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CLOSED-CYCLE MARICULTURE IN MARYLAND, VIRGINIA, AND DELAWARE: AN EXAMINATION OF THE ADAPTABILITY OF EXISTING FISHERY LAWS TO NEW TECHNOLOGY†

JOSEPH BOCKRATH* AND DIANA WHEELER**

INTRODUCTION

As closed-cycle mollusk mariculture, the artificial cultivation of marketable marine shellfish, approaches commercial feasibility, legal barriers posed by existing statutes are of increasing concern. Application of statutes obviously not intended to regulate closed-cycle mariculture, combined with uncertain economic factors, may deter growth of this potentially important new industry and defeat the ultimate objective of natural fisheries laws, maintenance of the quality and quantity of the fish resource of the state. Although artificial cultivation of shellfish could be permitted by enlightened construction of statutory schemes drafted to enable a flexible response to changes in technology or precisely drawn to limit regulation to natural fisheries, in some states new fisheries legislation undoubtedly will be needed. This article will examine present fish-

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1. For a discussion of institutional problems, such as permit requirements, see T. Kane, Aquaculture and the Law, Nov. 1972 (U. Miami Sea Grant Tech. Bull., number 2).
2. Statutes designed for the protection of natural fisheries probably would not allow for technological advances within the shellfish industry, and such regulations might discourage the establishment of a closed-cycle mariculture plant. However, statutes could be designed with sufficient flexibility to accommodate innovative developments without sacrificing effective protection of the natural fishery. A state might not necessarily wish to have legislation that would allow changes in the economic structure of the fishery because technological advances in the methods of taking and cultivation might be perceived as a threat to the economic viability of the traditional oyster fishery. Consequently, legislation discouraging the development of closed-cycle mariculture facilities within the state could be viewed as beneficial to fishermen.

Judicial interpretation of state statutes also aids in determining local attitudes towards the natural fishery and the perceived necessity of protecting it from all potential competition. An abundance of litigation concerning these statutes might indicate tension between the traditional oyster and threatening competition. Maryland, which has produced the only important decisions in the tristate region being considered in this study,
eries statutes in Maryland, Virginia, and Delaware in the context of the possible development of a closed-cycle mariculture industry, and will conclude that some statutory modification will be required in each state to accommodate recent advances in mariculture technology.

The closed-cycle mariculture system closely approximates natural marine environment and life support mechanisms, thereby allowing the production of mollusks by artificial means. Two basic subunits are contained in the system: the algal culture (the food supply) and the mollusk culture (the product of the system). The algae and the water in which

has been notoriously antagonistic toward the private cultivation of mollusks. Power, *More About Oysters Than You Wanted to Know*, 30 Md. L. Rev. 199, 202-16 (1970). The absence of important cases in the courts of Virginia and Delaware seems to indicate significantly less hostility toward the competitors of the traditional mollusk fisheries in these states.

3. Animals have certain requirements for life, and these requirements must be met whether the animals are growing in the wild or in a controlled environment. Any system, natural or artificial, capable of maintaining healthy organisms, must meet biological demands by supplying the organisms with food as well as vital inorganic nutrients, and by removing organic waste and other toxic substances.

Oysters can be used to illustrate how an artificial system must function to sustain the animals' health. Necessary inputs to the oyster tank include food, oxygen, and calcium. A multispecies algal diet is sufficient to serve as the sole food source of the oysters. See C. Epifanio & C. Mootz, Growth of Oysters in a Recirculating Maricultural System (Pub. No. 102, Coll. of Marine Studies, U. of Del.). Oxygen can be supplied by aerating the water with an internally circulating system. One of the most important inorganic elements is calcium. Because adult oysters are typically 80 percent calcium by weight, they require substantial amounts of this element to maintain normal rates of shell growth. See, Galtsoff, *The American Oyster*, 64 U.S. Fish & Wildlife Serv., Fishery Bull. 1 (1964).

Metabolic waste products must be removed from the oyster tanks because they become toxic to the animals as the concentration increases. Solid wastes accumulate as a sediment in the bottom of the tray and can easily be removed. Ammonia, which is excreted by the oysters into the water, is toxic to animals, but plants are able to utilize it as a source of nitrogen. Consequently, the dissolved portion of the oyster waste can be used to provide an important nutrient for raising the algae, the food supply of the system. See Eppley, Rogers & McCarthy, *Half-saturation Constants for Uptake of Nitrate and Ammonium by Marine Phytoplankton*, 14 Limnology and Oceanography 912 (1969).

Like the oyster tank, the algal culture is a restricted system which requires environmental controls to remain life sustaining. In addition to ammonia, the production of algae requires the input of light, carbon dioxide, trace metals, and micronutrients. See Ukeles, *Continuous Culture—a Method for the Production of Unicellular Algal Foods*, in *Handbook of Phycolgical Methods* (J. Stein ed. 1973); Glen, *Mass Culture*, in *Handbook of Phycolgical Methods* (J. Stein ed. 1973). The algae perform, in effect, a waste treatment process on the oysters' dissolved waste. If other food sources are developed and used in place of algae, a mechanical waste treatment procedure will have to be implemented to remove excess ammonia from the system.

it is grown are pumped into large mollusk tanks. The water in the tanks is aerated to supply the animals with oxygen, and the wastes are removed from the tanks in bulk. As the water flows out of the mollusk tanks and back to the algal culture, filters remove suspended waste and unused algae. Further purification is effected by ultraviolet treatment and an activated charcoal filter. Finally, the purified water, containing ammonia, reaches the algae tanks and the cycle is completed. The system is totally independent of any natural marine environment, being more readily analogous to a manufacturing plant than to the traditional fishery industry: rather than simply exploiting a natural resource, the system


5. A closed-cycle mariculture facility will be able to compete successfully with a viable traditional fishery only if its product is at least nearly equal to the naturally produced product in taste and cost. It may be, however, that a somewhat higher cost per unit will be offset by the lower risk of health hazards inherent in products produced in a relatively pollution-free environment. Oysters can again be used to illustrate how improvements on the natural product might be achieved. Potentially, the closed-cycle mariculture system can free the oyster market from the inconvenience of seasonal availability and can guarantee a product of the highest quality. Under natural conditions, oysters spawn during the summer months and state laws typically prohibit the taking of oysters during this period. In a mariculture facility, oysters can be induced to spawn at any time. See Maurer & Price, Holding and Spawning Delaware Bay Oysters (Crassostrea virginica) Out of Season, 1. Laboratory Facilities for Retarding Spawning, 58 Proc. of the Nat'l Shellfisheries Ass'n 71 (1968). The resulting larvae settle, after a three week maturation period, on material which is called cultch. When removed from this substrate, the young oysters continue to grow without attachment. See C. Epifanio & C. Mootz, supra note 3. The resulting cultchless oysters have a high market value as cocktail oysters.

