MARYLAND SEA GRANT

CHESAPEAKE QUARTERLY

A Magazine from Maryland Sea Grant

Online Feature

Publish or Patent
An Oyster Makes Legal History

Michael W. Fincham

FOR AMERICAN INVENTORS, the key to profit is a patent — and one key to getting a patent is persistence. As one of the principal inventors of the triploid oyster, an oyster packed with extra chromosomes, Standish Allen applied several times for patents. After all, he invented triploids, not once, but three times with three different oyster species. When he applied for his first patent, however, he lost, and when he appealed, he lost again. But he learned some lessons — and he made legal history.

On the tidal flats of the York River, *Standish K. Allen Jr. checks the work of his hatchery staff at the Aquaculture Genetics and Breeding Technology Center*. Credit: Michael W. Fincham.

His triploid oysters were an invention worth a patent. As their name suggests, triploids carry three sets of chromosomes while natural oysters are born with only two sets, making them diploids. Triploids grow much faster, and since they don't spawn, oyster farmers can sell them year round — usually at a higher price. Triploid versions of the native Chesapeake oyster are now being grown by oyster farmers in Virginia, and may soon make their appearance on Maryland oyster farms. Until it was discovered, the technique for creating triploids was not obvious; it was complicated and remains so today.

Allen first discovered the technique in 1979 while a beginning graduate student at the University of Maine. Through laborious trial and error he worked out a convoluted sequence of laboratory steps that included the carefully timed application of a toxic chemical called cytochalasin B. The technique created baby oysters carrying three sets of chromosomes. The species he worked on was *Crassostrea virginica*, the Eastern oyster native to the Atlantic coast and Chesapeake Bay. He applied for no patent on the work, however, and published the results in a research article coauthored with his mentor, Jon Stanley, and his advisor, Herb Hidu.

His next success with triploid oysters came in 1984 while he was a PhD student at the University of Washington. Working with his research partner, Sandra Downing, Allen created a triploid version of *Crassostrea gigas*, an oyster native to Japan that had been successfully transplanted to the west coast of America and renamed the Pacific oyster. Working with Coast Oyster Company, a subsidiary of Hilton Seafoods, the two grad students developed techniques for using the chemical to create triploids in large batches in a commercial hatchery. At the urging of Hilton Seafoods, the students then joined with a Hilton employee and tried to patent both the process and the product — the triploid oyster itself.

In a historic case the U.S. Patent Office denied their patent in, claiming — ironically enough — that anyone who read Allen's first publication could figure out how to create

Maryland Sea Grant
5825 University Research Court
Suite 1350
College Park, MD 20740

triploids using this chemical process. "Because we had been completely naive about intellectual property," says Allen, "we had published how to make a triploid." His technique was now part of "the art of oyster breeding." By publishing his earlier work in a science journal, a key step in his career path as an upcoming scientist, Allen lost his chance for a patent.

Allen and his new partners appealed, claiming the technique was new because they were applying it to a different species. In 1987,however, the Board of Patent Appeals and Interferences again denied them, citing the same reason: their chemical process was no longer original because it was part of the published literature. But in a groundbreaking addendum the Board announced — for the first time in history — that patents could be granted on living animals altered by science.

In shutting the door on Allen's triploids, the Board of Appeals opened the legal door for hundreds of other biotech researchers. A year later in 1988 the Patent Office cited the *Ex parte Allen* case, when it issued the first patent on a living animal to a Harvard researcher who had created a lab mouse that was hyper-susceptible to cancer. Those decisions set off debates in the press and in Congress about the ethical dilemmas implicit in "patenting life." Despite the debates, the door was open now: a biotech revolution was gearing up and scientists immediately began flooding the Patent Office with applications. Stan Allen's losing case had become a landmark in American patent law.

Allen had learned his lesson. In his next legal foray, he went for the patent first and science publication second. Allen and Downing soon developed a different technique for creating triploids, one that applied hydrostatic pressure to oyster larvae in order to create large batches of triploids in a commercial hatchery. They applied again, and in 1989 they won a patent for their new process.

In his third legal venture Allen tried to patent yet another new oyster, a tetraploid oyster that he invented in 1993 while working with Ximing Guo at the Haskins Shellfish Research Laboratory. Tetraploids carry four sets of chromosomes, and that makes them worth a patent: breeding tetraploids with diploids is clearly the most efficient way to create highly marketable triploid oysters. Along with Guo, Allen applied again and won again. This time, thanks to his earlier case, *Ex parte Allen*, he was now able to patent the product itself, a living animal called the tetraploid oyster.

Nearly all triploid oysters now coming to market now are bred with tetraploids, including the Pacific *gigas* oyster grown on the west coast and in other countries and the *virginica* oyster native to the east and gulf coast states. Using his patented tetraploids, Allen was able to create triploid versions of a third species, the Chinese oyster, *Crassostrea ariakensis*, the non-native species that was tested in Chesapeake waters for a decade before being rejected in 2009 as a supplement to the Bay's disease-stricken native oysters.

The patent on *tetraploid* oysters is now jointly held by the two scientists and Rutgers University. Which means that the hatcheries that use tetraploids — whether privately owned or university operated — have to arrange licensing rights with 4Cs Breeding Technology, a company set up by the patent holders.

In a final irony, just as triploid versions of the native Chesapeake oyster were beginning to be more widely adopted in Virginia, Allen decided to sever any profit-sharing relationship to 4Cs Breeding Technology. The purpose of the parting was to avoid conflicts of interest that could arise from his job as director of the Aquaculture Genetics and Breeding Technology Center at the Virginia Institute of Marine Science. Allen say he was uncomfortable trying to serve two groups: the oyster industry in Virginia that now uses triploid oysters and the 4C's company that licenses any commercial use of triploids. As the key inventor of triploids and tetraploids Allen only consults with the company now, primarily as a technical adviser on their international accounts.