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# EVALUATION OF MULTI-DECADAL CHANGES IN THE NEKTON COMMUNITY OF THE LOWER BRAZOS RIVER: POTENTIAL INFLUENCE OF FRESHWATER INFLOW

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# Importance of Gulf Coast Estuaries

- Commercial harvesting supports economy (Zimmerman *et al.* 2002)
- Fish assemblages are indicators of water quality (Araujo *et al.* 2000)



# Riverine Deltaic Estuary

- Brazos estuary is unique
- Highly dynamic system
- Complex, fluctuating species assemblages



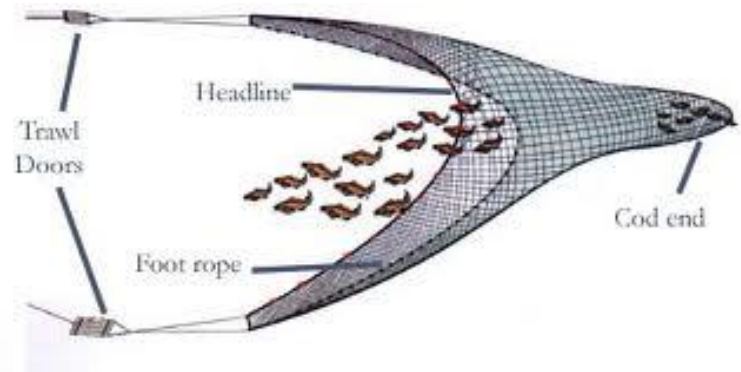
# Study Objectives

- Relationship of freshwater inflow on:
  - Salinity
  - Water quality
  - Available habitat
  - Nekton community
- Needed for adaptive management



# Data Collections Methods

- Review of Past Studies on lower Brazos River
  - Biological: bottom trawl collections
  - Hydrological: mean daily and monthly flow
  - Water quality: temperature, salinity, dissolved oxygen
- New Data collection on lower Brazos River



# Nekton Studies – Brazos River

- Johnson (1977) – TPWD
  - Inventory lower Brazos nekton monthly; 1973-1974
- Emmitte (1983)- Dow Chemical
  - Inventory lower Brazos nekton; 1982

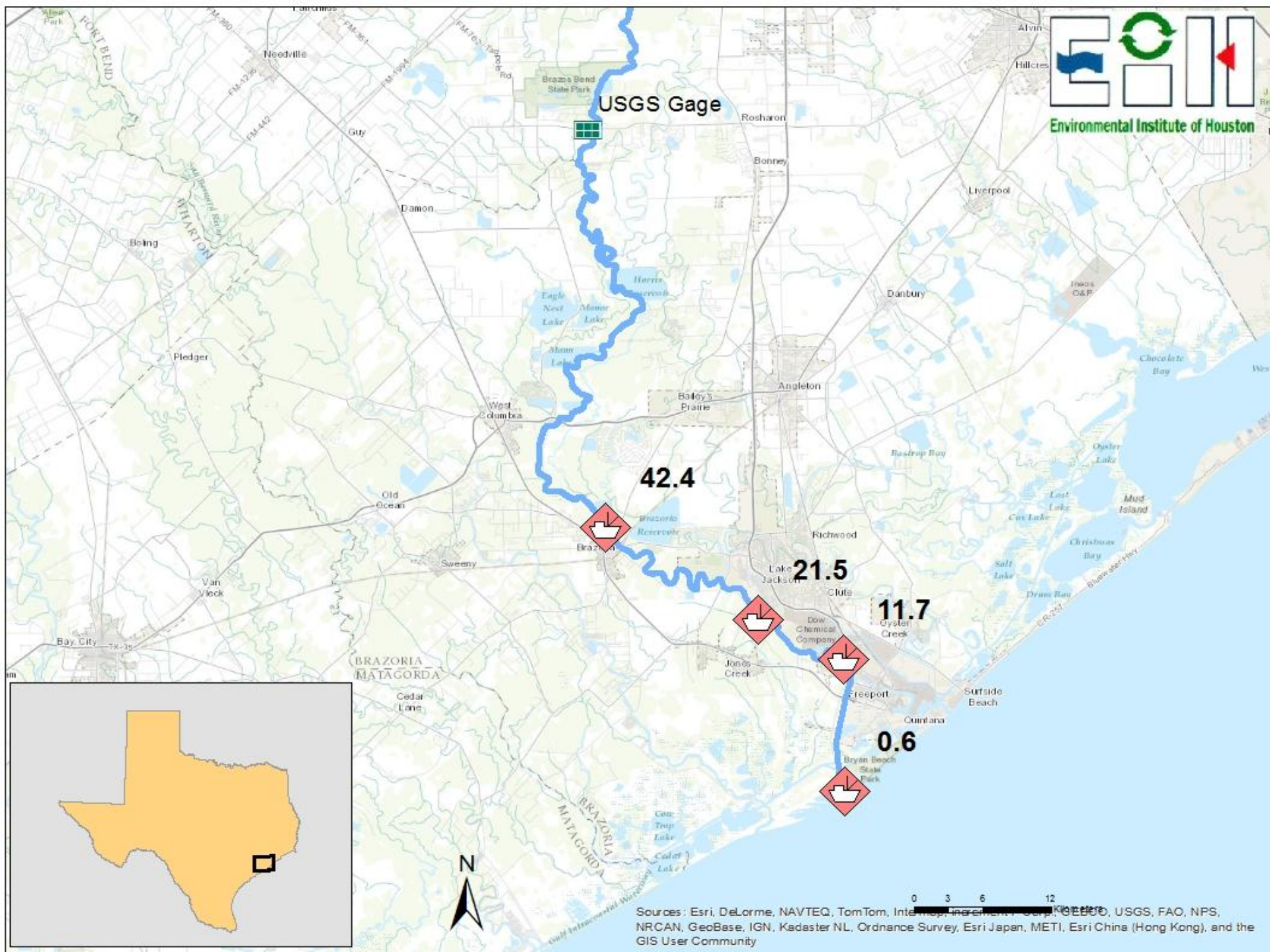


# Sampling Approach – New Data

- Sampled 4 of Johnson's sites each month for 1 year
- Water Quality:
  - YSI multiprobe data logger: Temp, DO, Sp. Cond., Salinity, pH and depth
  - Turbidimeter: water clarity (NTU)
- Hydrology
  - USGS gage at Rosharon
- Fish Collection: Otter trawls, supplemented with other methods







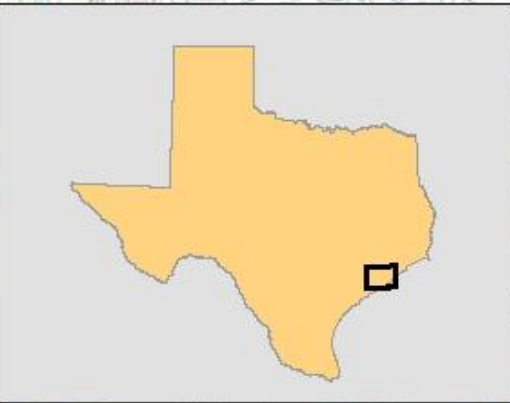
USGS Gage

42.4

21.5

11.7

0.6



0 3 6 12 Miles

Sources: Esri, DeLorme, NAVTEQ, TomTom, Intermap, Inc., Swire, GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), and the GIS User Community