To make a mariculture facility maximally profitable, the product must be grown to marketable size as rapidly as possible, with minimal mortality. To this end, new and faster-growing hybrids might be developed. In addition, the threat or presence of disease may necessitate the use of antibiotics. Food and drug laws that forbid the sale of mollusks treated with antibiotics may discourage entrepreneurs from venturing into mariculture because they cannot risk the possibility of an entire crop of healthy animals becoming unsalable.

Another area of confrontation between mariculture and the law may be pollution. Although mariculture facilities use natural waters as the original source for the water in the recirculating system, the applicability of local fishery bans during periods of pollution is questionable. To insure the health of its animals, the facility must maintain much higher standards of water quality within the system than those outlined by the law as acceptable in the natural environment. All water entering the system is sterilized to kill harmful organic elements such as pathogenic viruses and bacteria. After filters remove suspended particles, the water undergoes ozone treatment and filtration through activated charcoal. Furthermore, the recirculating water is given this treatment during each cycle as the water leaves the oyster growing tanks and returns to the algal cultures. Inorganic pollution, however, may be a problem since mollusks have the ability to collect heavy metals in their tissues. See Galtsoff, supra note 3, at
produces the resource that is to be exploited. Thus, the closed-cycle process fits awkwardly at best within statutory schemes enacted to protect natural marine assets rather than to regulate the artificial production of mollusks.

Certain general principles and problems are common to the fishery laws of most states. Before examining particular state statutes, consideration will be given to some of these transcending features, including the ownership and regulation of fish, as well as to definitional problems associated with the application of fishery laws to mollusk mariculture.

Problems of Definition

This article is concerned primarily with oysters and clams, both of which are mollusks and are included, in general usage, under the broader designation "shellfish." These animals, however, also may be categorized as fish under the generally accepted definition of that term. Consequently, laws that refer to fish, and not specifically to mollusks, arguably can be applied to oysters and clams when more specific legislation is lacking.

Statutes pertaining to the oyster fishery are generally more fully developed than those concerning other mollusks, and the varying degrees of state and private ownership of oyster fisheries have been explicated by some legislatures and court decisions. An "oyster bed" is simply "a place where oysters grow or are cultivated." More specifically, a "natural oyster bed" is one that has not been cultivated by man and is large enough to be the subject of successful exploitation, while an "artificial oyster bed" is one that has been planted and is located in any area where oysters do not grow naturally. A "privately owned oyster bed" is an artificially cultivated area that has been leased from the state; since leasing of natural beds would interfere with the common right of fishery, a private oyster bed must necessarily be an artificial one. A "private pond" is a body of water that lies entirely on the property of the owner and is not

383. The effects of harmfully high concentrations of heavy metals have not been studied, but should this factor present a threat, an additional chemo-mechanical procedure could cope with the problem.


7. Id. at 857.

8. Taylor v. Hancock, 227 Ala. 645, 647, 151 So. 596, 598 (1933), quoting WEBSTER'S NEW INTERNATIONAL DICTIONARY.


10. See id.

connected with other waters through which fish could escape. Although private ponds generally are associated with finfish rather than shellfish, the concept of a self-contained body of water in which fish live and propagate may be analogous in law to a closed-cycle mollusk mariculture facility.

Generally, the location of the mollusks' habitat will determine ownership, for fish, including shellfish, in their natural environment, are *ferae naturae* and as such are the property of the state. Fishery legislation generally regulates the state's own property, which is property common to all citizens, and permits private individuals to acquire property rights only by specified methods and procedures. Thus, individuals may acquire rights in mollusks only to the extent allowed by the state. Even after mollusks have been taken and reduced to possession, the state may regulate and restrain private ownership.

When taken out of their natural environment, mollusks cease to be wild animals and are appropriate subjects of private ownership. Ownership of cultivated shellfish is established when legal rights to the subsoil on which they grow are acquired. These rights may be secured through leasing from the state or by confining fish in a private pond and thus

13. Leonard v. Earle, 155 Md. 252, 258, 141 A. 714, 716 (1928); State v. Theriault, 70 Vt. 617, 622, 41 A. 1030, 1032 (1898); State v. Lipinske, 212 Wis. 421, 249 N.W. 289 (1933). The concept of state ownership of natural resources "is now generally regarded as but a fiction expressive in legal shorthand of the importance to its people that a state have power to preserve and regulate the exploitation of an important resource." Toomer v. Witsell, 334 U.S. 385, 402 (1948). Laws enacted pursuant to this fundamental power to regulate fisheries often impose criminal penalties for violations. Being criminal in nature, such statutes are strictly construed in favor of the individual. See Collins v. Bankers Accident Ins. Co., 96 Iowa 216, 219, 64 N.W. 778, 779 (1895) (strict construction of a statute forbidding the obstruction of the free passage of fish in navigable waters).
14. Washington Kelpers Ass'n v. State, 81 Wash. 2d 410, 415, 502 P.2d 1170, 1172-73 (1972). Power to control the shellfish industry is derived from the state's responsibility to regulate the exploitation of important resources, Toomer v. Witsell, 334 U.S. 385, 393-94 (1948), and more specifically, to regulate fish as an important consumer resource, People v. Bridges, 142 Ill. 30, 41-42, 31 N.E. 115, 118 (1892).
16. See cases cited note 15 supra.
17. See Windsor v. State, 103 Md. 611, 618-19, 64 A. 288, 291-92 (1906); State v. Lipinske, 212 Wis. 421, 249 N.W. 289 (1933). But see McKee v. Gratz, 260 U.S. 127, 135 (1922) (finding possession of shellfish to be in the owner of the land and not the state, but acknowledging the state's power of regulation over the shellfish).
acquiring absolute ownership with exclusive fishing rights. There is, however, no uniform position as to the state's power to regulate private fisheries.

