Nearshore ecological status and changes: spatial and temporal variation in biological communities and implications for understanding the nearshore zone of Lake Tahoe

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Nearshore Lake Tahoe

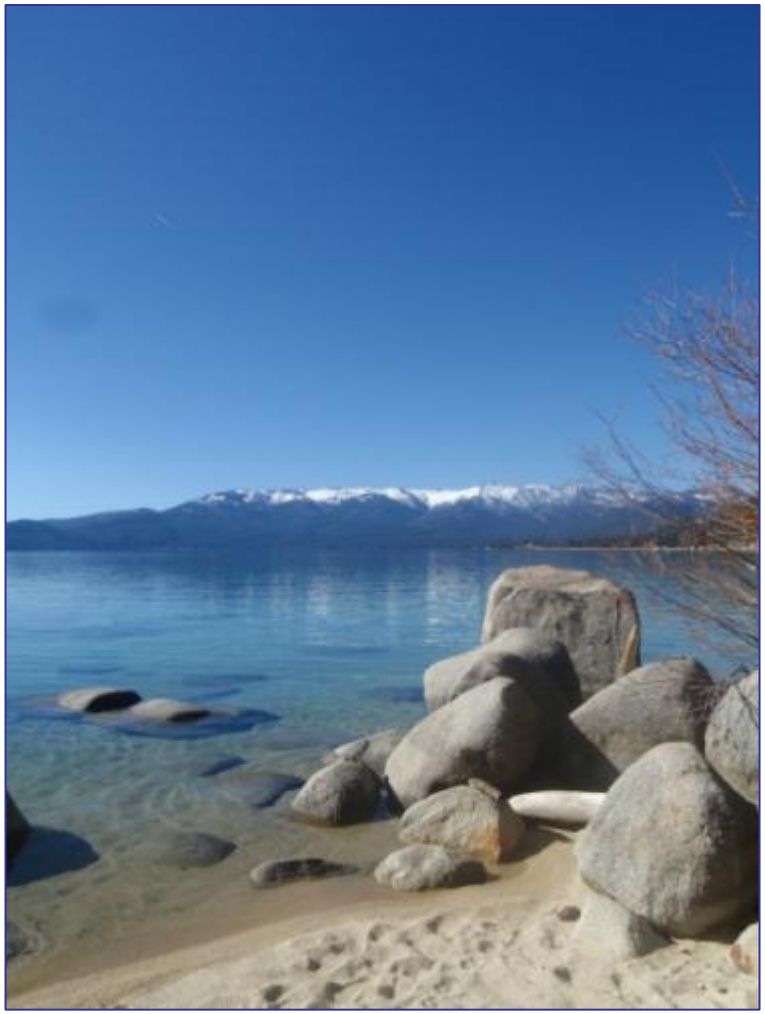

Photo by C. Ngai

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Nearshore Communities in Lake Tahoe

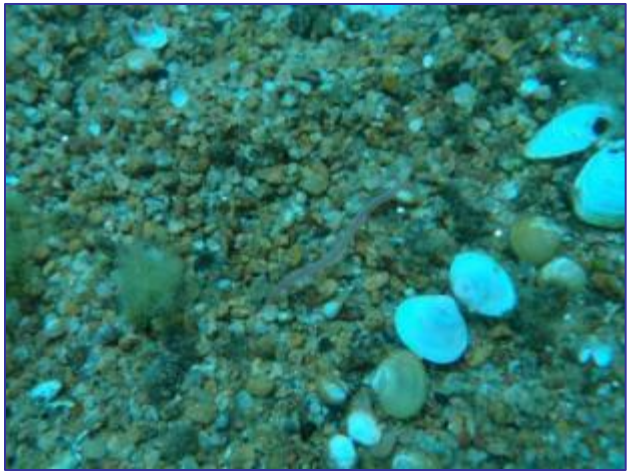

Photo by M. Wittmann

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Illustrated by S. Adler and L. Hennessy, funded by UC Davis TERC

Importance of Nearshore Communities

- Ecosystem function
  - Sediment mixing, organic matter breakdown, nutrient processing, food web interactions
- Interface between terrestrial and aquatic environments
  - Nutrient exchange, food web interactions
- Anthropogenic values
  - Recreation, aesthetic value

Monitoring Efforts in Nearshore Lake Tahoe

- Invertebrate Surveys
  - "Hard substrate" collections: lake vacuum (2009)
  - "Soft substrate" collections: benthic dredge (2008-09)
  - Crayfish collections: minnow trapping (2009)

Photo by J. Umek

Monitoring Efforts in Nearshore Lake Tahoe

- Fish Surveys
  - Nearshore minnow trapping and snorkel surveys
  - Marina electrofishing collections

Photo by J. Umek

Photos by C. Ngai

Monitoring Efforts in Nearshore Lake Tahoe

- Algal Surveys
  - Annual monitoring by TERC, UC Davis

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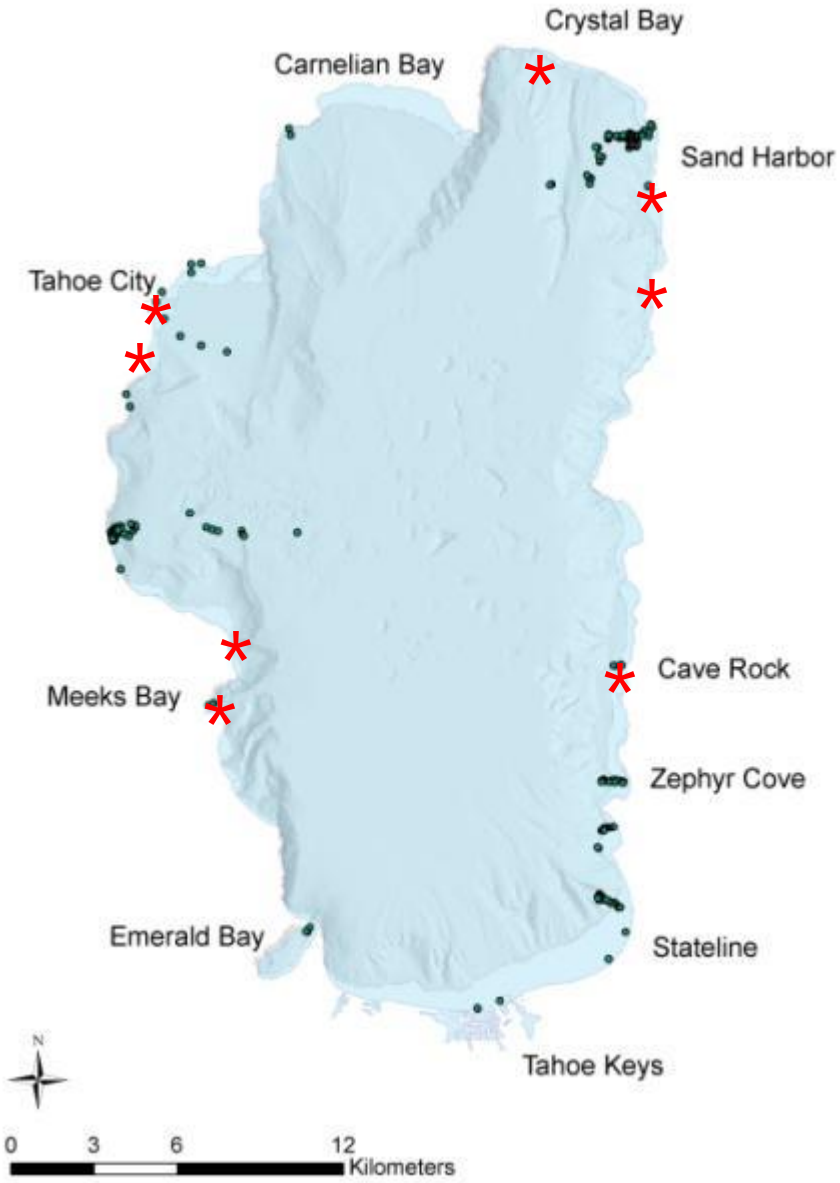
Nearshore Community Spatial Patterns