# Data Analysis

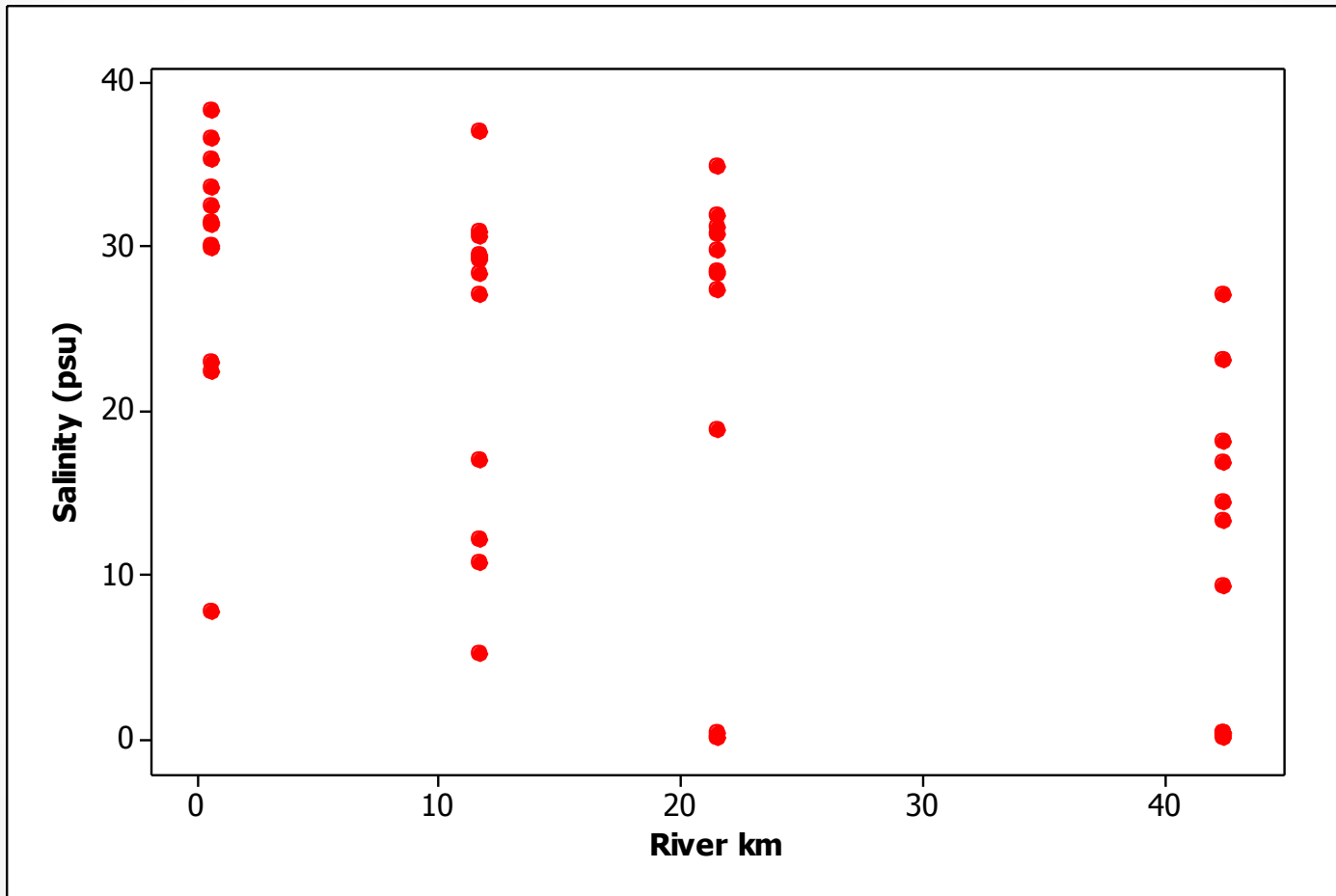
- Graphical comparisons of hydrology, species numbers and abundance
- Used IHA (Index of Hydrological Alteration = IHA) to evaluate long term trends in hydrology
- Multivariate Cluster Analysis: relation to species similarity with sites and times



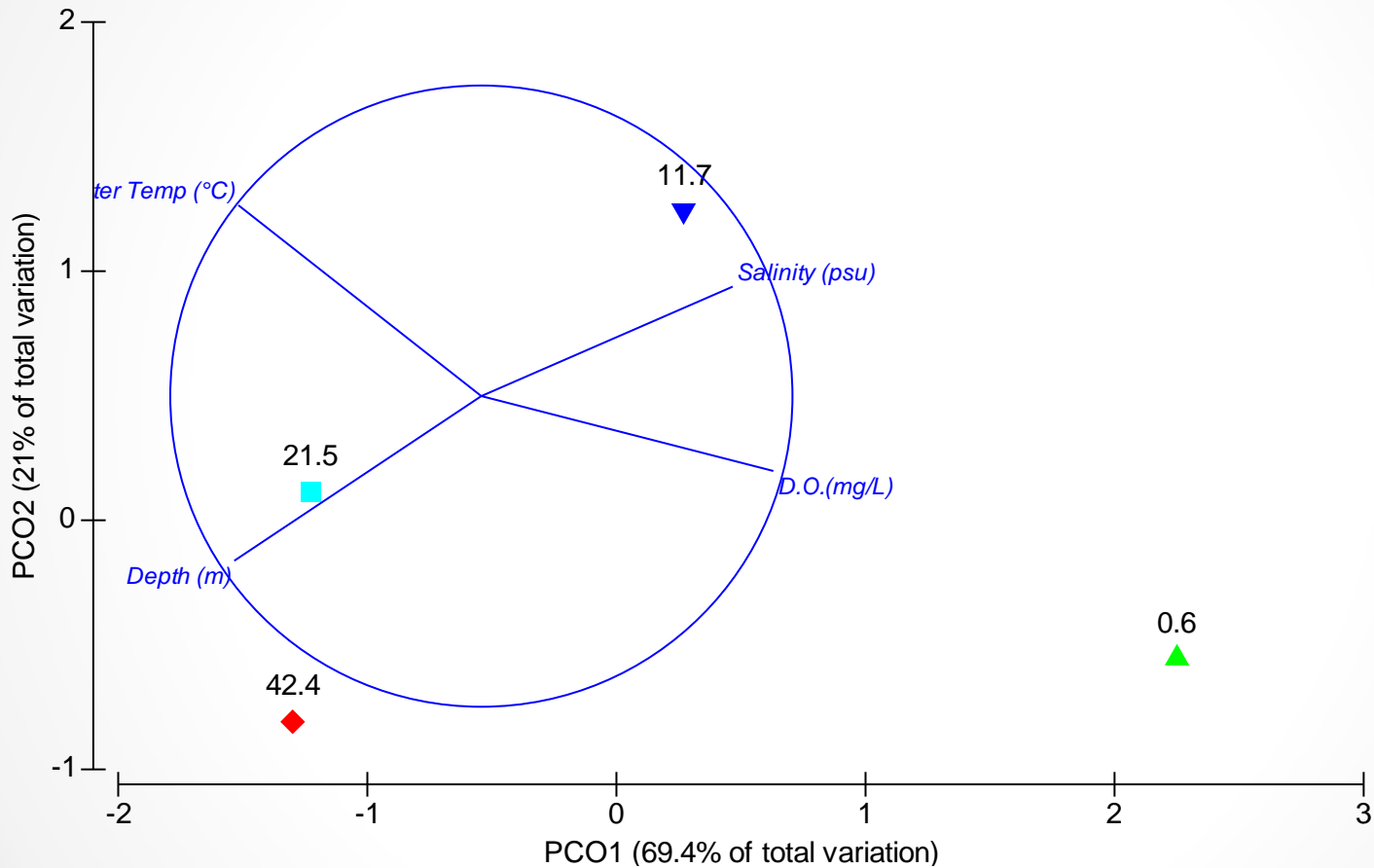
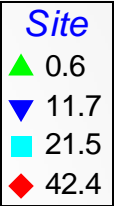
# Current Study Results



