

# Foraminifera Distributions in Sequim Bay, WA: Biological Indicators of Climate Change

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## Abstract

Distributions of micro faunal foraminifera preserved in sediment help to provide biological indicators of climatic change and hypoxia from both natural and anthropogenic causes, as foraminiferal species can persist in anoxic environments for varying durations. A methods analysis was conducted on surface and core samples from Sequim Bay in order to determine the most efficient way to extract foraminifera from sediment and obtain a census of assemblages. This research helps contribute to an ongoing assessment of biological indicators which are useful in creating a current and historical health report for Sequim Bay and the greater Puget Sound.

## Methods

Samples acquired from surface sediment via a Van Veen Grab in 2009 (see Sequim Bay sample locations map).

Sediment sieved through a 90 micron mesh screen, followed by a 20 micron mesh screen.

Dried at 80 degrees Celsius

Spread onto a black backed slide for species identification and distribution counts.

Foraminiferal species have been stored in the dark at refrigerated temperatures for almost two years. There are no living species in the sample as a result. There will be no differentiation between living and dead assemblages in this study.

If live, species would be stained with a rose bengal (red) stain, which would help differentiate living from dead, by staining protoplasm remaining in tests (calcium carbonate exteriors) (Bernhard 2000).

If excessive sediment sticks to specimens, trichloroethylene can be used to isolate specimens (Murray 2006). This does not appear to be a problem in Sequim Bay samples.

Attempts to sonicate samples to separate sediment from foraminifera did not yield positive results. It is possible that sonication process was destructive to delicate foraminifera tests.

## Significance

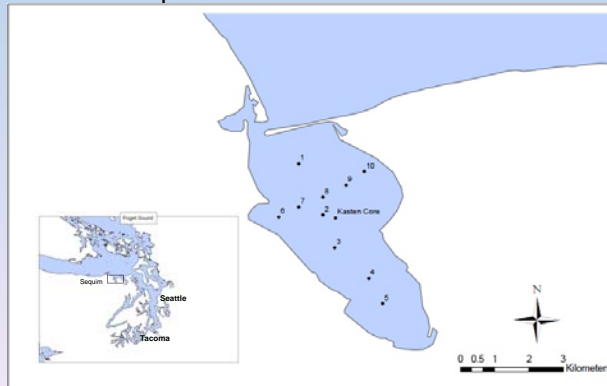
Foraminifera are useful indicators of the chemical and physical properties of water masses that they reside in (Brandenberger *et al.* 2008). Their calcareous exteriors are often well preserved in sediment and provide a historical record for changes in water composition such as temperature, salinity, and dissolved oxygen. While overall diversity of foraminifera decreases with increased levels of hypoxia (Murray 2006), certain species still persist making it possible to determine hypoxic and climatic conditions by examining population distributions of common species. *Eggerella advena* (pictured #3) is a common foraminiferal species that can survive in lower oxygen levels than their counterparts. Due to the multitude of foraminifera, species will be grouped based on similar survival parameters, specifically max depth present and oxygen requirements, based on previous studies in the Puget sound (Brandenberger *et al.* 2008, Blais-Stevens and Patterson 1998.)

## Sequim Bay

6.8 X 3.1km at widest point.

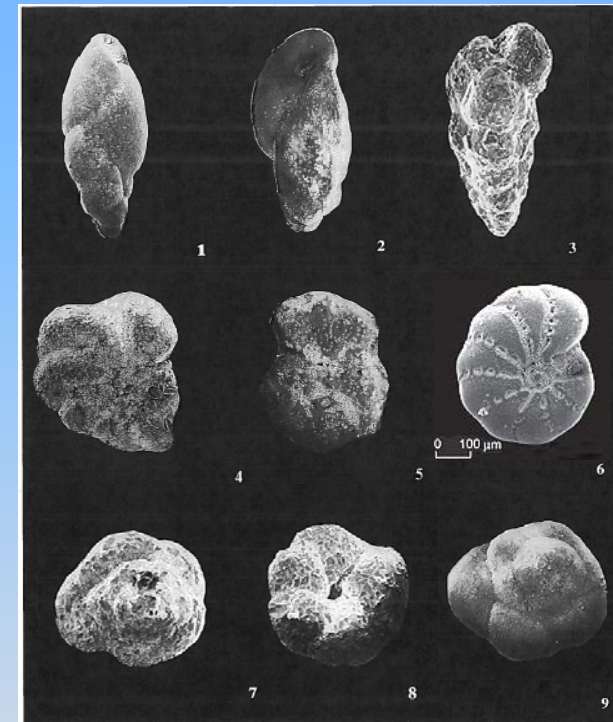
Travis Spit extends across the north end leaving a 400 meter channel.

Maximum depth: 37 meters.



Sequim Bay Sample Locations. Kasten core collected 0-76cm below surface sediment. Map by: Anna Rose Wallace, UW.T.

## Typical Species



Some typical species that are expected to be counted in Sequim bay. 1: *Stainforthia feylingi*, 2: *Blulinella elegantissima*, 3: *Eggerella advena*, 4, 5: *Dyocibicides biserialis*, 6: *Elphidium clavatum* (*Elphidium excavatum* is shown), 7, 8: *Trochammina discorbis*, 9: *Buccella frigida*. Images from: Blais-Stevens and the online foraminifera database at [www.foraminifera.eu](http://www.foraminifera.eu).

## Future Work

Specimens will continue to be identified and distributions determined in Summer of 2011. This work contributes to other projects analyzing micro faunal biological indicators in Sequim Bay .

## References

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- Blais-Stevens A. Patterson TR. 1998. Environmental Indicator Potential of Foraminifera From Saanich Inlet, Vancouver Island, British Columbia, Canada. *Journal of Foraminiferal Research*. 28(3) p. 201-219.
- Brandenberger J. *et al.* 2008. Reconstructing Trends in Hypoxia using multiple paleoecological indicators Recorded in Sediment cores from Puget Sound, WA. Report from the Pacific Northwest National Laboratory, Battelle Memorial Institute. 239 p.
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