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Check out more Marine Sediment Monitoring research here.
(<http://www.ecy.wa.gov/programs/eap/psamp/index.htm>)

I. Introduction

Investigation

This study investigates how the Puget Sound macrobenthic communities in Commencement Bay have changed over time from 1989 to 2014. The macrobenthic community has many important ecological functions, so understanding the structure of these communities and how they may be changing over time is critically important for conservation efforts.

Program

The Department of Ecology's Marine Sediment Monitoring Team collected specimens in Commencement Bay as part of the annual sediment quality monitoring work conducted in partnership with the Puget Sound Ecosystem Monitoring Program (PSEMP).

Projects

- Long-term Project = Annual samples collected at one station from 1989-2014
- Baseline Project = 25 samples collected in 1999
- Urban Waters Initiative (UWI) Project = 30 samples collected in 2008 and 30 samples collected in 2014

Sample Locations

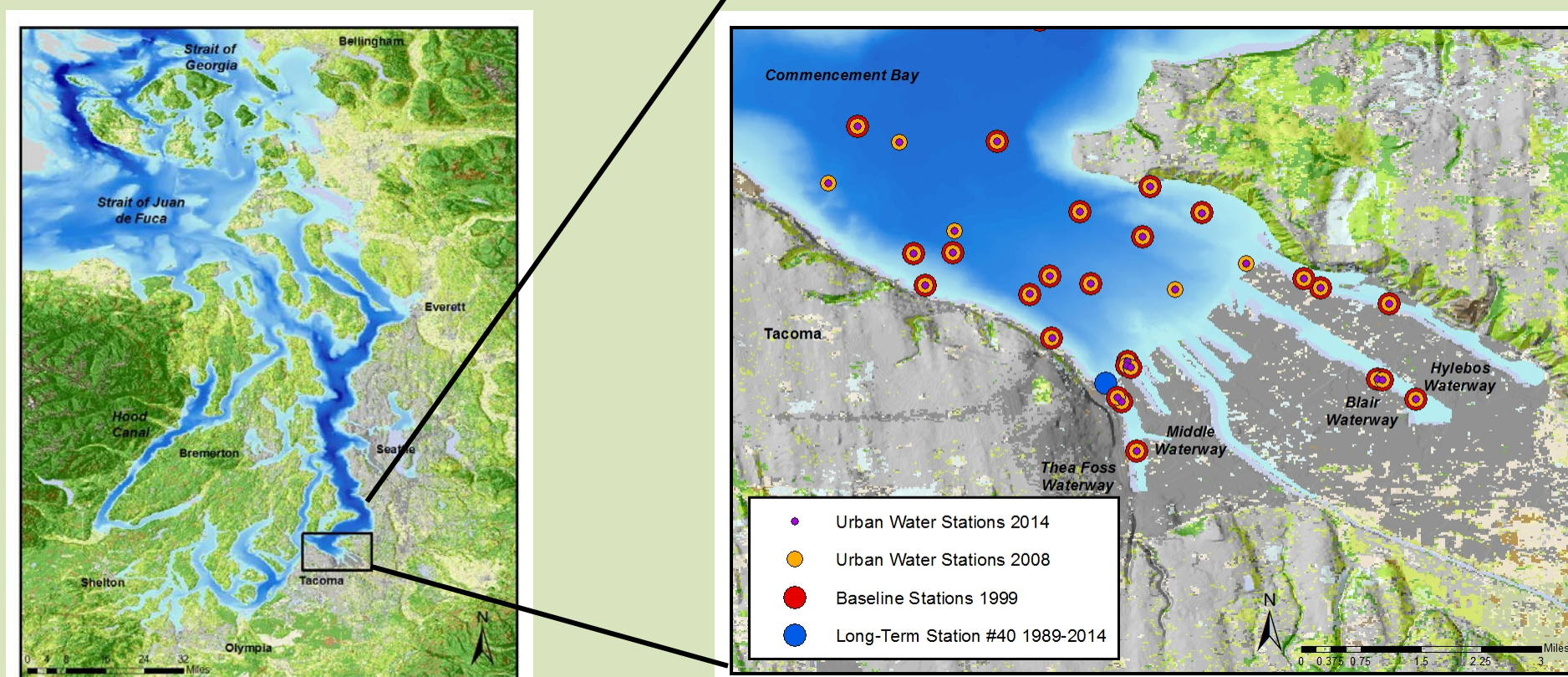


Figure 1. Puget Sound (left) and Commencement Bay with project sample locations (right).

II. Study Questions

- How has the macrobenthic community in Commencement Bay changed over time?
- Can we classify the bay's benthic structure?
- Is the Long-term Station 40 a good representative of the bay?

III. Methods

Sampling Methods: See reference, Dutch et al. 2009

Data Summary and Analyses Included:

- Calculation of community indices (total abundance, total taxa richness, major taxa group abundance, and feeding guild abundance)
- Assignment of species to feeding guilds (Macdonald et al. 2012)
- Analysis using scatter plots, bar charts, GIS Maps, and PRIMER MDS plots



Figure 2. Examples of common species in each feeding guild.

