

Managing mollusc fisheries and husbandry in multi-user zones.

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With thanks to Washington Sea Grant for the air fare and the hospitality.

Why are we here? Directives from House Bill 2220, 60th Legislature, 2007 Regular session, State of Washington.

(1) The sea grant program at the University of Washington shall, consistent with this section, commission a series of scientific research studies that examines the possible effects, including the cumulative effects, of the current prevalent geoduck aquaculture techniques and practices on the natural environment in and around Puget Sound, including the Strait of Juan de Fuca. The sea grant program

My task is to address how this directive fits in a larger problem of resource management in intertidal and shallow subtidal regions.

Specific tasks from House Bill 2220

(* in the workshop program)

- *Review literature to identify impacts and prioritize research.
- *Examine the effect of structures - this can be both positive and negative.
- *Examine harvesting impacts on benthic communities and recovery rates.
- *What are the impacts on overlaying waters.
- *A comprehensive examination of pest and parasite concerns.
- *Impacts of large numbers of cultured animals with limited genetic diversity and/or sterile triploids.
- Finish tasks by 12/ 2013.
- Technical advisory panels can be formed and tasked.
- Develop guidelines for siting and operation.

Place this in a larger context - a general overview of both mollusc resource and habitat management

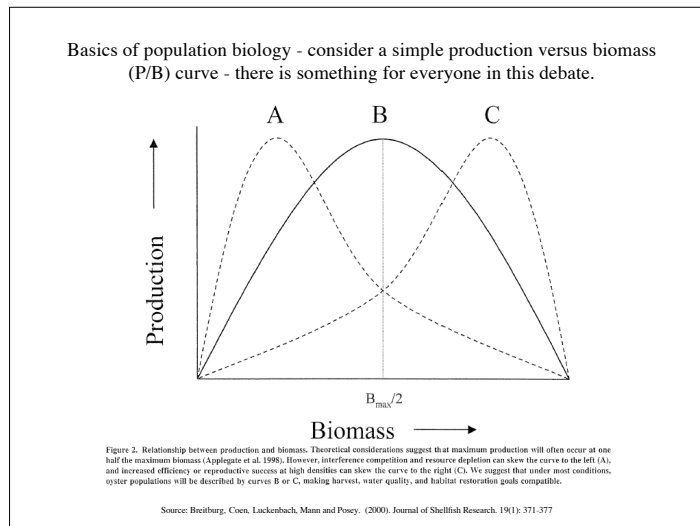
Focus on the mollusc resource and its exploitation:

- Historical access for individual subsistence fishing including native peoples - this continues to this day (federal and state legislation, including riparian and common property rights).
- Historical commercial market needs - these also continue.
- Recreational harvest - a more recent addition.
- Arguably few, if any of these are managed on a sound quantitative basis.

Focus on the habitat:

- Ecological services provided by the broader biological community - but what did this community originally look like?
- Habitat use in commercial culture - while being respectful of ecological limitations, this is about economic return.
- Aesthetic value (including riparian rights) - how are these quantified?

The challenge - a compromise among these assuming (perhaps naively) non exclusivity in optimal end points for each of them.



Implications of the P/B graph on our task: part 1, the mollusc.

Focus on the mollusc and its exploitation:

- Historical access for individual subsistence including native peoples - what was the pre-colonial community like? In Puget Sound the current dominants include non-native species. NO DATA? IRRETRIEVABLY ALTERED?
- Historical commercial market needs - this also continue. Shallow water shellfish fisheries typically have no adequate stock assessment so they cannot be managed by standard fishery models. Reporting is usually lax so harvest data based management (catch per unit effort) is also difficult. MARGINAL DATA?
- Recreational harvest - a more recent addition. This is more about recreation than quotas, but it has a significant economic impact that extends into local business. WHAT DATA?
- Arguably few, if any of these are managed on a sound quantitative basis. How do you retrofit management to an arguably depleted resource with an implicit goal of $dN/dT \geq 0$ or $R \geq F + M$

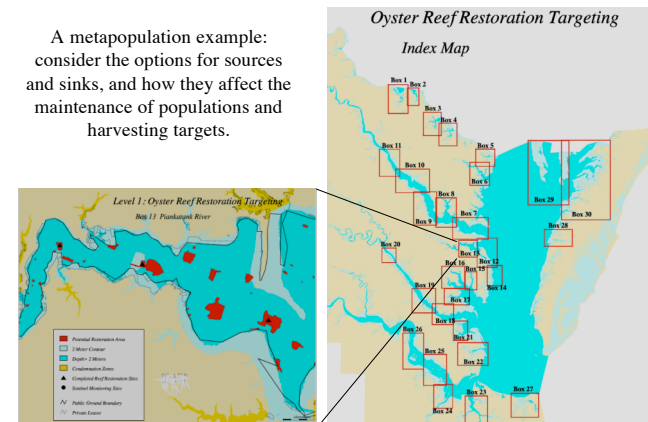
Implications of the P/B graph: part 1, the mollusc (continued).