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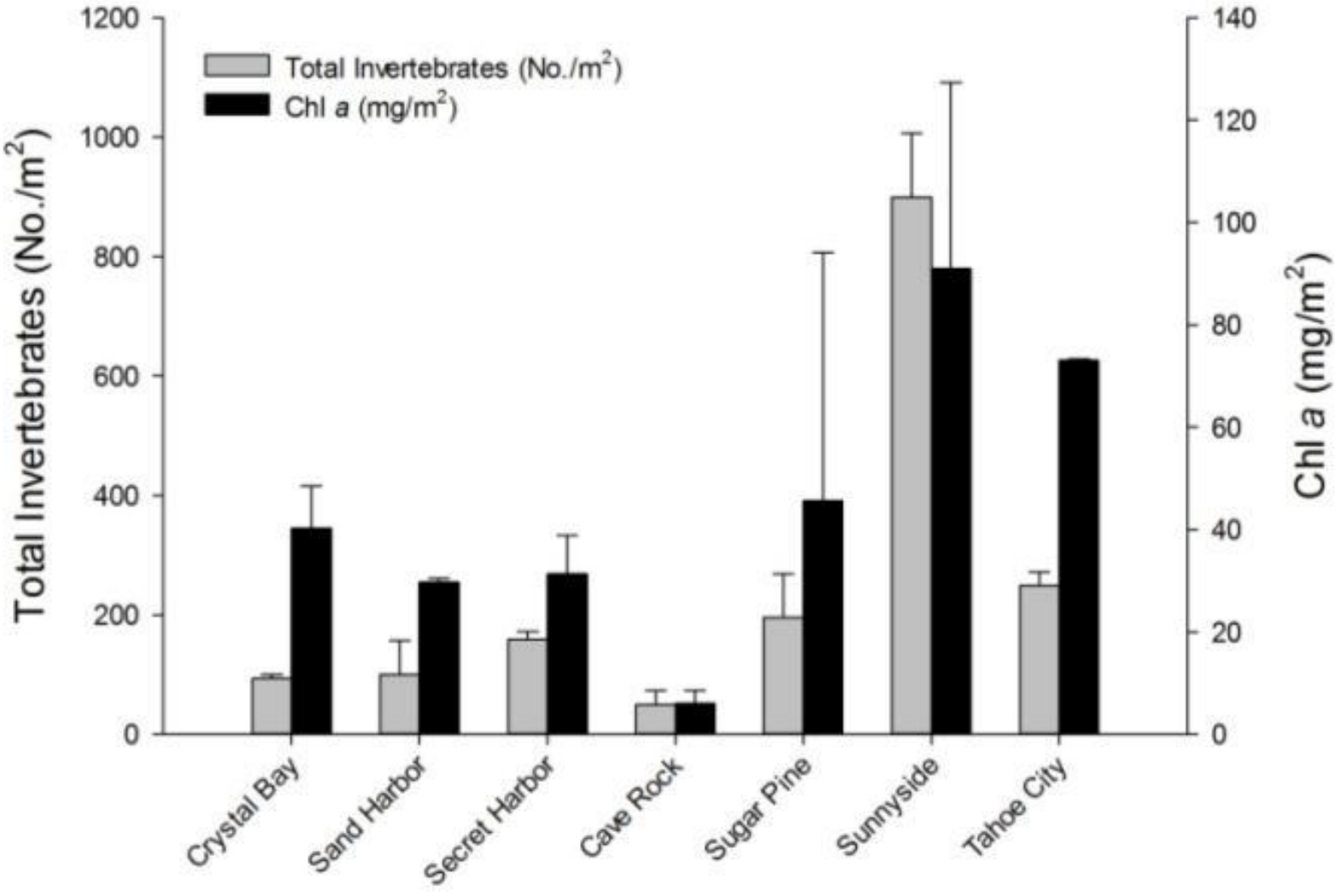
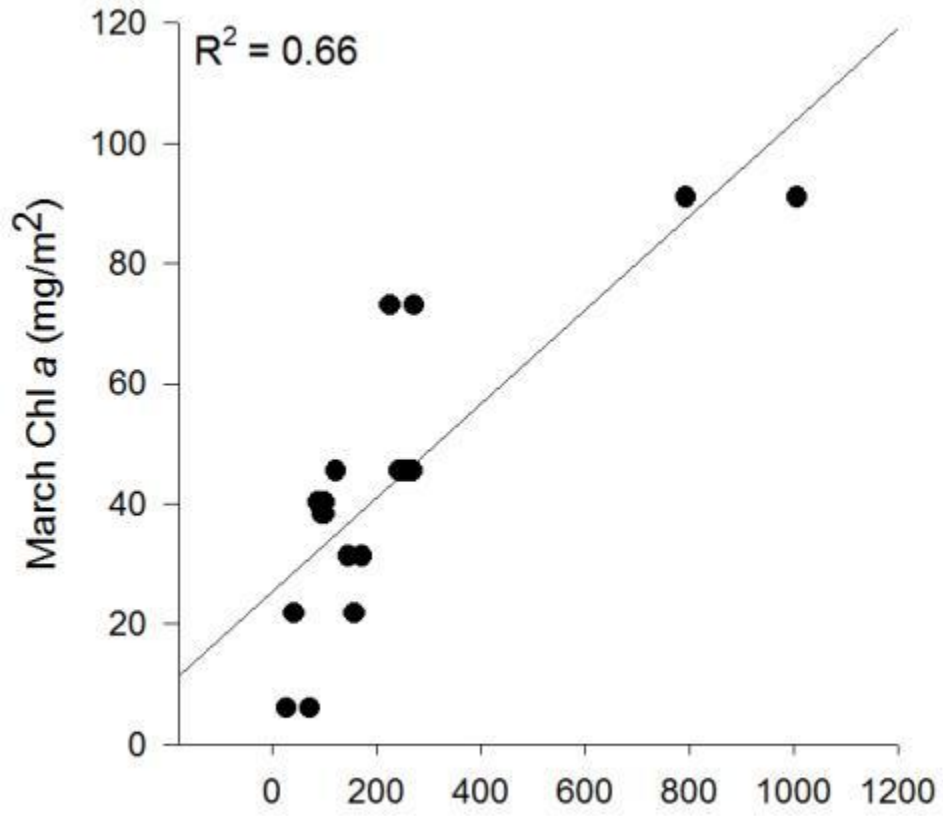
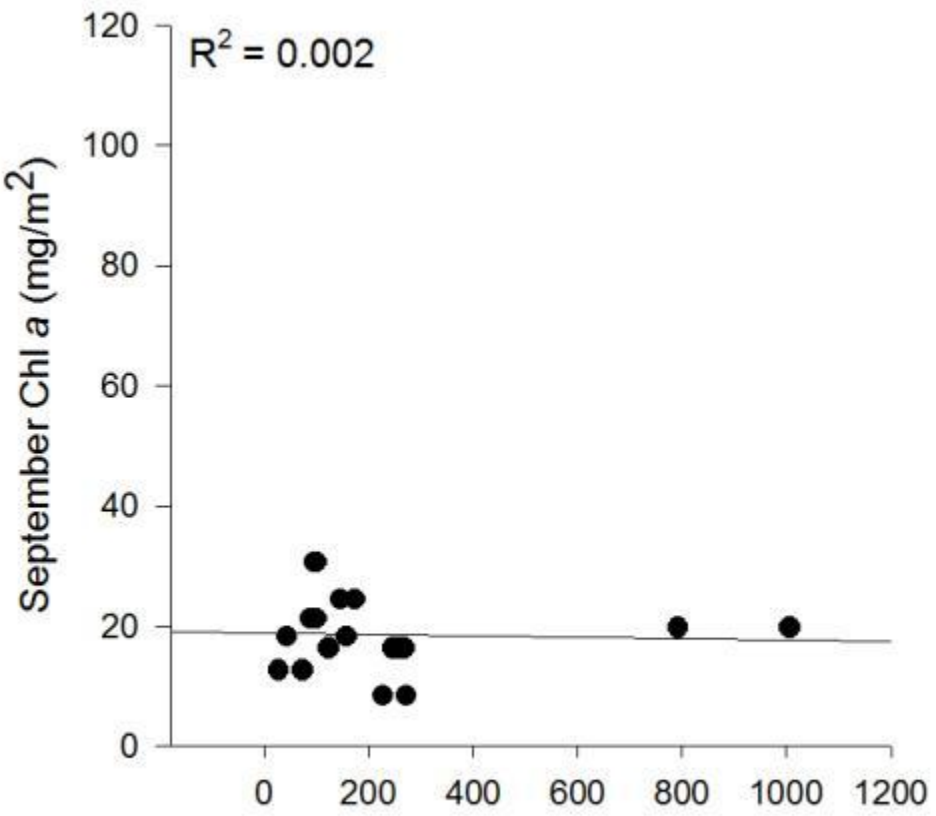
Invertebrates Densities Driven by Periphyton?