In order to protect the resources of all its citizens, the state may enact statutes that restrict the size, manner, and time of taking, as well as the possession and sale, of fish. Legislation may establish, for example, minimum dimensions below which mollusks may not be taken. Such statutes at times have been held applicable to the harvesting of oysters from private beds, although similar statutes have been held inappropriate to regulate the taking of oysters from private, leased oyster grounds.


20. State v. Lipinske, 212 Wis. 421, 249 N.W. 289 (1933) (state cannot prohibit removal of fish from nonnavigable water of private fish farm).


[The legislature] may regulate the public or private fisheries. They may even prohibit free fishing for a time and for such times as in their judgment it is for the best interest of the state so to do. They may withhold from the public use such natural oyster beds ... or other fish beds as they may deem desirable. ... [T]hey may delegate the administration of their regulations to such officers or boards as they may see fit.

Id. at 327, 77 A. at 158.

The state, however, may lose control of fisheries in self-contained bodies of water. In State v. Lipinske, 212 Wis. 421, 249 N.W. 289 (1933), the Supreme Court of Wisconsin held that:

When the animal or fish ceases to be wild in the legal sense, the power of the state over it ceases except such power as the state has with respect to the general property of its citizens. This seems elementary. Whether a landowner propagates fish in a glass bowl, a water tank, or a pond, such fish are not wild so long as they have no connection with navigable waters and so long as they are subject to the dominion and control of the owner. It appearing without dispute that the waters are not navigable, have no connection with navigable waters, that the fish sought to be taken are those planted in the waters wholly within the control of Farms, Inc., or propagated on the premises from legally possessed fish, we see no basis upon which the power to prohibit the taking of such fish therefrom can be based.

Id. at —, 249 N.W. at 291.

22. See Christy v. Clark, 195 Md. 66, 69, 72 A.2d 718, 720 (1950) (restrictions on possession of certain size oysters held applicable to oysters purchased out of state but brought to Maryland); Windsor v. State, 103 Md. 611, 616, 64 A. 288, 290 (1906) (restrictions on possession of certain size oysters held applicable to owners of private oyster beds). See also Commonwealth v. Gilbert, 160 Mass. 157, 160, 35 N.E. 454, 455 (1893) (sale of trout taken from private waters during closed season held to be a violation of ordinance forbidding sale of fish during closed season).

23. Department of Tidewater Fisheries v. Sellers, 201 Md. 603, 95 A.2d 306 (1953) (size
Similarly, statutes may require the use of special tools in the harvesting of fish to the exclusion of all other implements and methods, or may establish times during which fish may be taken. Such regulatory provisions also have been held applicable to fish propagated in privately owned waters. Laws that restrict the possession of fish have been applied to fish from private ponds and oysters taken from privately owned beds; courts even have upheld laws that applied the prohibition of sales during the closed season both to fish caught in public waters and to fish propagated on private property.

"Waters" and "waters of the state" are the most important terms upon which the applicability of a law to closed-cycle mariculture may depend. "Waters" usually implies a body of water or an aggregate of such bodies. Moving water is regarded as common property, while impounded standing water is subject to private ownership; therefore, the term "waters of the state," when used in reference to fishing laws, is usually construed as meaning public waters in contrast to private waters. Private waters may come under state regulation, however, by being waters under the jurisdiction of the state, which, as the Supreme Court of Michigan stated in People v. Lewis, "does not mean public waters only as distinguished from private ponds and lakes . . . . It signifies the power to declare and enforce the law as well as the territory within which such power may be exercised." This power to control private waters within the state derives not so much from a power to regulate the waters themselves, but from the "power to preserve and regulate the exploitation of an important resource." If the state feels that unequal restriction held not applicable to oysters gathered by private individuals on subsoil leased from state in view of longstanding administrative policy of nonenforcement).
application of the law to public and private waters threatens a public resource, then it may exercise jurisdiction over the resource grown in private waters.36

The foregoing definitional problems, and other problems inherent in the development of closed-cycle mariculture, will now be examined in light of the particular laws of the three Chesapeake Bay area states.

APPLICATION OF SPECIFIC STATE LAWS

Maryland

Under the Maryland Code, the waters of the state include both surface and underground waters of the state subject to its jurisdiction.37 Because the crucial language "subject to its jurisdiction" is employed, it might be argued that a closed-cycle mariculture system is included within the jurisdictional definition of waters of the state, since the state has control over the exploitation of resources.38

The Maryland Code divides the waters under state jurisdiction into two mutually exclusive categories: tidal and nontidal waters. "Tidal

37. The Maryland Code provides:
"Waters of the state" includes both surface and underground waters within the boundaries of the state subject to its jurisdiction, including that portion of the Atlantic Ocean within the boundaries of the state, the Chesapeake Bay and its tributaries, and all ponds, lakes, rivers, streams, public ditches, tax ditches, and public drainage systems within the state, other than those designed and used to collect, convey, or dispose of sanitary sewage. The flood plain of free-flowing waters determined by the department on the basis of the 50-year flood frequency is included as waters of the state. Md. Nat. Res. Code Ann. § 8-101(k) (1974) (second emphasis supplied).
38. For example, the Maryland Code authorizes the Department of Health and Mental Hygiene to close polluted areas. If the Department "determines by appropriate investigation that any area of waters of the state devoted to production or storage of shellfish is polluted so that shellfish produced or stored in the area are a hazard to public health, it shall restrict the area for the catching of shellfish." ld. § 4-742(a). A closed-cycle mariculture facility might be exempted from this health regulation if the waters circulating within the closed-cycle system are not considered "waters of the state." If the facility does contain waters of the state, they should be considered separately from offshore waters, since the closed-cycle mariculture facility is a sufficiently distinct system to merit individual consideration. For example, if shellfish grounds in an entire county were closed due to polluted conditions offshore, the closed-cycle facility should be considered separately, and if found safe, excluded from the prohibitions. In contrast, the Virginia pollution statutes avoid ambiguity created by the phrase "waters of the state" by applying their regulations to any place in the state from which shellfish are taken for food purposes. See notes 80-81 infra & accompanying text.
water" designates "water below a point where the tide ebbs and flows," predictably, "non-tidal water" means "water above a point where the tide ebbs and flows." Since an onshore closed-cycle facility would be located above a point where the tide ebbs and flows, the facility would fall under the plain meaning of "non-tidal water."

