

Community Liaison Committee

Meeting Minutes

Sunday, December 6, 2-4 pm

Present: CLC

Stephen Feist (CLC Chair)
David Garbary
Jim Lerikos
Roger Porter
Marc Genuist

TPO

Ernie Porter
Ted Porter
Rachel Odgers

Absent:

Hughie Stewart, Owen McCarron
Sean Day
Archie Mackenzie

Item	Time
1. Approval of Agenda - Chair	2:00
All Approved	
2. Approval of Minutes of November 15, 2020 meeting - Chair	2:05
Edit requested. Edit was approved and added to November 15th minutes.	
3. Review of Oyster Operations - Town Point Oysters	2:10
a. Similar Operations	
TPO discussed similar oyster farms. In particular ShanDanph Oysters in Merigonish Harbour. The president of TPO has volunteered on this farm, has visited many other farms, and will continue to associate with ShanDaph oysters and visit other farms.	
b. Town Point Operation	
TPO presented the expected farm operations including, seed collection, nursery operations, grow-out operations, and overwintering.	
4. Facebook Site- Town Point Oyster	2:25
a. Review of Site	

[CLC reviewed the Facebook page and it was discussed in detail. The members approved the use of a CLC Facebook page.](#)

b. Members Page with Bio

CLC members approved this.

5. Friends of the Antigonish Harbour Facebook site - Chair

2:45

a. Review of Items

b. Major Issues:

i. Piping Plovers

TPO outlined the investigative measures and information gathered relevant to this topic. TPO embarked on a long process to learn about Piping Plovers and other nesting birds in the area. TPO spoke with multiple accredited scientists and hired an environmental science consulting company to study the situation and provide scientific analysis. This information is all within TPO's application that is publicly available on the NSDFA website. The decision is in the government's hands and is part of the application review process.

ii. Nursery water supply and outflow Pipes

The issue of water flow through the nursery was discussed in detail. TPO noted the oysters filter incoming seawater to feed and no supplemental feed will be added to the silos. There will be no chemical treatment of the seed in the nursery. This is a flow through system, the same amount of water that enters the system is returned back to the harbour completely untreated other than the filtering from the oysters. In terms of temperature, TPO noted the changes would be negligible and water quality would be improved.

The nursery design, including supply and outflow piping, was thoroughly reviewed by NSDFA and numerous other governmental agencies. This was approved by the government agencies.

iii. Endanger Eelgrass

The issue of potential risk to eelgrass was discussed in detail. A formal onsite eelgrass survey was conducted by Department of Fisheries and Oceans (DFO) scientists. TPO pointed out that a scientist with DFO noted that the oyster farm will likely have a positive impact on the overall health of the eelgrass in the harbour due to reduced turbidity of the water. Though there is potential for some lesser growth directly under the growth units due to shading, feedback from this DFO scientist noted that the net effect more broadly is likely to be beneficial. Additionally, the design of the growth units TPO will use minimizes the shading of sunlight on the eelgrass below the growth units. TPO's oyster grow units will cover only 0.1% of the harbour's surface area.

Antigonish harbour is 4,400 acres. TPO's proposed lease sites are 90.3 acres which is 2% of the harbour. However, the growth units occupy <4% of lease areas. Therefore, the portion of Antigonish Harbour covered by growth units = 0.1%.

A peer reviewed article was also brought up by a CLC member and discussed by the committee. This article states that eelgrass can benefit from co-culture with oysters because co-culture with oysters was shown to reduce the severity of eelgrass wasting disease (EWD) by filtering out pathogens that cause EWD.

- A Photo copy of this peer-reviewed article's abstract is attached at the bottom of these minutes below.

iv. Oysters acidify the water

This issue was discussed in detail. Based on the review of a number of scholarly articles, growing oysters is not a driver of ocean acidification, in fact much research is currently underway to quantify and characterize the ways in which oyster farming may function to offset acidification through carbon sequestration by oysters during their shell building process. Unlike other ocean carbon sequestration techniques, the oyster shell permanently removes carbon from the ocean as well as the atmosphere. One of the largest concerns pertaining to ocean acidification and shellfish farming, is the potential risk acidified ocean waters present for shellfish, and their ability to form shells.

Over long periods of time, oyster shells left to decay in the ocean MAY provide a MINOR buffer against ocean acidification. Harvesting of naturally occurring as well as those grown on farms does result in removal of shell material without these shells being returned to the ocean so it is reasonable to suggest harvesting would lead to very minor reduction in this buffering effect. However, in Antigonish Harbour a much greater influence on PH levels is exerted by the several large gypsum outcrops that are constantly dissolving into the harbour waters (gypsum is composed mainly of calcium). Furthermore, the spat generated by mature oysters on the farm will surely produce more oysters beyond the farm that will not be part of the farm harvest and will also produce a mitigating effect.

v. Oysters compete for food with other wildlife

This issue was discussed in detail and the CLC determined that the proposed operation is expected to be well within the historical carrying capacity of the harbour.

vi. "Chemical Antifouling" used on oysters

This issue was discussed in detail. TPO does not plan to use any form of chemical antifouling.

vii. Oyster cages encroach on "registered navigable" route

This issue was discussed in detail. TPO has followed the regulatory process under Transport Canada's Navigable Protection Program (NPP) which is responsible for administering the Canadian Navigable Waters Act. It is this agency which will determine if there is or is not interference with navigation and whether any mitigation may be necessary.