Total Invertebrate Density vs. Chl *a*





September Total Invertebrate Density (no./m^2)

***Relationship driven by:**

-Chironomidae (midges)

-Ephemeroptera (mayflies)

-*Utacapnia tahoensis* (endemic stonefly)

-Gastropoda (snails)

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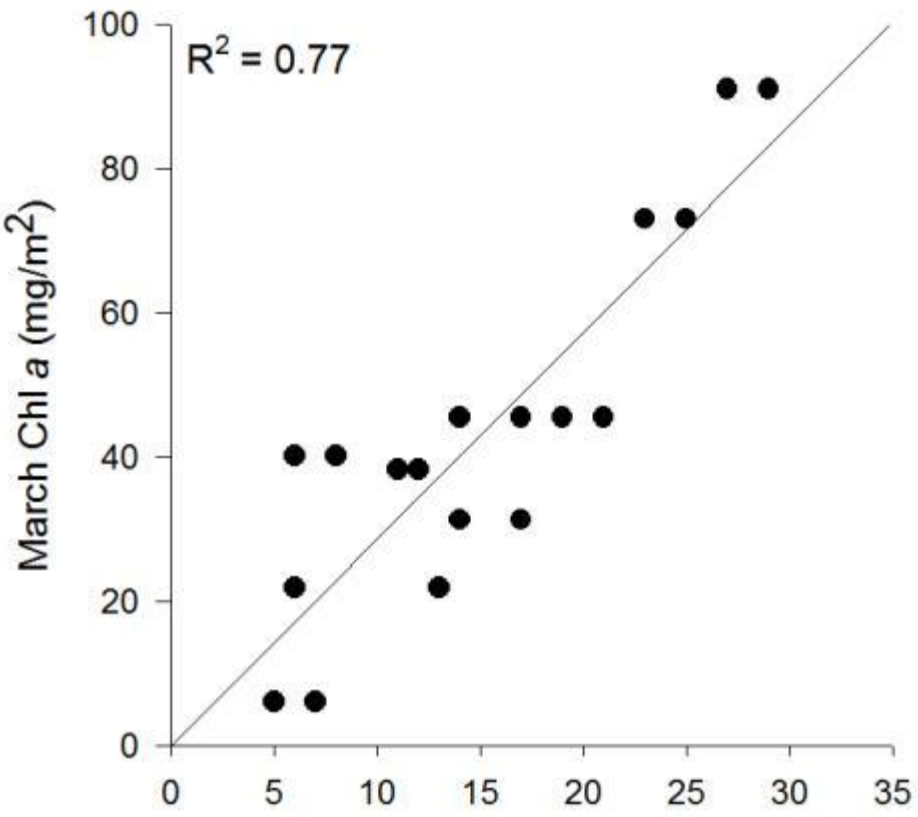
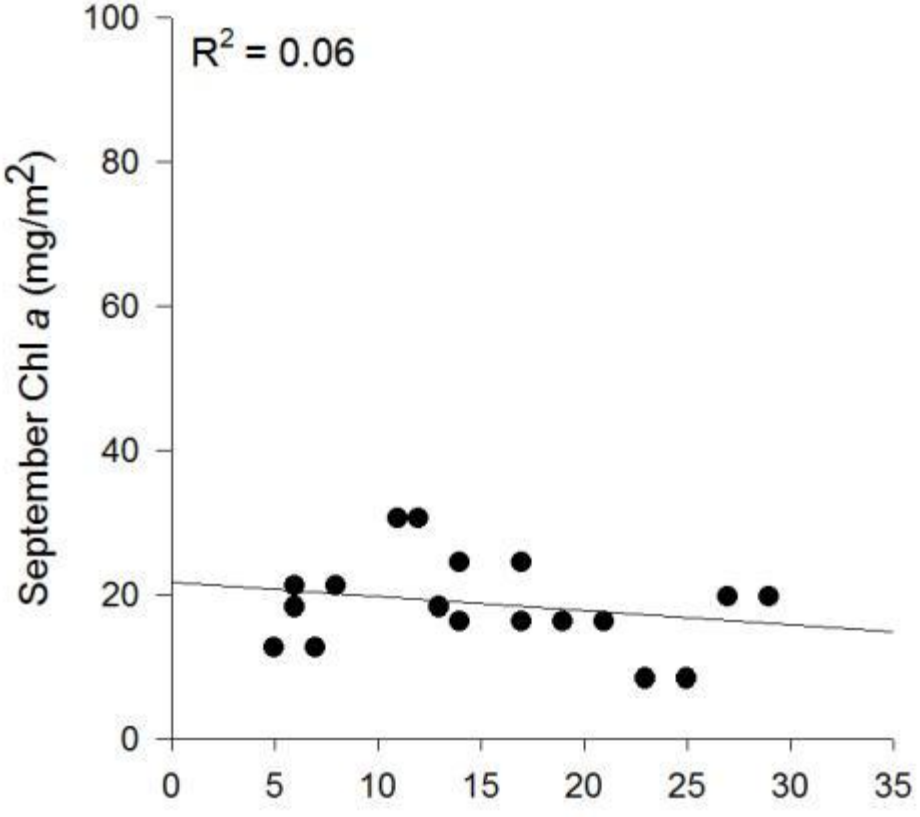
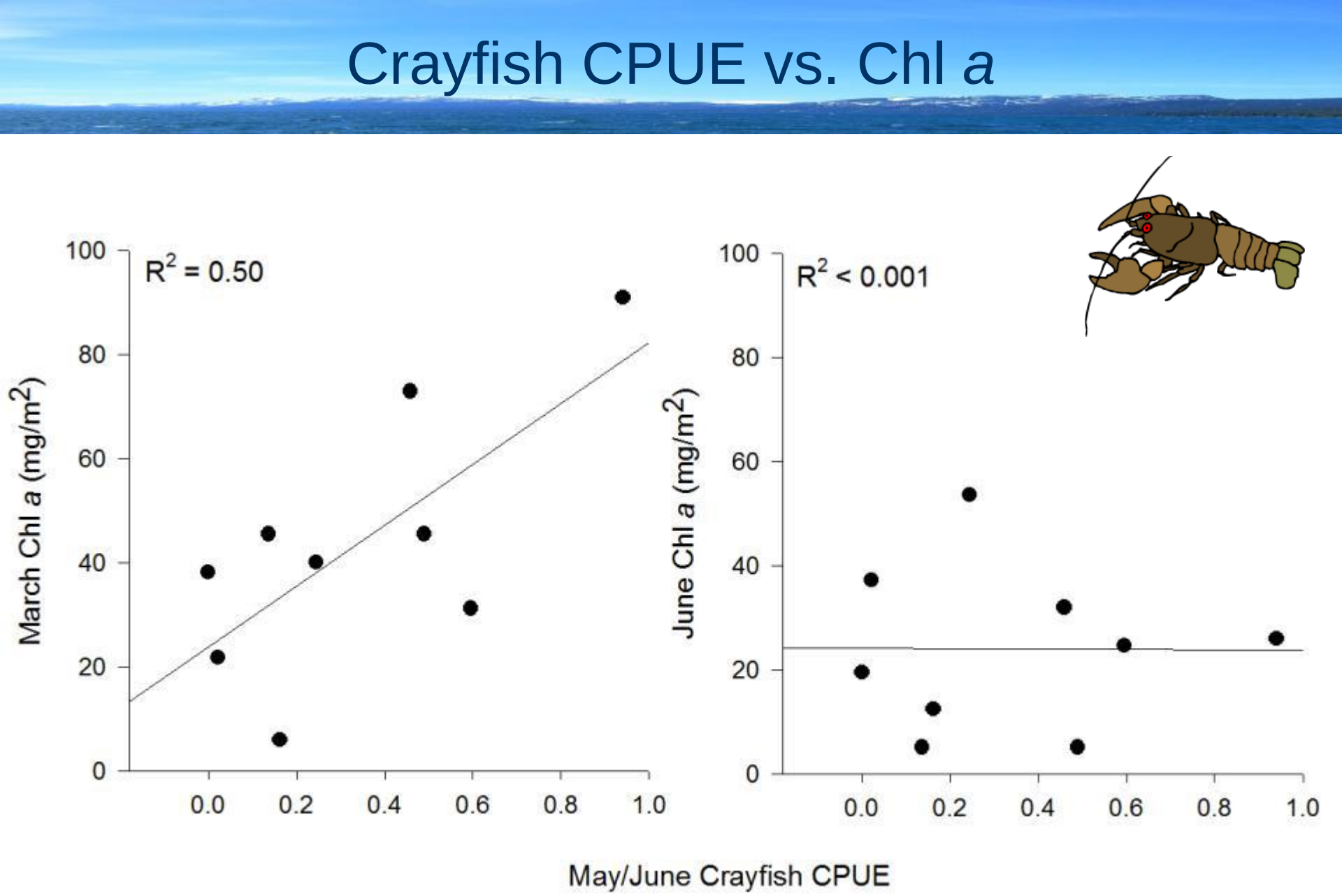
Total Invertebrate Richness vs. Chl *a*





