Connecticut's Inshore Fisheries Problems and Opportunities: An Environmental History Review of Oyster, Flounder, Clam and Smelt Fisheries

Site Specific Habitat Considerations for Fisheries Restoration Projects – What the past can tell us

Hard Clam, Flounder, Smelt and Oysters - Habitat Considerations

Timothy C. Visel - March 2, 2006

Abstract: Connecticut's inshore fisheries have been well documented in the historical literature. Catch statistics also provide important data in reconstructing coastal fisheries. What often is overlooked is the user practices of site specific fisheries, a cove or river which alone represents a fraction of historical fishing effort but combined may provide a larger view of estuarine dependent habitat ecosystems.

The association of habitat to resource productivity is usually non specific relating to commonly accepted habitat associations. Most often the only site specific research conducted is environmental impacts reviews for coastal development. This approach is highly reactive and very often species specific. Such assessments routinely consider present observed conditions and only rarely survey over seasons. Thus it is possible to miss significant ecological habitat considerations without a historical time frame or reference. Site specific research is dependent upon other sources of historical information such as logs, newspaper accounts and past practice of user groups. Combined they can represent an environmental fisheries history. That is the topic of this paper.

An Environmental History Review

The winter or black back flounder catches in Connecticut are today but a fraction of harvests 105 years ago. Connecticut oyster production is just a fraction of what it was 100 years ago. Is this a coincidence, or is it a reflection of a common ecological habitat niche that has been lost or degraded? Perhaps survey/under video studies could show this habitat relationship with other species. Flounder has long been associated with this shell/sand environment according to comments from oyster growers. Hard clams also seem to have benefited from past oyster Aquaculture practices.

Connecticut estuaries historically were important producers of bay scallop, smelt, flounder and oyster. Smelt and bay scallops are acutely sensitive to water quality changes and over time, retreated east as water quality declined. Today, they are non-existent as "fisheries". Oyster and flounder were more tolerant of poor water quality, but depended upon sessile specific environments – near shore areas with good currents required to keep bottoms "clean" and free of debris. Bay bottoms tended to be firm, consisting of sand, pebbles, shell and firm mud. They were dynamic systems subject to weather and storms, which provided the energy (mechanical) to maintain habitat diversity. We know the most about the conditions

of bay bottoms in the oyster fishery – even to specific beds, planted oyster ground and coves. Because of the commercial cultivation of oysters, oyster growers, as any farming activity noted leased acreage conditions of habitat as factors of growth, survival productivity. They formed industry associations, held conferences, and at industry meetings presented oyster culture research. We also have from them extensive information on attempts to modify the habitat, especially efforts to change soft bottoms into hard, so that oyster culture could be sustained.

Single Species Versus Multiple Approaches to Habitat Restoration

Shellfish are thought to be indicative of estuarine health. Other estuarine species/plants indicators would include the eelgrass and clams (both hard and soft). Shellfish species appear to be good overall indicators of estuarine health, especially the oysters requirement of a silt-free environment needed to grow and reproduce. Eelgrass has declined severely in Connecticut. Connecticut soft shell clam production (commercial public grounds) ceased in the 1960's. Today, in many Connecticut coves and bays, alteration of coastal ecology culverts and causeways, appear to be changing habitat profiles. Combined with excess nutrients and runoff, accelerated shifts in bottom types (from hard to soft) and from tidal current cleaned to areas of deposition have occurred. One of the most frequent habitat changes appear to burial by organic matter. This organic matter in 1980's was termed "black mayonnaise" or black oze and usually had lower ph and often-contained flounder which exhibited greater fin rot infections. This habitat shift appears to be more rapid in the last century accelerating in the 1950's. In review of Connecticut fishing statistics aside from losses in anadromous fisheries (such as salmon) and pollution (shellfish) inshore fisheries were relatively stable until the 1930's. From the 1940's, large harvest declines have been recorded for the smelt, bay scallop, flounder and soft shell clams.

Evidence in literary reviews and field observations indicate numerous site-specific habitats commonly associated with flounder and oyster have changed. Areas which were hard bottom and verified by field observations, now contain, in some instances, several feet of organic debris. No doubt nutrient enhancement and changes in tidal patterns with increased silt and road runoff are factors. Oyster growers noticed these changes as the industry declined from its record production levels at the turn of the century. Shellfishermen also reported similar concerns as coves showed the first eutrophication symptoms after World War II. This was especially true of Niantic Bay. (Most reports refer to large new growths of eelgrass or sea lettuce followed by sharp declines). Niantic Bay had a substantial bay scallop fishery that peaked in years of low ellgrass abundance. The Niantic Bay Scallop fishery was extensively studied by Nelson Marshall who went on to co-found the University of Rhode Island School of Oceanography. Niantic Bay and other eastern Connecticut coves showed early signs of siltation in the 1960's.

