

# Benthic Food Web Analyses

## Selenium Bioaccumulation in the Great Salt Lake



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DWQ Selenium Science Panel

# Objectives

- **Develop sampling methodology for brine flies and periphyton in benthic habitats of Great Salt Lake**
- **Collect brine flies, periphyton and water samples for selenium analyses during the nesting period**

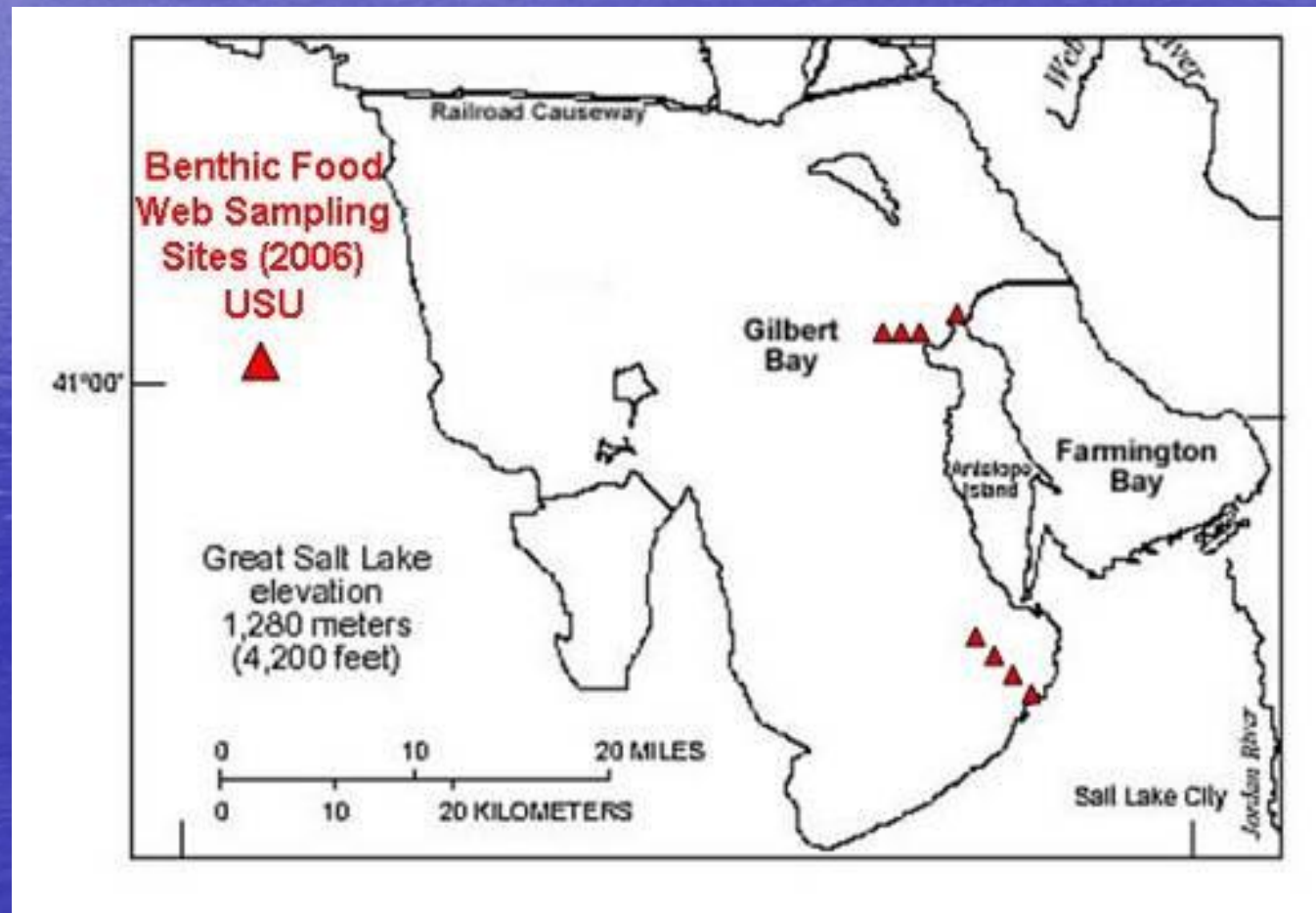
# Habitats sampled

- **Stromatolites**
- **Sand substrates**
- **Mud substrates**

- **Nominal Depths**