IV. Results

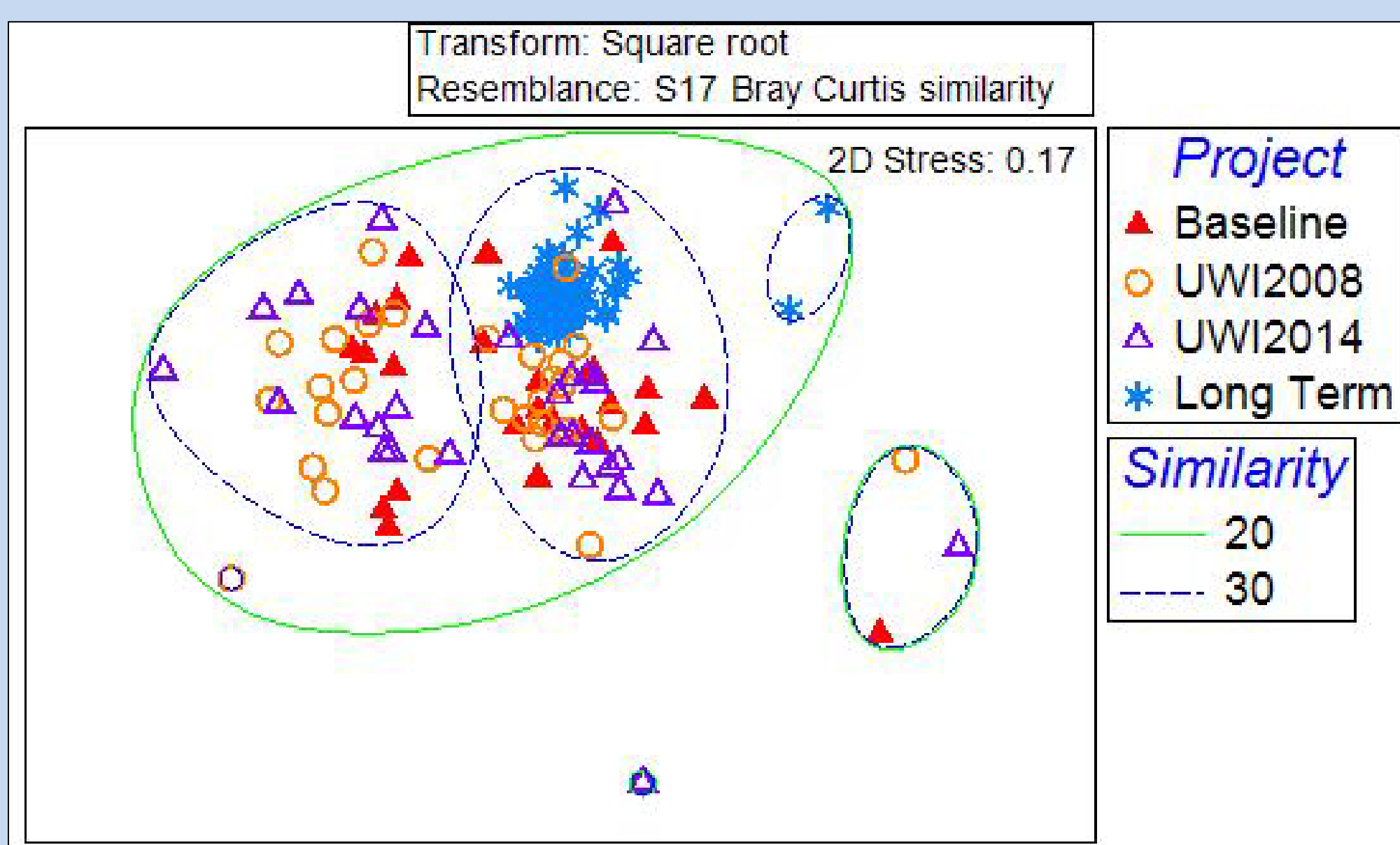


Figure 3. MDS plot showing similarity of stations at the species level.

- Commencement Bay can be considered two communities at the species level.

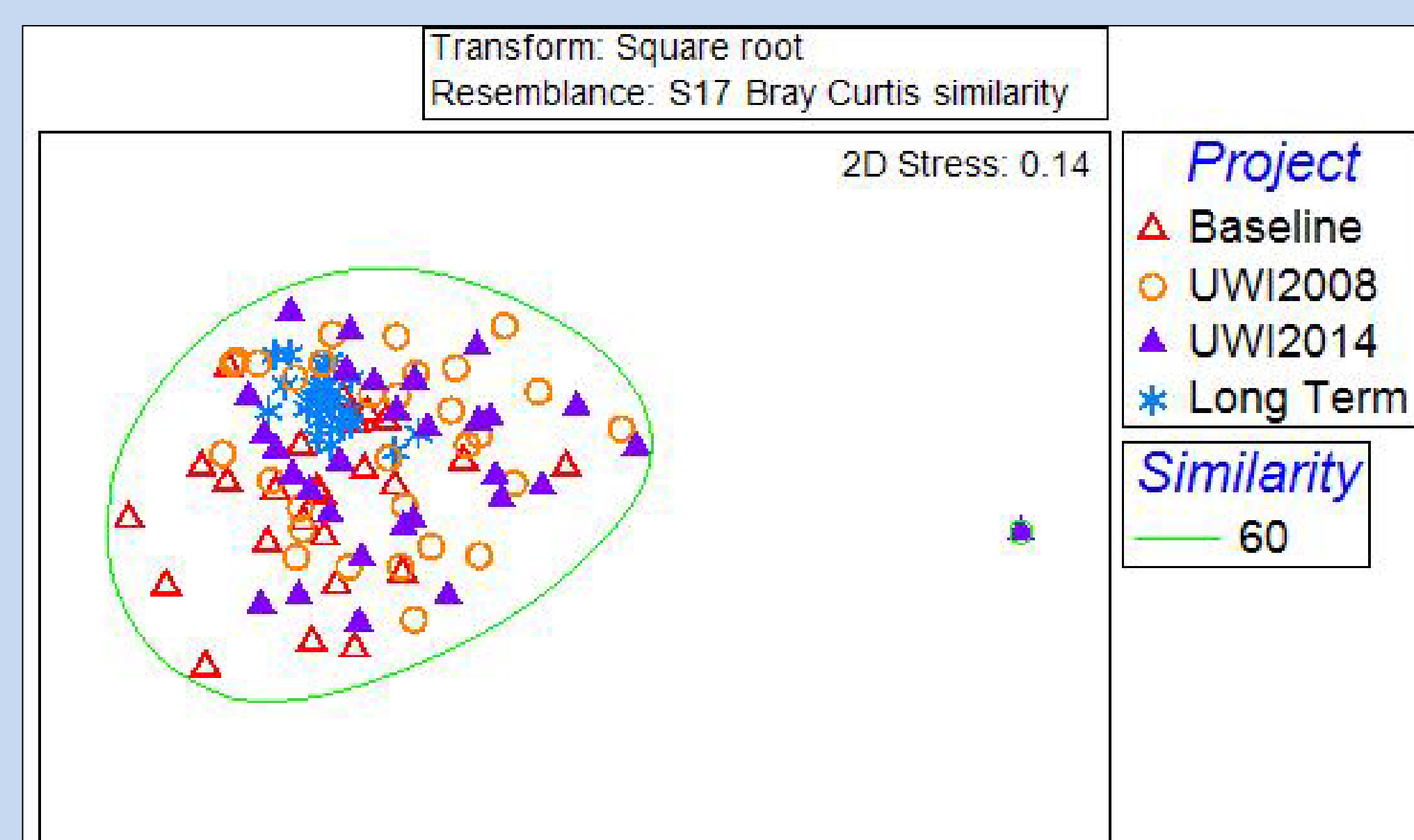


Figure 4. MDS plot showing similarity of stations at the feeding guild level.

