

# **Invertebrate Drift in the Red River of the North**

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# Presentation Overview

- **Invertebrate Drift**
  - Why animals drift ?
  - Why Study Drift?
- **Key Research Findings**
  - Taxonomic List
  - Community Composition
  - Environmental Relationships
- **Future Proposed Research**



# Lotic Ecosystem Processes



The diagram features a blue background with a white wavy line on the left and right sides. Four large, downward-pointing cyan arrows are arranged horizontally across the center. Each arrow is accompanied by a text label in orange. From left to right, the labels are: 'Organic Matter transport', 'Sediment Deposition', 'Aquatic Invertebrate Dispersion', and 'Water Movement/ Longitudinal Gradient'.

**Organic Matter  
transport**

**Sediment  
Deposition**

**Aquatic Invertebrate  
Dispersion**

**Water Movement/  
Longitudinal Gradient**

# What Is Invertebrate Drift?

- A common phenomenon in flowing water systems
- Proposed reasons for drift:
  - Increased flow and water velocity, physical disturbance (Poff & Ward, 1991)
  - Presence of predators, predator avoidance (Huhta et al., 2000)
  - Modifications in physical and chemical characteristics of water (Brittain & Eikeland, 1988)



- Redistribution in response to competitive pressure: food, resources etc (Brittain & Eikeland, 1988)

# Why Study Drift?

- Simple way to assess community composition
- Permits collection of both common and rare taxa
- Relates to secondary production (drift as a fish food source)
- Collection of pupal exuviae aids identifications (eg. chironomid genera)
- Reflects life history events (eg. insect emergence)



# What Will Drift?

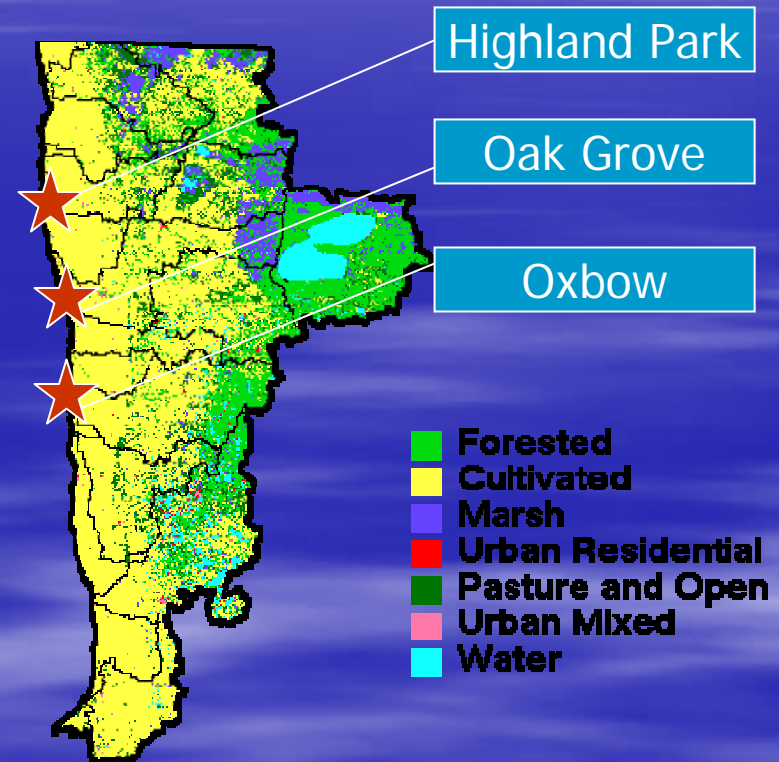
- Aquatic insects:  
(Ephemeroptera, Diptera,  
Plecoptera, Trichoptera, etc.)
- Crustaceans (amphipods,  
isopods)



- Periphyton
- Larval fish
- Amphibians

# Monitoring Invertebrate Drift in the Main Stem Red River

- Sampling Initiated May 2006
- Funded by NDWRRI, USBR
- Project Purpose:
  - Determine taxonomic composition of macroinvertebrate community
  - Assess spatial & temporal variability of this community
  - Evaluate relationships of fauna with environmental variables





Oak Grove Steel Bridge



Floating Drift Net



Highland Park Concrete Bridge

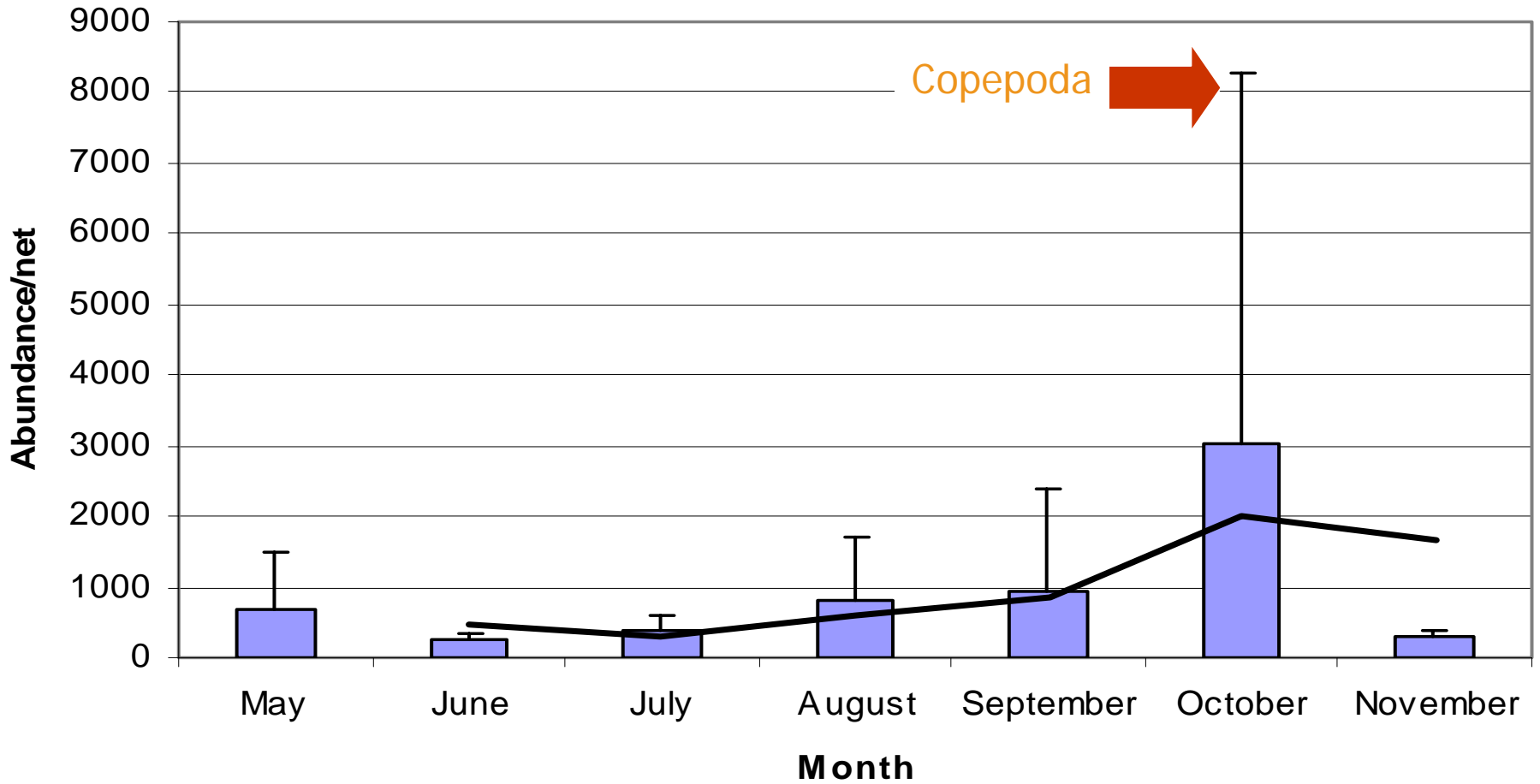
<u>Taxon</u>	<u>Number of families</u>
Coleoptera	21
Hemiptera	10
Diptera	8
Ephemeroptera	7
Hymenoptera	4
Gastropoda	3
Trichoptera	3
Neuroptera	3
Lepidoptera	3
Zygoptera	3
Amphipoda	1
Isoptera	1
Orthoptera	1
Collembola	1
Bivalvia	1
Copepoda	1
Plecoptera	1
Arachnida	1