  - 1 m
  - 3 m
  - 5 m

- **Stations**

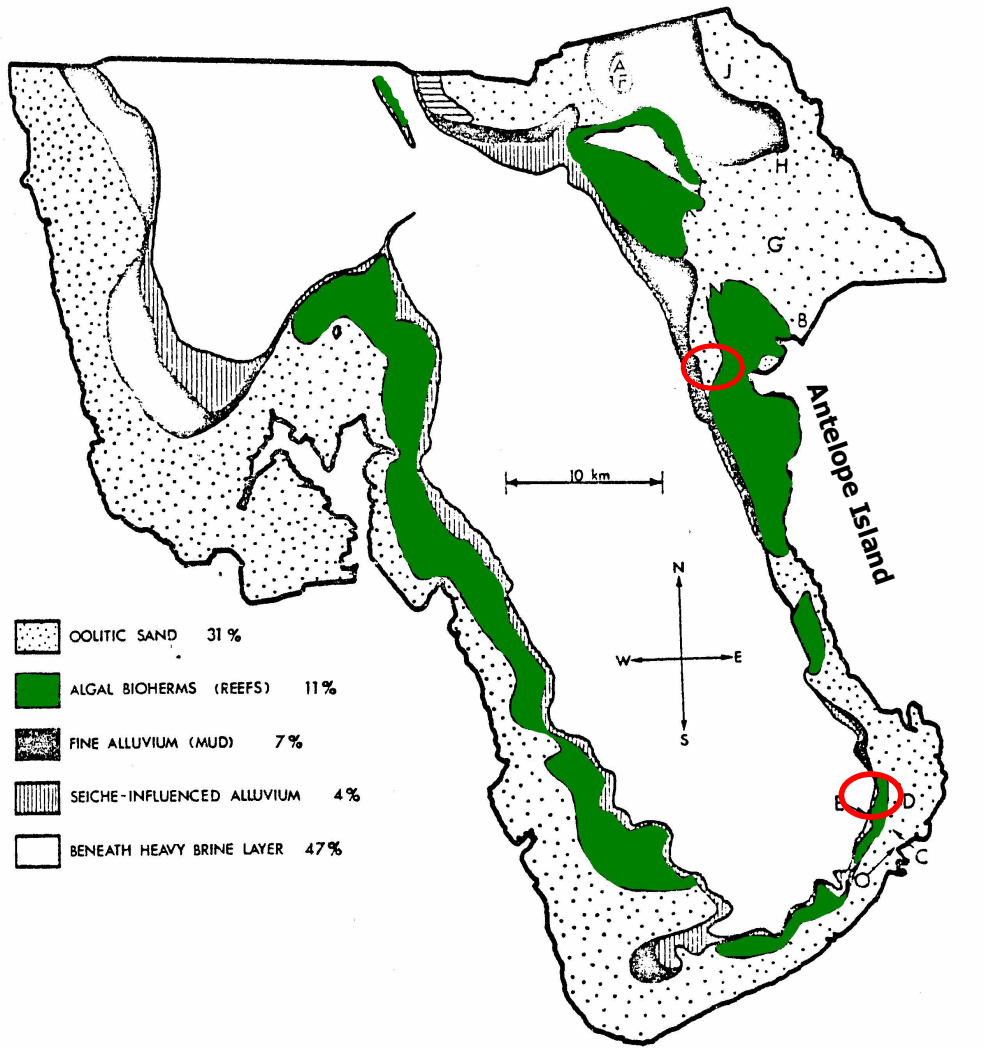
- **June 14-16**
- **Sept 28<sup>th</sup>**  
(Bridger Bay Only)



# Limnological Conditions (June)

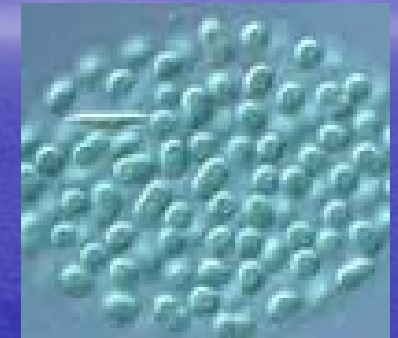
- **Temperature**                      **21.0°C**
- **Salinity**                              **12.0 ‰**
- **Secchi visibility**                  **0.7 -1.0 m**

## Distribution in Gilbert Bay



# Stromatolites

Dominant hard substrate for periphyton, brine fly larvae & pupae



*Aphanothece* sp.  
(cyanobacteria)

