2021 Chesapeake Oyster Science Symposium

Thursday, June 3rd, 2021 | 11 a.m. – 5 p.m.

LIGHTNING ROUND SPEAKER ABSTRACTS

Sierra Hildebrandt, Hampton University (moderator)

Investigating the Impacts of Oyster-Conditioned-Water on Crassostrea virginica Larval Direct Setting Efficiency

Direct setting substantially reduces material handling and cost in traditional remote setting by deploying pediveliger stage oyster larvae onto suitable substrate in the field. In this study, varying concentrations of Adult-Oyster-Conditioned-Water (OCW), water conditioned by adult oysters shown to induce settlement, on *Crassostrea virginica* larval setting were investigated in the field. In the field, oyster larvae were exposed to either control river water, low OCW, or high OCW treatment for 30 minutes and then directly set on artificial reefs. Ammonia concentrations in OCW treatments were 0.04-0.11 mg/L (control), 1.29-1.44 mg/L (low), 1.49-1.99 mg/L (medium), and 2.09-2.43 mg/L (high). Setting efficiencies averaged 0.67 % in control treatments, 0.94% in low OCW treatments, and 1.3 in high OCW treatments. These results suggest OCW has the potential to increase setting efficiencies in the field. However, there are many variables that contribute to the success of direct setting, such as release method, that need to be further investigated.

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Katie Boyle, NUI Galway, Ireland

Genomics to Investigate Toxin Producing Vibrio in Irish Shellfish

Intro: *Vibrio parahaemolyticus*, *Vibrio vulnificus* and *Vibrio cholerae* are marine pathogens that cause gastroenteritis in humans after the consumption of infected shellfish. This project investigates the occurrence and distribution of pathogenic and toxin producing *Vibrio* in farmed Irish shellfish and the association with seasonal fluctuations in temperature and salinity to determine the potential risk to shellfish production and human health

Methods: We developed a programme of monthly shellfish harvesting and environmental monitoring at shellfish farming locations on the West coast of Ireland. Shellfish, water and sediment samples were analysed for *Vibrio* using culture and genetic approaches. *Vibrio* isolates possessing toxigenic virulence genes associated with disease in humans were identified via PCR.

Results: Our *Vibrio* monitoring programme started in November 2020. So far we have detected *V. parahaemolyticus* at shellfish farm locations in sediment and oysters. Neither *V. cholerae* nor *V. vulnificus* were detected. No pathogenic *Vibrio* were identified in mussels. PCR analysis identified the presence of Type Three Secretion System toxigenic genes in 8 of 10 *V. parahaemolyticus* isolates. The effect of

temperature on the presence of *V. parahaemolyticus* was also apparent as it was undetected in waters less than 10°C.

Conclusion: By identifying the risks posed by pathogenic and toxin producing *Vibrio*, measures will be proposed and put in place to minimise and overcome these threats to both the shellfish consumers and shellfish producers.

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Shannon Fluharty, Virginia Tech/ERM

Opportunity Between the Turbines: A Willingness-to-Pay Experiment Regarding Co-Location Within the Coastal Virginia Offshore Wind Farm

With shipping routes, fisheries, conservation areas, recreation, and other maritime industries competing for space off Virginia's coastline, integrated solutions for marine areas may offer a way to limit conflict and maximize productivity. Countries across the world are researching the different ways in which the space between turbines can be utilized to provide economic and environmental benefits. The act of coupling other maritime activities with offshore wind farms is often referred to as co-location. As Virginia constructs the first offshore wind farm in United States Federal waters, there are new opportunities for co-location that could benefit the Virginia economy. Using data from a choice experiment and random utility modeling, this research quantifies Virginia Public preferences for various co-location options such as seaweed aquaculture, seaweed forests, and research areas within the lease area of the Coastal Virginia Offshore Wind (CVOW) farm. Our estimated WTP values show Virginia's public preference for the addition of co-location to the CVOW lease area upwards of $20 per 1,000 acres of activity. Our estimates can be compared to real implementation and management costs of each activity to determine the economic feasibility of incorporation of certain co-location techniques. The experimental design of this study can be applied to other offshore wind installments and varying co-location activities around the world.

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Skyler Golt, University of Maryland Center for Environmental Science Chesapeake Biological Laboratory

Advancing settlement of oyster larvae for commercial aquaculture

Golt, S., A. Conway. C. L. Mitchelmore, T. J. Miller.

