A look at the lower trophic levels: Biomass and size class determination of sediment-dwelling invertebrates residing in Puget Sound

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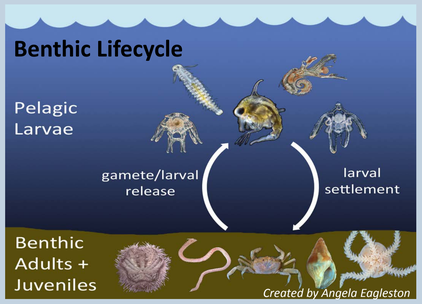
Why We Study the Benthos

We identify and count the benthic (sediment-dwelling) organisms in our samples as part of our Marine Sediment Monitoring Program. We are tracking the numbers and types of species we see in order to understand the health of Puget Sound and to detect any changes over time.

How Changes in the Benthos Can Affect Salmon Populations



Benthos Contribution to Zooplankton

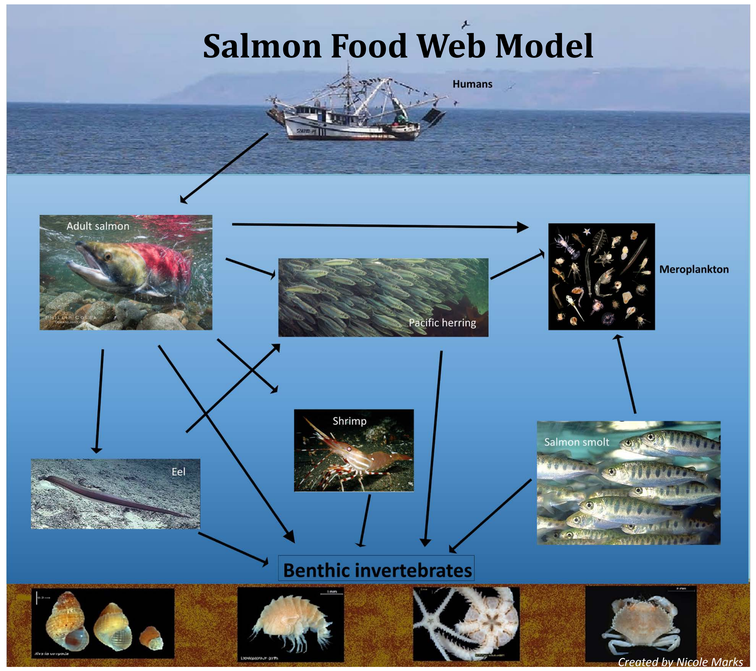
- The majority of benthic invertebrates (benthos) have a pelagic larval stage (Stanwell-Smith et al. 1999).
- Benthic larvae amount to about 21% of zooplankton (Keister 2014-2015).
- The benthos larvae that temporarily live in the water column are called meroplankton (Lassuy 1989).

Changes within the benthos can have a bottom-up cascade effect on higher trophic levels including salmon populations.

The connection between Benthos and Salmon

- A key salmon food source is Pacific Herring.
- Pacific Herring feed on the zooplankton which include benthos larvae.
- Juvenile salmon feed directly on the benthos (Simenstad et al. 1982).

The higher the biomass of benthos invertebrates, the more food availability for salmon.

