May 1st, 3:30 PM - 5:00 PM

Spartina Control Program in British Columbia – New and Improved with an herbicide option

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Buffett, Dan; Williams, Gary; Herborg, Matthias; Brown, Becky; Ralph, Dave; Moore, Kathleen; Knight, Rob; and Houghton, Kim, "Spartina Control Program in British Columbia – New and Improved with an herbicide option" (2014). *Salish Sea Ecosystem Conference*. 254.  

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Speaker
Dan Buffett, Gary Williams, Matthias Herborg, Becky Brown, Dave Ralph, Kathleen Moore, Rob Knight, and Kim Houghton

This event is available at Western CEDAR: https://cedar.wwu.edu/ssec/2014ssec/Day2/254
Zooplankton Monitoring in the Eelgrass Dominated Padilla Bay: A Baseline for Examining Future Changes

Nicole Burnett
Padilla Bay National Estuarine Research Reserve
Padilla Bay

- Approx. 8000 acre eelgrass bed
  - 1 of the largest contiguous eelgrass beds in North America
  - *Zostera marina* and *japonica*

- Shallow bay
  - 12 ft tidal range
  - Most of the bay is exposed at low tide
Zooplankton Monitoring

- Limited previous zooplankton work in Padilla Bay
- Compliments long term water quality and nutrient monitoring
- Serve as baseline

- Started mid 2007
- Once a month at 3 sites
- 153 µm mesh
- Identified to broad categories
COPEPODite
- Interactive Time-series Explorer module of the COPEPOD global plankton database project

- Online plankton time-series visualization toolkit
- Plankton, water quality and nutrient data
Data Analysis

- COPEPODite
Total Zooplankton

Ploeg

Bayview

Gong
Plankton ID Categories

• Copepods
• Crabs
• Barnacles
• Other Arthropods
• Annelids
• Gelatinous
• Mollusks
• Larvaceans
• Echinoderms
• Chaetognaths
• Unknown
Annelid
Copepods

Ploeg

Nauplii
Copepod
Copepod + Nauplii

2008 2009 2010 2011 2012 2013

0 20k 40k 60k 80k 100k

Oct + Nov + Dec

Annual Anomalies

Annual Anomalies

Annual Anomalies

Annual Anomalies
Data Analysis

• COPEPODite
| SST | Total Zoo | Annelid | Crab Larvae | Barnacle Larvae | Copepod + Nauplii | Other Arthro | Chaetognatha | Larvaceans | Hydrozoans | Ctenophores | Unk Gel Zoo | Echinoderms | Mollusca | Other unkn | Chla | PO4 | NH4 | NO2 | NO3 | NO23 | temp at depth | sal | DO | pH | Turbidity | Hadley Sal | SAT Chl | Sur Winds |
|-----|-----------|---------|-------------|-----------------|-------------------|--------------|--------------|-------------|------------|-------------|-------------|-------------|-----------|---------|-----------|-----|----|----|-----|-----|------|---------------|-----|-----|----|----------|-----------|--------|----------|
| SST |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Total Zoo |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Annelid |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Copepod + Nauplii |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Other Arthro |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Chaetognatha |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Larvaceans |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Hydrozoans |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Ctenophores |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Unk Gel Zoo |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Echinoderms |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Mollusca |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Other unkn |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Chla |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| PO4 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| NH4 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| NO2 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| NO3 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| NO23 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| temp at depth |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| sal |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| DO |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| pH |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Turbidity |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Hadley Sal |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| SAT Chl |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Sur Winds |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
Zooplankton Relationships
Shallow Eelgrass Sites

- Total zooplankton has significantly increased since 2007
- Copepods and annelids are the dominant groups
  - vary year to year in which groups blooms and intensity of the bloom

Deep Water Site

- Increasing trend of zooplankton but not significant
- Copepods and Larvaceans are the dominant groups
  - Little variation in annual pattern

Summary

Comparisons Analysis

- Few consistencies between or among sites
- Inconclusive results with water quality and nutrient data
Take Home Messages

- COPEPOdite is a great tool for analysis
- Longer time-scale to pick up trends with abiotic factors
- Even with broad categories and limited resources community trends can be detected
Thank You!

http://www.st.nmfs.noaa.gov/copepodite/
http://copepodite.org/

Alysia