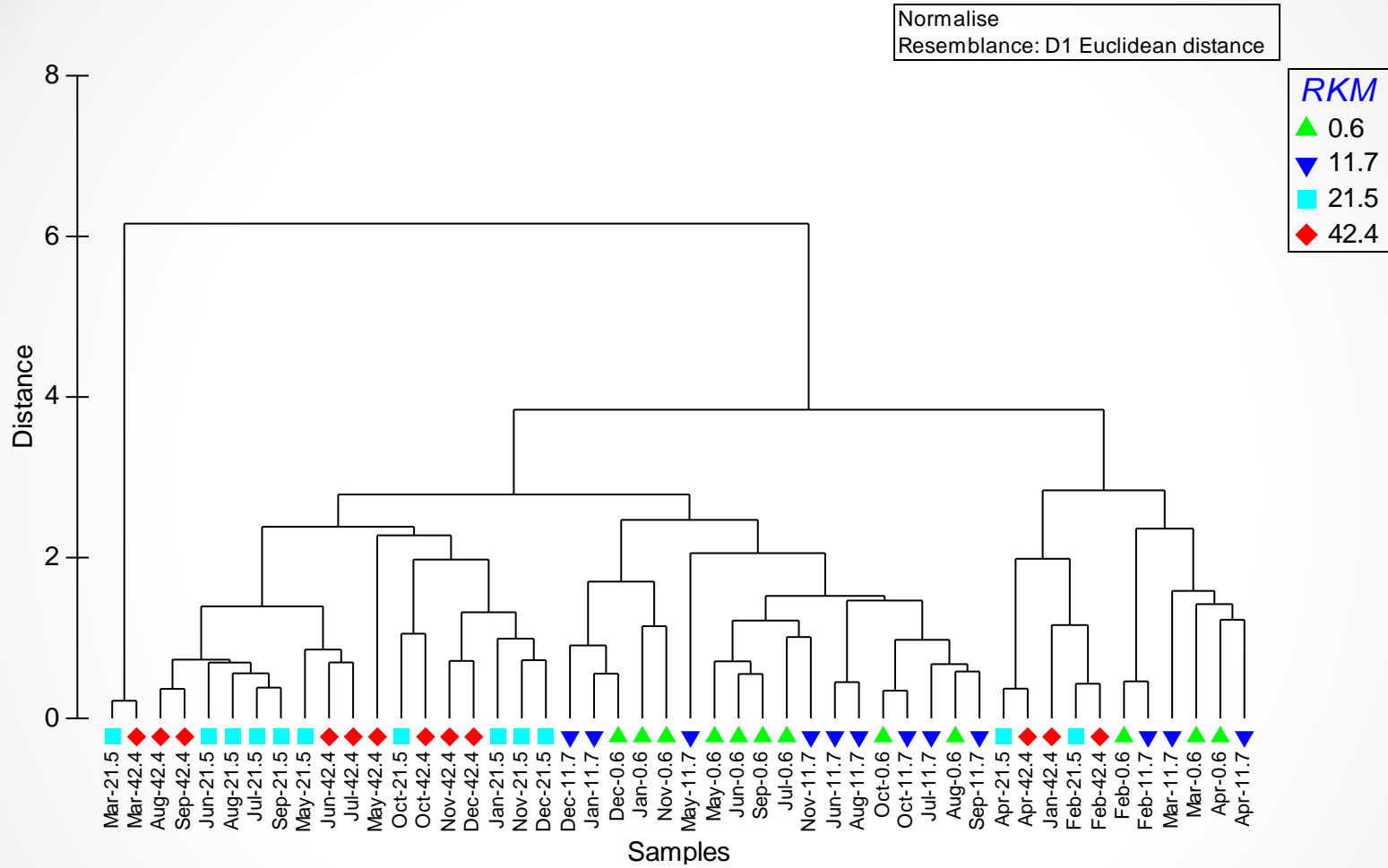
# Salinity by River Km



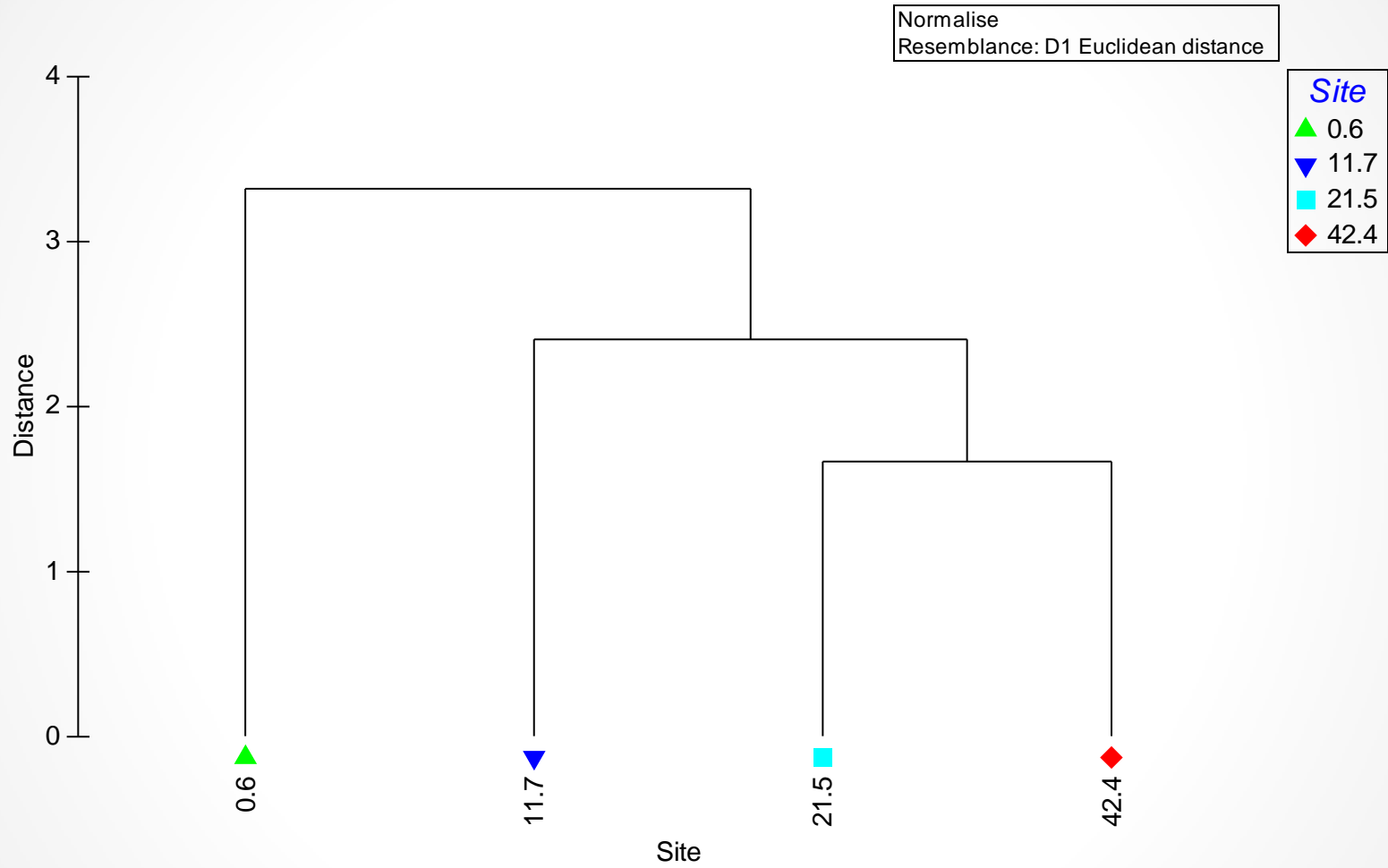
Normalise  
Resemblance: D1 Euclidean distance

