Deploying remote-set disease-resistant eastern oysters, *Crassostrea virginica*, in biodegradable netting on a shellfish lease in Connecticut

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ABSTRACT

The Connecticut oyster industry is subject to large production fluctuations due to two salient issues: epizootics caused by the parasite *Haplosporidium nelsoni* (MSX) and gap years between successful natural sets. Experiments aim to develop a method to restock Connecticut's natural oyster beds via disease-resistant remote *set Crassostrea virginica* seed-on-shell in biodegradable netting. Traditional bottom culture in Long Island Sound relies on natural oyster set for commercial harvest. Deploying hatchery-raised oysters on seed beds may compensate economically and ecologically for future MSX epizootics and/or insufficient natural sets. Hatchery reared, disease-resistant oysters were deployed on a shellfish lease off Westport, CT. Before deployment, the lease was dredged and species of local fauna recorded. Following remote setting techniques, oyster seed-on-shell was released with, and without, biodegradable New Zealand mussel socking. Seedless cultch for natural recruitment was deployed as the control. Oysters were sampled monthly during low tide. Oyster shells from each specimen group (n=30) were collected and counted to evaluate average survival and mortality of the set. One-hundred oysters were then measured to determine growth, and predators and fouling organisms were recorded. Preliminary results indicate lower initial mortality and greater growth in oyster set deployed in biodegradable netting. Netted, un-netted, and cultch samples exhibited substantial sets of fouling organisms such as *Crepidula fornicata, C. plana, Balanus balanus*, and *Anomia simplex*. Predators include *Urosalpinx cinera, Eupleura caudata*, and *Panopeus herbstii*. Early results demonstrate the potential of biodegradable netting as an effective predator control and offset to disease outbreaks or lack of natural recruitment.

MATERIALS & METHODS

Getting Ready for Deployment

- The lease was chosen off the coast of Westport, Connecticut, owned by Norm Bloom and Son L.L.C. clams and oysters.
- Benthic species were dredged in order to provide a clear area for the project.
- All species lifted from the lease were recorded as to provide insight into the fauna expected to affect oyster growth and survival, i.e. predators and fouling organisms.
- The lease was then transected into three distinct sections and marked by cinderblocks and bamboo poles.

Bamboo poles mark transected area

- Disease-resistant "Clinton" oysters were conditioned for 4 weeks in the Noank hatchery in the spring of 2012.
- Broodstock were spawned, and oyster larvae were placed into remote setting tanks where seed larvae settled upon whole cultch shells.
- Set-on-shell was bagged and submerged in the nearby estuary until being delivered to the Milford laboratory in June.

Deployment Day

- Disease-resistant remote-set oysters were counted to determine the average number of set per cultch shell. This number is to be used as a comparison from which survival rates may be measured.
- A sample size of n=30 shells was used and the corresponding average number of oyster set per shell recorded.
- 100 oysters measured to establish the original average size at the time of deployment.
- Sample sizes are carried through to the subsequent sampling dates.

- Half of the set is removed from the plastic mesh packaging and bagged using two types of New Zealand mussel socking: one made of pure cotton, the other with a 60% polyester/20% cotton material.
- Types of biodegradable netting were chosen given previous and concurrent tests for mesh size, durability, and degradation times.
- Set is divided into two distinct variables: set-on-shell, and set-on-shell in biodegradable netting.
- Oysters were carefully deployed in their designated transects. Plain aged oyster cultch was also deposited on the lease in the middle transect.
- Cultch serves as a control to observe any natural oyster set on the lease and was deployed in the middle transect as a distinct boundary between the two other variables.

