VIMS Urges Caution in Commercial Release of Non-Native Oysters to Chesapeake Bay

By David Malmquist

Two recent VIMS publications help provide a scientific basis for decisions concerning the potential use of non-native oysters to help rejuvenate Virginia's ailing shellfish industry and the Chesapeake Bay ecosystem.

The publications are based on five years of research by VIMS scientists. Their carefully controlled field experiments with small, sterilized populations of the Asian oyster *Crassostrea ariakensis* show that this non-native species grows faster and is more disease resistant than the native oyster *Crassostrea virginica*—while tasting just as good.

These promising results suggest to some oyster farmers, watermen, and resource managers that Chesapeake Bay be opened to large-scale aquaculture using sterile *ariakensis*. Others go a step further, arguing for introduction of reproductively capable *ariakensis*, in hopes of establishing a wild population to provide some of the ecological benefits once afforded by the native oyster.

The VIMS' publications address both possibilities. The *Statement on the use of* Crassostrea ariakensis *in Chesapeake Bay* advises against intentional release of reproductively capable *C. ariakensis* into the waters of the Commonwealth, calling it "imprudent" at this time in light of the uncertain ecological consequences of introducing non-native species. The statement also argues that any decision to release fertile *ariakensis* into Virginia waters should include stakeholders beyond the Commonwealth, "for the obvious reasons that colonization is enabled by larval transport and that risks and merits of this species may vary spatially."

The VIMS' statement views the use of sterile *ariakensis* more favorably, but urges a cautionary approach. The statement advocates caution in light of experimental evidence that sterilized oysters may regain reproductive capacity in the field, and recognition of the greater risk of accidentally releasing fertile individuals if and when small-scale field trials shift to large-scale commercial operations. The statement advocates continued testing in light of the oyster's potential economic and ecological benefits. It notes that "carefully designed and monitored commercial trials serve the dual purpose of providing data on the long-term aquaculture potential and the ecological impacts of this species."

Hatchery manager, Ron Zebal, placing non-native oysters in an isolation tank.

The second VIMS report describes and codifies the "biosafety protocols" developed by VIMS researchers over the last five years to minimize the risk of accidentally introducing fertile *ariakensis* into the Chesapeake. This report was approved by the Virginia Marine Resource Commission in January, and will serve as a biosecurity blueprint for any future VIMS research on *ariakensis* or other non-native species.

Triploid *Crassostrea ariakensis* grown in the VIMS hatchery.

The report, *Standing Policy for Non-native Oyster Research in Virginia*, specifies five levels of biosecurity tailored to prevent accidental release of non-native species (or any diseases they might carry) during any stage of the organisms' life cycle. The first level entails quarantine procedures in VIMS' Gloucester Point hatchery for newly imported adult animals. These procedures are designed to prevent imported adult organisms from escaping into Bay waters, and, just as importantly, from introducing to the Bay any diseases, parasites, larvae, or gametes.

Subsequent biosecurity levels apply to second-generation organisms that have been certified disease free. These measures focus on preventing the release of adults, larvae, and gametes, and are used at Gloucester Point and the VIMS Eastern Shore laboratory in Wachapreague. They employ physical barriers to prevent the escape of adults and juveniles, and treatment with chlorine to kill any larvae or gametes in wastewater. For field trials with non-natives, the controls specify deployment of sterile organisms only. The report also specifies safeguards to prevent release due to poaching, vandalism, and severe storms such as hurricanes. Soon, most, if not all, non-native oysters will be kept in VIMS' new Kauffman Aquaculture Center, a first of its kind for isolating oysters in quarantine.

The *Standing Policy* report mostly describes biosecurity measures that have been in use since VIMS first began working with non-natives. The only exception is a plan to relax the existing labor-intensive protocols during winter, when water temperatures lower than 12°C (54°F) render oyster reproduction moot, as gametes are inviable and spawning impossible.

Standing Policy cites the use of sterile animals as a key factor in preventing the accidental introduction of *ariakensis* to the Bay. VIMS' researchers render oysters sterile through chemical treatment or selective breeding. Both methods produce "triploid" oysters with three sets of chromosomes, rather than the pair of chromosomes carried by regular diploid oysters. The extra set of chromosomes renders triploid oysters sterile. However, field tests show that some triploid oysters can over several years begin to revert to an intermediate condition wherein they contain both triploid and diploid cells. This raises the possibility that some triploid oysters may eventually regain reproductive capacity (although this has not been observed).

The report describes numerous safeguards designed to ensure the sterility of field-test oysters. These include genetic testing of sperm, larvae, and spat to ensure their triploid condition before any field releases, and routine sampling of deployed animals to track their genetic condition. If sampling indicates a high rate of reversion from triploid to diploid cells, or the presence of viable gametes, the protocols call for immediate removal of the oysters.

To read the full text of these VIMS publications on-line, visit http://www.vims.edu/newsmedia/pubs/index.html