## Key Findings From the Study

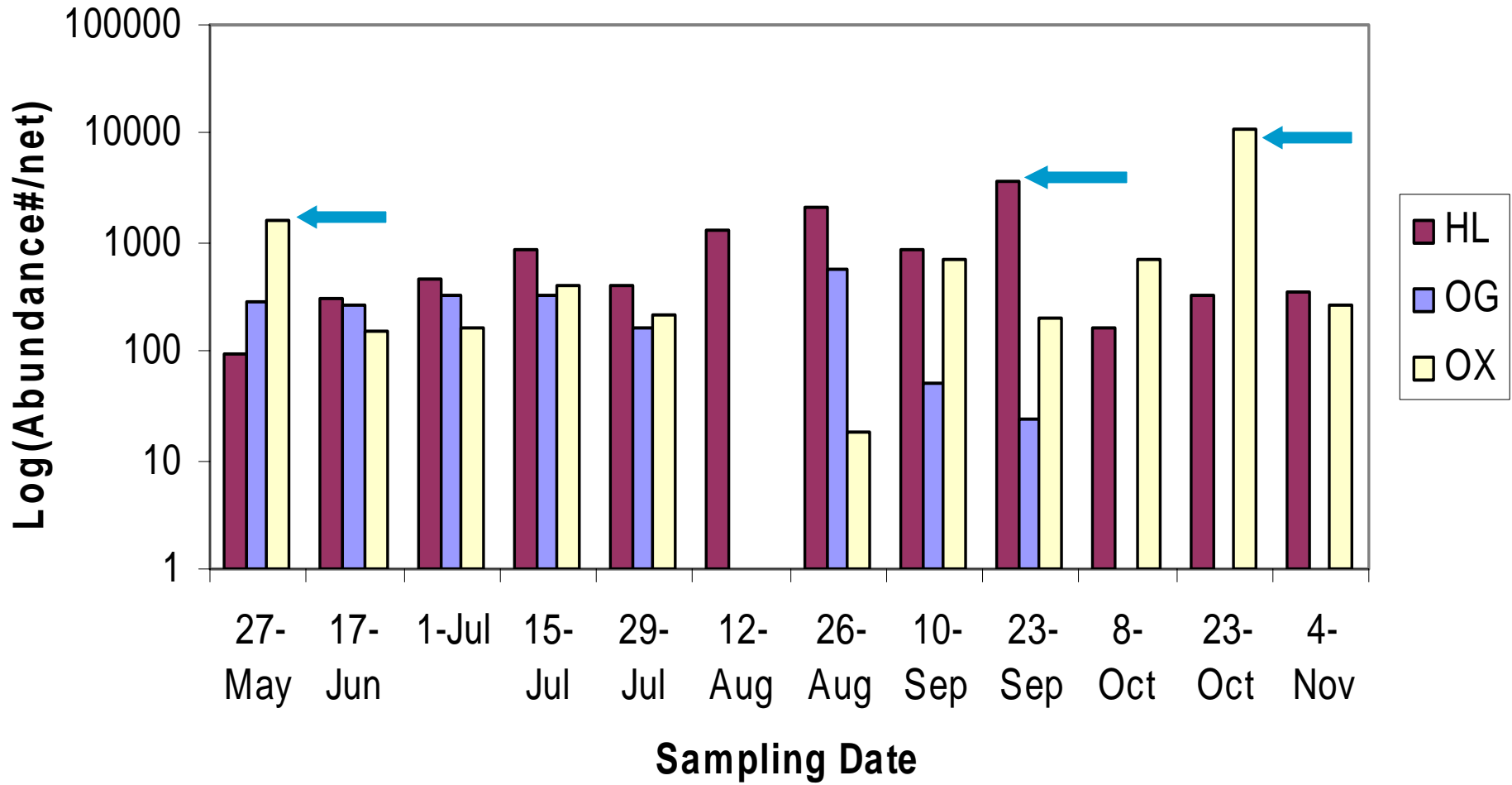
- High taxonomic richness:  
73 families found
- Both aquatic & terrestrial insects
- Even some molluscs (small snails & clams)