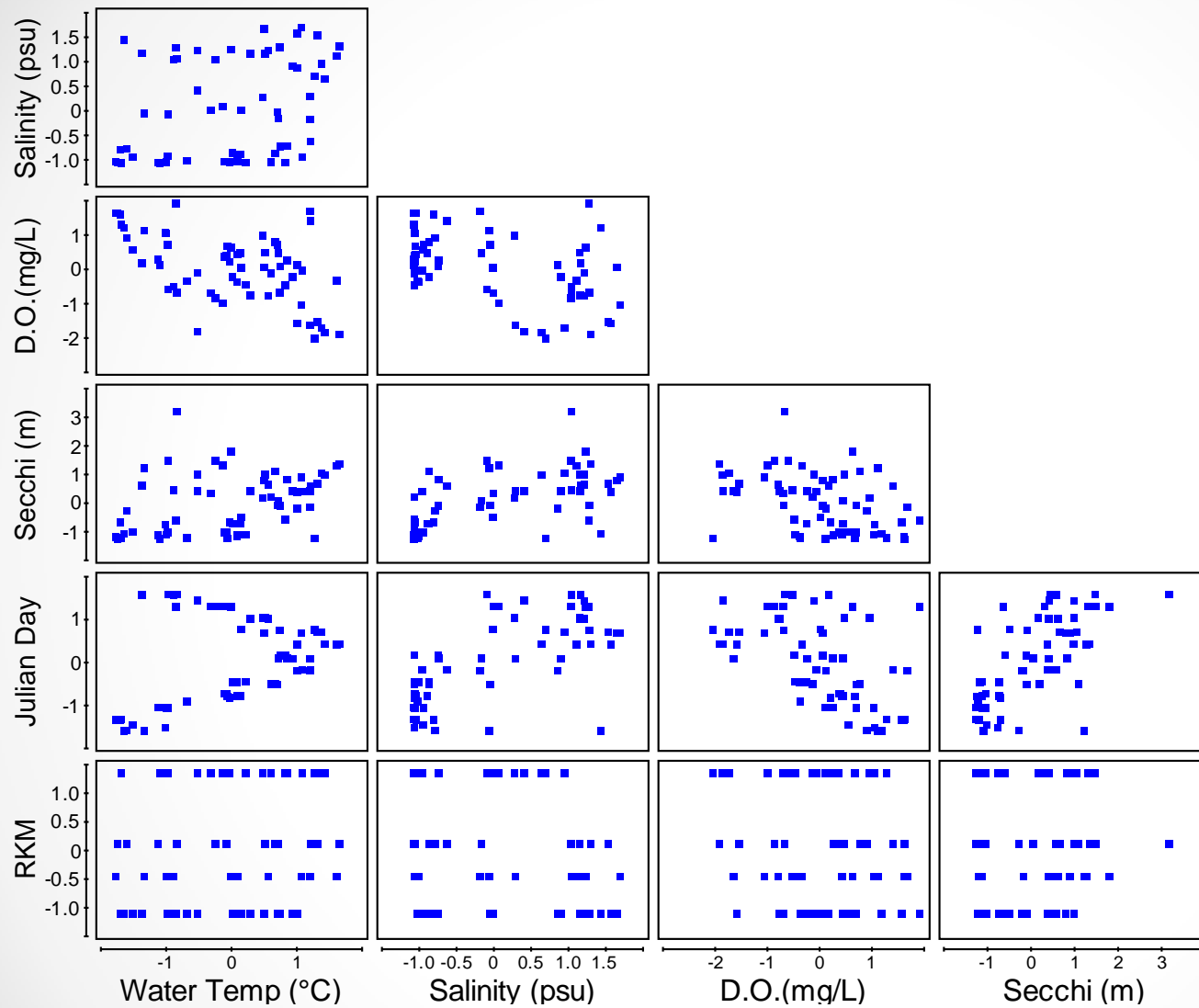


# Physiochemical Sample Similarity



# Physiochemical Site Similarity

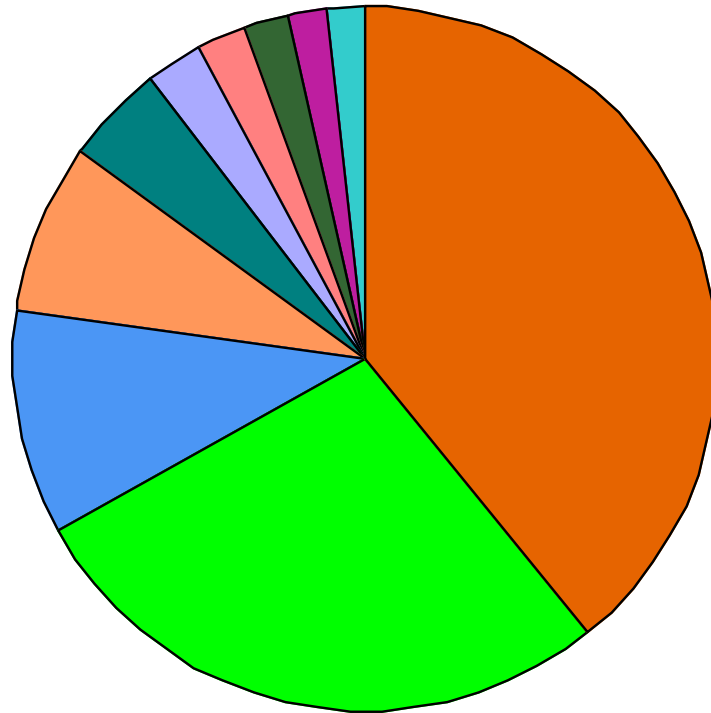




ghghfd  
ghghdf  
ghghdd  
ghghklk  
klkl