September Invertebrate Richness

Crayfish CPUE vs. Chl *a*



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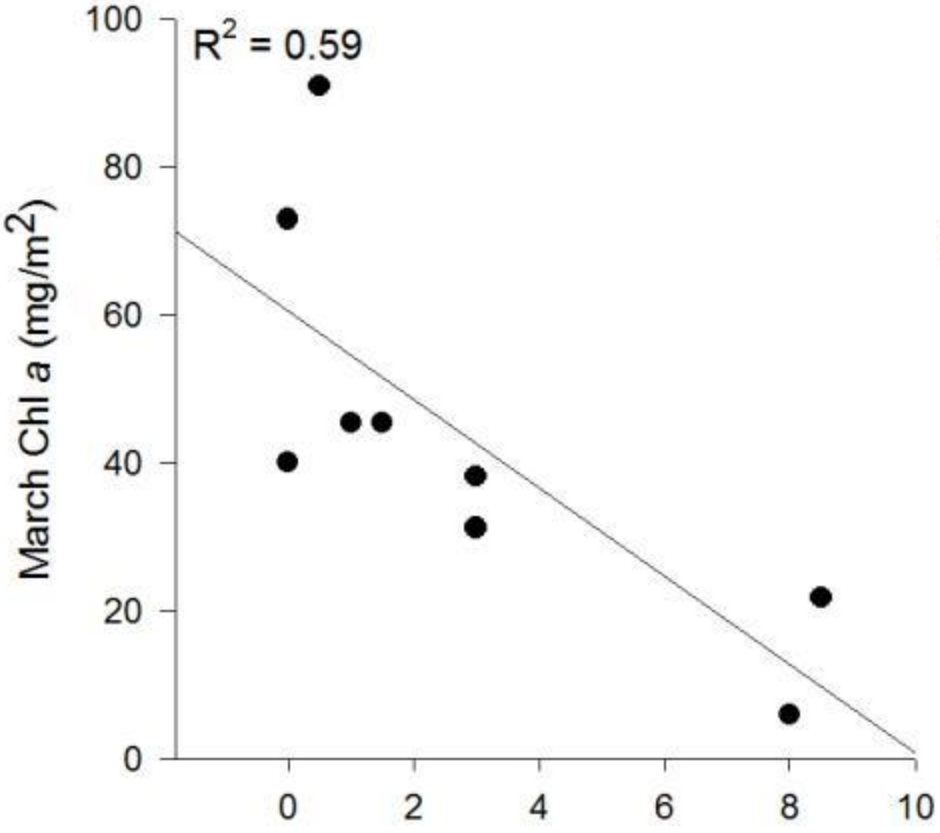
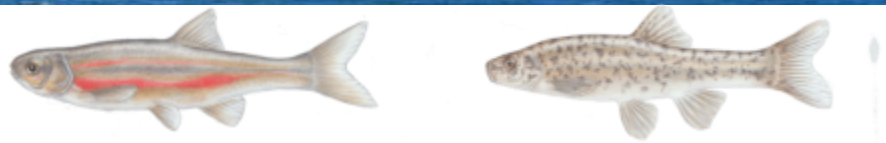
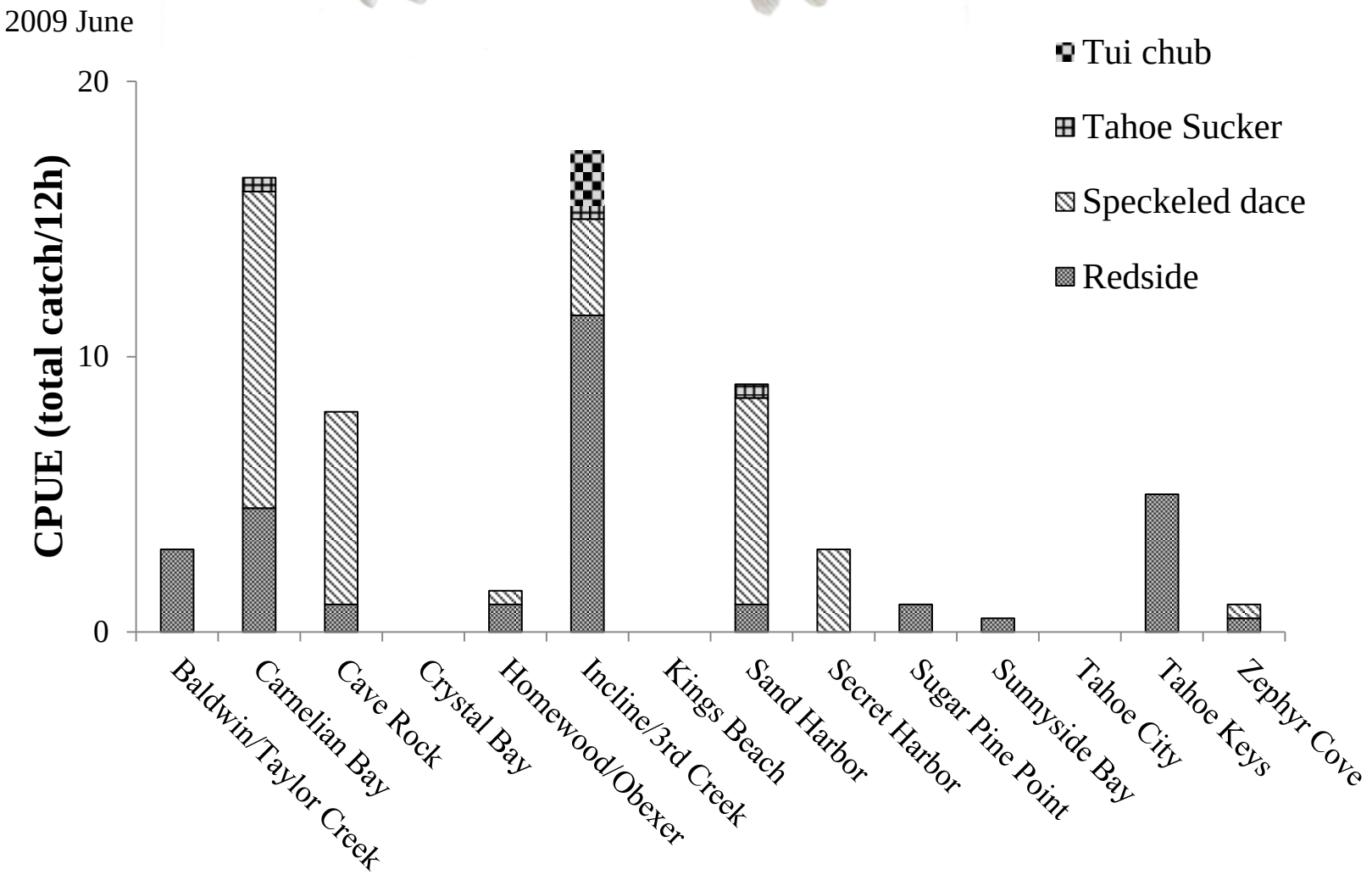
Minnow (Redside Shiner and Speckled Dace) CPUE vs. Chl *a*