# Abundance

Mean Abundance of Higher Invertebrate Taxa Collected in Drift



# Compare Stationwide Abundance



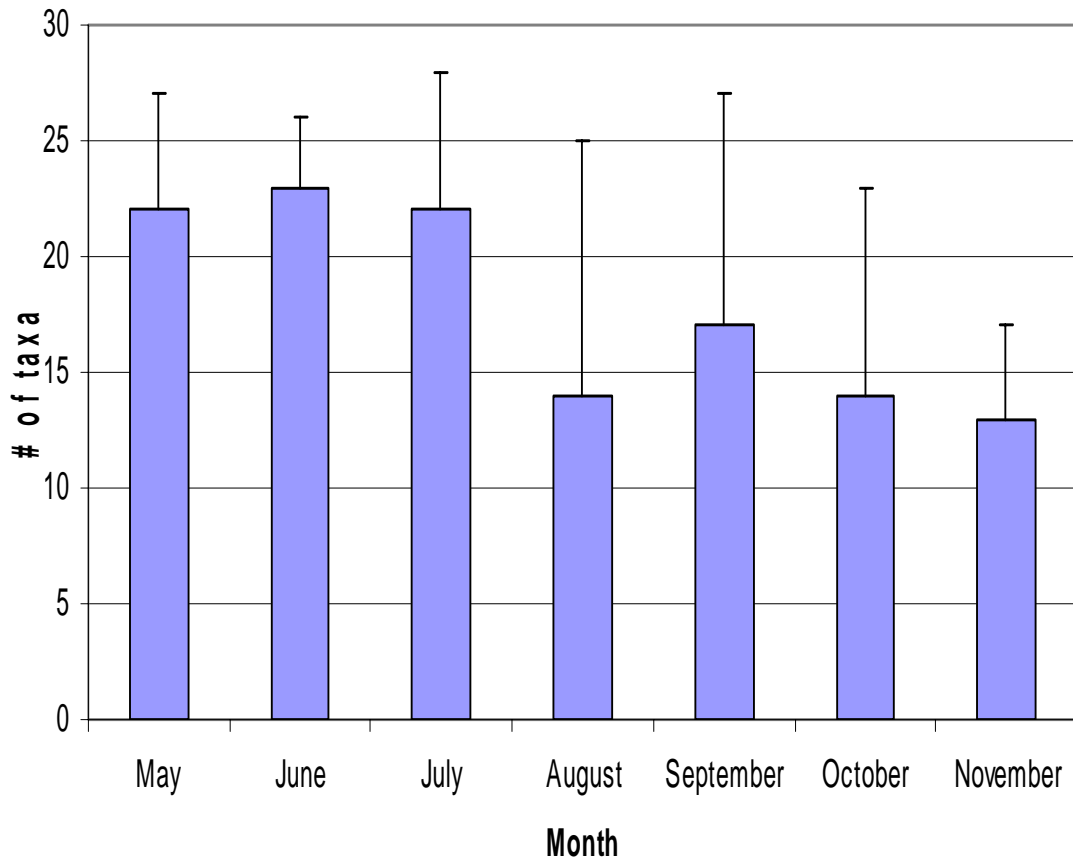
# Mean Abundance of Major Taxa

	May	June	July	August	September	October	November
<b>Chironomidae</b>	21	26	214	3371	1955	6	0
<b>Percentage(%)</b>	1.0%	3.5%	6.4%	84%	34.6%	0.005%	0%
<b>Polimitarcidae</b>	0	6	203	79	2	3	0
<b>Percentage(%)</b>	0%	0.8%	6.1%	2.0%	0.004%	0.002%	0%
<b>Total</b>	2001	744	3336	4034	5649	12121	605

Number/month

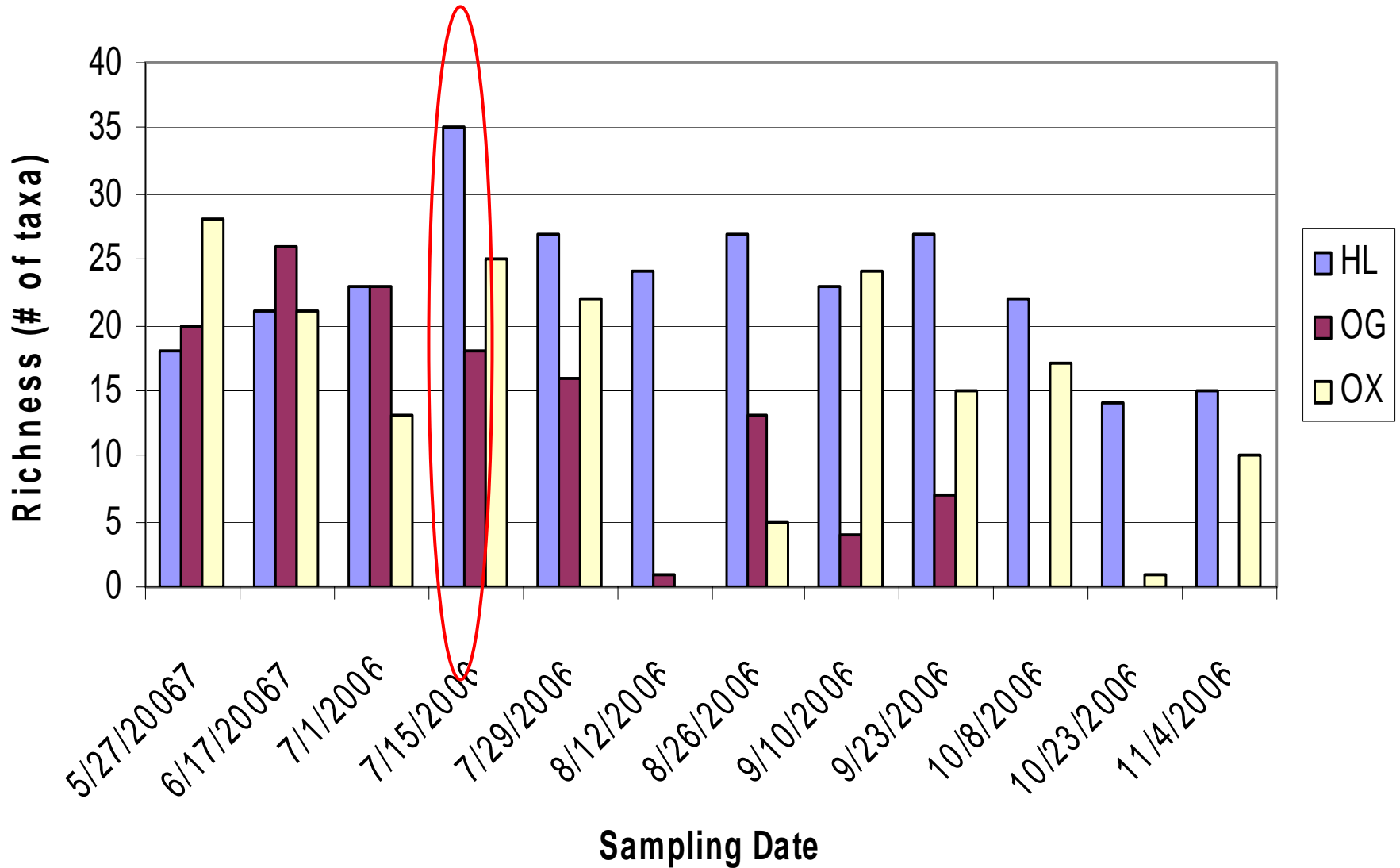
# Taxonomic Richness

Overall Taxonomic Richness



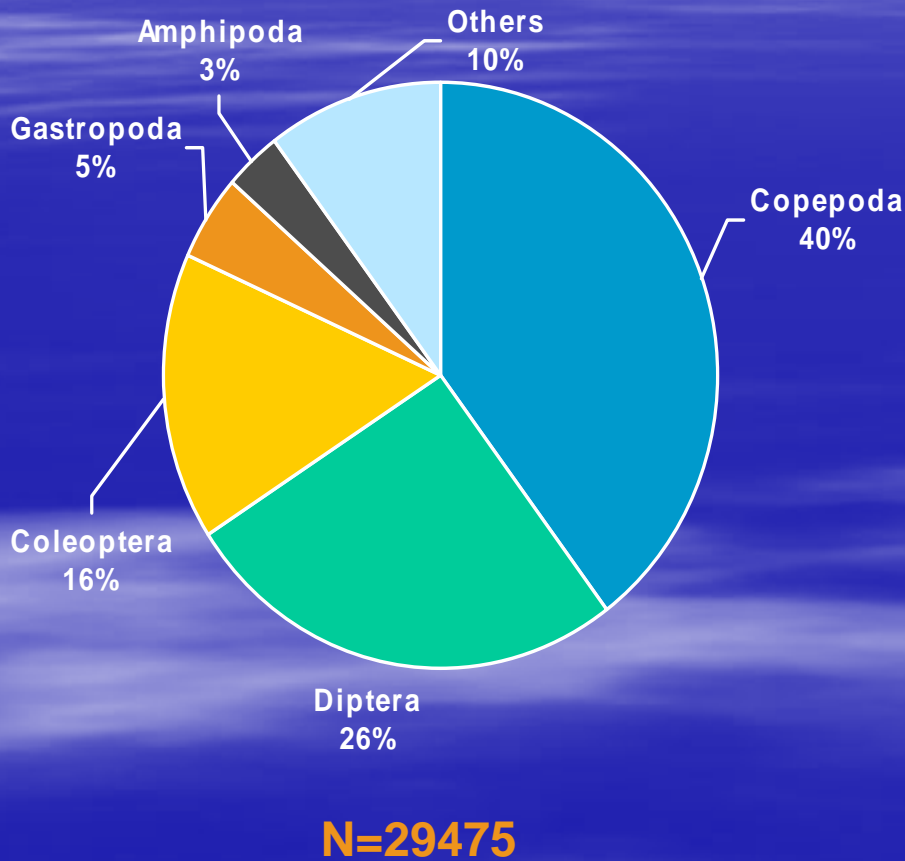
May	22
June	23
July	22
August	24
September	17
October	14
November	13