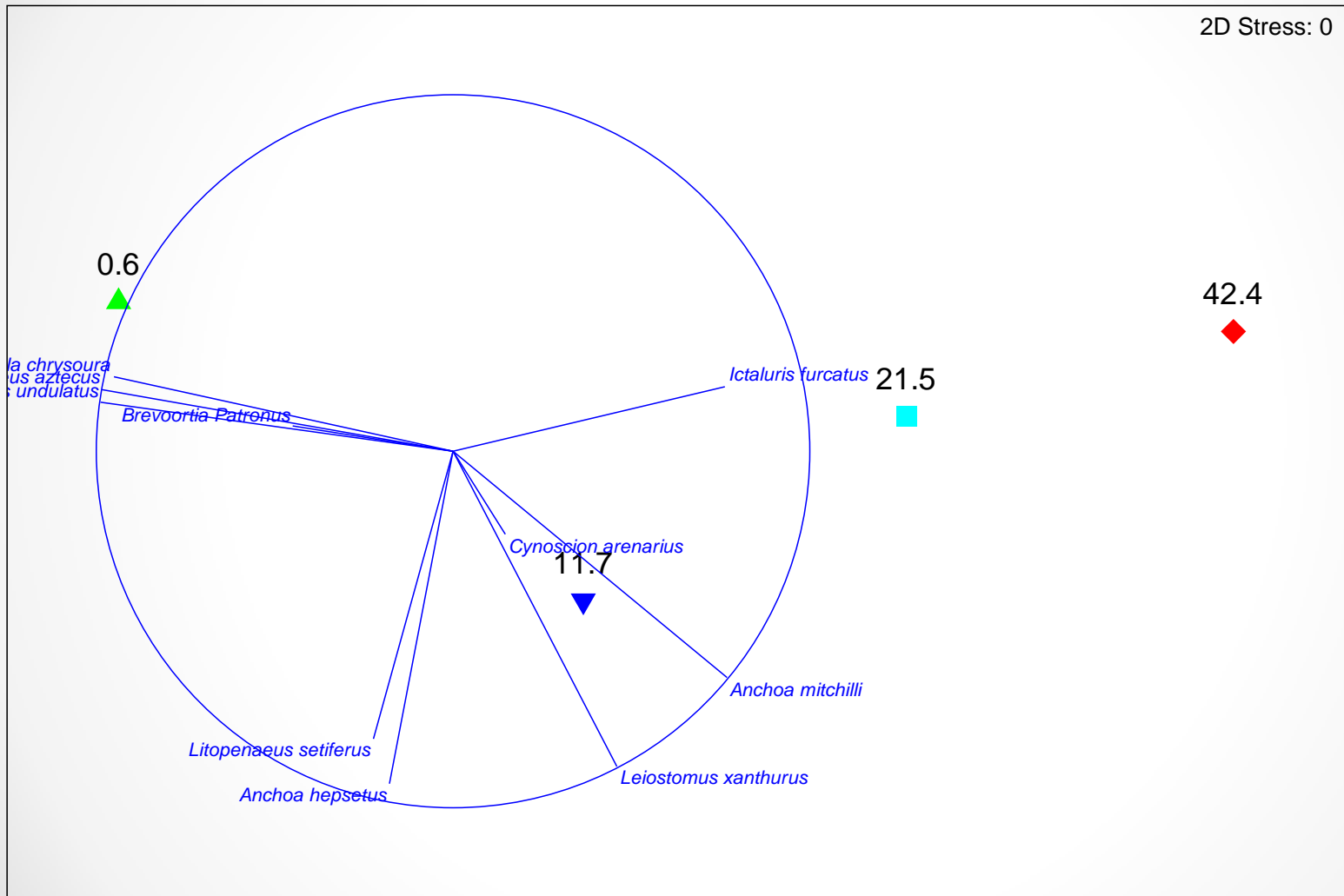
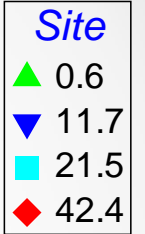
## Dominant Nekton



# Abundant Taxa MDS

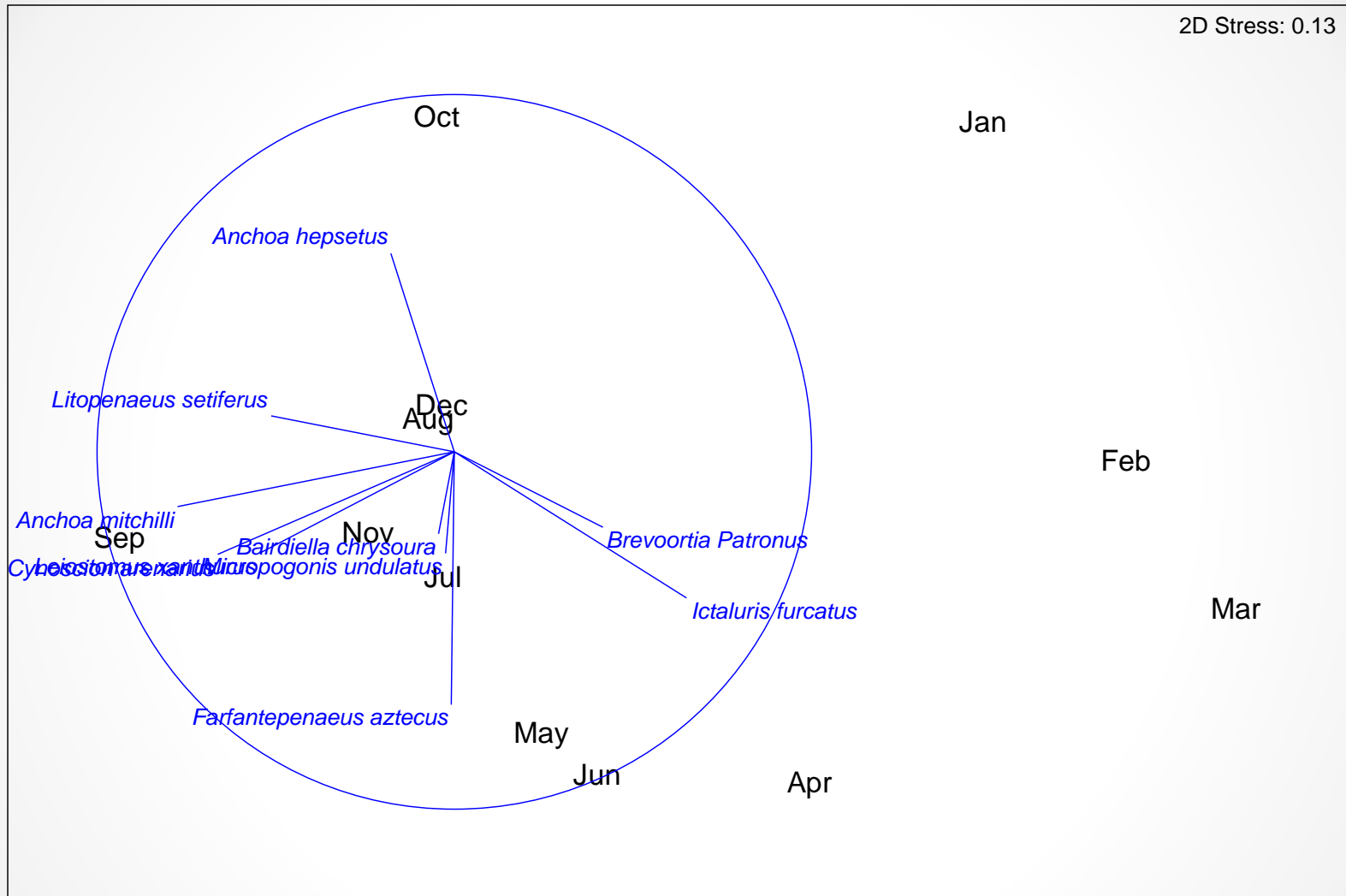
Transform: Log(X+1)  
Resemblance: S17 Bray Curtis similarity

