

ECONOMIC EFFECTS OF REGULATIONS IN MARYLAND OYSTER FISHERY

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Among the many species of shellfish harvested commercially in Maryland, the oyster is the most important by far. It accounts for over half the total value of the State's seafood landings. However, the oyster industry is not what it used to be.

Depletion and Repletion

In the late nineteenth century, Maryland oyster harvests exceeding 70 million pounds per year were recorded (Table 1). These large harvests were far greater than the maximum sustainable yield of the resource;

the depletion of the oyster beds during the period signalled the long-term decline of the fishery. During the first quarter of the twentieth century, oyster landings decreased rapidly--but stabilized later with harvests usually ranging from 10 to 20 million pounds during the next 30 years. Annual landings declined during the late 1950s and early 1960s to an all-time low of less than 8 million pounds in 1963.

To revitalize the industry, the State began an oyster repletion program in 1961. Oyster shells are dredged from nonproducing areas of the Chesapeake Bay and distributed on public oyster bars to provide "cultch" on which the oyster spat can attach and grow. The State also transplants seed oysters from nursery areas to growing areas, where the mature oysters are later harvested. In recent years, over one million bushels have been transplanted annually (table 2). As a consequence, the industry has recovered somewhat during the past few years; the 1966 harvest was over 16 million pounds, nearly double the 1965 landings. Maryland has now regained its position as the leading oyster producing state.

Table 1 - Maryland Oyster Catch, 1880-1966

Year	Catch 1,000 Lbs.	Year	Catch 1,000 Lbs.
1880	71,868	1944	14,127
1888	57,845	1945	15,034
1890	70,852	1946	13,590
1891	67,428	1947	13,077
1897	49,189	1948	13,285
1901	38,548	1949	13,718
1904	29,333	1950	14,406
1908	39,527	1951	14,522
1912	37,273	1952	16,288
1920	30,832	1953	17,434
1925	28,822	1954	20,363
1929	17,185	1955	17,272
1930	17,106	1956	15,844
1931	16,374	1957	14,144
1932	12,985	1958	12,027
1933	11,685	1959	11,966
1934	13,917	1960	11,770
1935	15,584	1961	10,337
1936	16,060	1962	8,138
1937	20,730	1963	7,756
1938	19,363	1964	7,948
1939	20,342	1965	8,620
1940	19,743	1966	11,789
1941	18,816	1967 (est.)	16,730
1942	13,768	1968 (est.)	14,429

Source: U.S. Department of the Interior, "Fishery Statistics of the United States," Annual Statistical Digest, BCF, 1965 and 1966. Catch figures for 1967 and 1968 are BCF estimates.

Table 2 - Oyster Seed Production, Maryland Oyster Propagation Program, 1961-1967

Year	Seed Production 1,000 Maryland Bushels
1961	237
1962	573
1963	932
1964	1,191
1965	1,192
1966	1,364
1967	1,278

Source: "Seed Oyster and Shell Plantings," Annual Report of The Natural Resources Management Division, Department of Chesapeake Bay Affairs, Annapolis, Maryland, 1961-1967.

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Fishery Regulations

Over the years, a complex system of State and county laws evolved in response to the depletion of the oyster fishery. Although these laws protected the resource from even greater depletion, some restrictions militated against economic efficiency.

There are good reasons for regulating fisheries, both from the conservation and the economic point of view. Conservationists wish to maintain the productivity of the resource. However, increasing demand for commercially valuable seafoods forces up the price, thereby drawing more labor and capital into the fishery. Since the increasing fishing effort will, at some point, permanently damage the resource, conservationists argue for regulations designed to forestall its depletion.

Economists argue for regulation on the basis of efficient resource allocation; that is, labor and capital should be allocated among industries in such a way that the total output of the economy is as large as possible. Unfortunately, when the fishing grounds are not privately owned, too much labor and capital enter the fishery^{1/}. Consequently, economists believe that regulations should be imposed with a view toward limiting the quantities of labor and capital employed in the fishery.

Regulations^{2/} employed in the Maryland oyster fishery include: Closed fishing areas, closed seasons, limitations on technology, tax measures, and private leasing of oyster beds.

Closed Seasons and Closed Areas

The season for tonging, the most common method of harvesting oysters in Maryland, extends from the middle of September to the end of March. The season for dredging is slightly shorter; it begins the first of November and closes the middle of March. The State also closes certain oyster-producing areas when deemed necessary to protect against overfishing.

A closed season causes specialized equipment to be idle during part of the year. It

also causes a concentration of fishing effort at the beginning of the season. However, the resulting inefficiencies are relatively unimportant in the Maryland oyster industry. This is because investments in specialized fishing gear are small, and most oystermen work either in other fisheries or on nonfishing jobs when not oystering.

Closed areas cause some fishermen to travel further between home port and oyster beds. However, some beds must be closed to improve their productive capacity in future seasons. Thus, the long-term benefits are greater than the immediate costs.