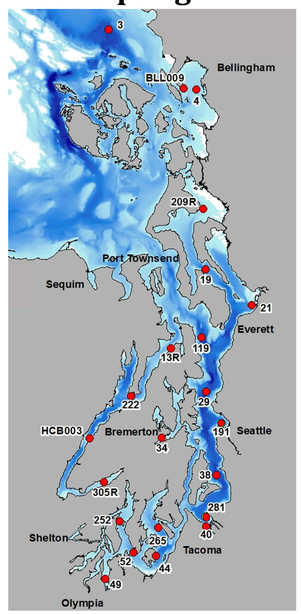


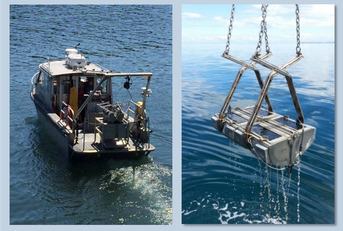
What We Gain From Biomass Estimates

- Establishment of baseline Puget Sound benthic biomass and size structure data
- Visibility of changes in trophic and size structure over time (Macdonald et al. 2012)
  - E.g. declining recruitment or annual variability in larval recruitment (juveniles are identified separately from adults)
- Information to determine the source of changes in sediment conditions:
  - Background environmental sources (e.g. climate-related)
  - Localized anthropogenic sources (e.g. discharge) (Burd 2014)
- Creation of a quantifiable food web model
- Assessment of food availability for salmon and forage fish populations (Macdonald et al. 2012)
- Anticipation of changes in salmon populations as a result of changes in benthos biomass

Our Field Sampling

- A Size Class Reference Collection is currently being established using benthos samples collected during 2016 PSEMP Long-term sediment sampling.
- The 22 Long-term stations used for this study are located throughout Puget Sound.
- 3 benthos sample replicates were taken from each station.

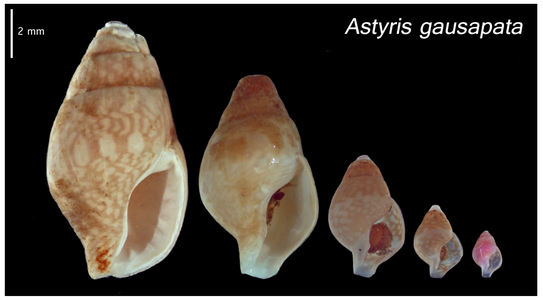




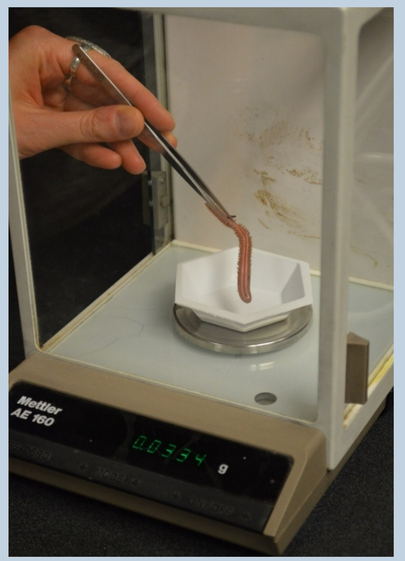
Sediment is collected using a double van Veen grab.

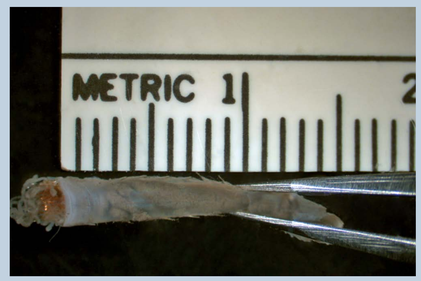
Samples are rinsed on a 1-mm screen and sorted at the lab.

How We Make Biomass Estimates and Size Class Determinations



1. Each identified individual specimen is wet-weighed on an analytical balance and measured (length and width) to the nearest 0.25 mm.
   - In the field, Megafauna (any single organism weighing more than 2 grams) are identified, weighed, and measured. They are then released.
2. After all wet weights and size measurements are obtained, benthos will be categorized into one of four size classes (modified from CORI 2015):
   - Juvenile (smallest individuals of a taxon; may be too small and/or underdeveloped to assign to genus and/or species)
   - Intermediate (smaller than adults by 5 to 10 times but still possess adult characteristics)
   - Adult (the largest specimens of a taxon; weigh under 2 grams)
   - Megafauna
3. Mean wet weights for each size class within a taxon will be used to calculate biomass estimates for future sampling efforts.





Specimens are wet-weighed and measured at the lab.

Literature Cited

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For more information: *www.ecy.wa.gov/programs/eap/psamp/index.htm*

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