



Fisheries and Oceans
Canada

Pacific Region
Pacific Biological Station
3190 Hammond Bay Road
Nanaimo, British Columbia
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Pêches et Océans
Canada

1. Density: 640ft² in commercial farms would equal ~1,200 geoducks
STUDY: 480 geoducks
2. PVC: 640ft² would equate out to ~600 PVC pipes
STUDY: 240
3. hand harvesting after one year

November 13, 2008

Bill Dewey
Taylor Shellfish Company
130 SE Lynch Road
Shelton, Washington 98584, United States of America

4. Inclusion of all sample points (i.e. those outside of disturbed area): should not be used to determine impact of harvesting
5. P 2 - PRECIPITATION

Dear Mr. Dewey,

This letter is in response to your enquiry about information on a research project that was conducted by Fisheries and Oceans Canada to examine the potential benthic impacts of geoduck clam aquaculture and harvest in British Columbia. In 2005, we seeded a small area (3 x 20 m) of intertidal land at the head of Nanoose Bay (Vancouver Island) with 480 juvenile geoduck clams. These were seeded within 240 sections of PVC pipe with mesh covers, similar to the technology used in Washington. One year later, the clams were extracted by hand and the research plot was completely disturbed down to a depth of approximately 1 m with the use of high-pressure water jets ("stingers"). This disturbance was meant to mimick a commercial intertidal harvest, albeit on a somewhat smaller scale (60 m²). Sediment samples were taken prior to outplanting the clams, immediately after outplant, at various time points after planting but before harvest, immediately before harvest, immediately after harvest, and at various time points after harvest. Additionally, samples were taken within the area of harvest and at varying distances away from this plot (5, 10, 25, 50 m) along three transects. Sediment samples were analysed for sediment grain size, percent organics, sulphide concentration, oxidative reduction potential (ORP), total organic carbon, total nitrogen, and infauna. While the final results are not yet known, I can comment on what our preliminary analyses have shown.

Age of clams
br, nets
geoducks
no extraction from
3' clams from

60m² = 640ft²
7-12 additional
not disturbed

Our data analysis shows no significant negative effects of planting or harvesting the clams on sediment parameters such as sulphide concentration, ORP, total organic carbon, and total nitrogen. Outplanting clams did not have a significant effect on sediment percent organics but harvesting did,

with levels being significantly less immediately after harvest than immediately before harvest within the actual harvest plot. However, this effect was not expressed when all the sampling points (including those outside the harvest zone) were taken into consideration, indicating that the effect of harvesting on percent organics is probably a near-field one. Sediment grain size was not significantly affected by outplanting the clams, but was significantly affected by harvesting in the harvest plot, although only the immediate post-harvest samples have been analysed to date (we have not yet analysed the grain sizes in the 4 and 6 month post-harvest samples). As with percent organics, harvesting did not significantly affect grain size when all the sampling points (including those outside the harvest zone) were taken into consideration, indicating that the effect of harvesting on grain size is probably a near-field one. Preliminary infaunal analyses indicate that planting clams did not significantly negatively affect species numbers or individual numbers. Harvesting did not significantly affect number of infaunal species (as compared to immediate pre-harvest conditions), but did significantly reduce overall numbers of individuals. Individual numbers immediately post-harvest, however, were not significantly different from numbers present prior to outplanting the clams (same time of year for both samples).

John samples
four sides of
harvest area are
included site
results are
diluted

Density decrease
Diversity similar

Density similar to
pre-planting

It should be noted that these are preliminary results. The dataset has not been fully analysed and conclusions may change slightly based on further analyses of the data. It should also be noted, that the area of culture/harvest was relatively small ($3 \times 20 \text{ m} = 60 \text{ m}^2$) in comparison to some of the commercial-scale aquaculture that is taking place. It is unknown, whether the conclusions from this small-scale study would logically extend to larger-scale aquaculture and harvest or to other geographic locations that may have different substrate or ecological characteristics. We have recently begun a study to examine benthic impacts of larger-scale harvests (450 m^2 , in both the intertidal and subtidal), including an examination of potential effects on nearby sensitive aquatic vegetation (seagrass beds). We are currently working on scientific papers from our previous research and would be glad to share these with you once they are available.

Sincerely,



Chris Pearce, PhD
Research Scientist

? No mention of MOCK
HARVEST @ 50m (p18
Env.)