2D Stress: 0

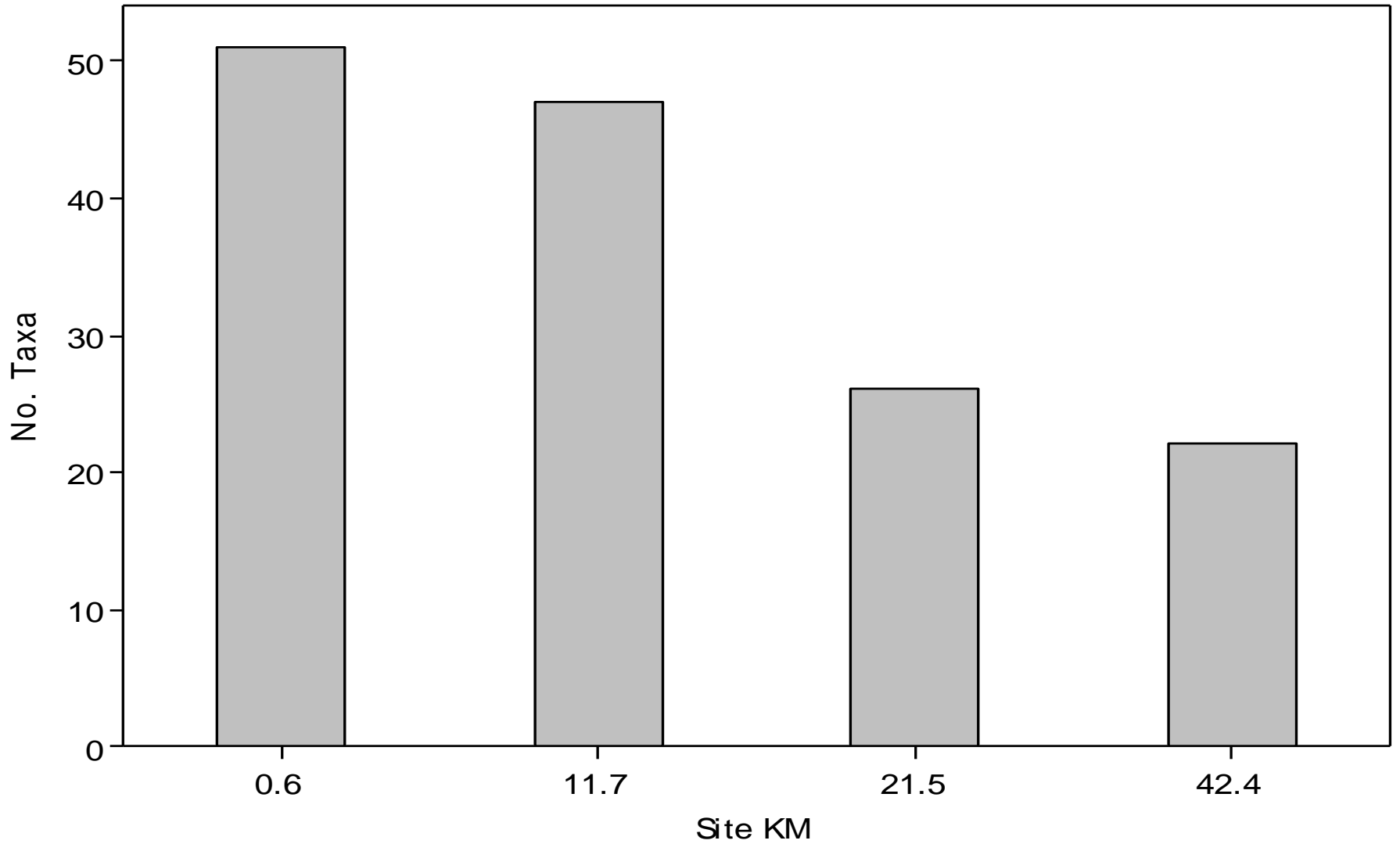


Transform: Log(X+1)  
Resemblance: S17 Bray Curtis similarity

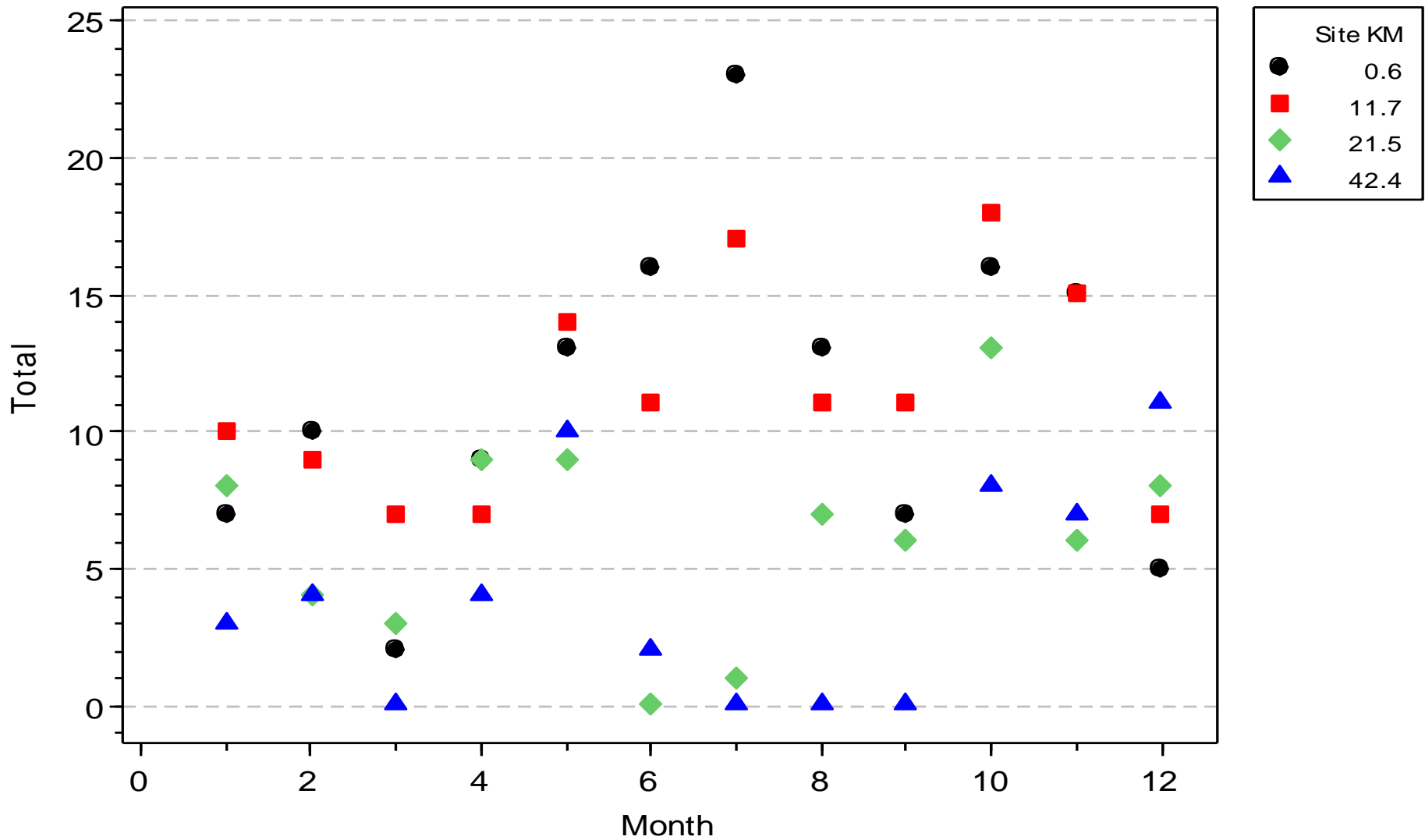
2D Stress: 0.13



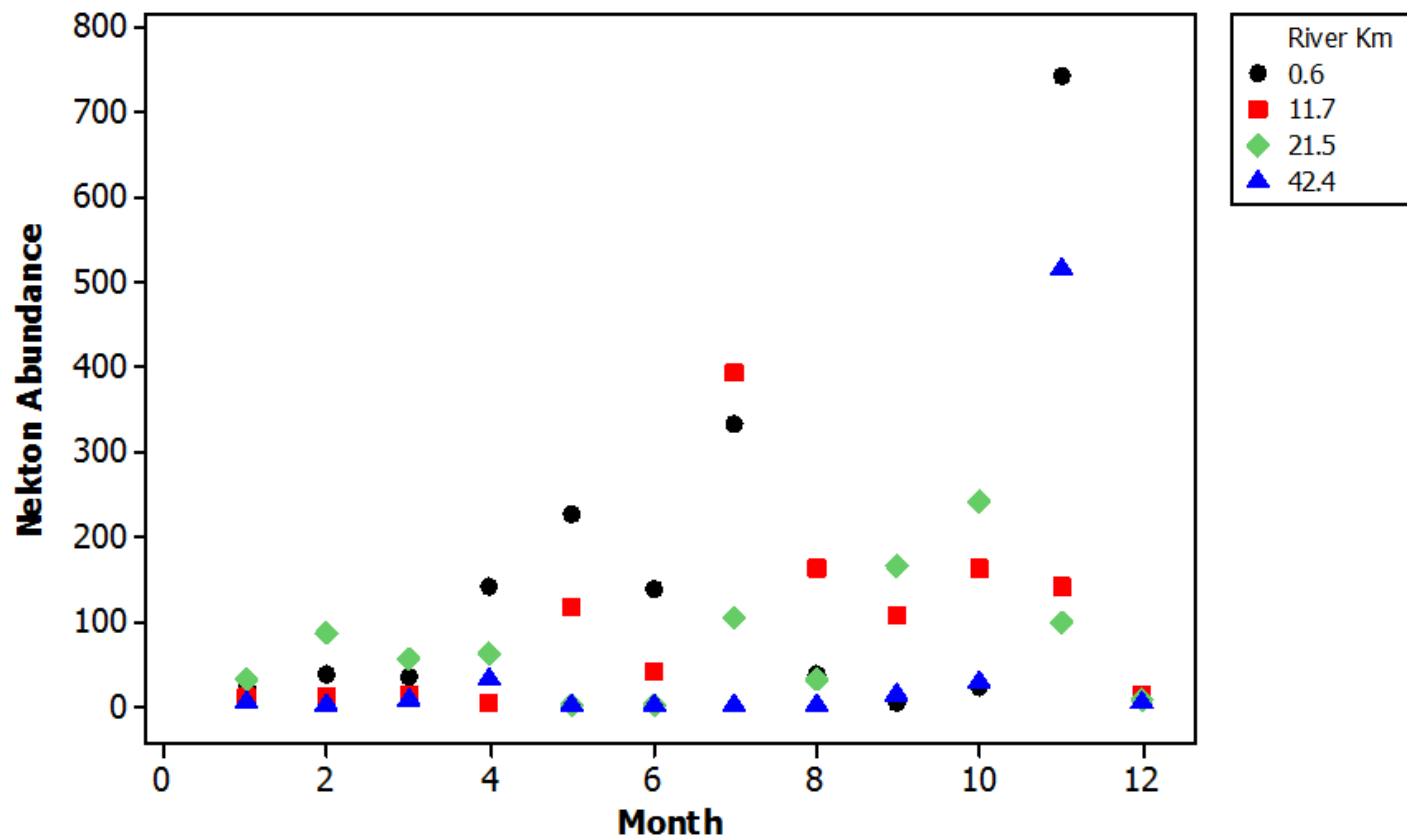
Cumulative No. Nekton Taxa 12 month Period