## Compare Richness at Different Stations

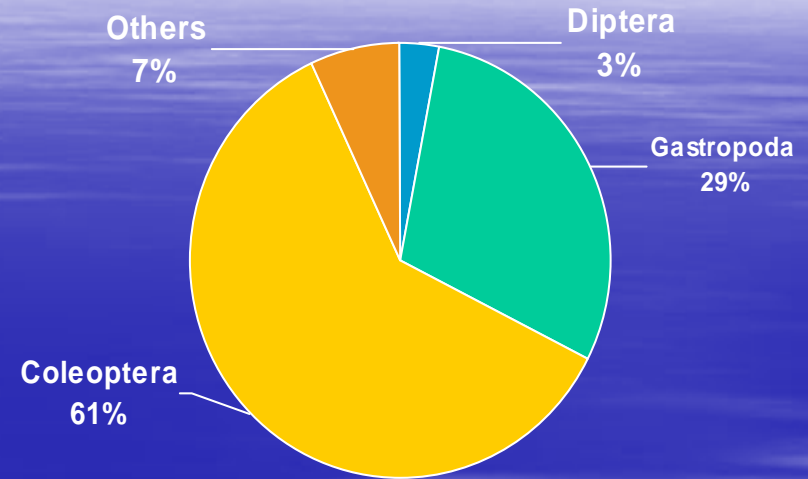


# Summary of Community Composition

## All Samples

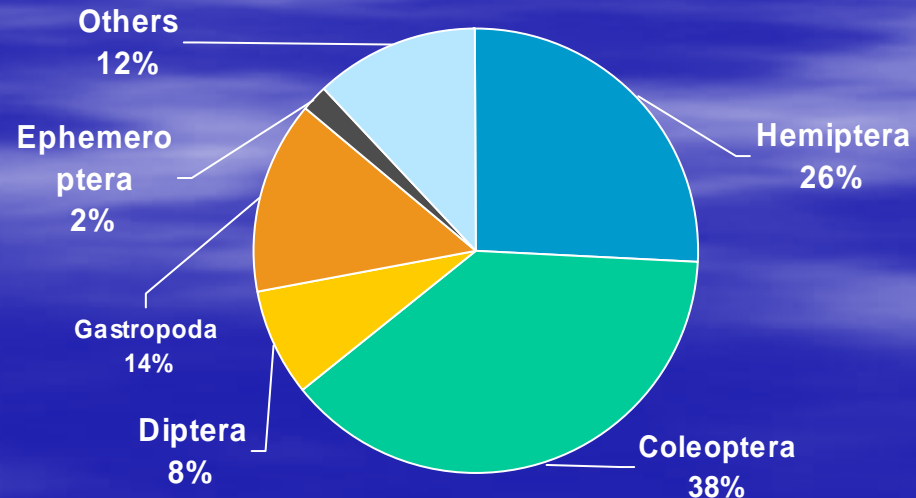


## May



## N=2014

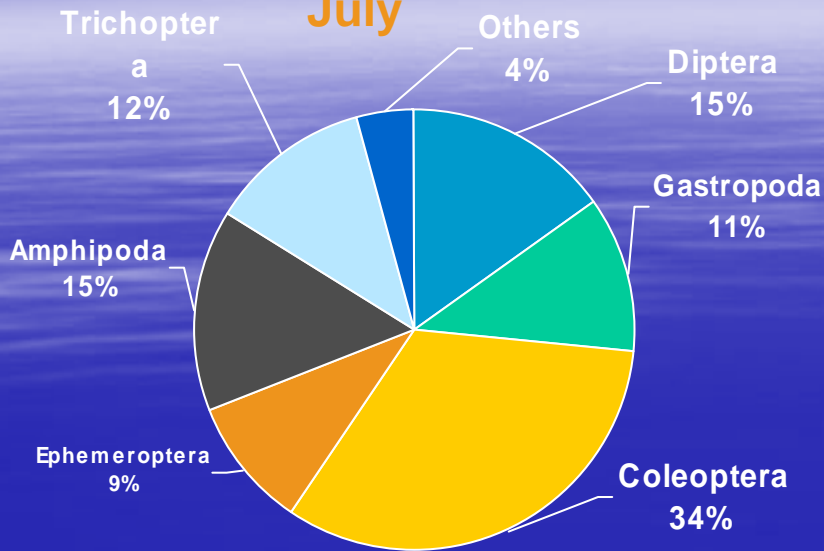
## June



## N=767

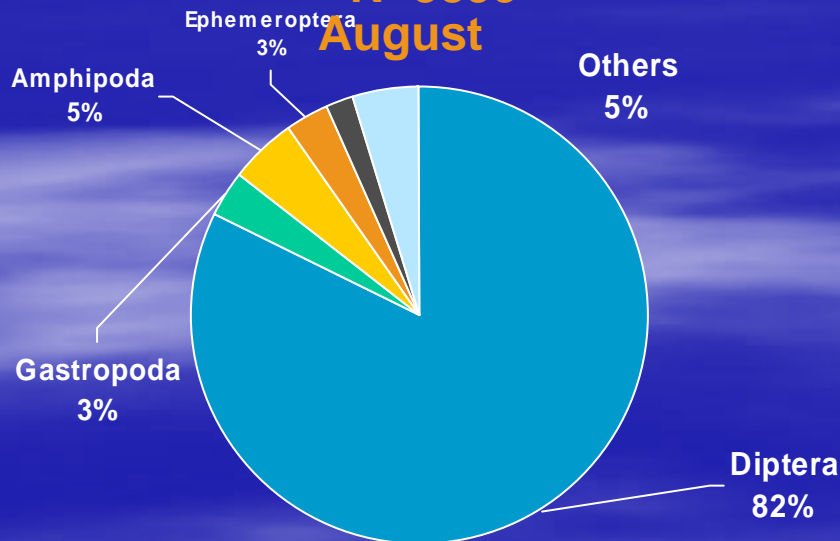
