"Bar Cleaning" in Oyster Restoration

A Consensus Statement from the
University of Maryland Center for Environmental Science
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The Issue

"Bar cleaning," or the removal of as many existing oysters as feasible, has become a regular component of oyster restoration projects in Maryland. The primary objective of this practice is to reduce the reservoir of the disease-causing pathogen *Perkinsus marinus*, which causes the oyster disease known as Dermo in advance of placing Dermo-free oyster spat on the restoration site. Bar cleaning, in this sense, refers to removal of diseased oysters and not "cleaning" of shells buried under accumulated layers of sediment.

Bar cleaning is typically accomplished by repeated dredging under power using a commercial dredge on a planned restoration site and the area surrounding it. This has the additional benefit of employing watermen in the process, thereby engaging them as supportive partners in the oyster restoration effort. The success of these activities has stimulated interest in expanding the bar cleaning program beyond potential restoration sites, with the ultimate goal of reducing Dermo to a very low level within an entire tributary or portion thereof.

Concerns have been raised that expansion of bar cleaning may further deplete the populations of oysters capable of spawning and contributing to natural oyster recruitment. Because the present populations of oysters are so sparse, it has been suggested that larval abundance, and thus spat set, is presently limited by the abundance of potential parents. Furthermore, it has been argued that widespread removal of oysters during bar cleaning or other power dredging could result in the elimination of surviving oysters that may be genetically more resistant to disease.

The Statement

Scientists with expertise in oyster biology, restoration, and management within the University of Maryland Center for Environmental Science met to discuss their diverse perspectives on bar cleaning and power dredging. They developed this consensus statement to offer the Center's best scientific advice to decision makers, managers, stakeholders and partners in oyster restoration. The rationale for each statement is provided as a series of points below each statement.

Consensus Advice

1. **Bar cleaning of infected oysters is an important part of Maryland's restoration strategy. Bar cleaning should be conducted within a prescribed radius of the restoration site. As a general guideline, this radius should be one nautical mile,**

but may vary depending on environmental conditions (e.g. in low salinity areas where disease transmission rates are low) and additional findings. It should proceed within a tributary river only in conjunction with restoration activities, ideally as part of a phased strategy of gradually expanding the restoration efforts throughout a river system.

- Studies have demonstrated that the rates of infection and related mortality of planted disease-free oysters are significantly lower when the number of pre-existing diseased oysters is reduced.
- Under the low-salinity conditions prevailing in most Maryland waters, Dermo infection is transmitted over relatively short distance (less than 1 km, or 0.6 mile); consequently, a one nautical mile clearing zone appears to be a reasonable guideline. However, when salinity becomes unusually high, such as during a drought, the rate of infections may increase dramatically and extensively, defying even the best efforts to control Dermo infections through bar cleaning.
- Removal of mature oysters over a broader area in regions where they could possibly produce surviving larvae might reduce local recruitment and eliminate more resistant survivors. Our current understanding of the spatial relationships between spawning stock and recruitment makes it difficult to predict the effect of large-scale bar cleaning. Recent research suggests that oysters may be recruited locally to a greater extent than previously believed. Thus, conserving local broodstock, at least where there may be some prospect for reproduction, may be an important means of maintaining genetic diversity.

2. **Oysters removed by bar cleaning are potentially valuable to the restoration effort, either as hatchery broodstock or through strategic relocation to enhance local recruitment. Each restoration site should have a clearly defined plan that outlines the proposed use of these oysters and maximizes restoration objectives. Factors that should be taken into account in the plan include: genetics, disease, local environmental conditions, logistics, and economic feasibility. If removed oysters are used in an attempt to enhance natural recruitment, they should be planted far away from restoration sites to avoid disease transmission, at sites likely to enhance spawning productivity, and in dense plantings to further promote spawning success.**
   - There is a continuing need for spawning stock for hatchery production. Larger surviving oysters may be particularly useful because of their fecundity and genetic characteristics.
   - Many remnant populations at restoration sites may be so sparsely distributed as to result in very low fertilization success due the dilution of eggs and sperm. Grouping these oysters may increase successful fertilization.
   - Research in Virginia has shown some short-term success in enhancing local spat set by grouping reproductively mature oysters from other sites into a single site. While recognizing differences in conditions for reproduction and disease pressure, such strategic deployments, if carefully monitored, could be an important part of an adaptive management approach to oyster restoration.

3. **Expansion of power dredging outside of its use in restoration-related bar cleaning should be considered with caution. There should be clear evidence that such expanded power dredging is not harmful to the recovery potential of oyster populations.**
   - With Maryland's oyster populations reduced to very low levels, more efficient harvesting techniques may reduce the number of potential spawners and lower the population's reproductive success.
   - There is no definitive evidence that power dredging increases the success of natural spat set by exposing buried shell. Shell exposed in this manner appears to silt over rather rapidly in most areas. Other techniques will likely have to be employed to recover sufficient shell to increase the area of oyster habitat suitable for larval settlement.
   - Where there are both strong and predicable spat set and disease hot spots (e.g., Tangier Sound region), it is possible that power dredging may pose relatively less risk of reducing reproductive success. However, power-dredging should not be undertaken unless there is compelling evidence that these activities would not result in depleting the populations (recruitment is at least equal to fishing mortality), as evidenced by monitoring of recruitment for at least three years. If implemented, any power dredging should be carefully managed to minimize the mortality of longer-lived, potentially more disease-resistant individuals, such as through the use of sanctuaries or size restrictions.

Scientists participating in the Consensus

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