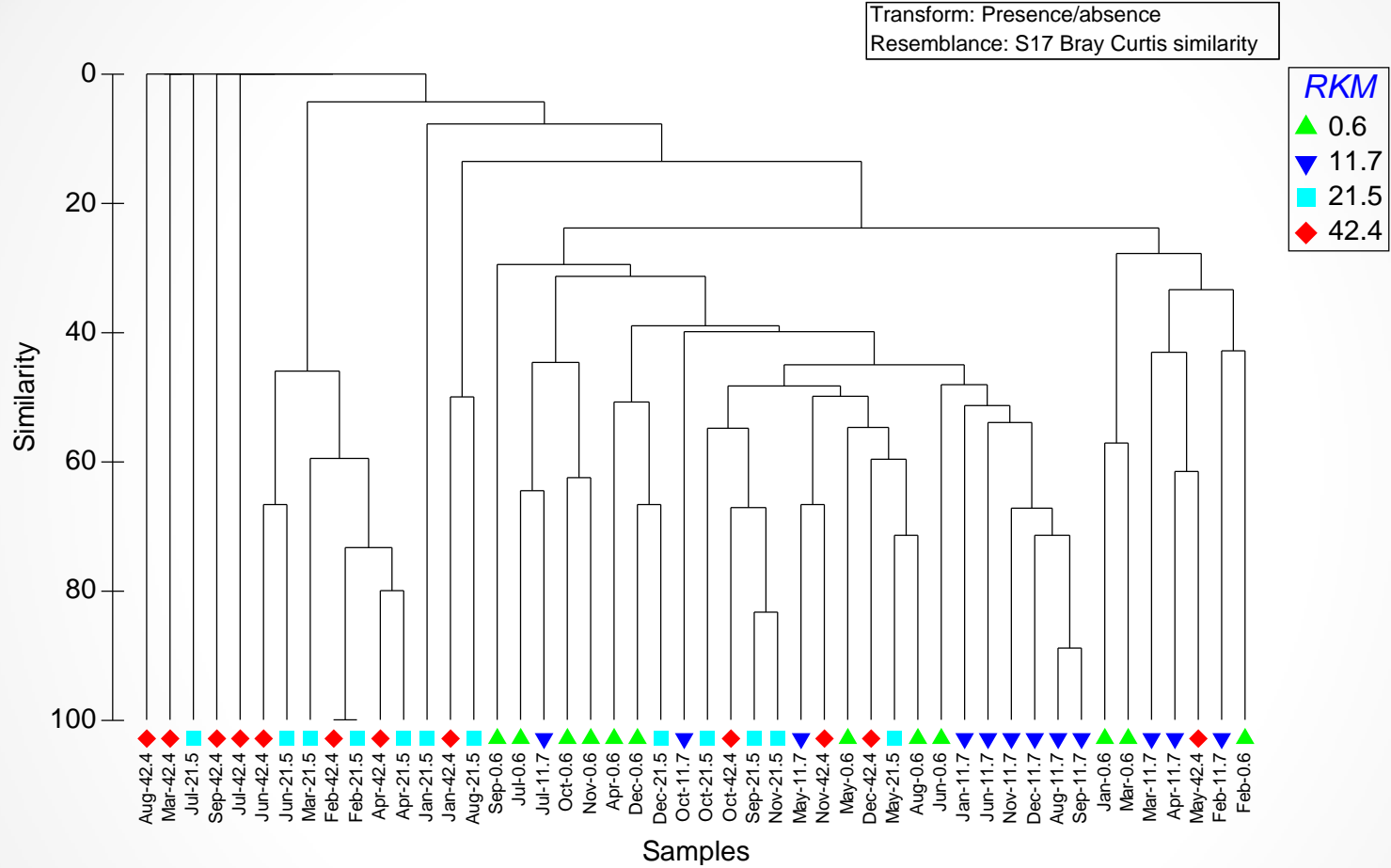
Number of Nekton Taxa by Month and Site



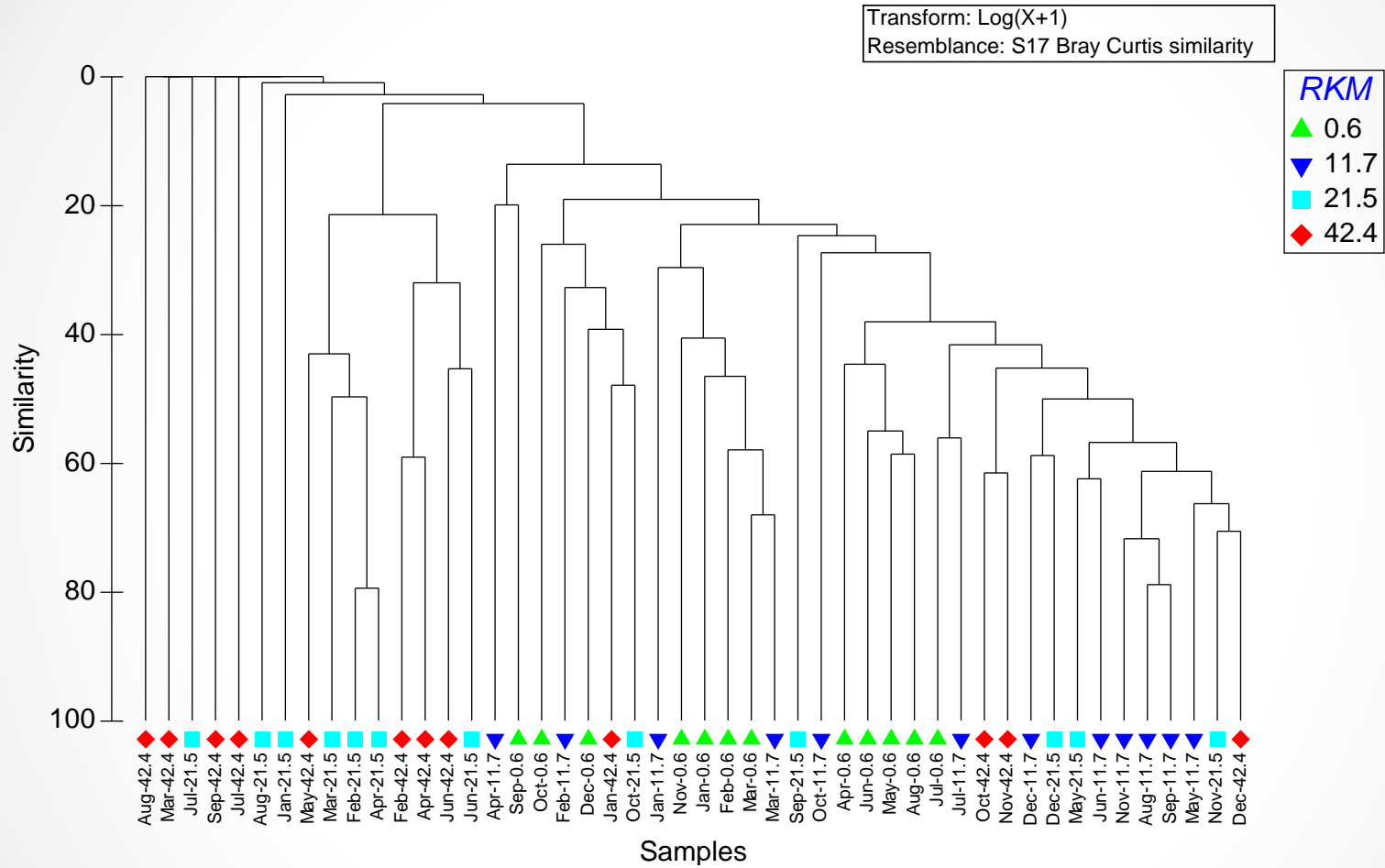
### Average Nekton Abundance/Month



# Nekton Presence Assemblage Similarity



# Nekton Community Similarity





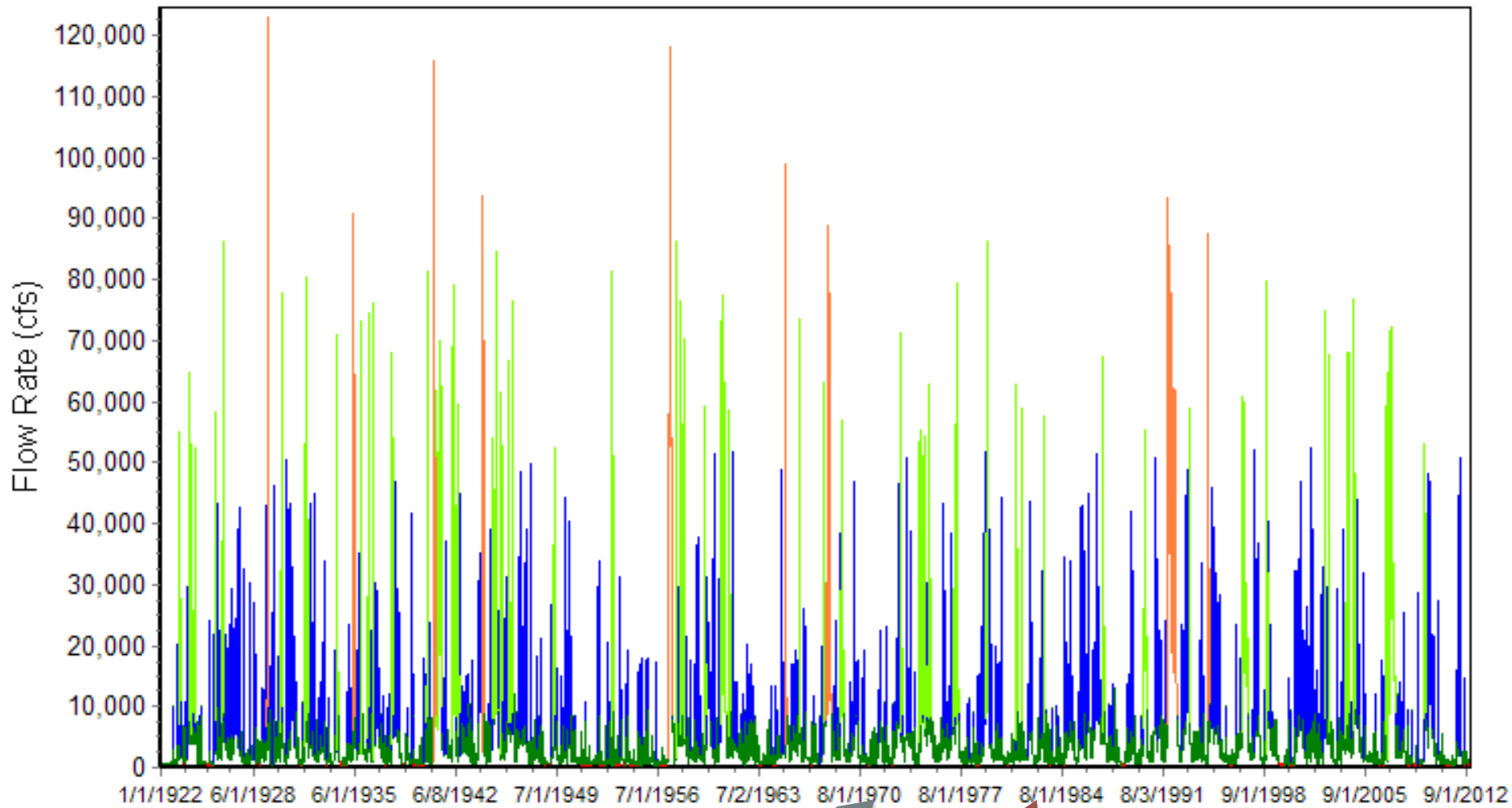
# Comparison with Past Studies

- Hydrologically different
- Effort and duration varied
- Current study: 4 sites, 0.6-42.4 RKM, 3 replicates ; 12 months; 144 total tows
- Johnson 1973-5: 5 sites, 0.6-42.4 RKM, 2 replicates; 24 months; 240 tows
- Emmitte 1982: 4 sites, 3 – 9.5 RM, 16 tows; 12 months (quarterly), no replicates