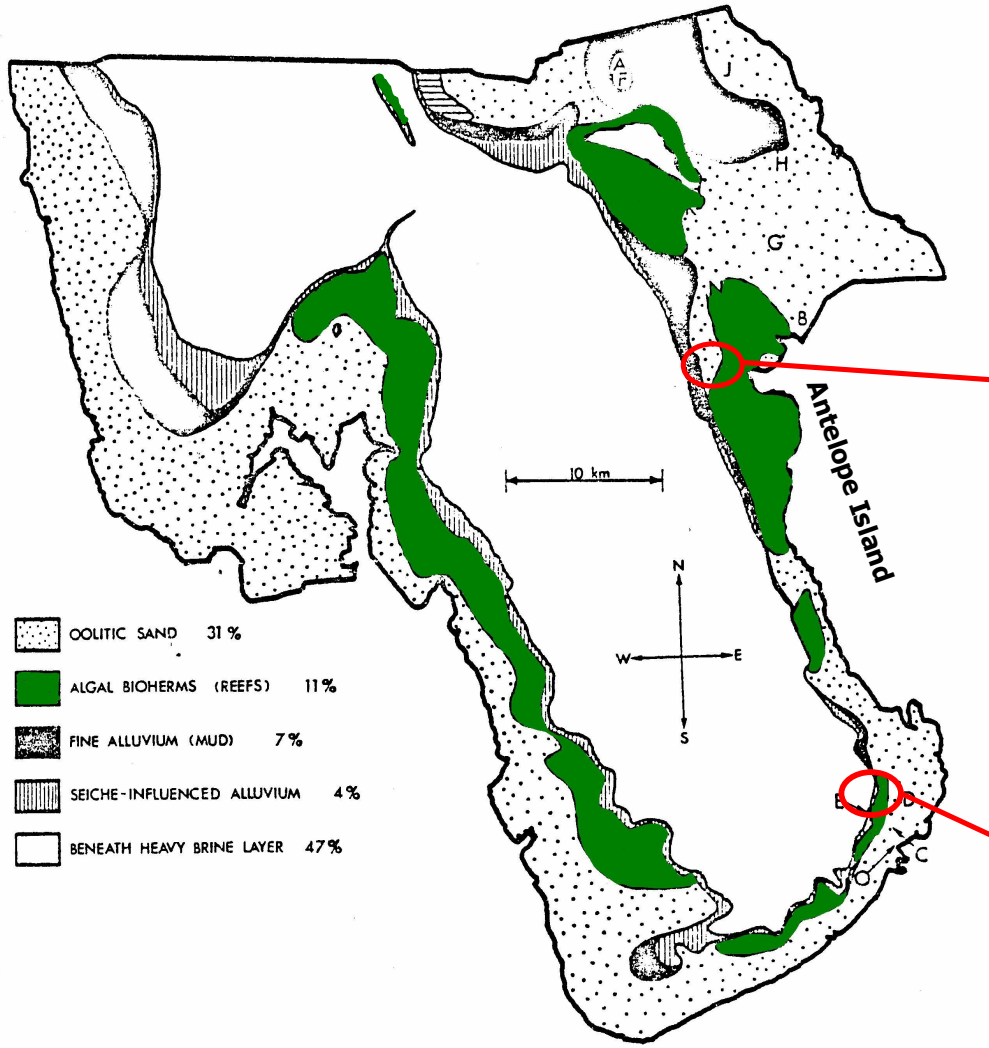
Food Web Importance:  
Principal Brine Fly Habitat



