

Evaluation and Development of Advanced Farm Management and Harvesting Tools for Economically Efficient and Environmentally Sustainable Production of Manila Clams

Project Summary: Bill Dewey is an innovator in applying mechanical agricultural tools to Manila clam growout and harvest on his Chuckanut Shellfish farm in Samish Bay. This includes: growing clams in net-protected rows; using tractor assisted methods to deploy and remove the nets, and remove net fouling; and harvest with a small-scale tulip bulb harvester. While the farm operations were Bill's primary focus, this project was directed at gaining a better understanding of the effects of the farm practice and clam production.



Bill Dewey steering the mechanical harvester on his Chuckanut Shellfish clam bed in Samish Bay. Joyce Dewey is sorting clams as they exit the conveyor at the rear of the machine.

Effects of mechanical and hand harvest, and farm versus non-farm operations on smaller sediment dwelling animals were examined. In general, there were no before versus after effects of mechanical harvest on total densities or taxa richness; but there were

significant differences in effects of hand harvest—taxa richness was significantly lower after hand harvest. Harvest was, however, very attractive to predators and scavengers. Immediately following harvest, gulls and crows were attracted to exposed clam tracts, and within a short time after tidal inundation a host of aquatic predators descended on the harvest tracts.

The other key aspect of the work was to measure yield in terms of clam growth (size and weight) between conventional and mechanized clam culture and harvest, and collect detailed seasonal water quality data. Information was incorporated into a Farm Aquaculture Resource Management (FARM) model to simulate potential harvest, sustainable carrying capacity, economic optimization, and other factors at the farm-scale.

Science Team: Dan Cheney, Jeff Cordell, Joth Davis, Joao Ferreira, Claire Levy, Camille Saurel, and Andy Suhrbier, and a number of support staff. The work was supported with a grant from the NOAA Saltonstall Kennedy (SK) program (# NA10NMF4270309). This was one of three SK projects completed by PSI between 2009 and 2014.

Work currently focuses on completion of manuscripts detailing research findings:

1) Ecosystem goods and services from Manila clam culture in Puget Sound: a modelling analysis (Saurel C., Ferreira J., Cheney D., Suhrbier A., Dewey B., Davis J., and Cordell J.). A significant document, the manuscript examines water quality, benthic fauna, shellfish yield observations, and applies these data for carrying capacity and other analyses, based in part on the FARM model. The journal *Aquaculture Environment Interactions* accepted a revised copy in July 2014 for publication.

2) Evaluation of mechanical and hand harvest of Manila clams in relation to water quality, sediments, and benthic and mobile fauna (Suhrbier A., Cheney D., Cordell J., Dewey B., Davis J., and Ferreira J.). This work describes the changes in water quality and epibenthic fauna due to farm operations, and responses of predators to clam harvest. A draft manuscript has been prepared for internal and external peer review.

3) Adaptation of land-based mechanical farming methods for Manila clam production and harvest in Washington State USA (Suhrbier A., Dewey B., Cheney D., and Ferreira J.). A manuscript intended for a general audience, layman's account, is under preparation for submission to *World Aquaculture* magazine.