- Commencement Bay can be considered one community at the feeding guild level.
- A possible slight shift was detected from Baseline to UWI2008

V. Conclusions

- Long-term Station 40 is a good representative of Commencement Bay at feeding guild level.
- Commencement Bay can be considered two communities at the species level and one community at the feeding guild level.
- There appears to be a pattern of feeding guild relative abundance over time but no apparent pattern of total feeding guild abundance over time.
- Total abundance and taxa richness are variable across stations but consistent bay-wide over time.

Total Species Abundances and Taxa Richness

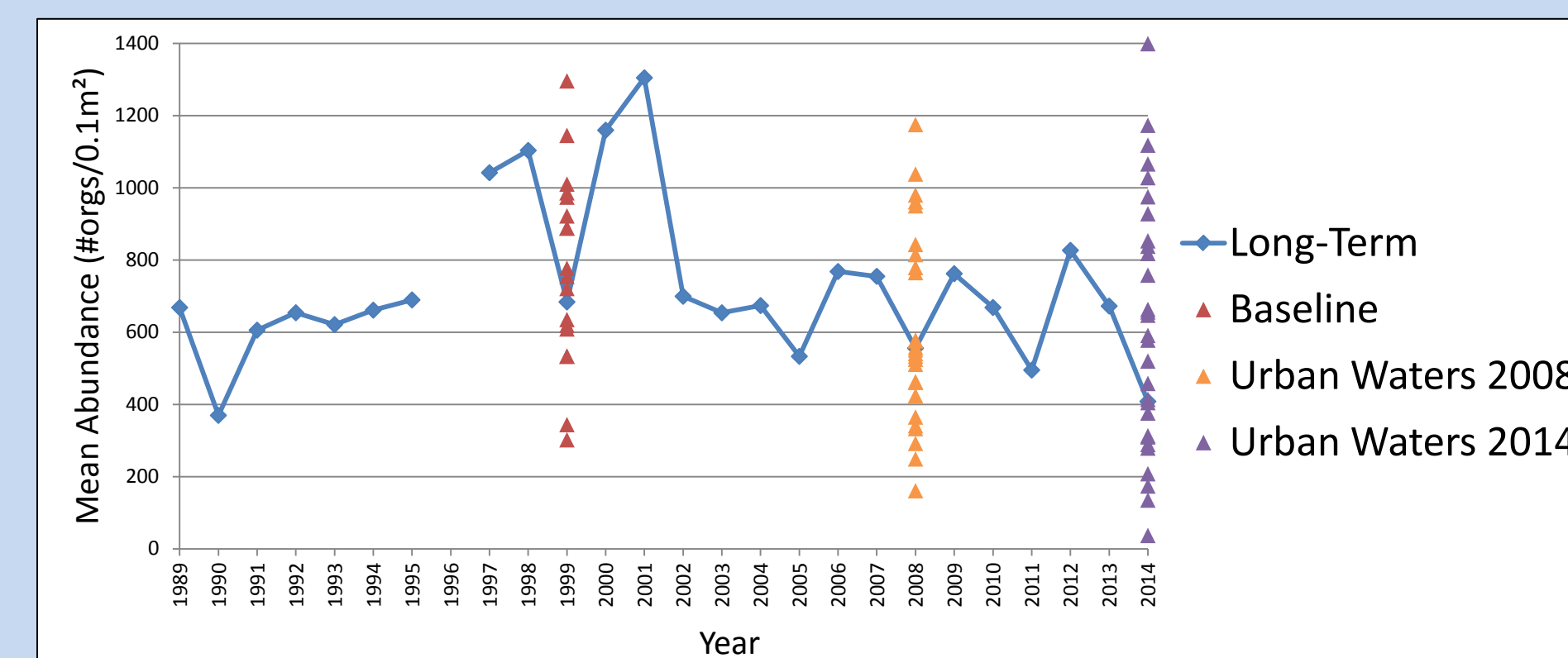


Figure 5. Scatter plot showing mean abundance over time at each station.

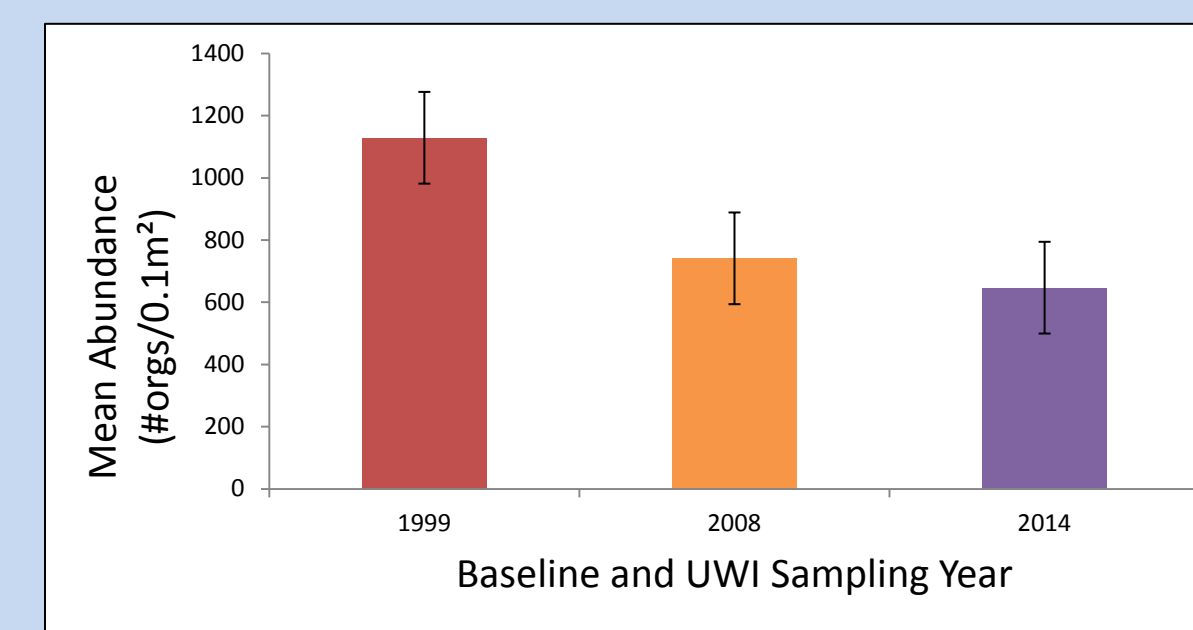


Figure 7. Histogram showing mean abundance with standard error bars for baseline and UWI project years.