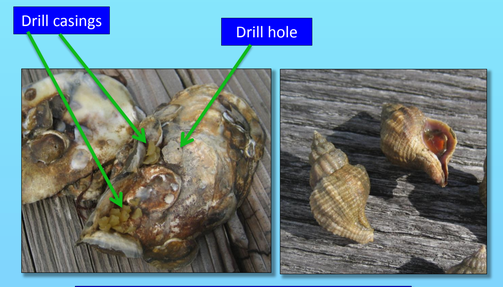
6/20/12

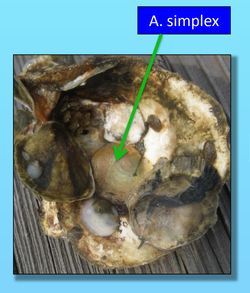
7/26/12

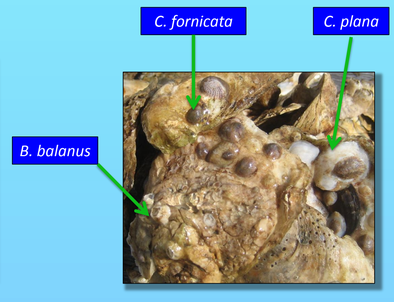
8/16/12

PRELIMINARY RESULTS

- Species dredged from lease: *Limulus polyphemus*, *Anadara ovalis,* and *Hyas araneus*.
- Fouling organisms: *Crepidula fornicata, C. plana, Balanus balanus*, and *Anomia simplex*.
- Predators noted: *Urosalpinx cinera, Eupleura caudata*, and *Panopeus herbstii.*







Samplings suggest that the oyster drill, *Urosalpinx cinera*, was a primary predator.

- Observational data suggests higher clustering of netted oysters, than those with no biodegradable netting; un-netted oysters were more scattered across the transect.
- Plain cultch shells exhibited highest amount of fouling, and there was relatively equal fouling on netted versus un-netted oysters.
- Oysters with and without netting exhibited similar growth patterns and size frequencies.
- Biodegradable netting did not increase growth of remote-set oysters.
- Natural set became evident near September and two distinct oyster size classes were visible: natural and remote-set.
- Cultch began to show measureable natural set in October.
- In comparison to plain cultch shells, the frequency of natural set per shell was significantly higher on shells with remote-set oysters already present.

Oysters were manually collected from water for measurement samples; observe relative oyster size on 8/8/12.

Set-on-shell in Biodegradable Netting

Set-on-shell No Netting

Cultch

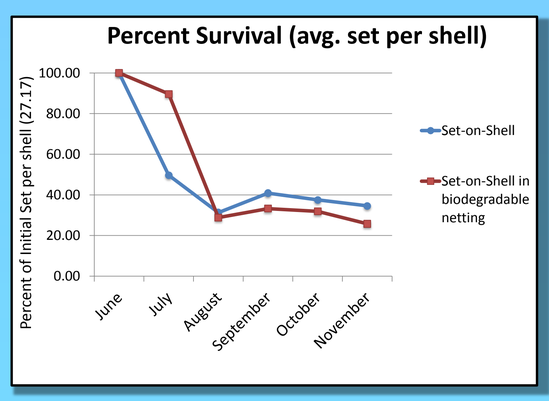


Figure 1. Percent Survival of Remote-set disease-resistant oysters. Initial survival from June to July much great in oysters with biodegradable netting, but as netting disintegrates, survival falls to equal set-on-shell with no netting.

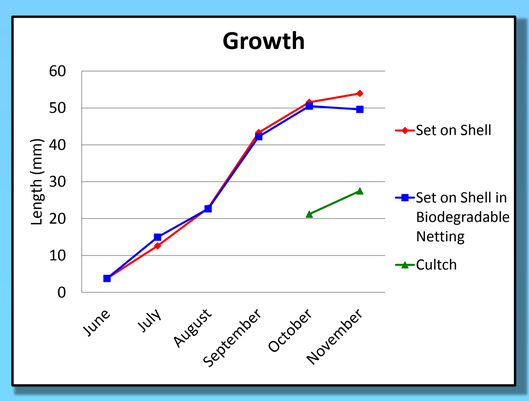


Figure 2. Growth curves of set-on-shell with and without biodegradable netting. Growth of natural set observed on cultch included for months set was observed.

CONCLUSIONS

- Deploying remote-set disease-resistant seed shows high potential for enhancing Connecticut's natural oyster beds.
- Net materials disintegrated too quickly to provide remote-set oysters with any significant benefit.
- According to the data, a net that persists for longer in the environment will serve as a better predator deterrent and may increase oyster survival percentages beyond the critical first month.
- Cultch showed much heavier fouling suggesting that organisms preferred setting on bare cultch in comparison to shells deployed with spat in the hatchery.
- Natural set appeared to settle largely on shells already deployed with seed oysters rather than plain cultch. This may be in part due to the high frequency of fouling organisms already present on the cultch at the time of natural recruitment.
- Results demonstrate the capacity for remote-set disease-resistant oysters to fill the gaps between years with successful natural set; thus providing a cushioning for the Connecticut commercial oystering industry.

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