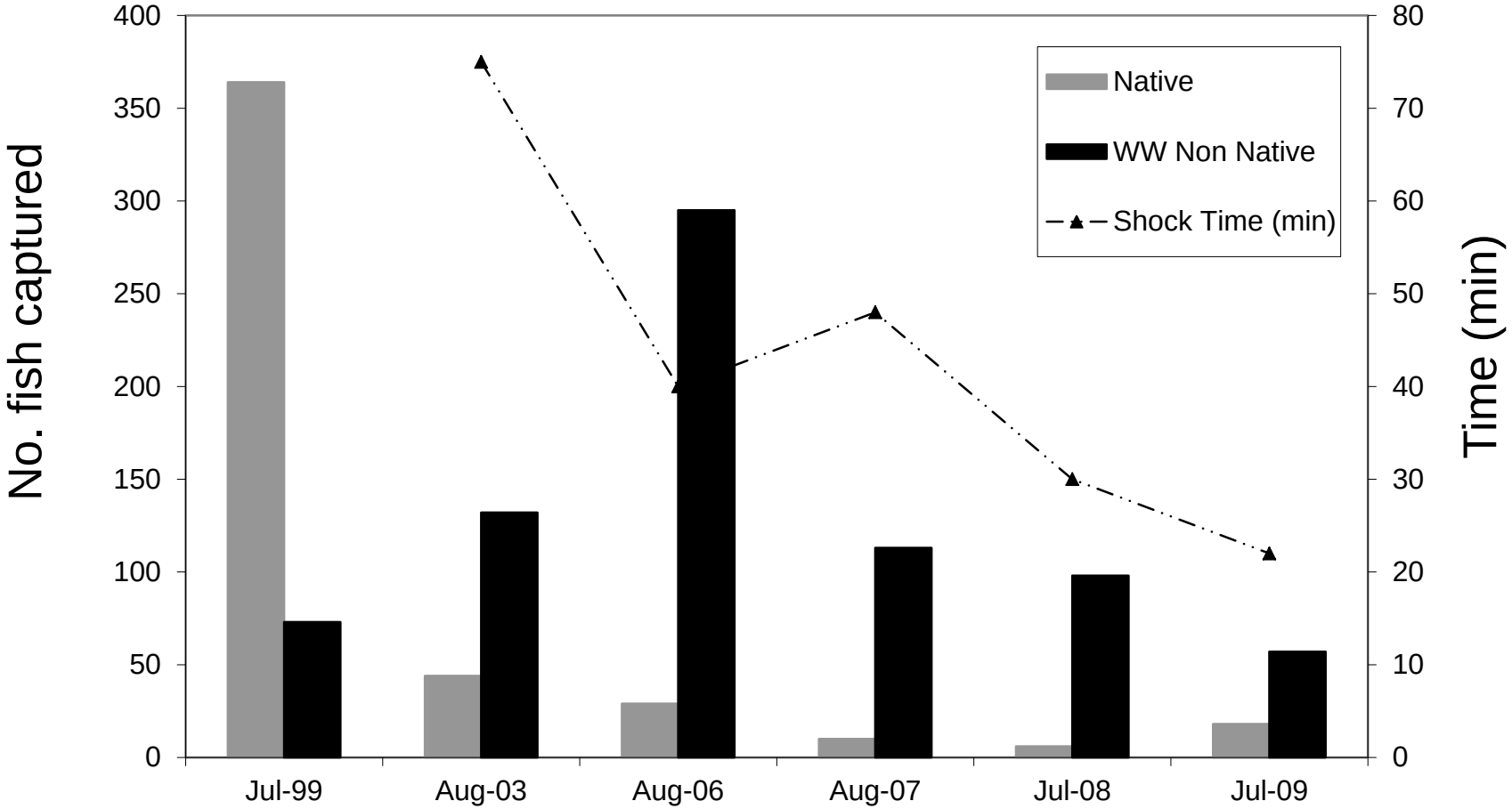
June Minnows CPUE

Native Minnow Distribution

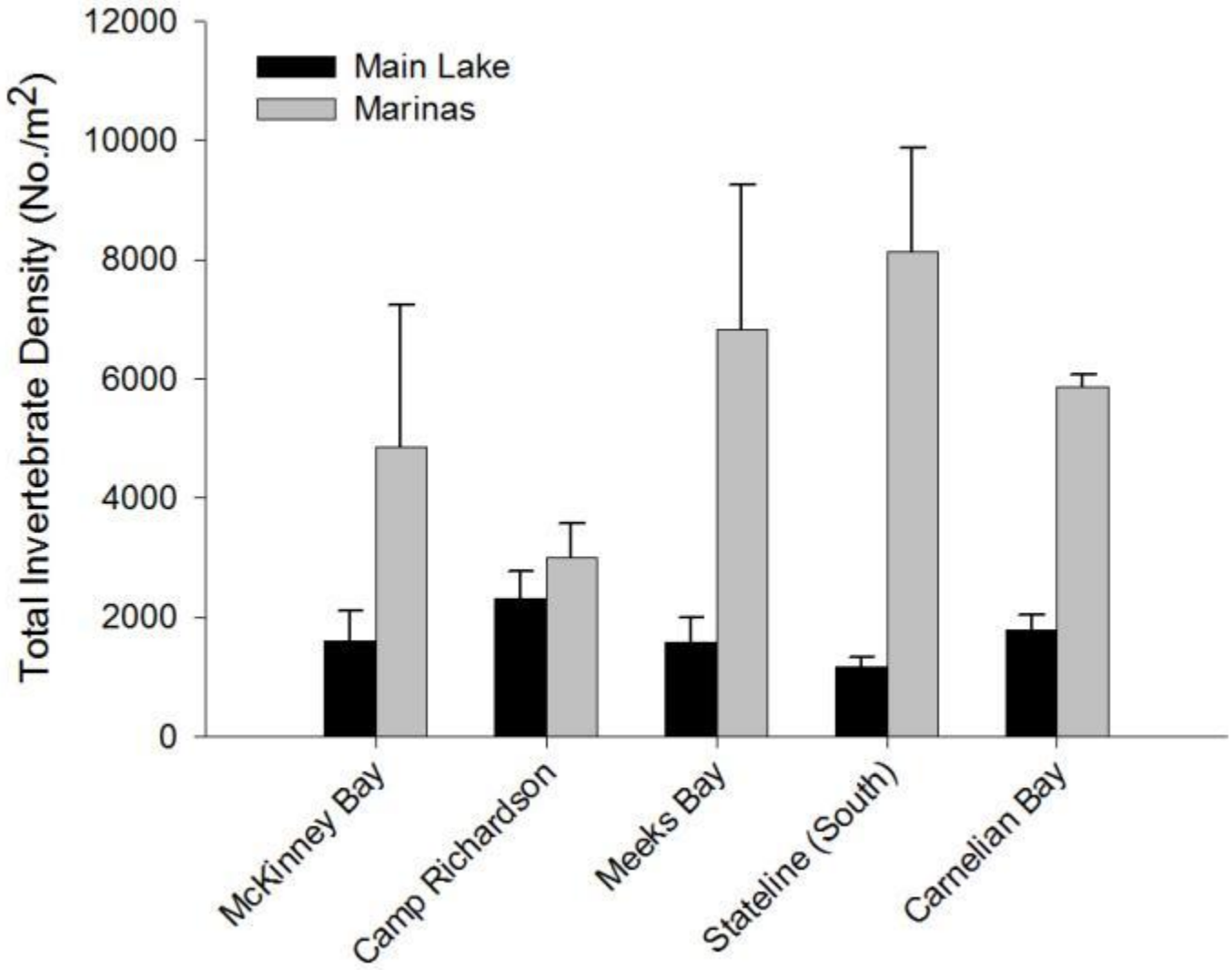




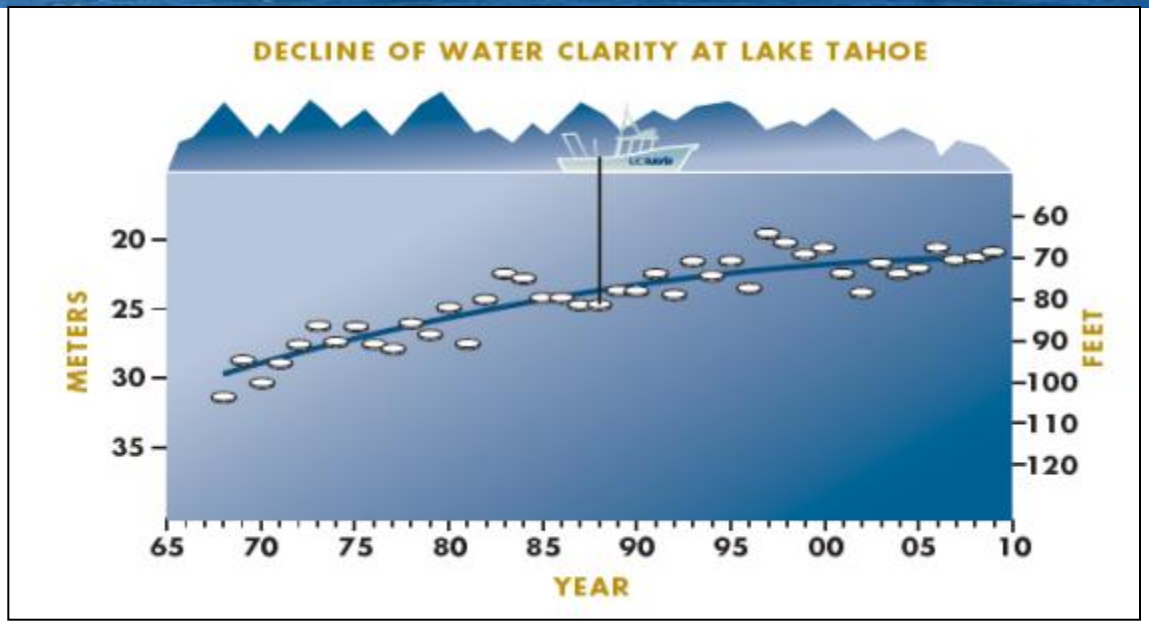
Fish Composition in Tahoe Keys

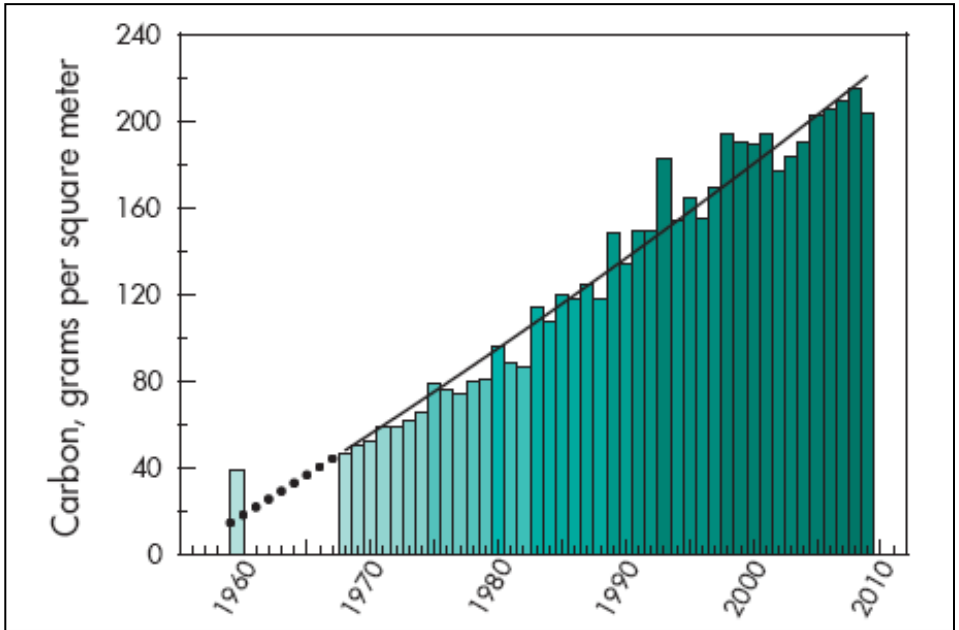


Marina vs. Non-marina Invertebrate Communities