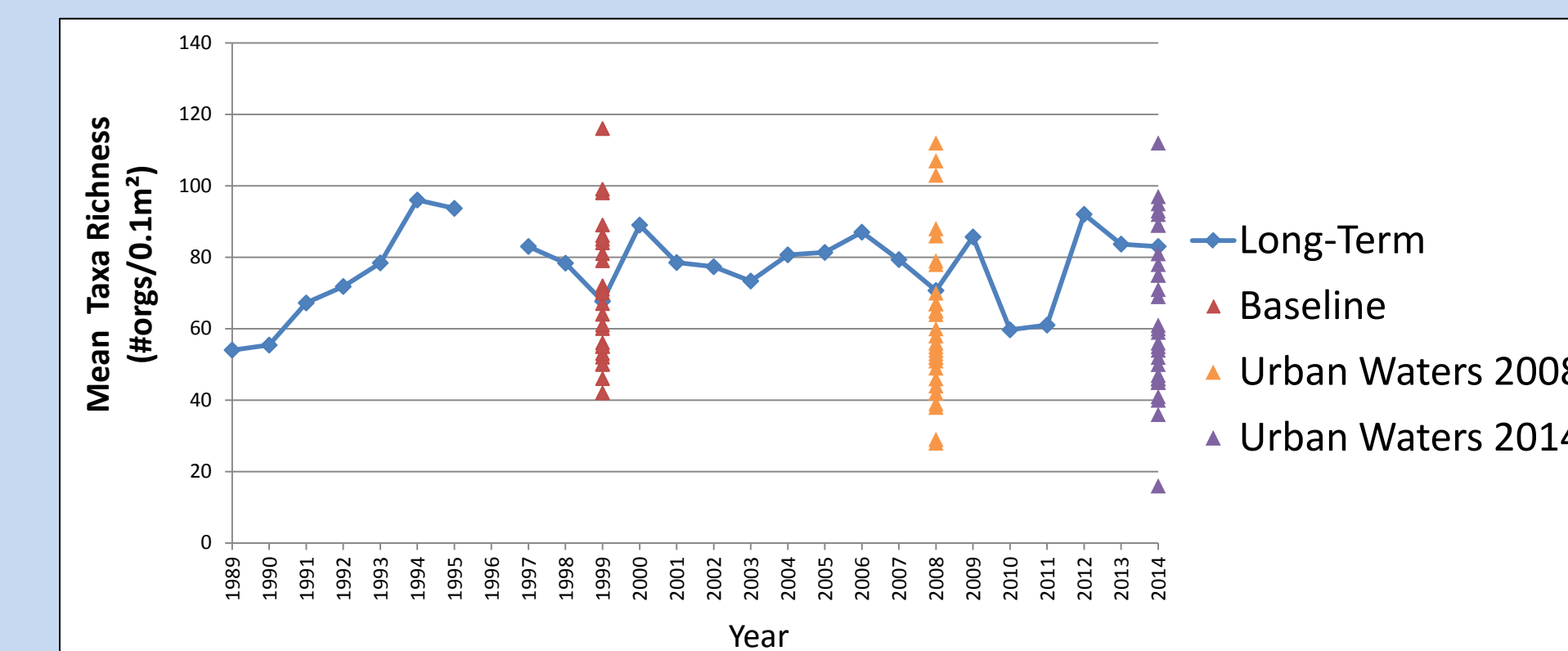


Figure 6. Scatter plot showing mean taxa richness over time at each station.

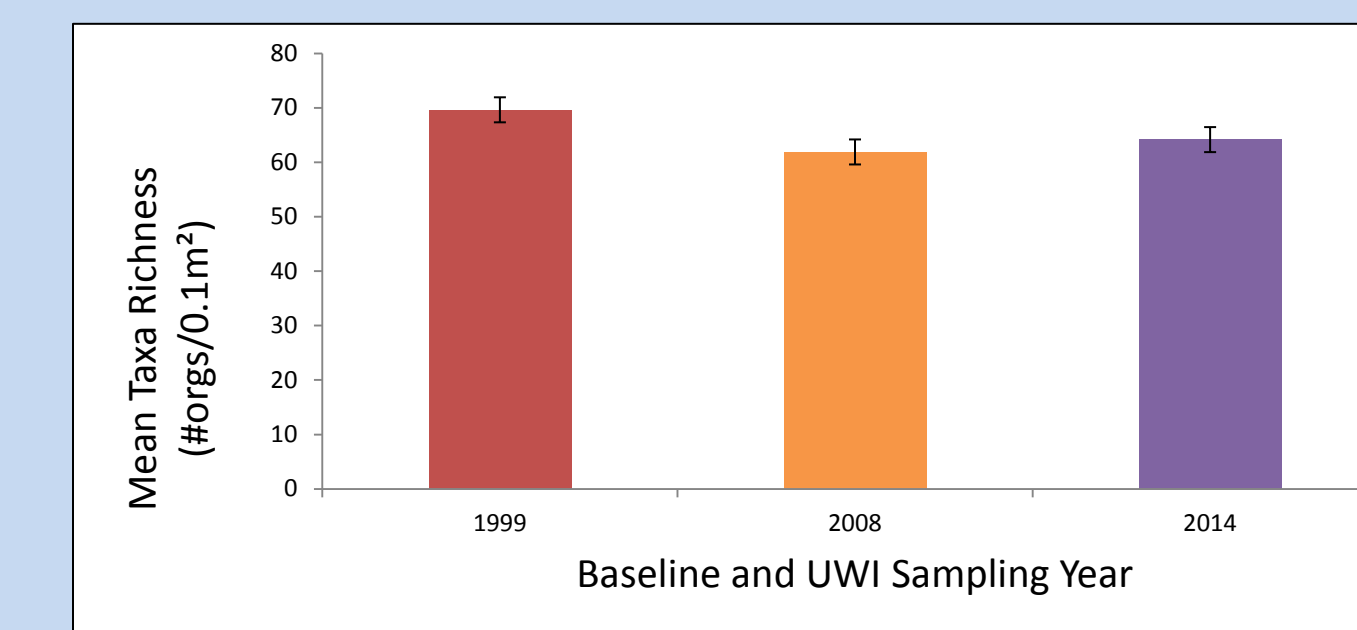


Figure 8. Histogram showing mean taxa richness with standard error bars for baseline and UWI sample years.