# Summary of Community Composition

July



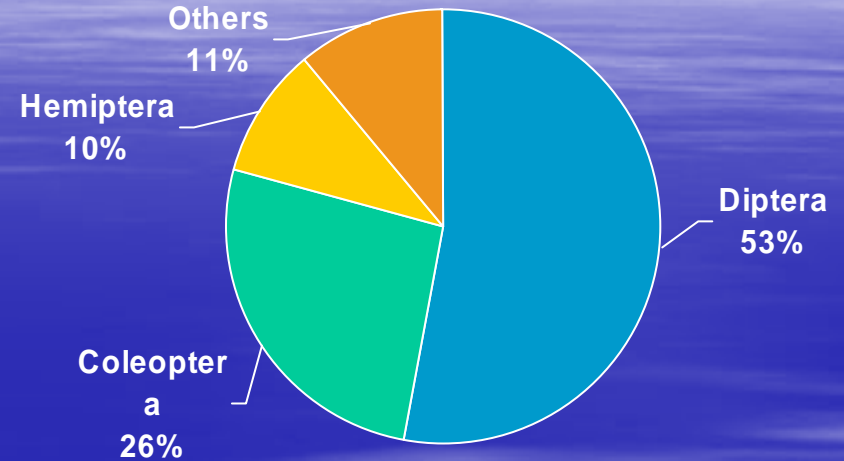
N=3899

August



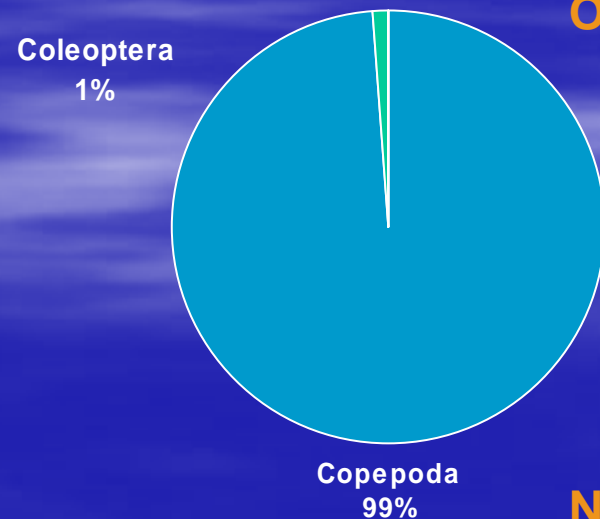
N=4241

September



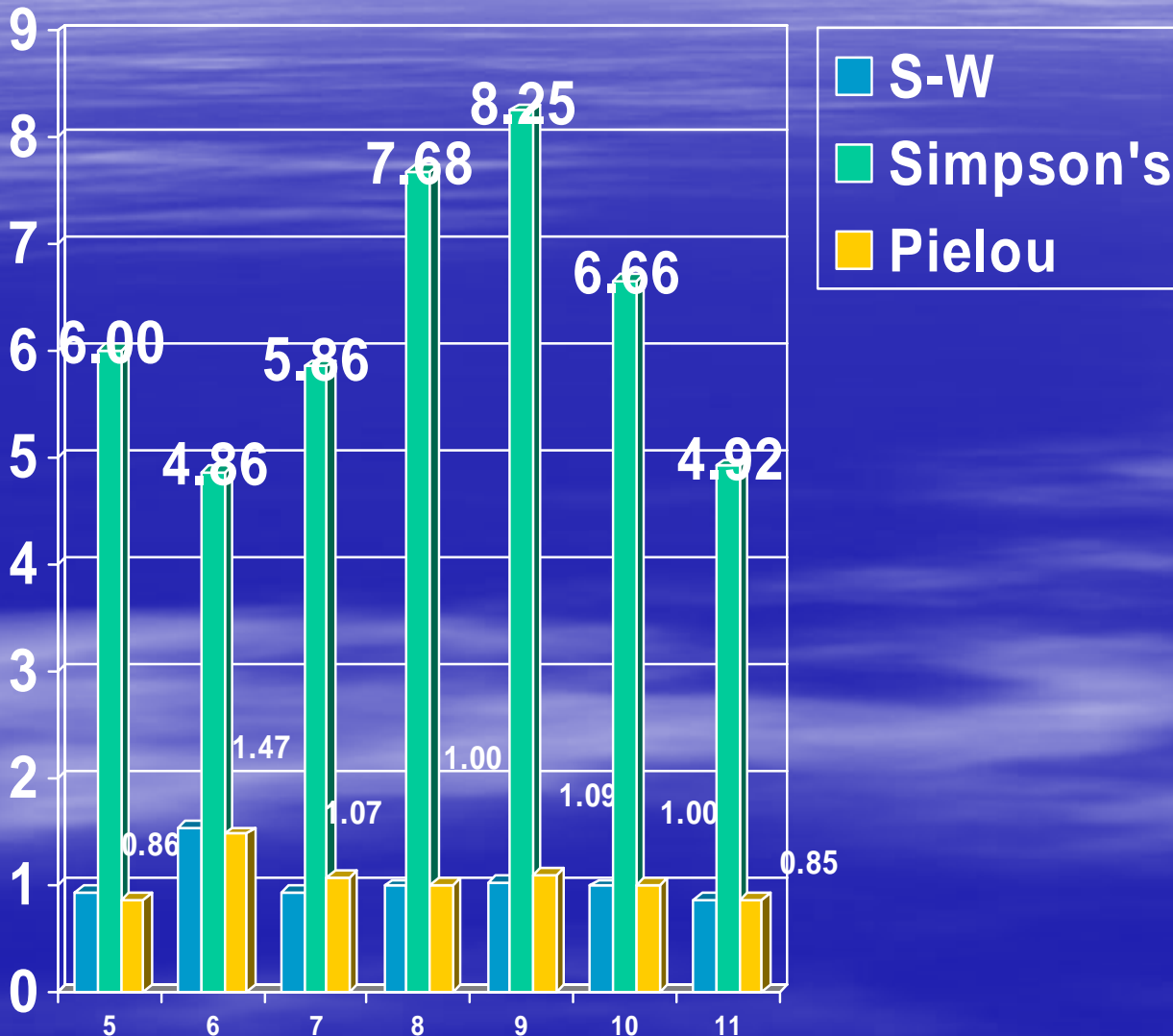
N=5817

October



N=12132

# Diversity Indices



Shannon-Wiener Index:

$$H' = -\sum_{i=1}^s p_i \log p_i$$

Simpson's Index

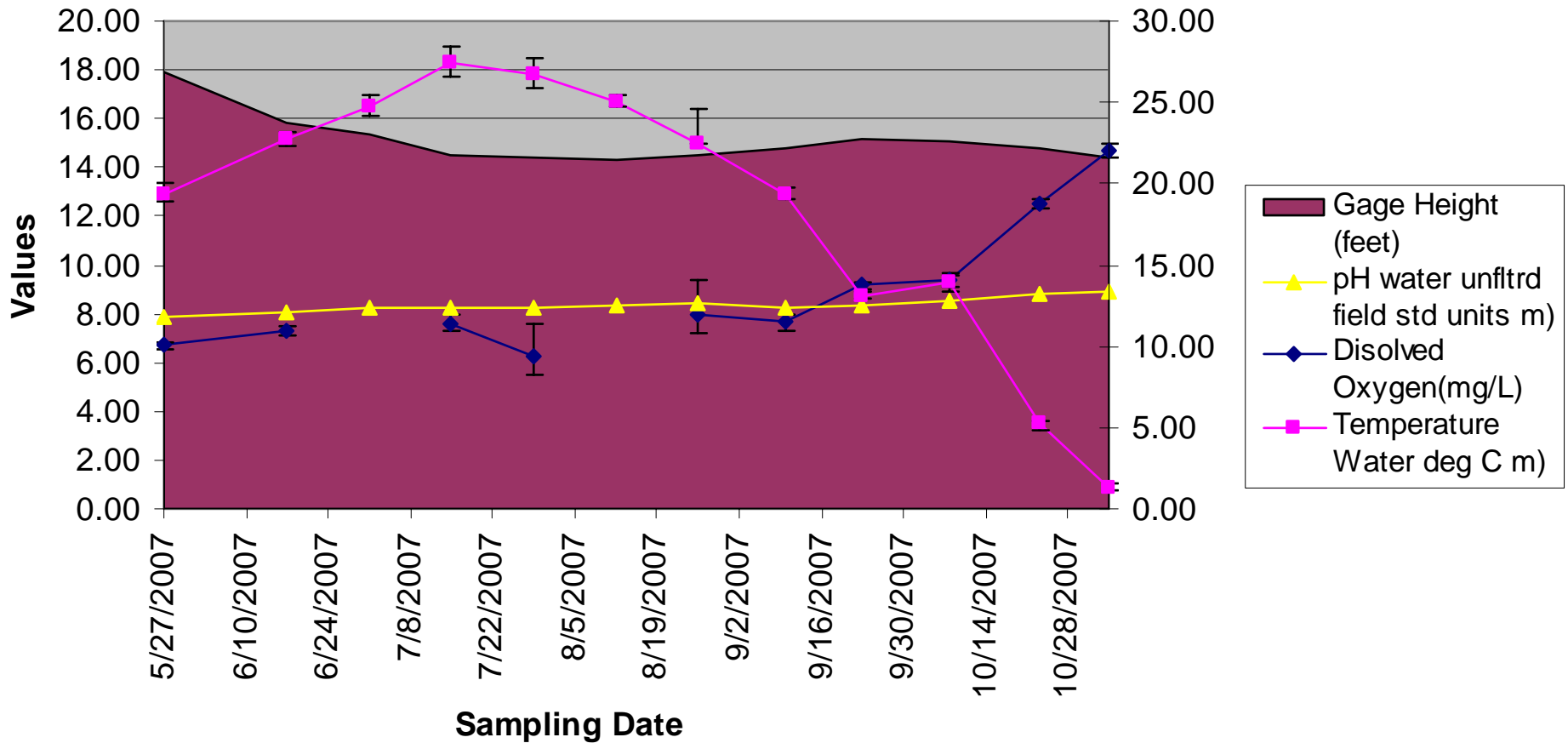
$$D = \frac{1}{\sum_{i=1}^s p_i^2}$$

Pielou's Evenness

$$J = \frac{H(s)}{H(\max)}$$

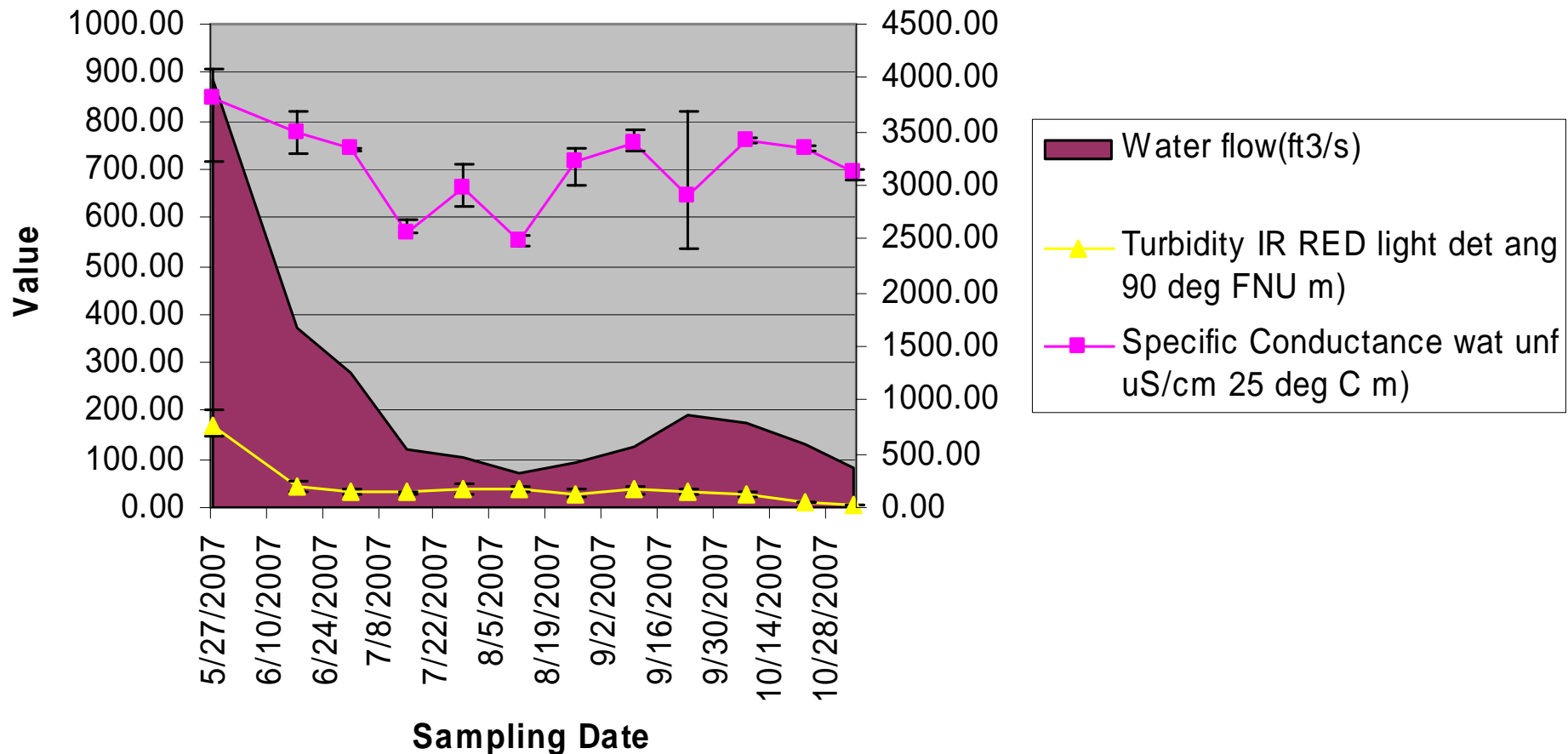