Historical vs. Contemporary Nearshore Communities





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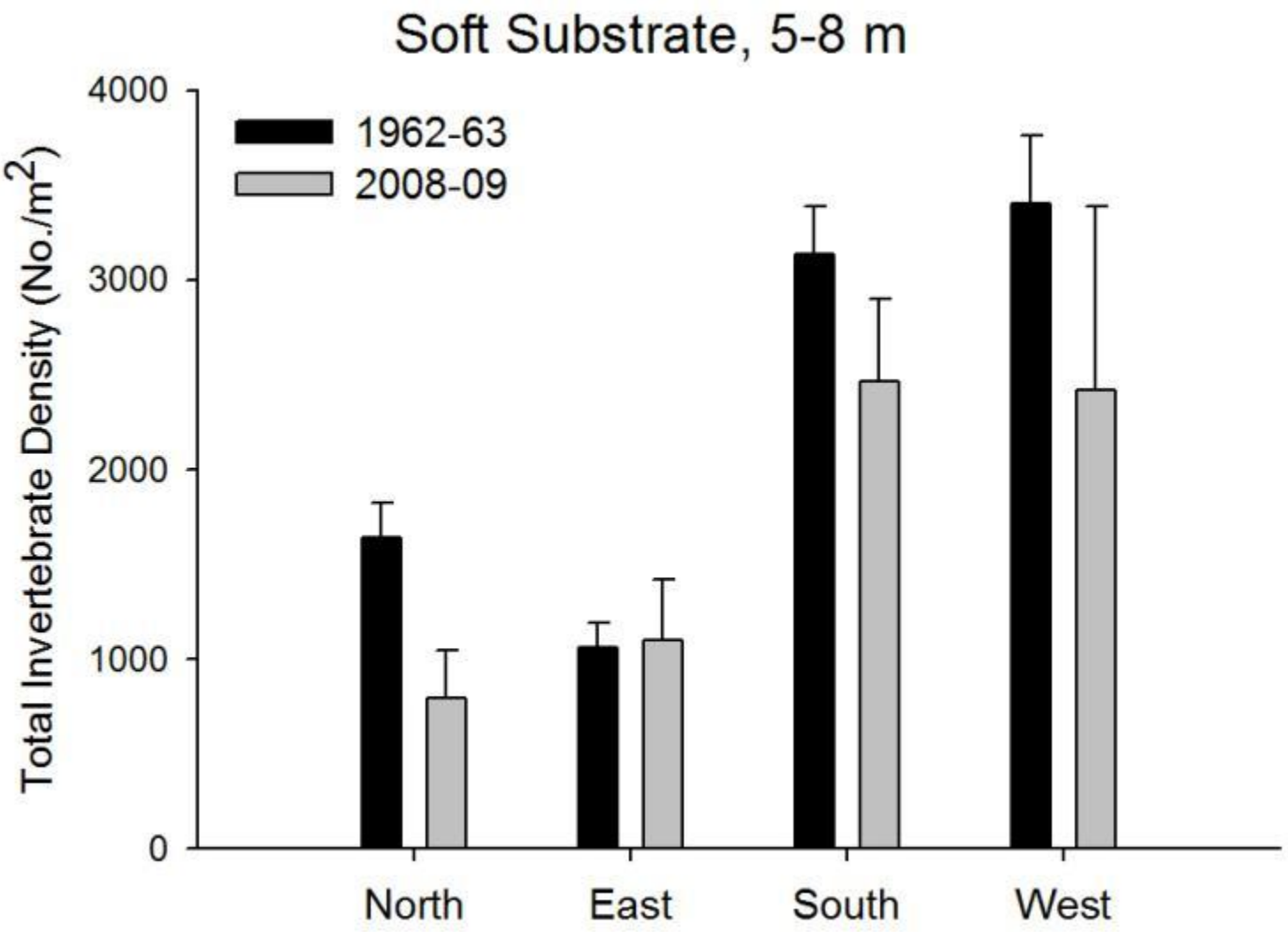
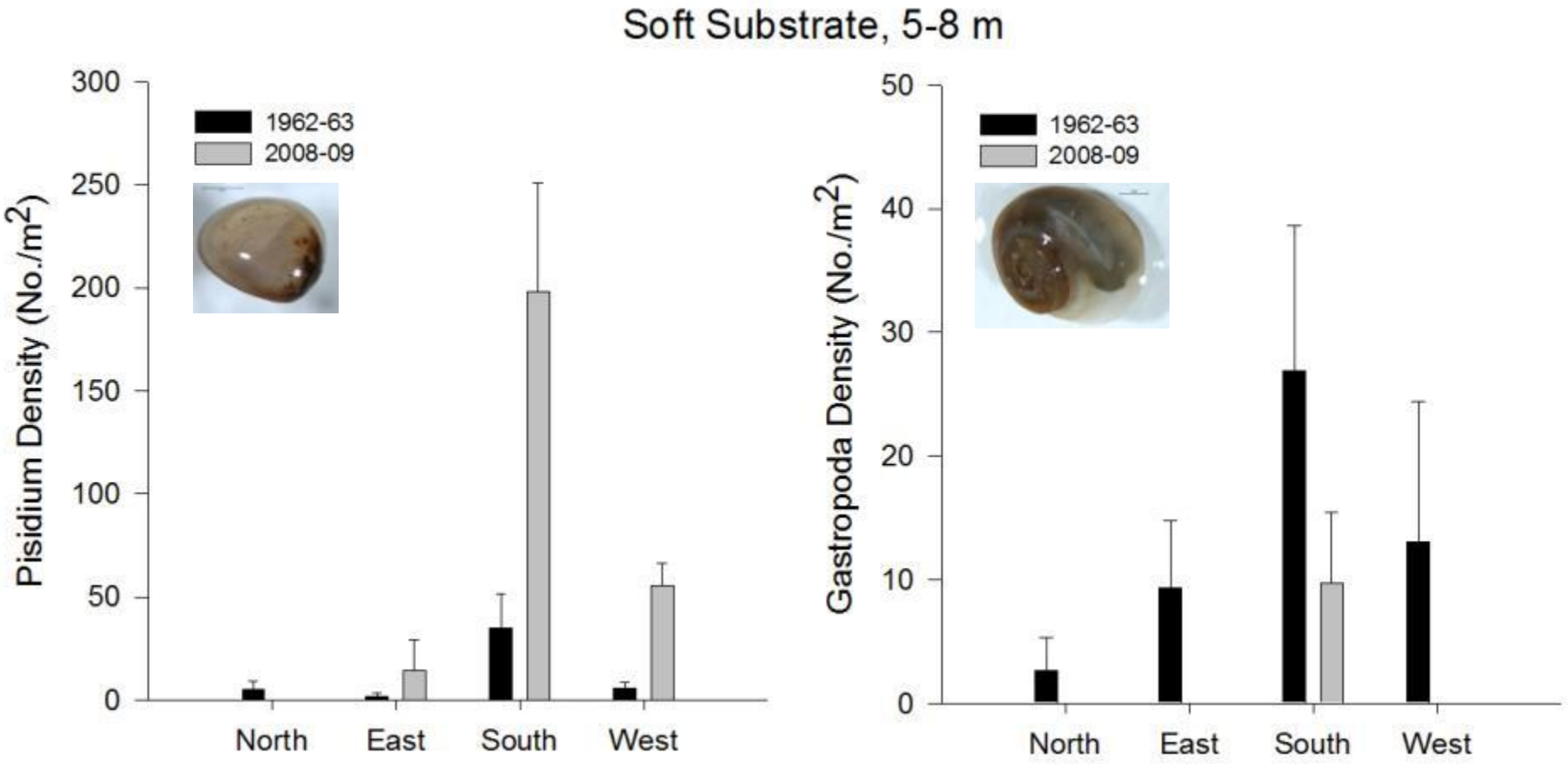
Historical vs. Contemporary Periphyton Communities