- Long-term data indicate no trend over time for total abundance or taxa richness
- Possible cyclical pattern in total abundance at Long-term Station 40 during last 10 years
- High variability among stations of abundance and taxa richness
- Significant total abundance decreases from 1999 to 2008 ($p < 0.05$), but no significant abundance difference between 2008 and 2014 ($p > 0.05$) at Baseline and UWI stations
- No significant taxa richness difference from 1999 and 2008 or from 2008 and 2014 ($p > 0.05$) at Baseline and UWI stations

Major Feeding Guilds

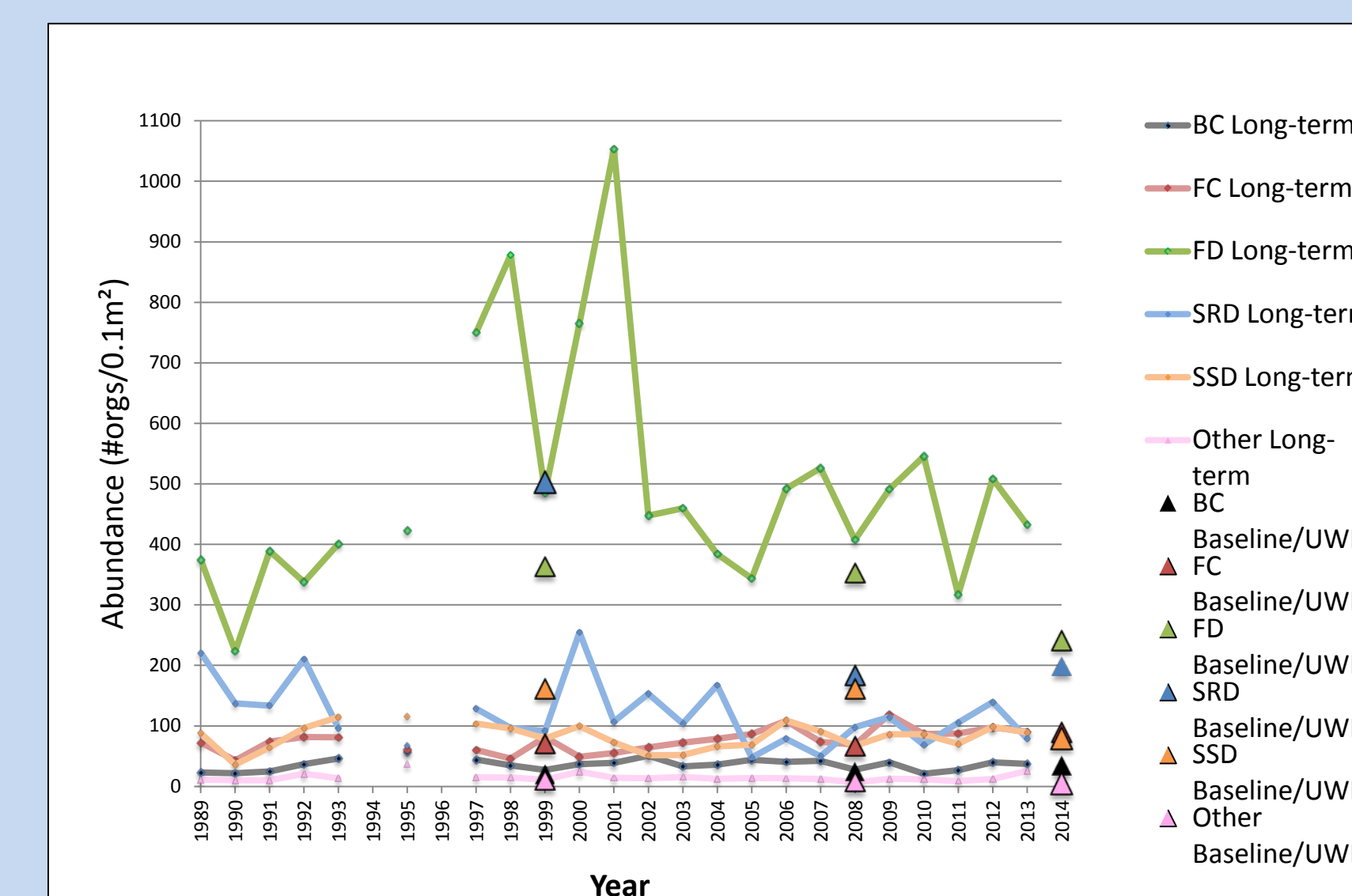


Figure 9. Scatter plot showing total feeding guild abundance over time for each station.

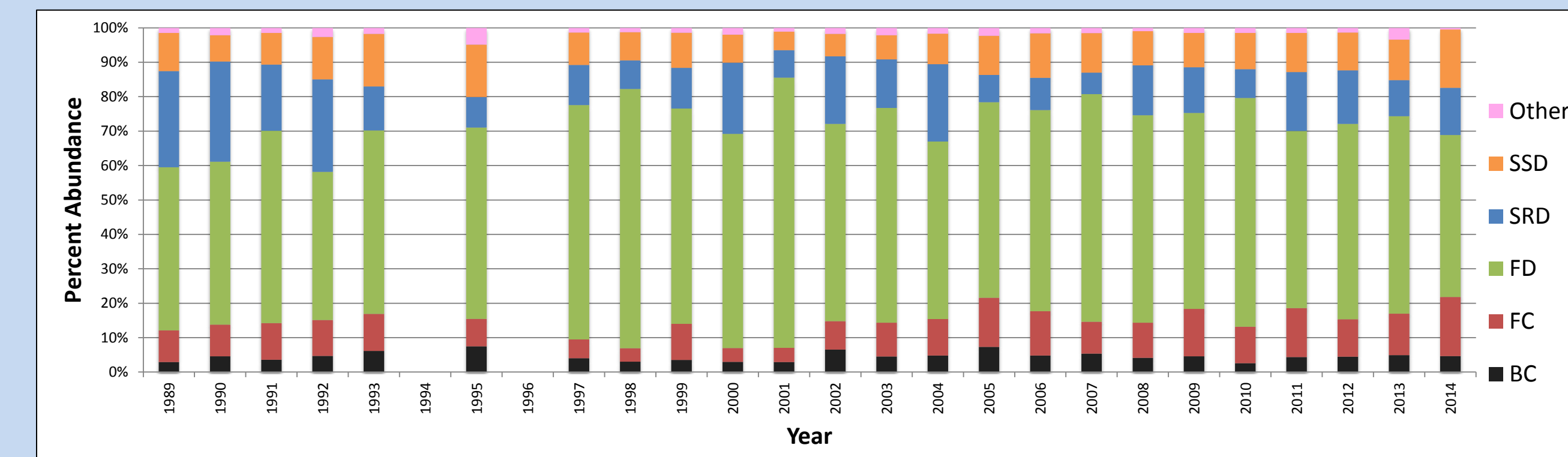


Figure 11. Histogram showing percent feeding guild abundance over time at Long-term station 40.