*Ephydra cinerea*

# Stromatolite Structures

## Distribution in Gilbert Bay

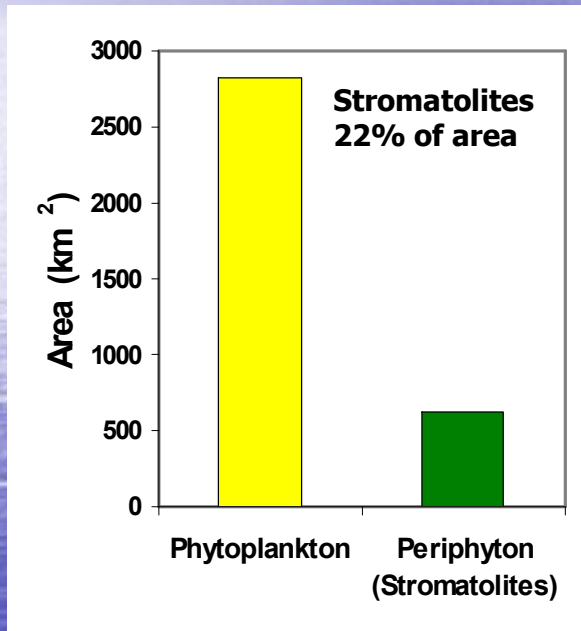


Flat, plate-like

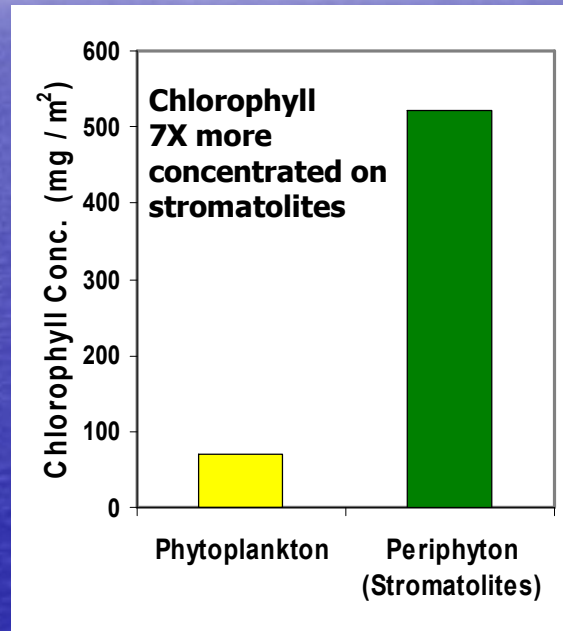


Mounds, ca. 1-m high

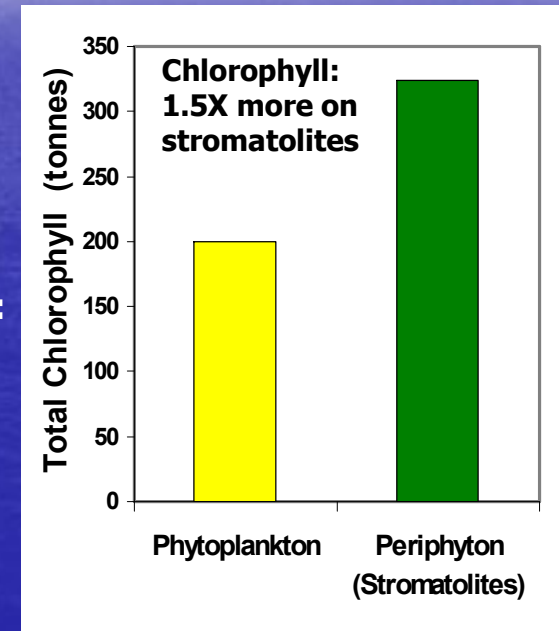
# Abundance of Periphyton on Stromatolites Compared to Phytoplankton



X



=



**Periphyton on stromatolites is a very important component of primary production for Gilbert Bay**

\*Based on May-October phytoplankton in Gilbert Bay (2002-2005), and summer periphyton values

# Methods

## Stromatolites

- Brine fly larvae & pupae:  
Bucket Sampler & SCUBA  
Scrub stromatolite  
surface with brush



Sample pumped  
to boat & sieved



**Stromatolite chunks broken off underwater**

- Chl *a* extracted
- Ash-free dry mass determined
- Periphyton removed
  - With & without acidification  
to remove carbonates
  - Se measured



# Methods

## Soft Substrates

- Ponar dredge
- Sectioned (if intact)
- Sieved on boat



# Methods

## Water Samples

- Collected by SCUBA divers with syringe ca. 5-cm above substrates
- Filtered with GF/F cartridge filter on boat & preserved with nitric acid



