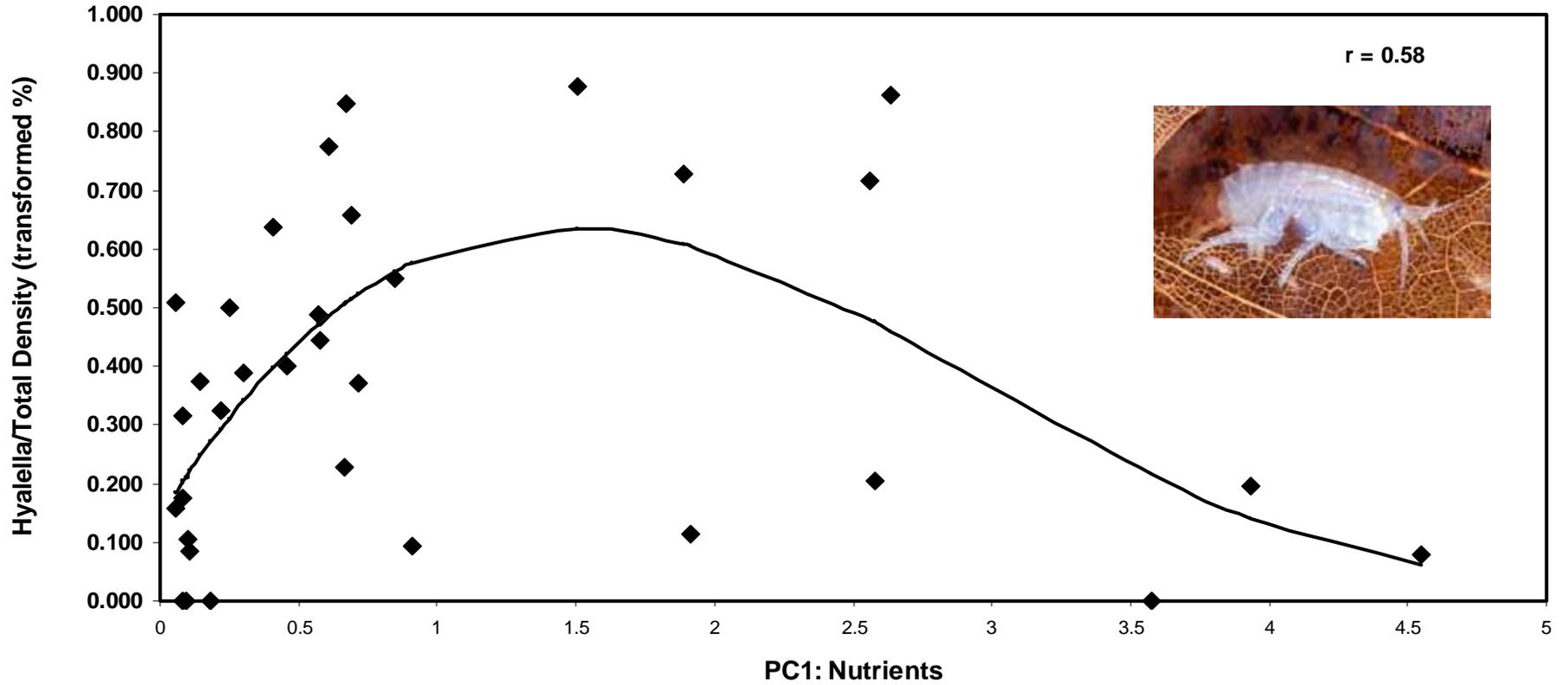
1. Macroinvertebrate communities show consistent differences between ponds that are correlated with nutrient concentrations.
2. Differences can be quantified by several community metrics that are generally uncorrelated with each other.
3. A combination of metric scores (B-IBI) is correlated with nutrient concentrations, particularly in quantitative samples with sufficient sample size.

If macroinvertebrates are considered to be useful enough for inclusion in future assessments of the wetlands, the next steps are:

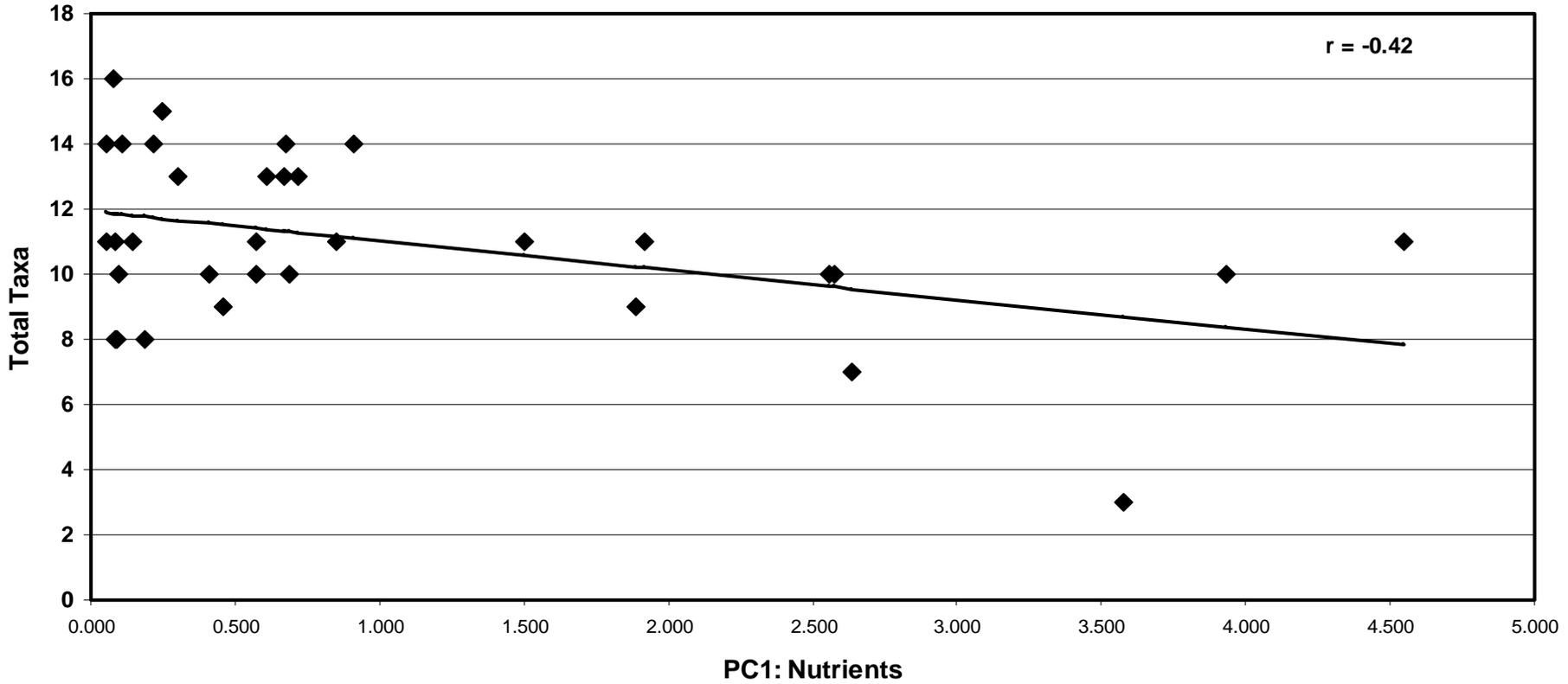
- 1) to determine an appropriate field sampling protocol,
- 2) to evaluate individual metrics with respect to environmental stressors using the sampling protocol, and
- 3) to evaluate the weighting of the B-IBI within the framework of the overall wetlands assessment.