Limitations on Technology

The limitations on technology in the Maryland oyster fishery are both well known and widely criticized. The complete prohibition on dredging public grounds with mechanical power was recently relaxed to allow power dredging 2 days per week. Only dredging by sail boats is allowed on other days. The impact of this limitation is illustrated by comparing harvesting techniques in the 2 Chesapeake Bay States. In Virginia, where power dredging is lawful 6 days a week, 48 percent of the oysters was harvested by dredges in 1966. In contrast, only 23 percent of the Maryland catch was harvested by dredges.^{3/}

There are at least 2 objections to limitations on technology. First, the enforced inefficiency increases the cost of harvesting a given quantity. Second, the artificially high prices resulting from exclusion of the most efficient harvesting techniques induce too much labor or capital, or both, into the industry. Also, in a long-run context, it may be argued that current limitations on technology discourage innovation. A potential innovator may, with some justification, expect the passage of a new regulation outlawing any new efficient gear that he may develop. This would explain why the harvesting methods in the Maryland oyster industry are virtually the same as the methods of the nineteenth century.

Tax Measures

Taxes are taking on an increasingly important role in regulating the Maryland oys-

^{1/}The economic theory underlying this statement is discussed in the Crutchfield and Zellner reference.

^{2/}A detailed discussion of fishery regulations can be found in the Scott reference.

^{3/}Fishery Statistics of the United States, 1966."

ter industry. The 1968 session of the State legislature raised the tax on locally produced oysters from 2 cents to 25 cents per bushel ^{4/}. Also, it increased the tax on oysters shipped out of the State in the shell from 2 cents to 10 cents.

A simulation model of the Maryland oyster industry was used by the authors to evaluate the economic impact of various tax rates. The simulation results (Table 3) include the projected 1975 price, fishing effort, oystermen's income, and tax revenue under three alternative tax rates: 0.31 cent per pound (2 cents per bushel), 3.88 cents per pound (25 cents per bushel), and 5.88 cents per pound.

Table 3 - Projections of Maryland Oyster Industry Under Alternative Tax Levels, 1975

	0.31	3.88	5.88
Tax rate (cents per pound) . .	0.31	3.88	5.88
Price (cents per pound)	91.4	87.7	85.7
Effort (men) ^{1/}	4,012	3,919	3,866
Net income per man (dollars) . .	2,567	2,526	2,502
Tax revenue (thousand dollars)	42	526	797

Source: The projections were obtained from a simulation model of Maryland oyster industry. The model will be presented in a forthcoming University of Maryland Agricultural Experiment Station bulletin.
^{1/}Effort is defined as number of full-time equivalent oystermen.

An increase in the tax rate causes a decline in the exvessel price and a fall in oystermen's net incomes. So, there is a decline in fishing effort as some oystermen leave the industry or cut down the number of days fished.

The higher tax rates coupled with only minor changes in landings results in substantial increases in tax revenues. By setting an appropriate tax rate, the State can collect enough revenue to pay for the oyster repletion program.

Private Leasing

If the oyster beds were controlled by individuals, there would be no need for legal restrictions limiting fishing effort. Long-term leases on oyster beds enable the fisherman to cultivate the beds just as a farmer cultivates his land. If there were a large number of competing firms, as in U.S. agriculture, private leasing would promote efficient use of labor and capital inputs. In addition, the resource would be conserved be-

^{4/} A Maryland bushel contains 6.3 pounds of oyster meats and usually returns between \$4 and \$5 to the oysterman.

cause the renter would have the same incentive for conserving his oyster bed as the farmer his land.

Table 4 - Total and Private Catch in Leading Eastern Oyster Producing States, 1966

State	Total Catch	Private Catch	Percent Private
			Percent
. . . . (1,000 Lbs.)			
Maryland . .	11,789	1,437	12
Virginia . . .	9,443	4,639	49
Louisiana . . .	4,764	3,741	79
Texas	4,725	199	4
Florida	4,292	238	6
South Carolina	2,615	2,615	100
Mississippi . .	2,232	0	0

Source: "Fishery Statistics of the United States, 1966."

Private leasing is common in many states (Table 4). About 79 percent of the 1966 Louisiana oyster production and 49 percent of the Virginia production were harvested from private beds. On the other hand, only 12 percent of the 1966 Maryland production and 4 percent of the Texas production were landed from private grounds. The argument against extensive private leasing is a non-economic one; namely, that residents of a state should have free access to publicly owned natural resources. Thus, the private ownership question is a question of value judgments, which must be decided in the political arena.

As the above percentages indicate, Maryland has attempted to steer a middle course by leasing some Chesapeake Bay bottom while leaving most acreage open to public fishing. Certain areas may be leased if the area does not contain a natural oyster or clam barrens if the area produced no marketable oysters in the last 5 years prior to application. As a consequence of these rather severe restrictions, a relatively small acreage has been leased.

Conclusions

The many regulations applied to the Maryland oyster industry all tend to reduce pressure on the fishery resource, thereby contributing to the conservation goal. On the other hand, some regulations, particularly limits on technology, hinder the efficient use of labor and capital. However, there is some tendency to move in the direction of regulations conformable with economic efficiency. Notable changes are the partial relaxation of the prohibition on power dredging and the increased tax on oyster landings.

the absence of a large increase in private leasing, which is unlikely, restrictions will be required to protect the fishery resource. As a result, there will probably be

no radical changes in the foreseeable future in regulations pertaining to closed seasons, closed areas, and fishing gear.

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