# Brazos River at Richmond 08114000 Environmental Flow Components (1922-2012)

- Extreme Low Flows
- Low Flows
- High Flow Pulses
- Small Floods
- Large Floods

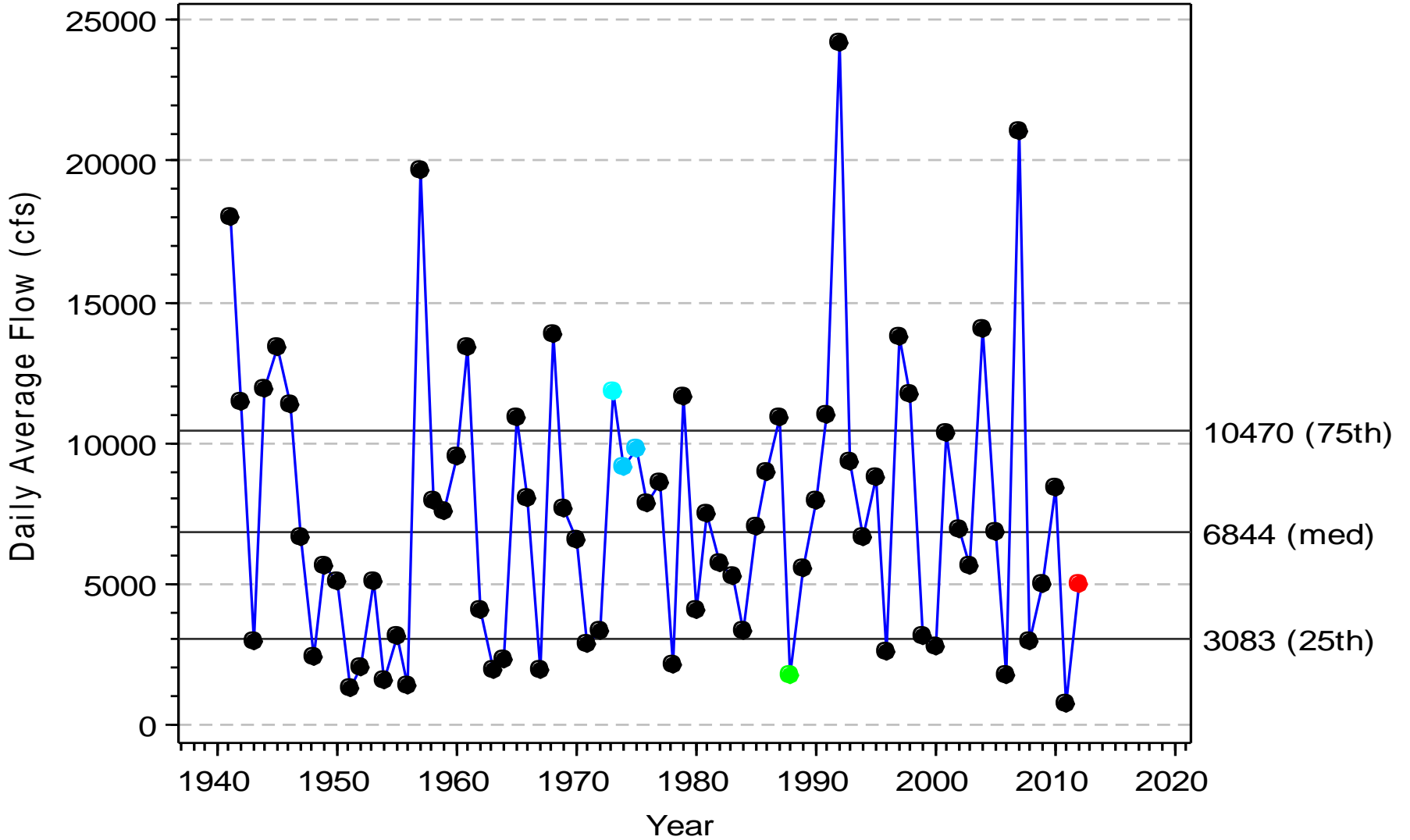


Johnson 1973-5

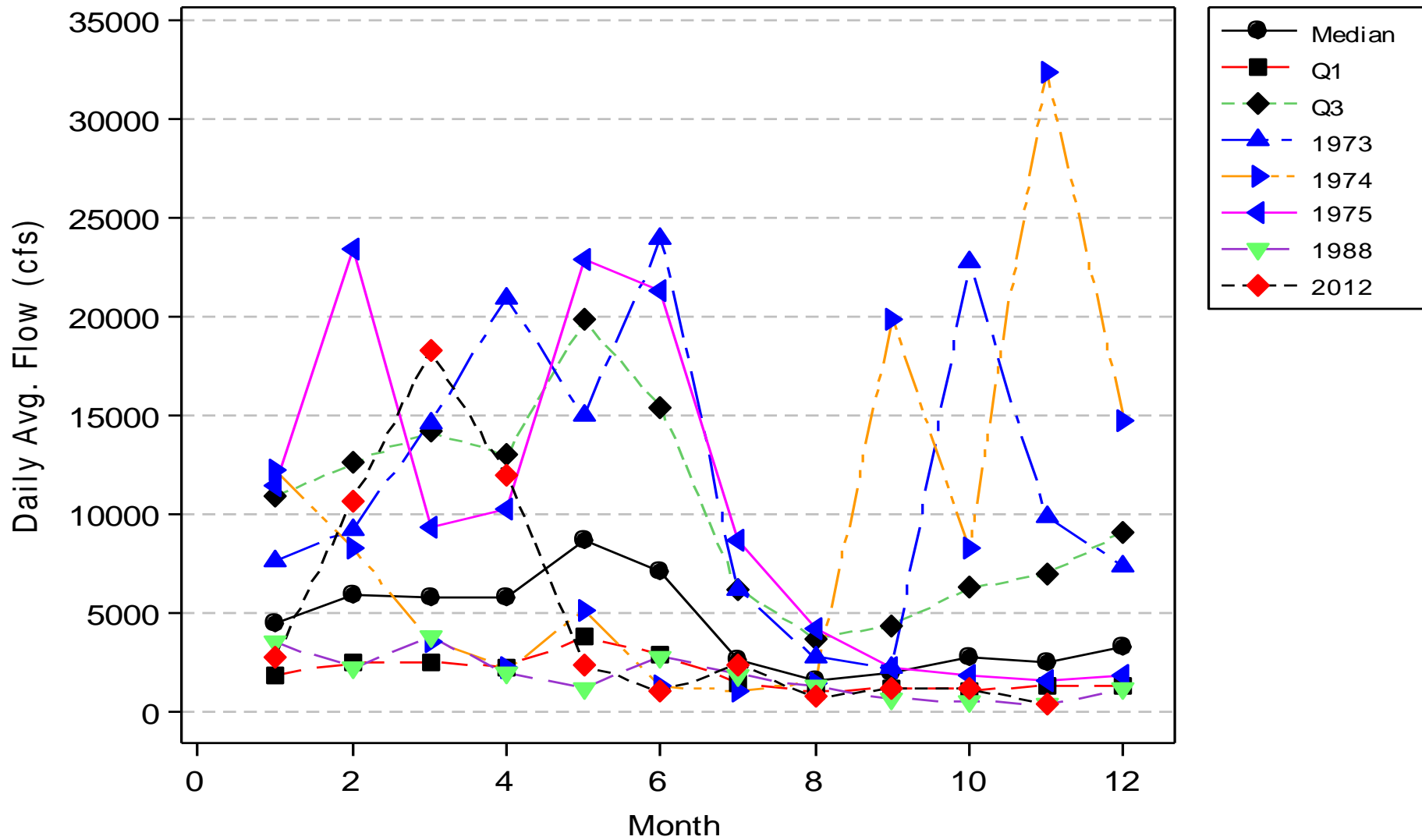
Emmitte 1983

Current Study

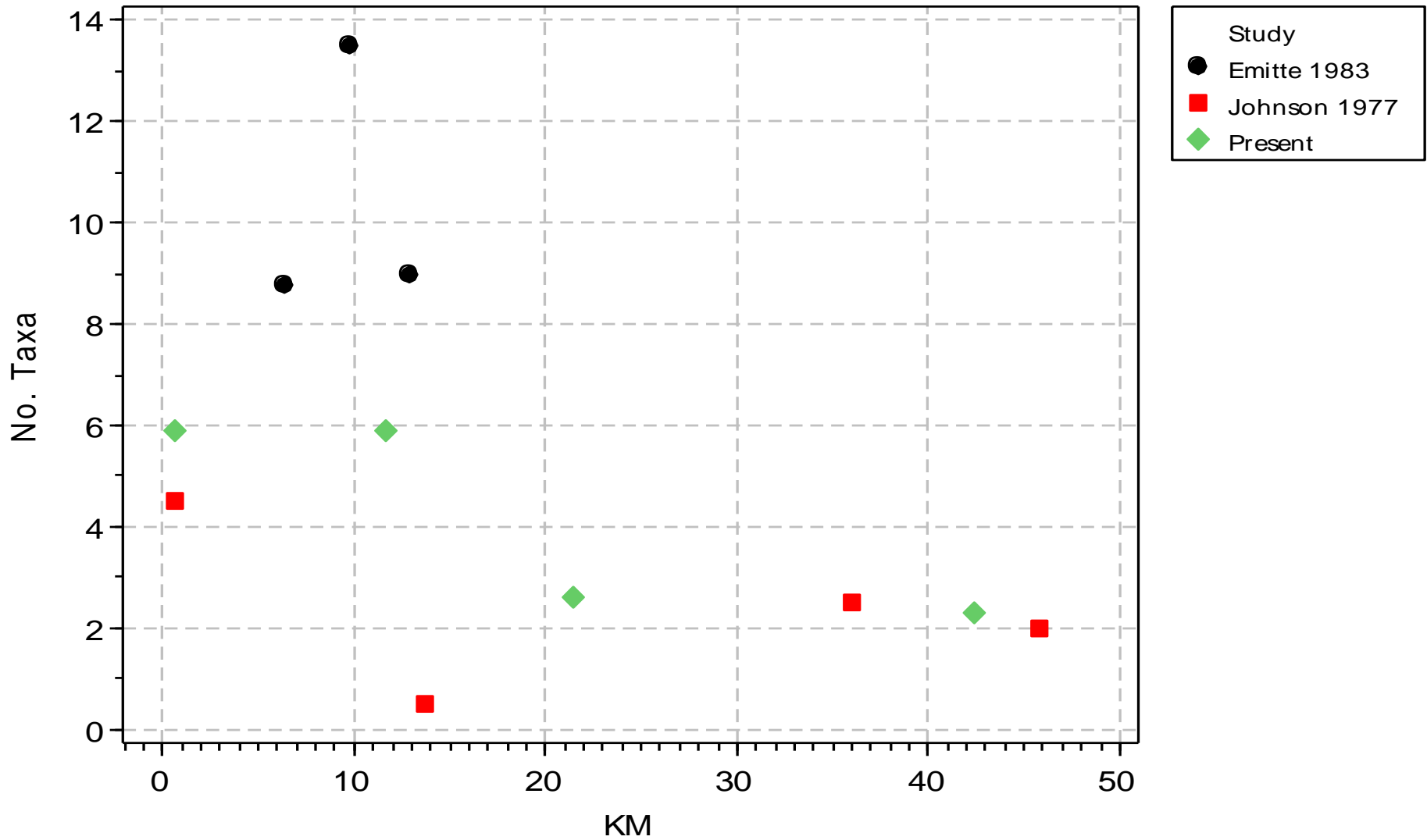
### Daily Average Flow by Year



### Daily Avg. Flow by Month



Average No. Taxa by Study





# Discussion

- Decreased peak Brazos River freshwater inflows
- Flow regime impacts lower river nekton communities more so than upper reaches
- Greatest diversity at the mouth of river



# Literature Cited

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- Thanks to all who helped!





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