TPO also noted that they reached out to the the NPP in regards to this concern. The NPP did confirm that they are familiar with TPO's application and that TPO has correctly followed the regulatory process which will determine if there is or is not interference with navigation and whether it can be mitigated.

viii. Oyster cages may break free during storms

This issue was discussed in detail. It was noted that the harbour provides significant protection from the full impact of storm but if growth unit loss does occur TPO stated that they would react quickly to retrieve and re-secure the growth units.

ix. Oyster cages endanger boaters and fishers

This issue was discussed in detail. Protection for boaters are prescribed by Transport Canada. They consider the circumstances and dictate to the operator what conditions must be met to ensure safety for all.

x. An environmental impact study needs to be completed

This issue was discussed in detail. TPO noted that environmental impact studies are not a requirement of an oyster aquaculture application. As part of the application process, a development plan must be included. One purpose of the development plan is to demonstrate that the proposal is environmentally sound. Furthermore, Nova Scotia has a mandated Environmental Monitoring Program, which is incorporated into the site-specific license conditions. TPO has accurately followed the regulatory application process laid out by the NSDFA.

xi. Only seasonal jobs

This issue was discussed in detail. TPO has spent considerable time and analysis in order to “right size” the farm in order to make year-round employment possible. After the farm is fully developed most positions will be year-round, not seasonal.

xii. Crown Land Right of Way & “Public Beach”

Discussed at length. CLC determined this is not relevant to the consideration of TPO’s application.

The CLC also determined that it is important for the community to know;

- This is not “the only public access” to Antigonish Harbour. There are multiple other public access points to and designated public beaches on the harbour including: The Antigonish Boat Club, The Landing, Dunn’s Beach, Mahoney’s Beach, and Terra Tory Drive,
- All shoreline below the ordinary high water line are accessible by the public. That said, there is no designated “public beach” at Town Point, and very little of the Town point shoreline is accessible from the crown land without actively trespassing across the private property of the riparian landowner.

xiii. CLC is an exclusive group

This issue was discussed in detail. The CLC wants all voices heard and encourage participation, whether it be submissions to the committee, attendance at the meetings, or applying to become a CLC member.

There were multiple forms of public advertisement to recruit members for the CLC. Physical flyers were posted around town. A local radio ad ran for a week. It was posted on the CLC’s website and Facebook page. All forms of advertisement were inviting all members of the community to apply. The CLC is still open for applications from community members.

FOAH members were directly invited via the FOAH Facebook page 3 times. This invitation was deleted each time and FOAH refused to share the CLC's invitation flyer with their Facebook community.

- xiv. CLC "stands to channel local people's concerns into a powerless institution"

The CLC's purpose is to provide a forum for the exchange of fact and science based information, as well as to promote open dialogue between TPO and local stakeholder communities. The CLC stands to combat misinformation and confusion by providing only facts and scientifically supported information to the local communities in order to allow the community as a whole to become informed.

The establishment and operation of the CLC follows the principles of Nova Scotia Environment's Guide for the Formation and Operation of a Community Liaison Committee. The formation of a CLC it is not a requirement of the application process, however it is encouraged by NSDFA.

- 6. Next Steps for CLC Committee - Chair 3:45
 - a. Determination of first Public Meeting

CLC Chair noted that unfortunately, this is difficult due to the current circumstances with Covid 19. We will move forward with the Facebook page for now. We hope to be able to safely host a public meeting soon.

- b. Determination of Next Steps

The CLC decided to move forward with the Facebook page. Schedule another CLC meeting in the near future to discuss/plan a safe public meeting.

- 7. Adjournment 4:00

Please Note: Due to the current COVID situation, masks and sanitizer will be provided



Oysters and eelgrass: potential partners in a high pCO₂ ocean

MAYA L. GRONER,^{1,10,11} COLLEEN A. BURGE,² RUTH COX,¹ NATALIE D. RIVLIN,² MO TURNER,³ KATHRYN L. VAN ALSTYNE,⁴
SANDY WYLLIE-ECHEVERRIA,^{5,6} JOHN BUCCI,⁷ PHILIP STAUDIGEL,⁸ AND CAROLYN S. FRIEDMAN^{5,9}

¹Atlantic Veterinary College, University of Prince Edward Island, 550 University Ave., Charlottetown, Prince Edward Island C1A 4P3 Canada

²Institute of Marine and Environmental Technology, University of Maryland Baltimore County, 701 E Pratt St., Baltimore, Maryland 21202 USA

³Department of Biology, University of Washington, 24 Kincaid Hall, Seattle, Washington 98105 USA