Apparently, mollusks, especially oysters and clams, were not intended to be included among the fish regulated in sections dealing with nontidal waters. First, the Code provides that "'game and freshwater fish' means fish found in nontidal water, including but not limited to, a pond, lake, or canal, whether publicly or privately owned." While this language may possibly be construed to include closed-cycle facilities if the phrase "game and freshwater" is read as a single modifier of the word "fish," saltwater inhabitants would be excluded not only from its meaning, but also from subsequent sections pertaining to fish and fisheries in nontidal waters. Further, nowhere in these sections regulating game and freshwater fish are shellfish or mollusks cited; the only specific references in the nontidal sections are to various species of finfish, and extensive oyster and clam legislation is found in other sections of the Code. Clearly, the legislators did not anticipate the development of a structure, designed for the purpose of cultivating marine animals, containing seawater located above the point where the tide ebbs and flows.

Many Maryland statutes impose restrictions upon the catching of an organism. "Catch" is defined in the Code to mean "to take, kill, trap, gather, harvest, or in any manner reduce any fish to personal possession." The focal concern pertaining to the application of this term to closed-cycle mariculture is the distinction between ownership and personal possession. The lessee of an oyster bottom has "exclusive ownership of and title to all the oysters planted by him or existing on the

40. Id. § 4-101(h). If closed-cycle mariculture facilities were deemed to be within the definition of nontidal waters, section 4-602 would allow the Secretary of the Department of Natural Resources to control the operation of the facility. This section states: "With due regard for distribution, abundance, economic value, and breeding habits of fish in nontidal waters, the Secretary may adopt rules and regulations to extend, restrict, or prohibit catching, possessing, purchasing, transporting, or exporting fish from nontidal waters." Id. § 4-602(a).
41. Id. § 4-101(g).
42. Id. §§ 4-1001 to -1119.
43. Id. § 4-101(b).
leasehold.” Since Maryland permits private ownership of oysters cultivated on leased lands, it would seem reasonable that the mariculturist who owns the facility in which oysters grow would have similar property rights in his oyster crop. But ownership does not entail possession. The meaning of “catch” for oysters grown on leased lands is best rendered by “harvest,” the act or process of gathering a crop. If this process consists of the removal of oysters from their growing environment for commercial or personal use, then oysters in a closed-cycle mariculture system theoretically could be “caught” when taken from their trays and packed for market. Even though the Maryland definition of “catch” may seem sufficiently broad to include the closed-cycle mariculture facility within its scope, it would seem more logical that closed-cycle mollusks be considered to be in the personal possession of the entrepreneur at all times, therefore being incapable of further reduction to personal possession. Such an interpretation would obviate many of the potential difficulties posed by the construction of Maryland law, for all references in the Natural Resources Code that regulate the catching of mollusks would be made irrelevant to the closed-cycle situation.

Because most of the laws in Code subtitles 4-10 (Oysters and Clams) and 4-11 (Oyster and Clam Culture) that could be applied to a closed-cycle system use the terms “catch” and “waters of the state,” only a modification of these statutes will be sufficient to clarify the law in respect to closed-cycle mariculture. Statutes pertaining to leased oyster grounds, which are included in the subtitle on oyster and clam culture, apply only to submerged lands leased from the state, however, and are thus inapplicable to closed-cycle systems, although the exemption from restrictive regulations given the private oyster industry may be taken as a measure of the state’s willingness to condone and support these private

44. Id. § 4-1114(a).
45. The Maryland Code avoids the use of “waters of the state” in regulations authorizing the quarantine of shellfish: “To protect the shellfish resources of the state, the department of Natural Resources may adopt rules and regulations prohibiting the importation of any shellfish and quarantining any area within the state populated by shellfish infected or affected or suspected of being infected or affected by any destructive disease, deleterious genetic characteristic, dangerous parasite, or other biological threat.” Id. § 4-743. The directive “to protect the shellfish resources of the state” is more extensive than “waters of the state,” for it cites a purpose that must be effected regardless of place. While this statute is an important regulatory measure, it is not necessarily prohibitive of the success of a facility.
46. Id. §§ 4-1108 to -1119.
47. Id. §§ 4-1101 to -1119.
enterprises. If the state’s attitude is consistent, the same leniency could arise in relation to closed-cycle mariculture.

The Maryland Code allows only residents of the state to “catch oysters or clams on any area in the waters of the state from which catching oysters or clams is permitted . . .” 48 Similarly, only residents may lease grounds from the state to be used for “protecting, sowing, bedding, or cultivating oysters or other shellfish . . .” 49 and corporations and joint stock companies are denied the privilege of leasing any submerged land of the state for cultivation purposes. 50 Although the closed-cycle facility would not be located on leased submerged land, and therefore the applicability of these regulations to closed-cycle mariculture is unclear, the attitude toward investment by corporations in the fishery resource appears to be inhospitable.

The Maryland Code regulates, to some extent, methods of harvest: 51 “A person may catch oysters or clams in the waters of the state only by rakes, tongs, patent tongs, dredges, handscrapes, cultch material suspended on strings, in trays, in bags, or similar devices. Soft shell clams may be caught by hydraulic or mechanical dredges or rigs.” 52 While the use of “catch” and “waters of the state” may exclude closed-cycle facilities from the meaning of the law, this Code provision would seem to allow the methods that most likely would be utilized in closed-cycle oyster mariculture harvesting. The private oyster-culture laws provide less restrictive regulations in regard to the methods of harvesting: “A lessee may cultivate or remove oysters planted on his leased oyster bottom in any manner he deems proper, if he complies with the provisions of this subtitle [11] relating to dredging and tonging when transplanting oysters or catching them for commercial purposes.” 53 Both dredging and tonging require licenses under all circumstances. 54

Maryland exercises its right to impose restrictions on the times and seasons during which shellfish may be taken: “A person may not catch oysters on Sunday or between sunset on any day and sunrise on the following day . . .” 55 In addition, section 4-1017 states that a “person may

48. Id. § 4-1003.
49. Id. § 4-1108(a).
50. Id.
51. See, e.g., id. §§ 4-1005, -1011 to -1013.
52. Id. § 4-1005(a). As to clams see id. §§ 4-1021 to -1023, -1036 to -1039.
53. Id. § 4-1116(a).
54. Id. § 4-1116(b).
55. Id. § 4-1008(a).
not catch or possess oysters between April 15 and September 1.” 56 A tonging season 57 and a dredging season 58 are also imposed by the Code. Less restrictive legislation is in effect for private oyster grounds leased from the state. Oysters on leased bottoms may be caught for commercial purposes throughout the year, between sunrise and sunset of any day except Sunday. 59 Where year-round oystering is legal, a person may possess oysters at any time. 60 An application of the more stringent restrictions prohibiting catching and possession of oysters from April 15 to September 1 to closed-cycle mariculture would negate one of its primary advantages, the ability to produce marketable oysters and clams throughout the year by manipulating the breeding cycle and accelerating growth.