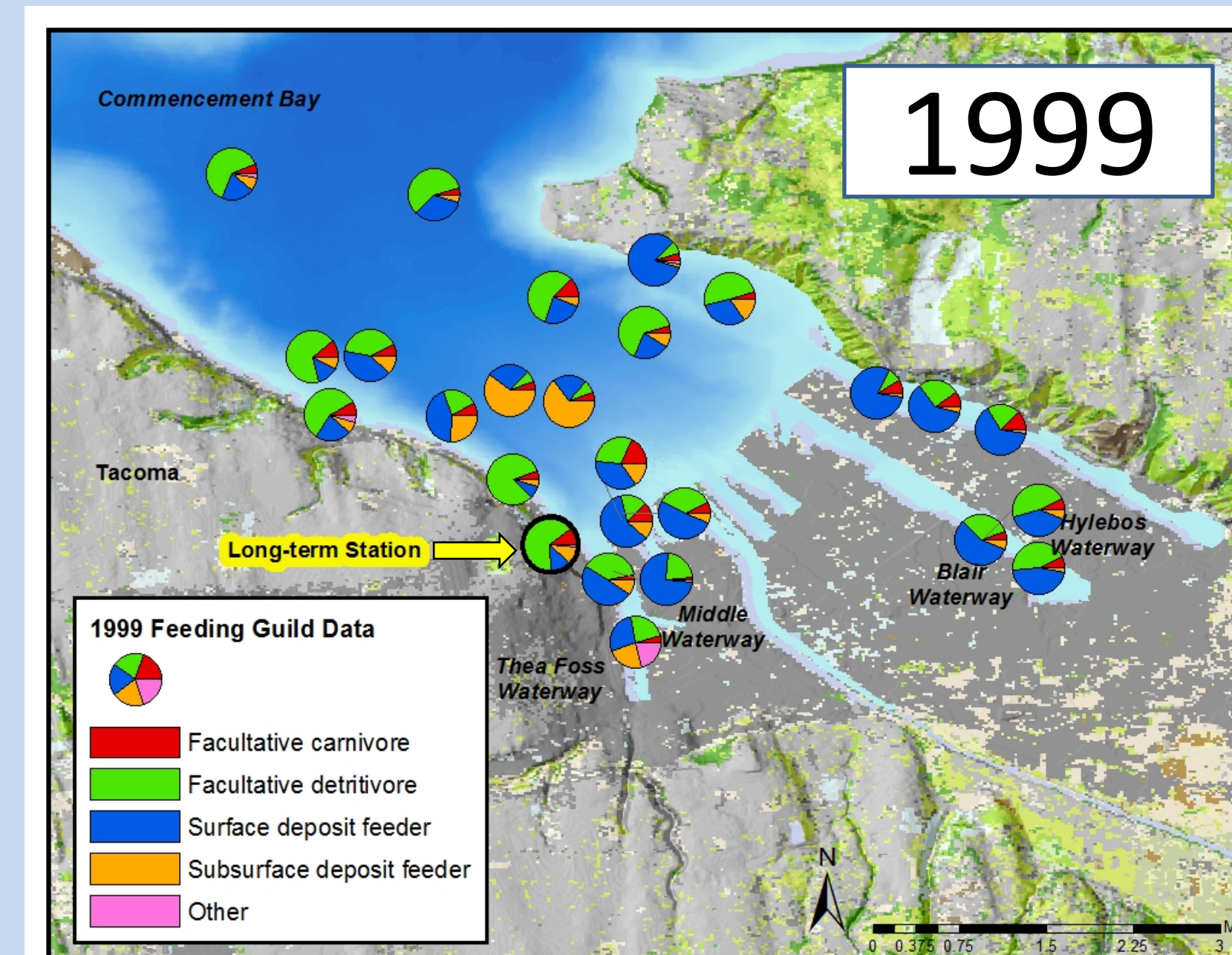


Figure 13. GIS map showing relative feeding guild abundances at each station in 1999.