Focus on the mollusc and its long term management

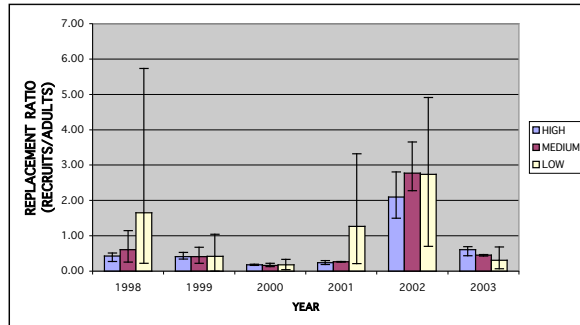
- The spatial dynamics of the targeted population(s) are a function of metapopulation dynamics - the connection of component populations by the pelagic larval forms. Where are the sources of the larvae (that should obviously be preserved) and where are the sinks (that can arguably be targeted for exploitation)?
- The stock versus recruitment relationship is not well understood. Again consider the shape of the P/B curve and where you want to be, as opposed to where you are now (assuming you have some idea of where you are now).

N.B. These same arguments apply to other members of the benthic community whose contribution to ecosystem services are of interest.

A metapopulation example: consider the options for sources and sinks, and how they affect the maintenance of populations and harvesting targets.



What can we say about stock versus recruit relationships? Consider the replacement ratio (# recruits/#adults) for oysters in the James River, VA. It is variable and unpredictable. Is this to be expected of most benthic communities, and if so how do we accommodate for this in management?



Data from Mann, Southworth, Harding and Wesson, unpublished.
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Implications of the P/B graph on our task: part 2 the habitat.

Focus on the habitat

- Ecological services are provided by the broader biological community - but what did this originally look like? Can we estimate (guesstimate) species diversity and abundance from historical records (are there any?) or services using an approach based on carrying capacity?
- Commercial habitat for culture - while being respectful of ecological limitations, this is about economic return. There is no consideration for harvest size or season AS SET IN A FISHERY CONTEXT because perpetuating recruitment and limiting fishing mortality is the not the issue.
- Commercial aquaculture must be cognizant of carrying capacity in order to set stocking density and manage production on a continuing basis - but it is this value that has trickle effects on the rest of the community - you will hear much more about this later in the meeting.
- Aesthetic value (including riparian rights and common property rights) - This is a relatively new addition to the discussion. How is these quantified?

Two questions on carrying capacity..
1. What is the upper estimate of carrying capacity in intertidal systems?
2. How does this influence our assessment of the magnitude of aquaculture, harvest and/or ecological services under optimal conditions?



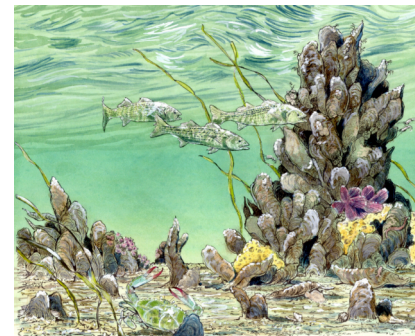
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Matsushima Bay, Japan
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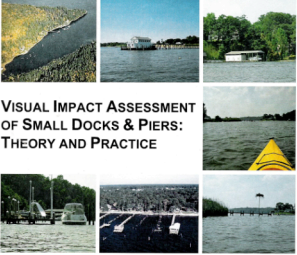


And what are the trophic impacts of increased population size and/or density of mollusc species?



- Increased filtration and fecal deposition - water quality improvement?
- The fate of the deposits is site specific and affects benthic accumulation.
- Support of complex food chains (good for recreational fishing).
- Provision of structure and aggregation of higher trophic levels (also good for recreational fishing)..
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Decision Analysis Series No. 25



**VISUAL IMPACT ASSESSMENT
OF SMALL DOCKS & PIERS:
THEORY AND PRACTICE**

Steve Bliven and Ruth Kelly
September 2005

Do we have guidelines for
“aesthetic” evaluation?

- Legal basis for developing visual impact and aesthetic standards.
- Analysis techniques.
- Capabilities at the local and state level to develop and implement standards.
- Examples from ongoing programs.
- Mitigation options and case studies including judicial review.

Suggestions on where to go from here..

In addition to the literature review you need:

- An assessment of the benthos in the target region in terms of species abundance and diversity (What are you disturbing right now?).
- A functional food web diagram, including the water column, to assess potential impacts on energetic or elemental budgets (as barometers of how the system works).
- Estimates of carrying capacity for ecological, fishery and culture purposes.
- Estimates of disturbance and recovery through physical and biological (notably recruitment) process. Time frames and biological measures.
- A balanced approach to assessing *all* users with a common or limited measure (dollars would be good, but its not the only thing).
- Proactive dialogue among the parties. Pointing fingers is not productive.
- A planning process that is subject to periodic review and revision as needed.