While a mariculturist could argue that he was not catching the oysters within the meaning of the Code, it would be futile to deny that he was in possession of them. The New York Court of Appeals, in People v. Buffalo Fish Co., 61 addressed itself to the meaning of a prohibition of the possession of fish during a closed season, although the decision dealt with fish imported from Canada, and the interpretation of the court is relevant only by way of analogy. The court stated that:

The word “possessed” obviously refers to those fish the catching or killing of which is forbidden; that is to say, fish in the waters of this state, and not those procured in a foreign country. It is simply a perversion of the statute to hold that the mere possession by any person within this state of the fish described in the statute during the closed season is a violation of it, without regard to the place where it was procured, or to the manner obtained. 62

According to this interpretation, the word “possession” in section 4-1017 would apply only to illegally caught fish. It also could be argued that this restriction refers only to the public oyster grounds since the Code provides separate regulations for leased oyster grounds. Thus, since the

56. Id. § 4-1017(c).
57. Id. § 4-1008(b) (September 1-March 31).
58. Id. § 4-1008(c) (November 1-March 15).
59. Id. § 4-1114(d).
60. Id. § 4-1017(c). This section states in pertinent part: “In counties where oysters may be caught from leased areas at any time pursuant to the provisions of Subtitle 11, a person may possess oysters at any time.”
61. 164 N.Y. 93, 58 N.E. 34 (1900).
62. Id. at 98, 58 N.E. at 36.
Maryland Code mentions only two types of grounds, public and private, the prohibition on catching and possession must refer to the public oyster grounds, which are unquestionably in state waters. Closed-cycle mariculture would not be included within the meaning of this statute, since the restriction would apply only to oysters caught in the natural oyster beds of the state.\(^3\)

Laws regulating the minimum size of marketable oysters are entwined with the state's cull laws, which regulate the return of undersized oysters and excess shell material to the oyster bed. This cull procedure is intended to permit small oysters to live to marketable size and to provide cultch material for future generations. While the first provision of the cull section does not appear to be applicable to closed-cycle mariculture because of repeated references to the culling of oysters on the natural bars on which they are caught,\(^4\) the second paragraph is not qualified by references to natural bars of waters of the state: "A person may not possess . . . oysters less than three inches from hinge to mouth."\(^6\) Culling young oysters from the marketable oysters would be unnecessary since all oysters in a tray reach maturity at approximately the same time. Because this provision prohibits the possession of oysters less than three inches long, however, it would be useless for the mariculturist to deny that he possessed the oysters in his facility prior to their sale, especially if he were to have argued that he could not "catch" oysters that were already in his personal possession. Perhaps an argument based on an interpretation of possession as found in Buffalo Fish Co. could be used to extricate closed-cycle mariculture from the meaning of the statute.

The final paragraph of the oyster cull statute provides that the entire section applies to "oysters in the shell found anywhere within the state, whether afloat or ashore, and whether said oysters have been caught

\(^{63}\) See notes 9-12 supra & accompanying text. Similarly, a statutory provision prohibiting oystermen from cultivating oysters of any species other than *crassostrea virginica* would appear to be inapplicable since the closed-cycle mariculturist will not be a lessee of submerged lands. Md. Nat. Res. Code Ann. § 4-1115(a) (1974). Enforcement of a similar statute against closed-cycle mariculture facilities would discourage the development of more valuable species and hybrids.


\(^{65}\) Id. § 4-1015(b). See also id. § 4-1031 (prohibiting possession of hardshell clams having transverse dimensions of less than one inch). The third paragraph of the culling section provides that a "person may not transport or attempt to transport outside the state oysters measuring less than three inches in length from hinge to mouth regardless of whether they are caught on the natural bars of the state or from private beds and lots in the state." Id. § 4-1015(c). This provision is unimportant since a mariculturist would have no reason to ship or attempt to sell nonmarketable, undersized oysters.
within the waters of the state or shipped or brought into the state."  

This provision, although not unconstitutional on grounds of illegal interference with interstate commerce, has been seriously questioned in relation to leased private beds in *Department of Tidewater Fisheries v. Sollers.* The result of this case is not directly applicable to the closed-cycle system since indoor oyster beds are not leased from the state. The rationale of the decision is relevant to closed-cycle mariculture, however; the court based its decision on the following principle:

"[I]f the language [of a statute] is fairly susceptible of more than one construction, the Court may seek the legislative intention by considering the facts of contemporary history, the prior state of the law, and the particular evil, abuse or defect which the statute was designed to correct and the remedy which was intended. The statute should then be so construed that all of its parts harmonize with its general scheme to effectuate the Legislative purpose." 

The court pointed out that three subsections of the statute governing private oyster culture increased the freedom of the oyster farmer to plant and harvest whenever the condition of his beds so allows. The first subsection provides that the lessee acquires exclusive ownership and title to the cultivated oysters. The second provides that he may remove the oysters in any manner that he deems proper, so long as he secures any required license for tools employed. Furthermore, the section provides that the lessee may harvest oysters throughout the year, regardless of the season. The court determined that these special privileges, in conjunction with the complete omission of culling from the specific restrictions on oyster culture, supported the argument that oysters of any size could be taken from private grounds without culling. Finally, an expert on oysters testified that culling would be ecologically unsound, undermining the objectives of the legislation. These considerations led the court to conclude that "the cull law is not applicable to oysters gathered by private planters from their leased lots." 