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We conducted an experiment that quantified the effects of batch and water treatment on settlement success, survival, growth and yield of Eastern oyster (*Crassostrea virginica*) when grown at scales that replicate commercial production using micro-cultch. The first experiment was conducted as a split plot experiment with water treatment applied at the main plot level and batch applied at the subplot level. Settlement conditions included an ambient water treatment and a "stressed" treatment of 5-µm filtered water. Water used in the experiment was pumped from the Patuxent river. We found significant effects

of both batch (batch, p< 0.001) and water treatment (p<0.001) on settlement success and size at settlement. Settlement success in individual silos ranged from 5-100%. Overall, batch level settlement success varied from 21.3 – 55.7%. The overall settlement success in this experiment was 35.9%. Subsequently, the growth, survival and yield of juvenile oyster produced in the settlement phase were tracked over an 8-week period in nursery phase. The nursery phase of the experiment was conducted as a randomized complete block design involving water treatment during settlement and batch. Results indicated significant effects of batch and water treatment during settlement phase on juvenile growth, with those oysters exposed to stressful conditions during settlement growing significantly faster (p<0.01) during the nursery phase. Final yield was also significantly different among batch and settlement conditions. However, the level of variation among batches and water treatment during the settlement phase declined over the production cycle, declining from an almost 20-fold level in variation in settlement success to a less than 4-fold variation in yield. This suggests variation in settlement success of larval oyster may not be a significant concern to the operators of commercial nurseries.

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Fernando Goncalves, Virginia Tech | Virginia Seafood AREC

Economic benefits of the Virginia Seafood industry

I am conducting a study about the economic benefit of the Virginia seafood industry, where I will need to survey stakeholders of the seafood industry this summer. Our goal is to assess and summarize the Virginia seafood supply chain and its various entities and actors and to develop an economic impact analysis that provides quantitative estimates of the direct, indirect, and induced economic benefits of the Virginia seafood industry and identifies key economic sectors in Virginia that are supported by seafood activities.

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Alison Levy, NUI Galway, Ireland

Investigating the Risk of TTX biosynthetic Vibrio in Irish Shellfish

The marine pathogens, *Vibrio vulnificus, V. parahaemolyticus and V. cholera* are causative agents of gastroenteritis in humans. Additionally, these pathogens have been seen to produce the potent marine neurotoxin tetrodotoxin (TTX). This study aims to examine the presence of TTX biosynthetic *Vibrio* within Irish shellfish farms and investigate the biosynthetic genes associated with TTX producing *Vibrio* for the purpose of genetic detection. TTX is a potent sodium channel blocker most known for the paralytic effects caused by 'pufferfish poisoning'. It has the highest fatality of all known marine intoxications. In 2015, the first detected case of TTX within Europe in UK coastal waters, was found within shellfish containing TTX biosynthetic *Vibrio*. Since, TTX has been detected in Spain, Greece, Portugal and the Netherlands within sea snails, mussels and oysters. In recent years marine waters have warmed, causing more favourable environments for *Vibrio* species. With climate change, the distribution of these marine pathogens is thought to be expanding causing *Vibrio* to be more prominent within oyster and mussel farms. Marine filter feeders can harbour pathogenic and toxigenic *Vibrio* and the presence of these bacteria within the shellfish can pose a huge threat to human health as well as shellfish production. The presence and identification of TTX producing *Vibrio* from 2 mussel and 2 oyster farms from Irish coastal water will be determined through biochemical and immunological assays. The biosynthesis of TTX in *Vibrio* is still unelucidated. A genetic approach involving comparative

whole genome sequencing will be conducted to evaluate TTX producing *Vibrio* genes. This aims to highlight the possible presence and risk of toxigenic *Vibrio* within Irish oyster and mussel production.

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Ming Liu, Morgan State University/PEARL

Development of Chesapeake PEARL Oysters

Ming Liu*, Brittany Wolfe-Bryant, Jon Farrington, Scott Knoche

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Maryland oyster aquaculture grows rapidly in the past ten years. The industry mainly locates at the coasts of the upper/middle Chesapeake Bay where the low salinity and disease are the main issues that are constraining the industry growing potential. The aquaculture team of Patuxent Environmental and Aquatic Research Laboratory have developed an oyster selective breeding program since 2018 to improve the survival and growth of the Chesapeake Bay oysters. We employ the genetic breeding approaches including genomic selection and triploidy-tetraploidy technology to create the superior diploid, triploid and tetraploid oyster lines that are derived from wild stock of the Chesapeake Bay Maryland portion. The broodstock of the new lines are anticipated to be available for aquaculture industry in 2023.

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