# Methods

## Adult Flies

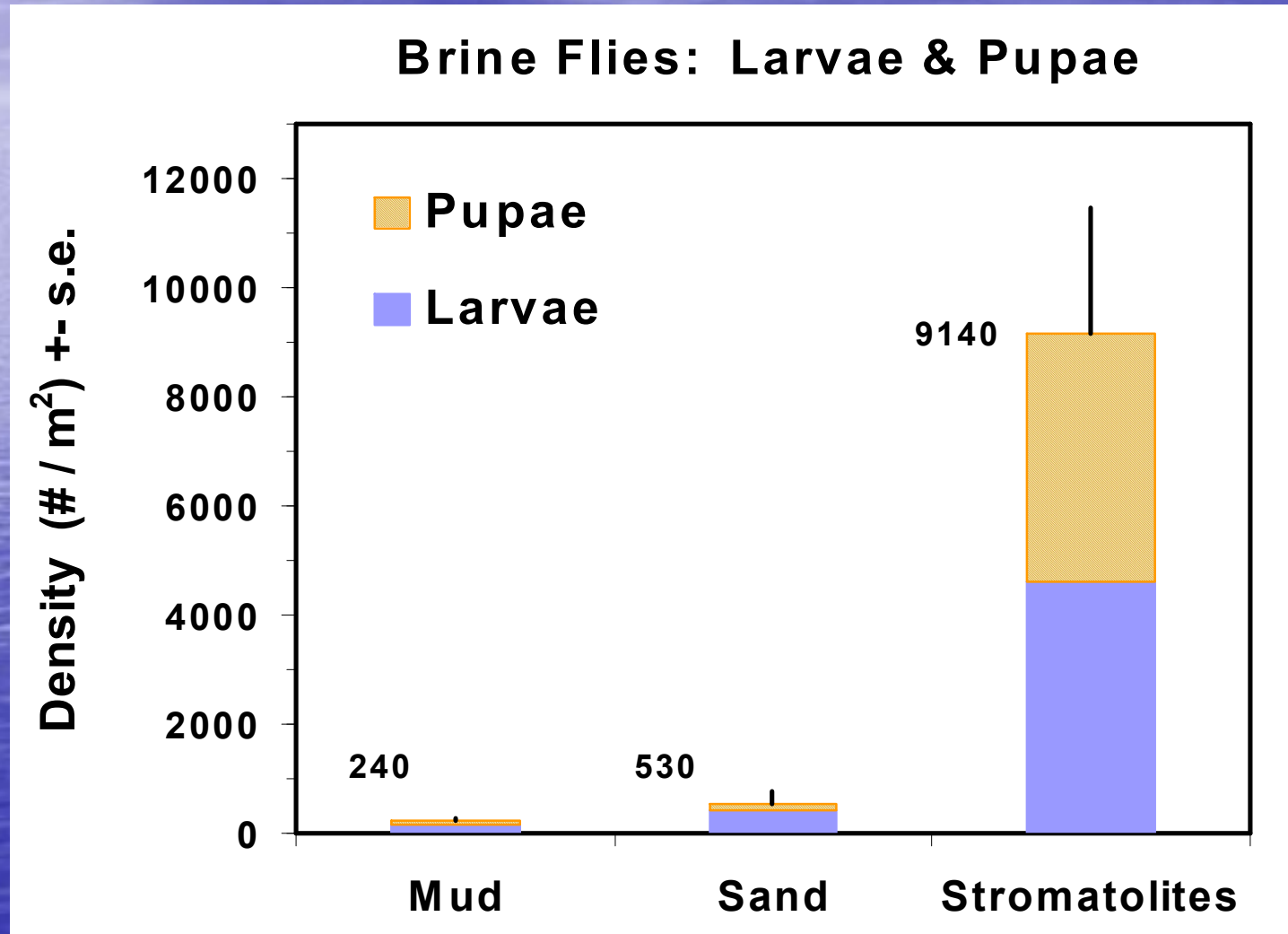
- Netted over water or on shore
- Frozen on dry ice
- Rinsed with deionized water
- Dried, Se measured