- Elevated periphyton communities in Tahoe City area since at least the 1960s
  - Abrahamsson 1970
  - California-Nevada-Federal Joint Water Quality Investigation of Lake Tahoe, July 1969 – June 1970
  - Goldman 1970

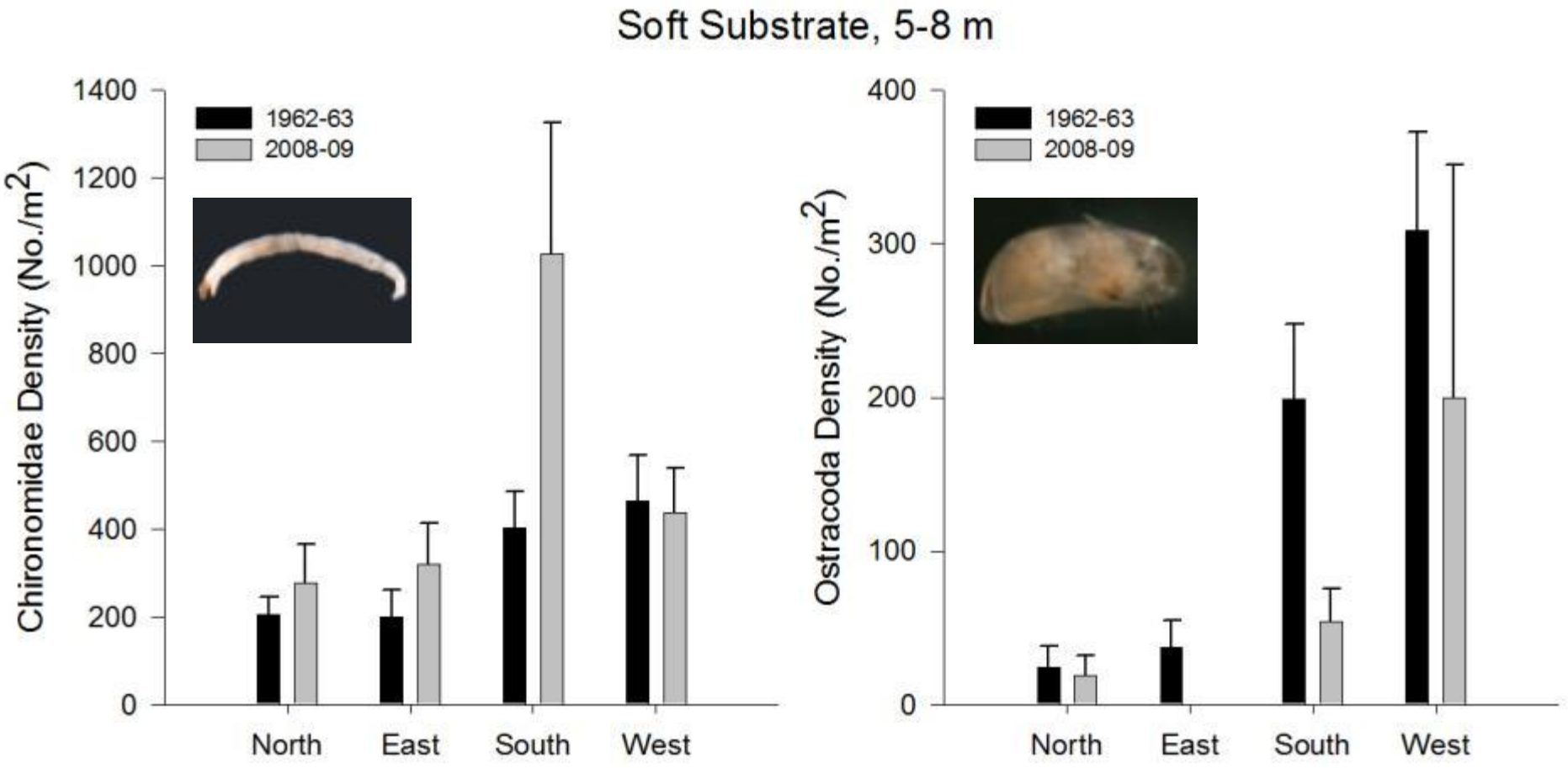
Historical vs. Contemporary Invertebrate Densities