# Environmental Variables

Mean Value of DO,Temp,pH,Gage Height

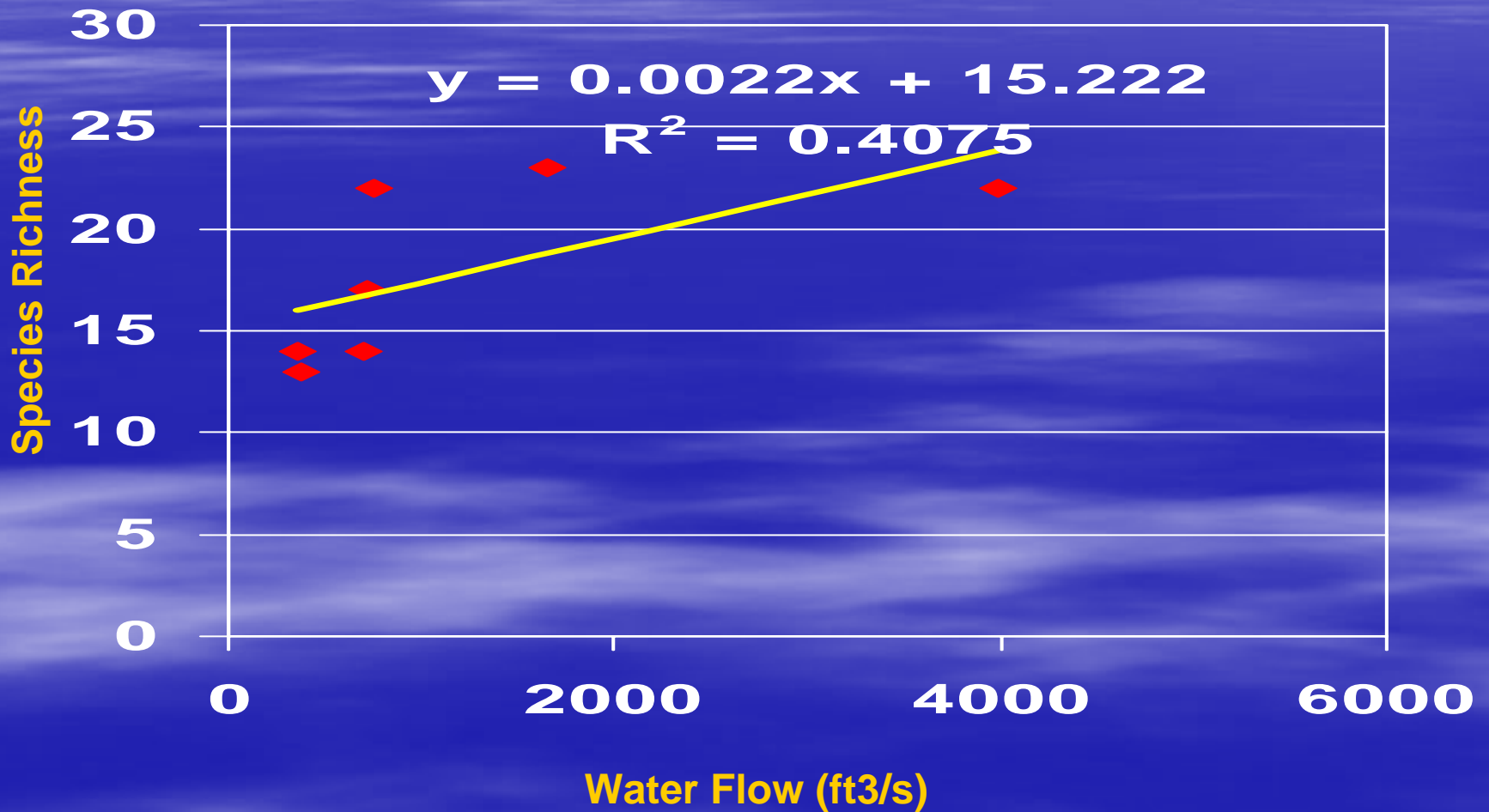


# Environmental Variables

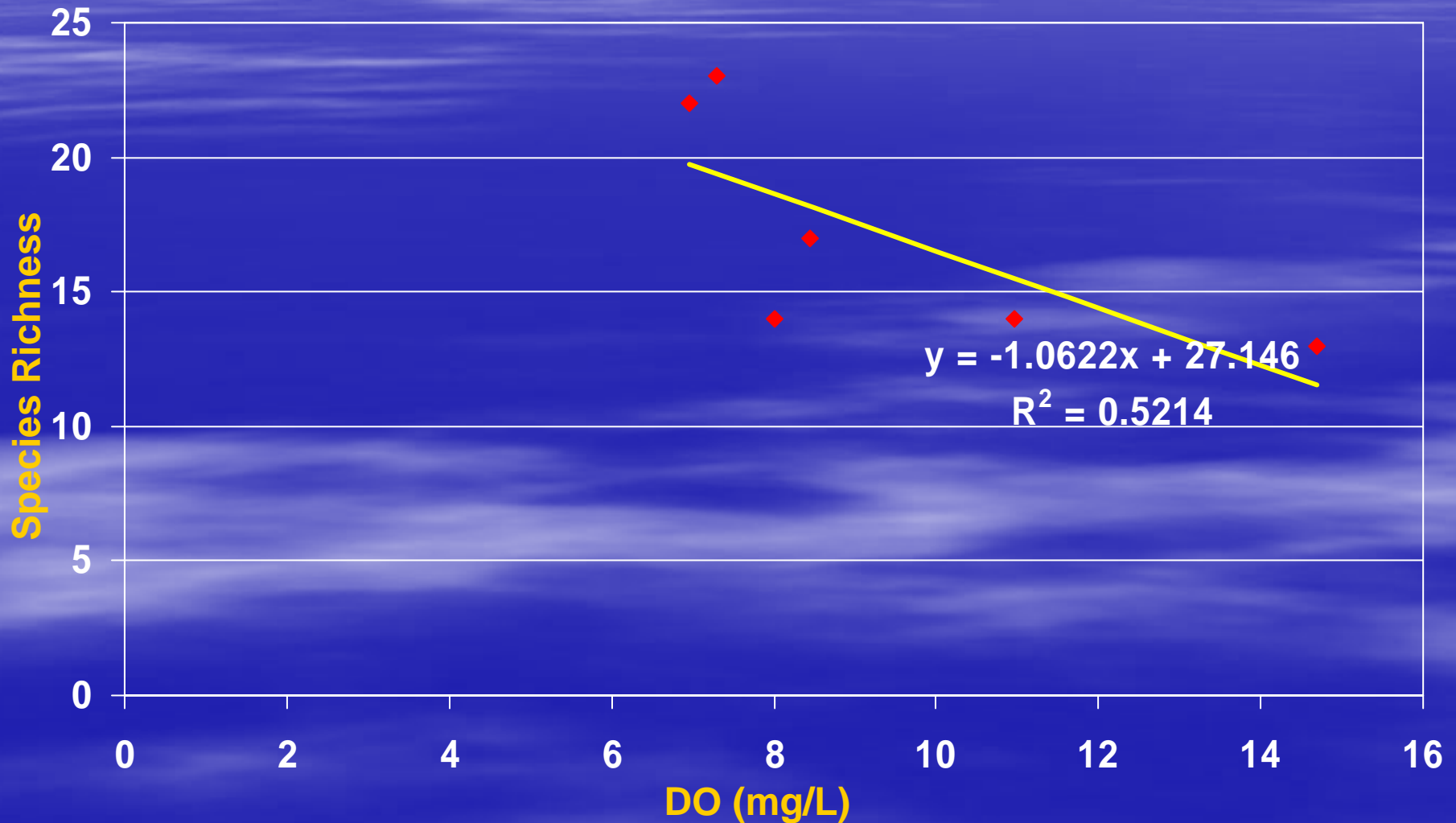
Mean Value of Water flow, Specific Conductance, Turbidity