⁴Shannon Point Marine Center, Western Washington University, 1900 Shannon Point Rd., Anacortes, Washington 98221 USA

⁵Friday Harbor Laboratories, University of Washington, 620 University Rd., Friday Harbor, Washington 98250 USA

⁶Center for Marine and Environmental Studies, University of the Virgin Islands, 2 John Brewers Bay, St. Thomas, Virgin Islands 00802 USA

⁷School of Marine Science and Ocean Engineering, University of New Hampshire, 8 College Rd., Durham, New Hampshire 03824 USA

⁸Rosenstiel School for Marine and Atmospheric Science, University of Miami, 4600 Rickenbacker Causeway, Miami, Florida 33149 USA

⁹School of Aquatic & Fishery Sciences, University of Washington, 1122 NE Boat St., Seattle, Washington 98105 USA

Abstract. Climate change is affecting the health and physiology of marine organisms and altering species interactions. Ocean acidification (OA) threatens calcifying organisms such as the Pacific oyster, *Crassostrea gigas*. In contrast, seagrasses, such as the eelgrass *Zostera marina*, can benefit from the increase in available carbon for photosynthesis found at a lower seawater pH. Seagrasses can remove dissolved inorganic carbon from OA environments, creating local daytime pH refugia. Pacific oysters may improve the health of eelgrass by filtering out pathogens such as *Laurencia zosteriae* (LZ), which causes eelgrass wasting disease (EWD). We examined how co-culture of eelgrass ramets and juvenile oysters affected the health and growth of eelgrass and the mass of oysters under different pCO₂ exposures. In Phase I, each species was cultured alone or in co-culture at 12°C across ambient, medium, and high pCO₂ conditions (656, 1,158 and 1,606 µatm pCO₂, respectively). Under high pCO₂, eelgrass grew faster and had less severe EWD (contracted in the field prior to the experiment). Co-culture with oysters also reduced the severity of EWD. While the presence of eelgrass decreased daytime pCO₂, this reduction was not substantial enough to ameliorate the negative impact of high pCO₂ on oyster mass. In Phase II, eelgrass alone or oysters and eelgrass in co-culture were held at 15°C under ambient and high pCO₂ conditions (488 and 2,013 µatm pCO₂, respectively). Half of the replicates were challenged with cultured LZ. Concentrations of defensive compounds in eelgrass (total phenolics and tannins), were altered by LZ exposure and pCO₂ treatments. Greater pathogen loads and increased EWD severity were detected in LZ exposed eelgrass ramets; EWD severity was reduced at high relative to low pCO₂. Oyster presence did not influence pathogen load or EWD severity; high LZ concentrations in experimental treatments may have masked the effect of this treatment. Collectively, these results indicate that, when exposed to natural concentrations of LZ under high pCO₂ conditions, eelgrass can benefit from co-culture with oysters. Further experimentation is necessary to quantify how oysters may benefit from co-culture with eelgrass, examine these interactions in the field and quantify context-dependency.

Key words: *Crassostrea gigas*; disease ecology; ecosystem service; filtration; ocean acidification; plant defense; seagrass.

INTRODUCTION

Climate change is linked to declining biodiversity, increasing infectious disease, regime shifts, and compromised ecosystem services in both marine and terrestrial systems (Worm et al. 2006, Doney et al. 2009, Altizer et al. 2013, Rocha et al. 2015). The primary driver of climate change is increased atmospheric carbon dioxide (pCO₂). In the ocean, increasing aqueous pCO₂ (coupled with increased atmospheric pCO₂), has caused changes in seawater chemistry leading to a prolonged decrease in ocean and coastal pH, a process referred to as ocean acidification (OA) (Doney et al. 2009, Gledhill et al. 2015). OA results in lower availability

of the carbonate ion (CO₃²⁻) and, therefore, a decrease in the saturation state of calcium carbonate (CaCO₃), making it more difficult for marine invertebrates to form calcified shells (reviewed by Hofmann et al. 2010, Kroeker et al. 2010, 2013). Not all organisms are impacted equally by OA (Kroeker et al. 2010, 2013) or by other factors associated with climate change (Howard et al. 2013). Physiological requirements of individual species and altered interactions within ecological communities will determine whether a species is predicted to be a “winner”, i.e., experiencing population growth under OA conditions (e.g., seagrasses and algae), or a “loser”, i.e., experiencing population declines under OA conditions (e.g., bivalve molluscs, corals, and coralline algae) (Howard et al. 2013, Kroeker et al. 2013, Zimmerman et al. 2017).

In response to observed and predicted effects of OA on sensitive natural and managed populations, numerous agencies are calling for mitigation action plans. For example, in the United States, the Washington State Blue Ribbon

Manuscript received 6 February 2018; revised 25 April 2018; accepted 3 May 2018. Corresponding Editor: A. Randall Hughes.

¹⁰Present address: Prince William Sound Science Center, 300 Breakwater Ave, Cordova, Alaska 99574 USA.

¹¹E-mail: mgroner@pwssc.org