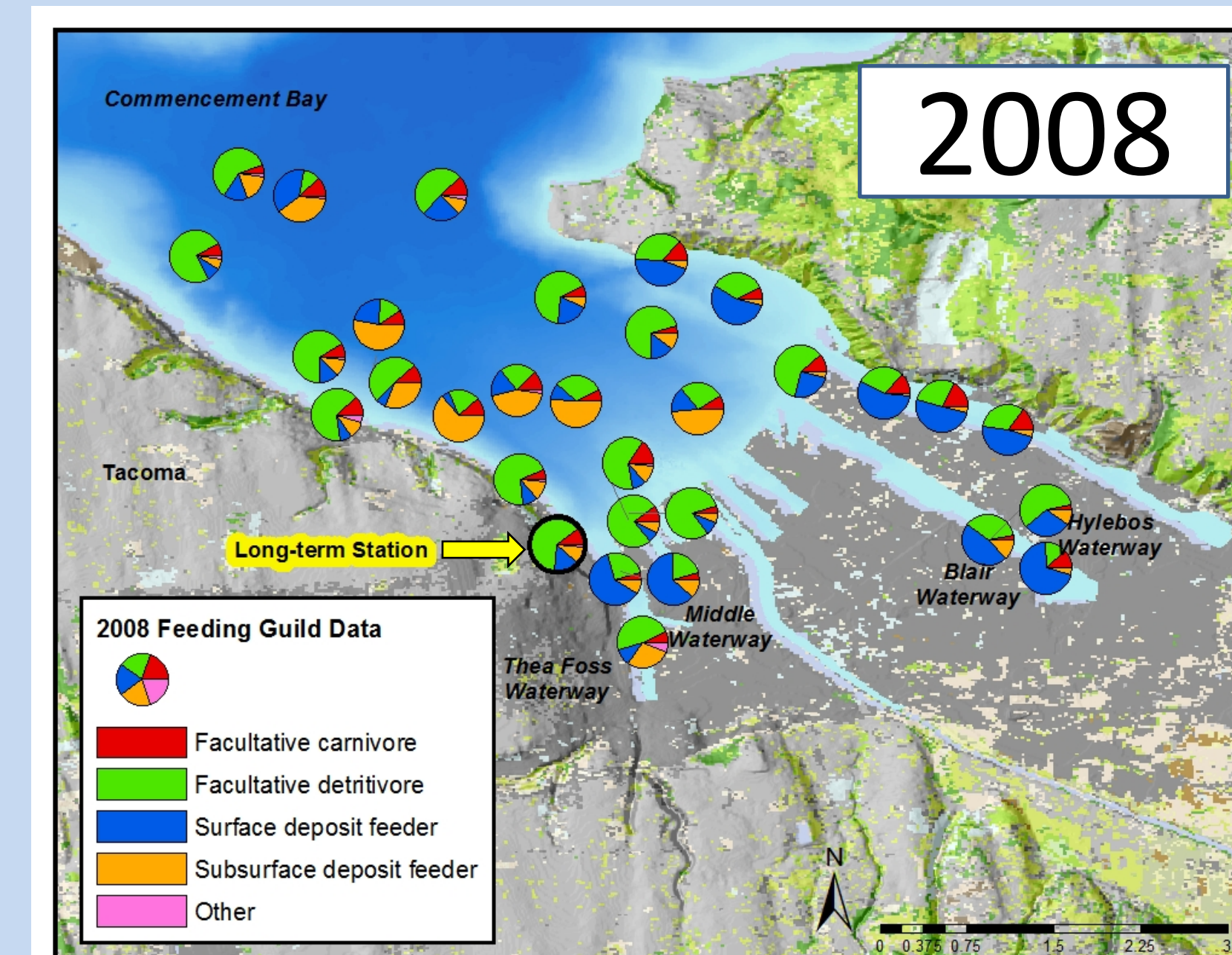


Figure 14. GIS map showing relative feeding guild abundances at each station in 2008.

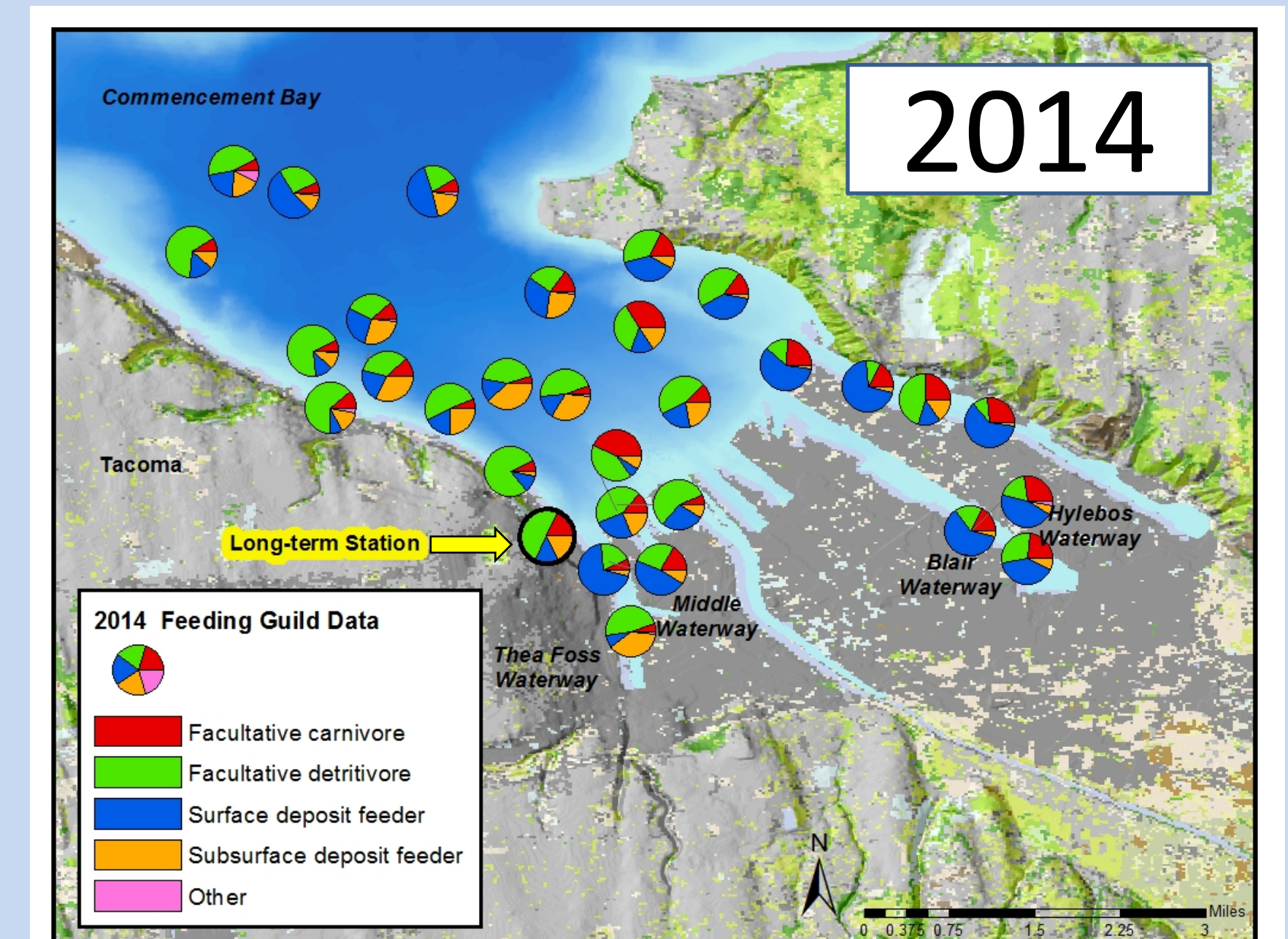


Figure 15. GIS map showing relative feeding guild abundances at each station in 2014.