66. *Id.* § 4-1015 (d).
68. 201 Md. 603, 95 A.2d 306 (1953).
69. *Id.* at 611, 95 A.2d at 309.
70. *Id.* at 611-12, 95 A.2d at 309.
71. *Id.*
72. *Id.*
73. *Id.* at 614, 95 A.2d at 311.
74. 201 Md. 603, 616, 95 A.2d 306, 312 (1953).
The cull law is important in relation to natural oyster bars in that it prohibits the taking of oysters and clams before they reach breeding and marketable size and it induces further culture growth. Possession of undersize oysters and clams by mariculturists, however, is not contrary to the purpose for which the law was drafted and should not be considered a violation of it.\textsuperscript{76}

\textbf{Virginia}

In Virginia, legislation regulating shellfisheries is now in effect as to oysters, clams, scallops, and surf clams.\textsuperscript{76} As the extent of these laws varies with the importance of the individual fishery, the majority of regulations pertain specifically to oysters, the dominant sector of the industry. Although legislation pertaining to clams is less extensive, it tends to parallel the oyster sections in purpose and in scope. Provisions regarding scallops are very limited and include only regulations of seasons, size limits, and public scallop grounds.\textsuperscript{77} The only surf clam statute authorizes the Commission of Fisheries “to promulgate such regulations as it deems necessary and appropriate to promote the conservation and wise use of the surf clam resource.” \textsuperscript{78}

The shellfishery in Virginia is subject to specific health provisions in the Code,\textsuperscript{79} which provide that the Health Commissioner of Virginia has the authority to examine fish and shellfish at any place in the state to determine matters of public health.\textsuperscript{80} The state thus regulates all shellfish industries regardless of location. Because the phrases “waters” or “waters of the state” do not appear, ambiguity of interpretation in relation to closed-cycle systems is avoided, and there is no question that


\textsuperscript{77} \textit{Id.} §§ 28.1-162 to -163.

\textsuperscript{78} \textit{Id.} § 28.1-120.1.

\textsuperscript{79} \textit{Id.} §§ 28.1-175 to -183.2.

\textsuperscript{80} \textit{Id.} § 28.1-175 provides in pertinent part:

For the purpose of protecting the fish and shellfish industries of the State, as well as the public health of the country, and preventing the sale of fish and shellfish which are deemed unfit for market, the State Health Commissioner is hereby directed in his discretion, or at the request of the Governor or the Commission or Commissioner of Fisheries, to make an examination or analysis of the fish and shellfish, whether on the planting grounds, in packinghouse, or in any other place or places in this State, from which fish and shellfish are to be taken or sold for food purposes.
closed-cycle mariculture facilities would be included within the scope of this section.

The Virginia Code further authorizes the Health Commissioner to be the "sole judge as to whether or not such fish, shellfish and crab meat are sanitary and fit for market and also of such standards, examinations, analysis and inspection." 81 Thus, the Commissioner is given some discretionary power which can be used to evaluate new or unique combinations of factors that combine to shape individual pollution cases. 82 As a result, these applicable health provisions are flexible and adaptable to new technological changes in the shellfish industry, such as closed-cycle mariculture.

The legal structure in Virginia, allowing for the leasing of grounds, pertains primarily to oyster culture. The Code applies these same provisions to clams, 83 but there are no provisions for the leasing of grounds for the purpose of scallop culture. Laws governing private leased grounds, and laws governing public grounds, exhibit striking differences in the amount of jurisdiction granted the Commission of Fisheries. The dichotomous nature of the statutes requires a careful wording; as a result, the regulatory statutes have been constructed with a precision that elucidates the legal status of closed-cycle mariculture.

81. *Id.* § 28.1-176. The Code provides further for the criteria to be used in closing a growing area:

> When from examination of or analysis of the shellfish in a shellfish growing area, or the bottom in or adjacent to such area, or the water over such area, or the sanitary or pollution conditions adjacent to or in near proximity to a shellfish growing area the State Health Commissioner determines that the shellfish growing in such area is unfit for market, he shall, after notifying the Commissioner of Fisheries . . . [cause the area to] be condemned, and remain so until such time as the Health Commissioner shall find such shellfish or area sanitary and not polluted.

*Id.* § 28.1-177. In short, the Health Commission, through inspections, may determine that pollution or unsanitary conditions exist in any of three areas: the packing-house, the shellfish themselves, or the oyster ground.

While health regulations should be applicable to any industry that produces marketable food, they need not affect the normal operations of a properly functioning plant. Unsanitary packing conditions and tainted oysters would not exist in a correctly operating closed-cycle facility. If the ocean water from which a mariculture facility replenishes its water was found unsuitable for the taking of shellfish, condemnation of the facility would not necessarily follow, for the purification and sterilization procedures performed on incoming water by the facility should be sufficient to render it immune to almost any pollution threat.

82. See *id.* §§ 28.1-177 to -178, -183.

83. "All provisions in this title referring or relating to the leasing of oyster grounds shall also include the right of the Commission to lease grounds for the purpose of planting, growing, storing and harvesting clams." *Id.* § 28.1-110.
The Code regulates the mollusk industries through restrictions on methods of taking, times and seasons of taking, and size. Laws concerning the planting, growing, storing, and harvesting of oysters on both public and private grounds are the most fully developed. The only oyster harvesting implements restricted by the Code are patent tongs, dredges, and scrapes. The use of tongs for “taking or catching oysters from the natural or public rocks, beds or shoals of the Commonwealth” is unlawful in the geographical areas specified in this section. Under no circumstances can the weight of the tongs exceed 100 pounds or the teeth exceed 4 inches. Neither private oyster grounds nor closed-cycle facilities come within the meaning of this regulation.

The use of dredges and scrapes as implements for taking oysters “from any public rocks, beds, or shoals in this State” is also illegal. Permits are available, however, to allow the use of dredges and scrapes in private oyster beds. Dredging by permit is lawful at any time, except on Sunday and at night. Although dredging would not be used to take oysters from a closed-cycle mariculture facility, the authorization of dredging and scraping in private oyster beds, without the limits of a closed season, is an indication of the extent to which the legislature is willing to concede special rights to the privately owned oyster.

Through the state’s sovereign power, Virginia exercises the right to protect and control the fisheries by imposing a closed season on the taking of oysters “from the natural, or public oyster beds, rocks, or shoals in any of the waters of this Commonwealth . . . .” The length of the season varies with the method of taking and with the geographic region, but applies only to oysters taken from public oyster grounds, so that closed-cycle mariculture would be excluded from the scope of the law.