This siltation concern is well documented in the scientific literature. As early as the 1880's, references can be found about the demise of Hudson River oyster fisheries

by silt. On pg 746, in the Report of the Natural History of Aquatic Animals (1887), US Fish Commission section 219: Physical and Vital Agencies Destructive to Oysters, the author notes:

"There is probably no worse enemy of the oyster culturist than this very mud or sediment. It accumulates on the bottom of oyster grounds, where in the revise of time, it may become deep enough to cause serious trouble. Especially is this true of ponds from which the sea ebbs, and to which flows through a narrow channel. The falling leaves from neighboring trees in autumn also contribute to the pollution as well as heavy rains which wash deterious materials into it." The oyster fishery will provide the most documentation; the deeded or leased ground was recorded and mapped. Production levels were published with often site-specific references. Thus, it is possible to precisely locate an oyster bed or natural bed and record not only the current habitat but also examine the environmental history – the habitat below and impacts of eutrophication as a "now and then" picture.

In the 1980's, I observed changes in plant/algae growth. In many cases in eastern CT, coves (with documented flounder fisheries and oyster beds) were now being buried - in some cases by several feet of organic debris. In many cases, these areas had been subjected to greater amounts of nutrients. Several projects attempted to clear leaves/grass/sticks and other organic debris from the oyster beds, some had success and some did not. Perhaps a pilot project – a complete biological assessment of "before and after" on an old oyster habitat could prove a relationship to winter flounder. I was always interested in the habitat community and although I had numerous historical references that flounder lived either on or in the oyster habitat, not much can be found in the literature. Mapping the present habitat and history of anecdotal references could prove useful for potential inclusion into future LIS study habitat restoration projects. Changes in near coastal habitat has certainly impacted the oyster industry as buried natural oyster beds indicate, but other species dependent upon that habitat may have been impacted as well, such as black back flounder and the hard shell clam.

Raking tonging and hand dredging activities may have kept areas clean by moving leaves/sticks and organics on regular basis. These activities were stopped in many areas when water quality did not meet National Shellfish Sanitation Program Standards. During a period when cultivation became more important these beds weren't cultivated at all.

Cultivating oyster shell bases have been shown to improve oyster setting (Oyster Culture in Long Island Sound 1970; and How to Increase Oyster Production, 1983) by Clyde Mackenzie. But specific before and after studies are few and only occasionally are mentioned with other species associated with the oyster restoration/cultivation activities.

The process of dredging oyster beds, especially those in rivers natural beds tended to free the clutch of silt. This exposed the beds and the "black shells" in a low pH environment and therefore, biologically cleaned were ready to accept oyster larvae. This process is described by accident in a US Fish Commission Report, pg 279: Oyster Fisheries of the Taunton River – 'A well-known lessee on the Freetown shore, thinking at the expiration of his lease (oyster) he would not be able to renew it preceded to dredge his whole land in the autumn, leaving it as barren a ground as possible for his successor. To his astonishment when his deed was renewed, he picked off an area 12,000 bushels when in the past yielded him 6,000 to 7,000 bushels. Hence, he concluded that the thorough scraping had done the bottom good."

In the 1983 Marine Fisheries Review article titled: How to Increase Oyster Production, Clyde Mackenzie, Jr., reviewed oyster cultivation practices from 1880 to present. In his paper, he notes "in Long Island Sound, most of the seed oyster beds lie along the Connecticut Coast, the remainder are in the mouths of a few Connecticut Rivers." These "natural" beds, the ones the industry depended so much for "seed" were located in areas most susceptible to human activities.

Many of the most important seed oyster beds in New Haven Harbor, for example, were filled in for road construction, others were impacted by road and rail causeways, while others by urban runoff. By 1960, most of the manmade seed oyster beds were abandoned because of lack of productivity. Mackenzie estimated that the oyster industry by the 1970's was spreading only 10% of shells to catch a set it had a century ago.

Aquaculture Techniques and The Benthic Community

The procedures utilized in shelling and cultivating seed oyster beds may have had additional ecosystem changes. Information from oyster companies tells of the appearance of the hard shell clam sets after scraping and shelling the bottom. The cultivation of the soil (substrate) followed by shelling could have increased pore-size in the soil and created greater soil/water circulation increasing pH. Massachusetts, Rhode Island, New York and Connecticut relate increases in the hard clam density after such techniques. Some of the most important bull rake hard clam grounds in Rhode Island and New York exist on previously planted oyster leases - those today still covered with remnant oyster shells.

The Oyster Bed as a Habitat Community

It would be interesting to include a review of the literature (perhaps a cooperative placement or special topics project) regarding the oyster reef community and the other species that occupy this ecological niche. One possible study could combine

spatfall tests and shelling a piece(s) of bottom and surveying what changes if any occur to the benthic community.

Today the management of fisheries is tending to be viewed more and more as a multi-species approach. The oyster industry can provide some connections to this management process detailing habitat enhancement, restoration or creation? Perhaps the oyster industry was practicing poly-culture a century ago and did they didn't even know it? The oyster habitat may have been a significant part of near coastal ecology which helped build an industry and also documented the negative impacts upon that ecology when it declined.