Major Taxonomic Groups

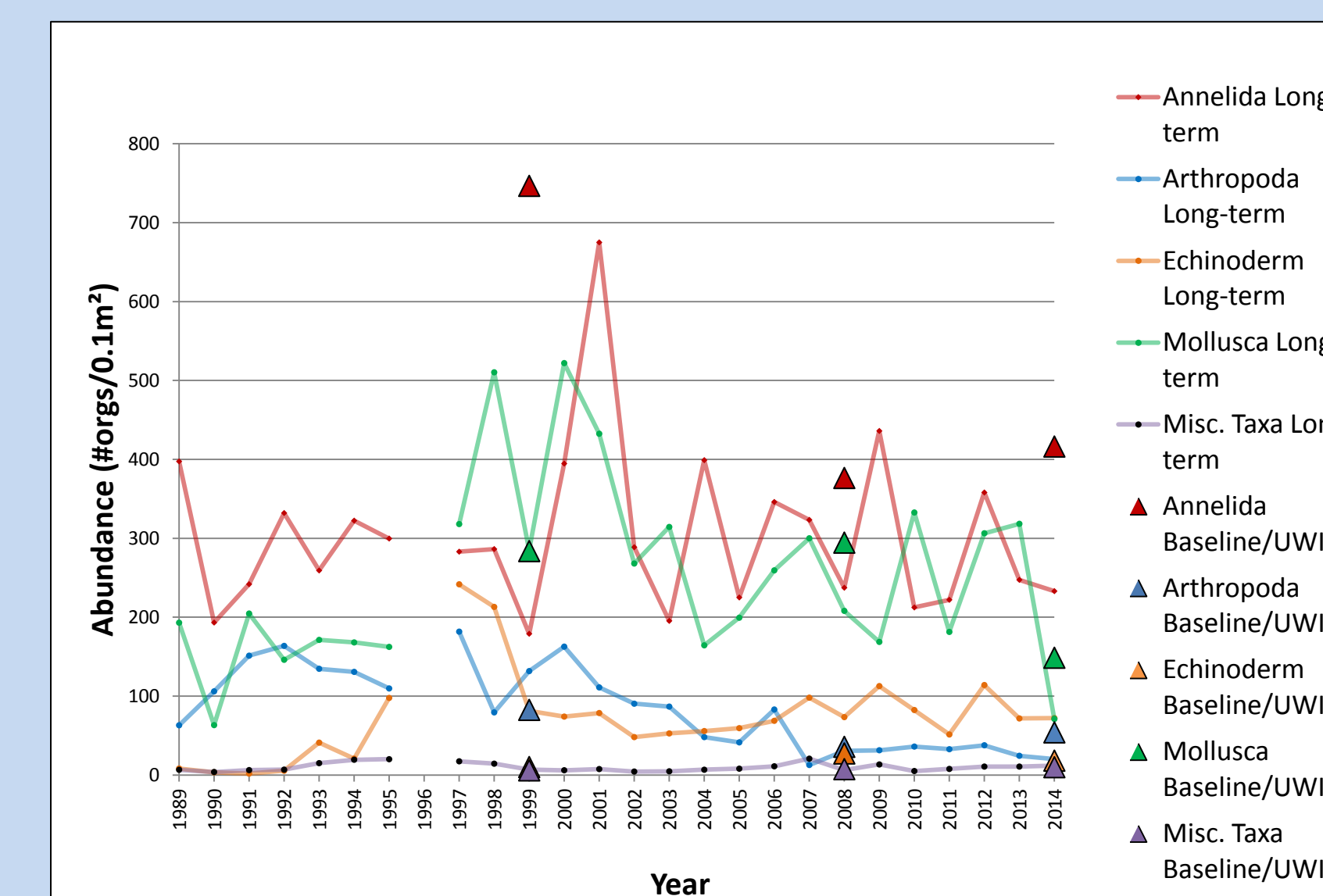


Figure 10. Scatter plot showing total major taxonomic group abundance over time for each station.

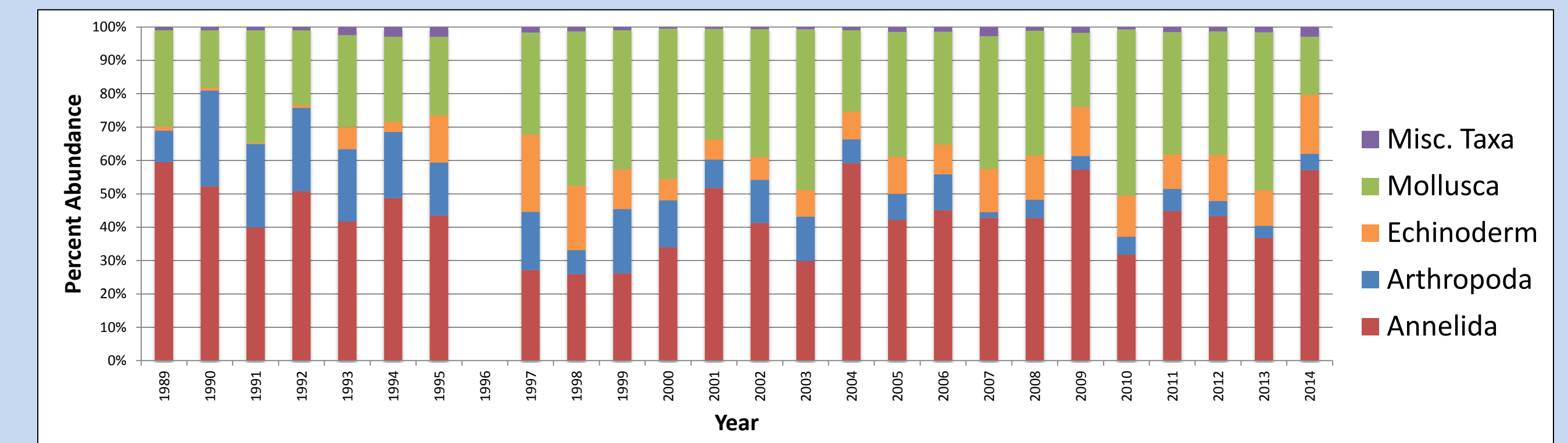


Figure 12. Histogram showing percent major taxa abundance over time at Long-term station 40.

- Annelids, predominantly polychaetes, and mollusks are the most abundant taxa in the bay
- Significant decrease in annelids from 1999 to 2008 ($p < 0.05$) at Baseline and UWI Stations
- Significant decrease in mollusks from 2008 to 2014 ($p < 0.05$) at UWI Stations
- Possible cyclical patterns in major taxa abundance at Long-term Station 40