Further restrictions are placed on taking by the provision stating that no “person shall take oysters or clams in the waters of this State, from either public or private grounds, on Sunday or in the nighttime between the hours of sunset and sunrise . . . .” Although this regulation does

84. Id. § 28.1-83.
85. Id. §§ 28.1-83(1) to -83(6).
86. Id. § 28.1-84.
87. Id. § 28.1-128.
88. Id. § 28.1-134.
89. Id.
90. Id. § 28.1-82.
91. Id.
92. Id. § 28.1-139. But see id. § 28.1-139.1 (permitting the taking of clams on Sunday if done by hand or handrake and for household consumption).
include both public and private grounds, the phrase "waters of this State" may make the statute inapplicable to a closed-cycle facility.

Other provisions regulate the size of oysters: "It shall be unlawful for any person to buy, sell, or possess oysters under the prescribed size [three inches in length] and shells so taken from the natural rocks, beds, and shoals." Since the size restrictions are applicable only to oysters that have been grown in natural oyster beds, oysters spawned within a closed-cycle mariculture facility would be exempt.

The law regarding clams renders it "unlawful for any person to harvest or ship any clams smaller in size than the legal size fixed by the Commission." A mariculture plant would have no apparent reason to "harvest or ship" a clam product smaller than the legal limit, and this regulation does not include a prohibition on possession. In relation to scallop cultures, however, the Code states that "it shall be unlawful for any person to take, catch, or have in his possession scallops of a size smaller than one and three quarter inches . . . ." Although this statute clearly is intended to apply only to publicly controlled scallops, the wording should be changed if Virginia desires to promote closed-cycle scallop culture.

Because nonindigenous species may prove easier to raise for market than local varieties of mollusks, mariculturists might be desirous of importing mollusks for cultivation. If the internal waters of the mariculture facility are considered "waters of the state," the statute regulating the importation of shellfish for introduction into the state would be applicable to a closed-cycle system. This statute provides that a shellfish can be legally imported for the purpose of introducing it into the waters of the state only if:

(a) The . . . shellfish is coming from within the continental United States from a state or waters which is at that time on the Commission's list of approved states and waters, and is a species which is at that time on the Commission's list of approved species; or (b) The person, firm or corporation has notified the Commissioner of such intent and has received written permission from the Commissioner.98

93. Id. § 28.1-124 (cull statute).
94. Id. § 28.1-125.
95. Id. § 28.1-120(6).
96. Id. § 28.1-163(3).
97. See id. § 28.1-183.2.
98. Id.
Even if the mariculture waters are considered to be within the scope of this statute, cultivation of foreign species is possible under the above statute, which is sufficiently flexible to accommodate closed-cycle mariculture if necessary.

To qualify for residency as the term is used in the Virginia fisheries statutes, a person must be either a taxpayer who has maintained a residence within the state for one year or a purchaser of land in Virginia. In either case, he must actually live in the state for four months prior to making any application for a fishing license. No person other than a resident may "take or catch fish or shellfish, in any of the waters of this State, or in any of the waters under the jurisdiction of this State, for market or profit, . . . or . . . rent any oyster-planting grounds, or plant shellfish in any of the waters of the State, or waters under the jurisdiction of the State . . . ." Furthermore, except as minority stockholders of an authorized corporation, nonresidents may not have an interest in a business that involves the taking of shellfish for market or profit in Virginia waters.

Corporations may engage in oyster culture on grounds leased from the state. Nonresidents can participate in the venture as long as 60 percent of the stock is owned by Virginia residents. Within the corporation, the workers employed in planting, cultivating, selling, and marketing the oysters must be Virginia residents, and the principal place of business for marketing and selling must be located within the state. These provisions, although somewhat restrictive, could be financially advantageous to Virginia. While some financial support is allowed from outside the state, jobs are created for Virginians and the majority of the income from the corporation remains within the state. This type of statute may do more to protect and encourage the shellfish industries of the state than a more restrictive statute, such as Maryland's, which completely prohibits corporate participation in the industry.

The relevance of these residency laws to closed-cycle mariculture revolves around the meaning of "waters of the state" and "waters under

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99. Id. § 28.1-121.
100. Id.
101. Id. § 28.1-122.
102. Id. § 28.1-123.
103. Id. § 28.1-109(2).
104. Id.
105. Id.
106. See note 50 supra & accompanying text.
the jurisdiction of this state.” Undoubtedly, it would be most convenient for a facility to hire residents to operate the plant, but some financial backing from out-of-state investors may be necessary. Since no regulations are in effect for mollusk grounds on lands other than those leased from the state, no restrictions presently exist for this type of investment. However, in view of the attitude of exclusivity prevalent in the Virginia and Maryland statutes, the state may be moved to invoke restrictions for the new facilities with the advent of commercially viable closed-cycle mariculture.

Overall, the Virginia Code exhibits a progressive attitude toward privately owned fisheries. The statutes concerning the sale of artificially propagated fish provides an example of this attitude toward fish culture. In the case of trout, the Virginia statute states:

Any provisions of this title to the contrary notwithstanding, it shall be lawful to sell or offer to sell for human consumption trout which have been lawfully acquired provided such trout have been propagated and raised in a hatchery or by other artificial means.

The Commission of Game and Inland Fisheries shall by appropriate regulation establish a practical system of identification of trout so offered for sale for table use.107

This Virginia law explicitly approves the unrestricted sale of artificially propagated trout. Furthermore, the legislature directs the Commission of Game and Inland Fisheries to develop a practical method of identifying cultured trout, thereby obviating an objection raised by courts in other states.108 Through this legislation, Virginia is both encouraging trout culture and protecting the natural populations. A similar statute applying to closed-cycle mariculture is ultimately desirable.

Delaware

The mollusk statutes of Delaware exhibit a very precise construction that eliminates much of the confusion resulting from attempts to apply


108. In Commonwealth v. Gilbert, 60 Mass. 157, 35 N.E. 454 (1893), it was held that a penalty for selling trout out of season applied to artificially propagated fish, notwithstanding a statute permitting their culture. The court reasoned that the law was formulated in this manner to protect naturally occurring trout, and since artificially propagated trout could not be distinguished from the natural populations, all sales must be banned. This interpretation of a law that was intended to encourage the artificial propagation of fish in effect rendered the statute ineffective by making the venture economically unattractive.
Maryland and Virginia laws to closed-cycle mariculture. The meaning of the law and its consequent applicability to closed-cycle mariculture is conveyed by language that exactly defines the extent and intent of the statutes. As a result, the mariculturist will not have any difficulty ascertaining the laws applicable to his facility.