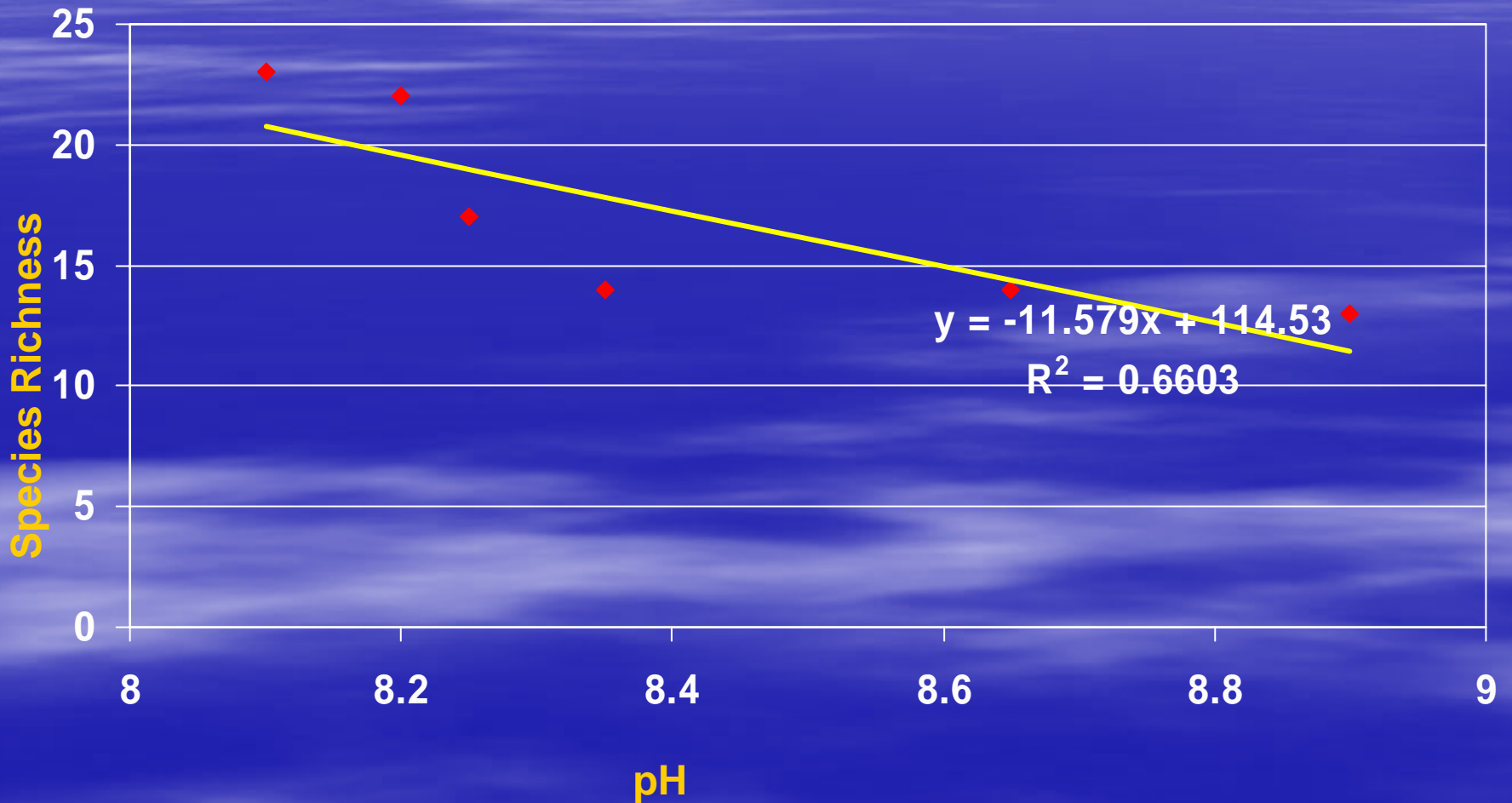
# Water Flow Vs Species Richness



# DO Vs Species Richness

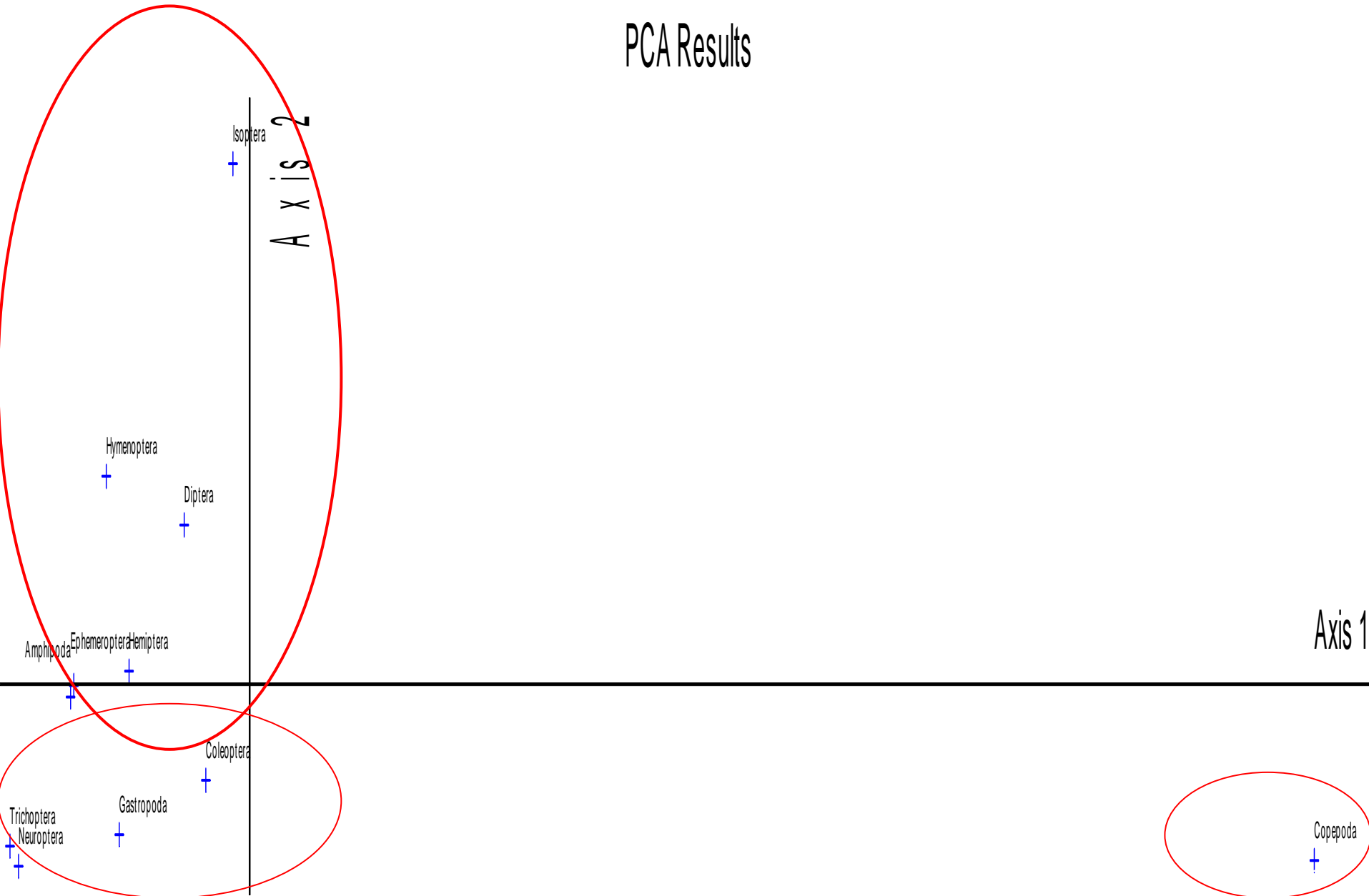


# pH Vs Species Richness



# PCA

## PCA Results



# Future

- A. Identify the specific microhabitats that support the most significant taxa (numerically or ecologically)
- B. Assess the best sampling methods for monitoring these organisms
- C. Continue to explore spatial and temporal variation in the macrobenthic community through the open water season
- D. Provide information useful in development of long-term biological monitoring protocols for the Red River

# Acknowledgements

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