

Summary

SQO - RMP Benthic Work Group Meeting

Wednesday, June 3, 2009
San Francisco Estuary Institute, Oakland, CA

Meeting Participants:

Ananda Ranasinghe; Steve Weisberg; Sarah Lowe; Aroon Melwani; Michael Johnson; Michael Kellogg; Heather Peterson; Jim Oakden; Karen Taberski; Steve Bay; Bruce Thompson; Meg Sedlak

WG Participants unable to attend:

Peter Ode, Karen Gehrts

Background, Work Group Tasks

Bruce summarized the goals for the meeting:

- Orient and establish the benthic work group
- Review spatial and temporal extent of benthic assemblage in SF Estuary
- Discuss options for mesohaline benthic assessment methods

Long Term Goals for the Work Group

Review, revise, create benthic assessment methods for several SF Estuary and Delta assemblages.

- mesohaline (San Pablo -, South Bay)
- oligohaline (Suisun Bay)
- limnetic (Delta)

Benthic Data for SF Estuary and Delta

Sarah summarized the data compilation effort: Data from 12 studies were compiled with benthos samples collected between 1992 and 2008, including wet/dry-season and monthly sampling. Studies that employed a 0.5 m² core size and 0.05mm sieve size were targeted (except the BPTCP97 study which had a final core size of 0.23m²). A total of 366 unique stations were represented with ~2,100 station visits. Taxonomy across studies was standardized through consultation with regional taxonomists (who worked on the original study IDs). Further standardization was done for the analysis dataset used in the cluster analysis. The 2008 DWR data has not been released by DWR and was not included. The 2008 SQO data was only recently completed and was not included in this analysis, but will be used in follow-on runs.

Preliminary Results: Benthic Assemblages in SF Estuary and Delta

Ananda presented the initial cluster analysis results for a dry season sample of the dataset (July – October). He further reduced the sample size by only including the first replicate of samples and selecting only 2000, 2007, and 2008 DWR-EMP data. This resulted in 501 samples with 297 taxa.

The resulting cluster analyses was presented to the WG in the form of station and species dendrograms, two-way table, map of the clusters, and scatter, box-plots of the habitat characteristics, and tables of dominant taxa in each preliminary cluster group.

The initial station dendrogram was split into 9 clusters. The group reviewed the various results and then evaluated how much agreement there was that the cluster splits made sense in the group's professional opinion.

Steve Weisberg led the discussion by listing each cluster and providing initial thoughts as to why it was (or was not) a separate cluster. Follow-analyses were discussed (listed below).

The work group generally agreed on the following:

Cluster Groups 1-3 are clearly different from Group 4-9.

- Grps 1-3 are tidal fresh stations in the Delta with very different species

Group 4 is different from Group 5-9:

- Grp 4 is mostly located in Suisun Bay. However most species also occur in adjacent groups

Group 5 is different from Group 6-9:

- Grp 5 samples were from mostly sandy habitats, and had several unique taxa

Groups 6 - 9 represent a gradient of taxa along the estuary salinity gradient.

- Are 6&7 different from 8&9 ?
- Many taxa in groups 6,7 are usually considered to be mesohaline taxa. Are 6 and 7 a separate assemblages or sub assemblages? ,
- Many taxa in 8,9 usually considered to be obligate polyhaline taxa.

Group 8 stations appear to be from the NOAA00-01 study. We know that the taxonomy for this study may have significant inconsistencies (despite effort to standardize the taxonomy to west-coast standards by NOAA).

Questions about Cluster Analysis

- Group 1-3 Question: Is this one assemblage, or 3 sub-assemblages? Which habitat factors are related to the 3 clusters?

Group 4 Is this a 'real' assemblage or an artifact of mesohaline and limnetic assemblages averaged over several years of samples?

Groups 6-9 After resolving the NOAA taxonomy issue, is there better resolution of these groups. What habitat factors are related to the differences?

Follow-up Analysis Recommendations

Follow-up analyses are needed to clarify several issues.

1. Are the groups robust in space and time? Test the robustness of the cluster groups, sub-groups. Validate groupings. Re-run random sub-samples of the 501 stations to observe any differences in groupings and if groups are robust.
 - Selectively remove and/or add-back samples to check robustness of clusters.
 - Can also use different visit replicates.
For DWR monthly data, evaluate if keeping all four months (dry season) data is warranted or if it dominates the results. Can see if the clusters are different for one month at a time. Ananda will evaluate the clusters and will send the result to Mike Johnson for review and statistical testing using Mantel's test. This test should clarify the proximity of most similar samples.
2. Are the dominant taxa in each group different enough to justify calling a group an 'assemblage' or sub-assemblage? Evaluate the taxa that are driving the clustering selectively removing the most similar taxa from adjacent groups, using the PRIMER tool using "SIMPER" (which calculates the per-species contribution of (dis)similarity between groups).
3. Are the habitat factors for each group different enough to justify assemblage designations?. Which factors appear to be driving the differences. Evaluate which habitat factors (water year, salinity, sediment type) are significantly different for various different cluster groups. Heather suggests using the annual median of the Net Delta Outflow Index data (QOUT).

Additional Analyses

- Include seasonal data, and more years, as available.
- Run using presence/absence or 4th root transformations to see if dominance influences clusters.
- For Grps 1-3, add May 2008 SQO data, and rerun analyses including the May GRTS samples from 2007 & 2008. (Sarah to provide 2008-05 DWR GRTS data to Ananda. Will also evaluate adding the SQO chemistry cruise ancillary data to the dataset (note that samples were taken on different days up to 14 days apart).

Summary of Mesohaline Benthic Assessments

Bruce summarized the SQO phase I benthic index development, the current status of the mesohaline indices, and options for revision and creation of new indices for other assemblages. It was agreed that using a Bests Professional Judgment (BPJ) exercise, as was done in Phase 1, would provide the best opportunity to identify benthic response gradients in the assemblages, upon which to base index development and validation.

This process will require the identification of benthic experts to evaluate the condition of benthos in selected samples from each assemblage. So, a list of potential experts was started. Additionally, the BPJ process requires a selected set of samples that represent a range of benthic condition from 'reference' to 'severely impacted' for the experts to use. The SFEI-SCCWRP team will begin to develop sample selection criteria, for work group review.

Next steps, future meetings, work assignments, etc.

- Sarah to send Ananda the DWR-EMP 2008-05 dataset
- Bruce and Steve W. to work on identifying, and recruiting BPJ reviewers.
- SCCWRP-SFEI team to begin evaluation of samples for BPJ exercise.
- Ananda to run the various analyses mentioned above (Aroon to assist)
- Steve Bay to set up an FTP site with reports and publications from SQO Phase I. This site may also be used to provide analysis results to the work group.
- Chris Beegan to talk to Central Valley Water Board staff to see if they should participate in the work group process.

Proposed Next Meeting Date

Monday, August 24th was available to all present. Bruce will check availability with those that were not at the meeting.