The regulations restricting the involvement of nonresidents in Delaware's shellfishery should have no effect on the mariculturist since the residency requirements are imposed only upon lessees from the state; consequently, neither the mariculturist nor his employees would have to be residents of Delaware. Because the regulations restricting the times and seasons of taking, and the minimum size of mollusks, apply only to oysters and clams in the creeks and rivers of the state, the Delaware statutes have a narrower scope than statutes referring to the "waters of the state." The waters to which a closed season applies are specifically named in the Code, and restrictions on the taking of oysters during hours of darkness are limited to creeks and rivers. Size restrictions contained in the Delaware Code similarly pertain only to oysters caught in certain specified waters of the state. Closed-cycle facilities would be outside the

109. Del. Code Ann. tit. 7, § 2111(c) (4) (1974) provides: "The captain or operator and crews of tonging vessels operating within the public tonging area shall be bona fide residents of the State for 12 months preceding." For the purposes of section 2111, a resident is defined as "any person not an alien who has resided a year or more within this State." Id. § 2111(b) (8). This section would have no effect upon the mariculturist. See id. § 1908(21) (boats used in leased areas must be owned and operated by residents). Section 1908(1) does not allow state leasing of shellfish bottoms to nonresidents.

110. Another provision included among the regulations for leasing acreage under the jurisdiction of the department prohibits nonresidents from being issued a license that allows them to take and catch clams for commercial purposes. Id. § 1908(6). Although this passage does not itself refer to leased land, its inclusion with other rules and regulations which "govern the work of the Department with respect to the leasing of acreage in the areas over which the Department has jurisdiction" places the provision within the context of leasing. Id. § 1908. Such a construction would eliminate the employees of a closed cycle facility from the meaning of the law, since the Department of Natural Resources would not have jurisdiction over the leasing or purchasing of the land of the facility.

111. Id. §§ 2103-04.
112. Id. § 2133.
113. Id. § 2103. A mariculturist would not be exempt from the provision that "all licenses issued by the Department are void on Sundays." Id. § 1906(b).
114. For example, oysters less than three inches in length may not be taken from the Broadkiln River or its tributaries. Id. §§ 2104, 2131. The same size restriction applies to oysters "taken from the public tonging areas in the Delaware Bay" and these small oysters may not "be in the possession of any person after being so taken." Id. § 2111(c) (6).
scope of these statutes, since they would not be located in any of the specified bodies of water. A similar result would obtain for the several Delaware statutes regulating the implements used in harvesting oysters since the Delaware laws declare which methods of taking must be used in certain waters and thus do not totally ban the use of any devices that might be employed in a closed-cycle facility.

The extensive pollution and health regulations outlined in the Maryland and Virginia laws are nonexistent in the Delaware Code. The sole applicable provision provides for the monitoring of the condition of imported oysters and states that "[w]hen any oysters from outside of this State are secured for the purpose of planting in the waters of this State, they shall be accompanied by a certificate of purity from the proper authorities of the State from which obtained. . . ." This being the only Delaware prohibition on importing mollusks for cultivation in state waters, apparently no barriers exist to prevent the introduction of new species or hybrids.

The most important element of the Delaware Code with respect to closed-cycle mariculture is the power of the Department of Natural Resources and Environmental Control to make and enforce new regulations for the shellfish industry. The Secretary could exercise this power to adopt regulations that would facilitate the development of the closed-cycle industry, although, if he perceived closed-cycle mariculture as a threat to the shellfish industry, he could hinder its growth without action from the legislature.

115. First, no mechanical devices using vacuum or suction to catch shellfish are permitted. Id. § 1911. Such instruments would not be required by the mariculture facility. Second, clams may not be taken "in Rehoboth Bay or in Indian River Bay with any rake, dredge, appliance, or device operated by motor power or towed or hauled by a boat propelled by motor power." Id. § 2306. This regulation is inapplicable on two counts: the facility would not be located in those waters and motor powered devices should not be necessary for efficient harvesting. Third, in areas designated as public tonging areas, "No person shall use catching devices other than patent tongs or hand tongs for the catching of oysters. . . ." Id. § 2111(c)(3). Clearly, a closed-cycle facility would not be designated a public tonging area. Finally, the Code states that the department may lease land "for the purpose of planting oysters and clams and catching same by means of dredges, tongs or rakes. . . ." Id. § 1908(2). While these tools might be the only legal harvesting devices on leased lands, the closed-cycle facility would not be included in the leasing regulations.

116. Id. § 1908(17).

117. The Department of Natural Resources and Environmental Control is granted control and direction of the shellfish industry and of the protection of shellfish to preserve and improve the industry throughout the state. Regulations issued by the Department are to have the force and effect of law. Id. § 1907.
CONCLUSION

Increasingly, advances in technology place new stresses on laws that were designed to accommodate one set of circumstances but whose words have effects not considered at the inception of the laws. The applicability of these laws to new situations is largely a function of chance wording, foibles of drafting, or peculiarities of the subject of the law. Rapid advances in closed-cycle mariculture technology will place strains on laws designed to regulate natural fishing. Some states, such as Delaware, have fortuitously drafted fishery laws that will readily accommodate closed-cycle mollusk mariculture. Even though these location-oriented statutes impose no significant barrier to the commercial development of a closed-cycle mariculture facility in Delaware, the fate of artificial shellfish cultivation may depend upon the almost unlimited discretion of the Secretary of the Department of Natural Resources and Environmental Control to regulate the shellfish industry. In Maryland and Virginia the head of the comparable agency does not hold such power, and the degree to which closed-cycle mariculture fits into the present framework of shellfishery laws is directly dependent on the wording and intent of the statutes. Presently, the application of statutes of these two states to closed-cycle mollusk mariculture is sufficiently uncertain to discourage the development of the new industry. Although many Maryland and Virginia statutes governing private mollusk grounds would be appropriate for a closed-cycle facility, these enactments cannot regulate mariculture because they apply solely to lands leased from the state. The remaining mollusk legislation regulates the natural fisheries but the use of terms such as “waters of the state” obscures its applicability to closed-cycle systems. If Maryland and Virginia wish to encourage closed-cycle mariculture development, the adoption of entirely new statutes is necessary.