# Number of Samples Collected

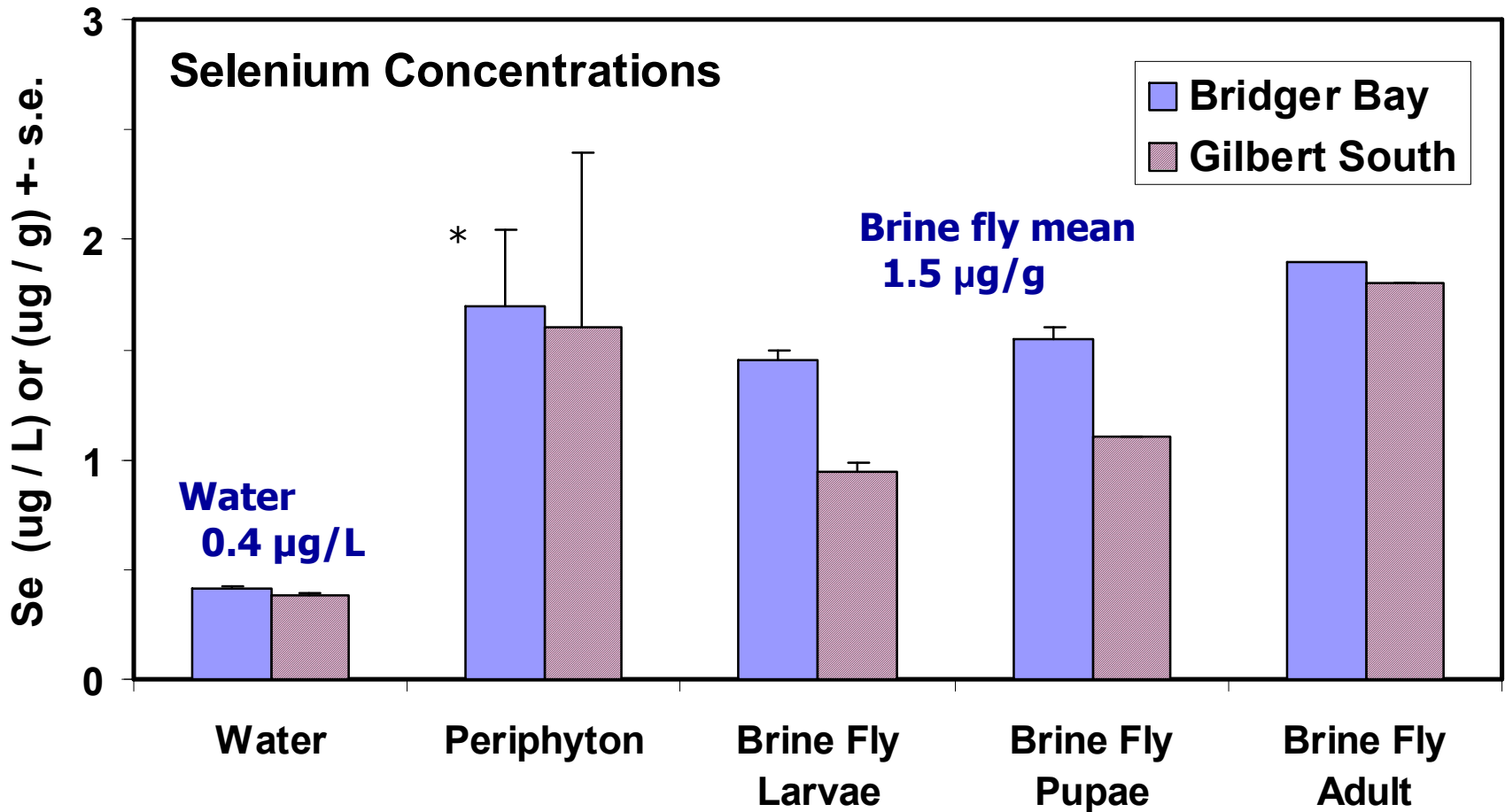
Region	Larvae	Pupae	Adults	Periphyton	Water
Bridger Bay	12	12	3	9	5
South Gilbert	7	7	2	4	4

# Brine fly: Larvae & Pupae Densities



June 2006

# June Selenium Data



## 2-way ANOVA

Tissue  $p = 0.75$

Location  $p = 0.54$

\* One outlier removed ( $9.8 \mu\text{g} / \text{g}$ )

# Conclusions

- **Stromatolites/periphyton and brine flies are important in the economy of the lake**
- **Sampling technique for brine flies is effective but:**
  - **limited to horizontal surfaces: does not work well on sides of erect stromatolites**
- **Brine fly larvae and pupae densities approximately 20 X higher on stromatolites than mud and sand**
  - **Greater areal extent of mud and sand, however, means that these habitats are also important areas of brine fly production**

# Conclusions

- **Selenium concentrations are low in:**
  - **Overlying water (0.4  $\mu\text{g/L}$ )**
  - **Periphyton (1.7  $\mu\text{g/g}$ )**
  - **All life stages of brine flies (1.5  $\mu\text{g/g}$ )**
- **There was no biomagnification within the short benthic food web**