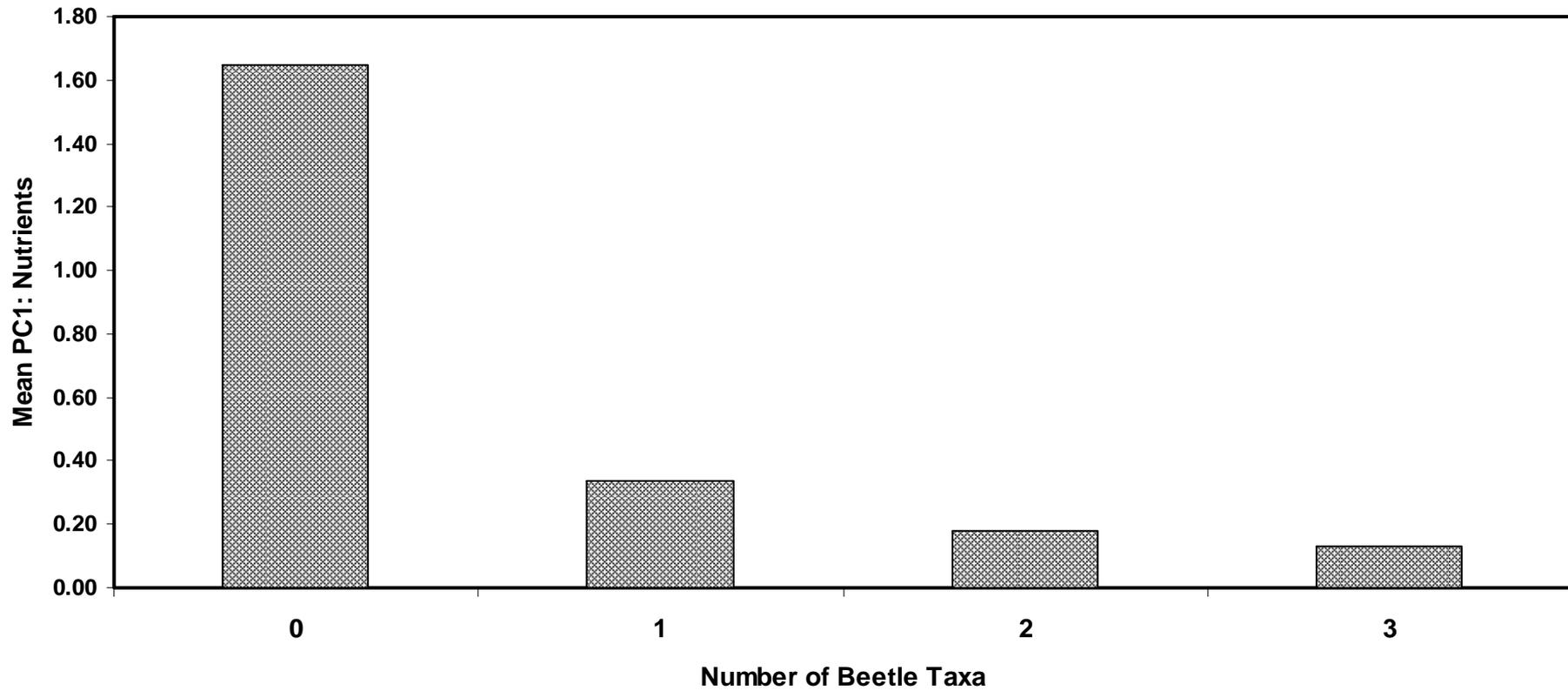
# *% Hyalella*



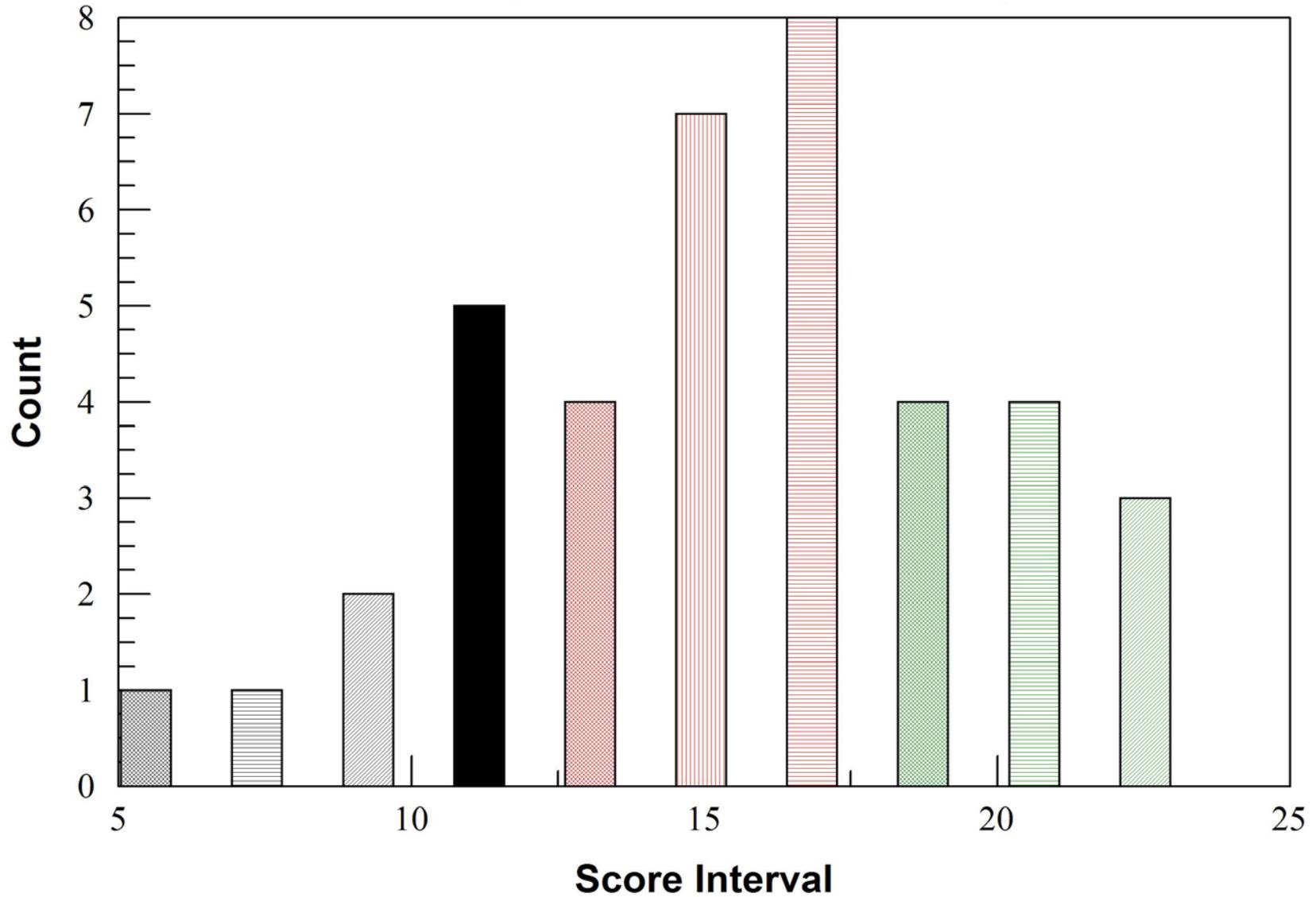
# Total Taxa



# Number of Beetle (Coleoptera) Taxa



# Distribution of B-IBI Scores



# Chironomidae