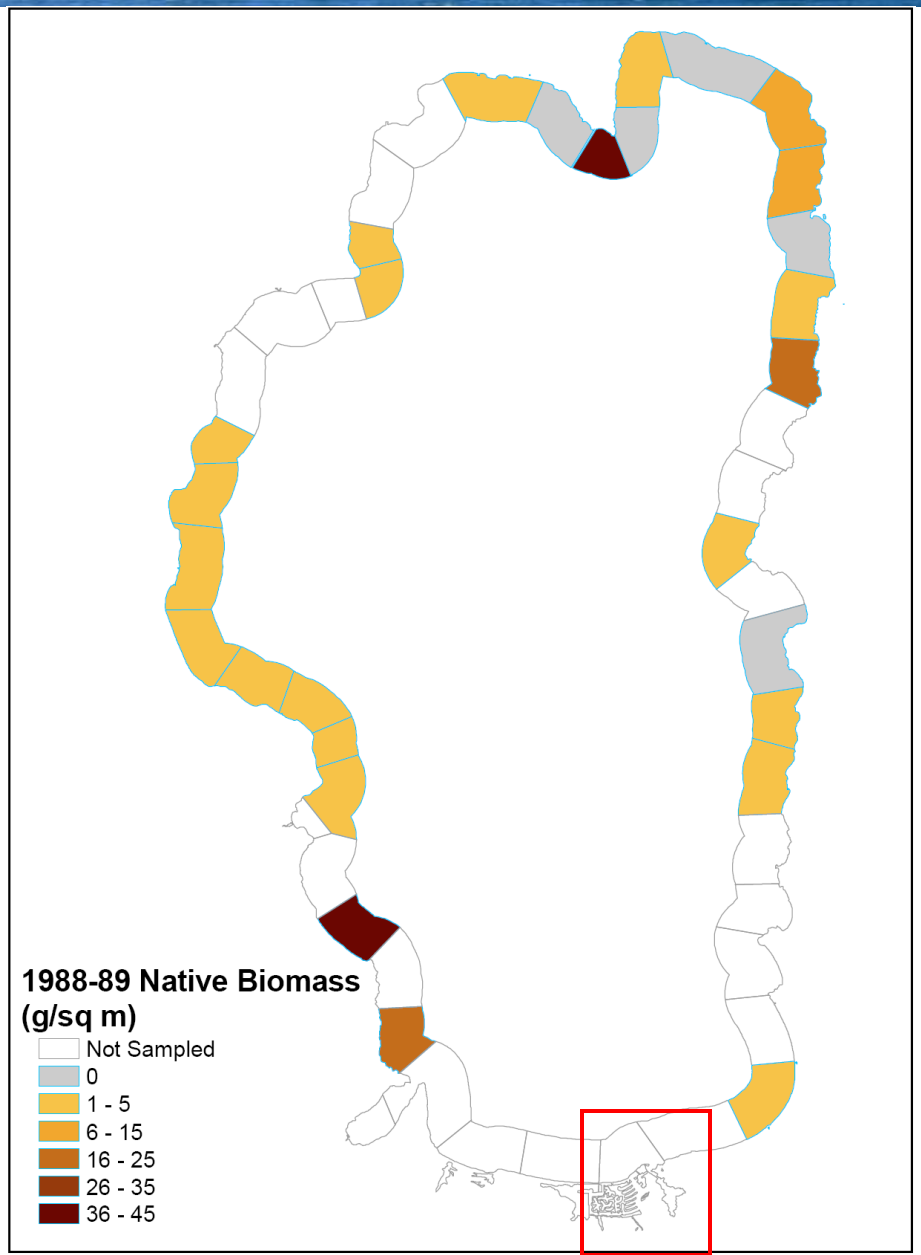
Historical vs. Contemporary Invertebrate Community Structure Shifts

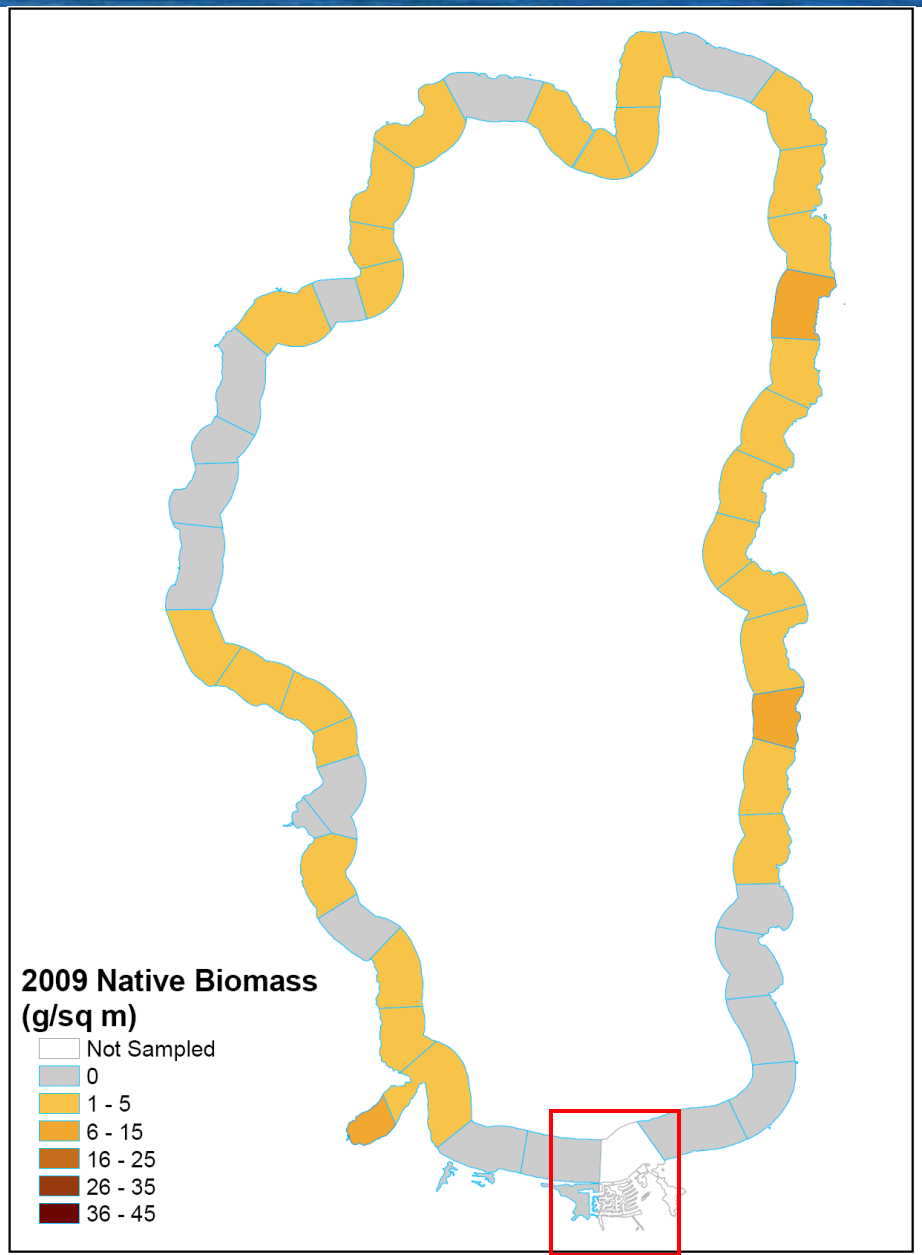


Historical vs. Contemporary Invertebrate Community Structure Shifts



Historical vs. Contemporary Native Minnow Communities





Summary

- Hotspots of invertebrate and periphyton assemblages
  - Hard Substrate: northwestern corner of the lake
- Spring periphyton growth appears to have a positive influence on invertebrate communities later in the season
- Native minnow communities show a spatial pattern that differs from periphyton and invertebrate patterns
- Marinas support a higher abundance of invertebrates and higher numbers of non-native fish species
- Historical vs. contemporary community patterns
  - Periphyton and invertebrates appear to show similar spatial patterns in contemporary and historical abundance
  - Shift in nearshore invertebrate community structure
  - Native fish declines

Recommendations

- Concurrent studies of nearshore communities in order to better understand interactions between taxa
- Studies of community composition change over time (emphasis on change in taxonomic composition and associated implications)

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