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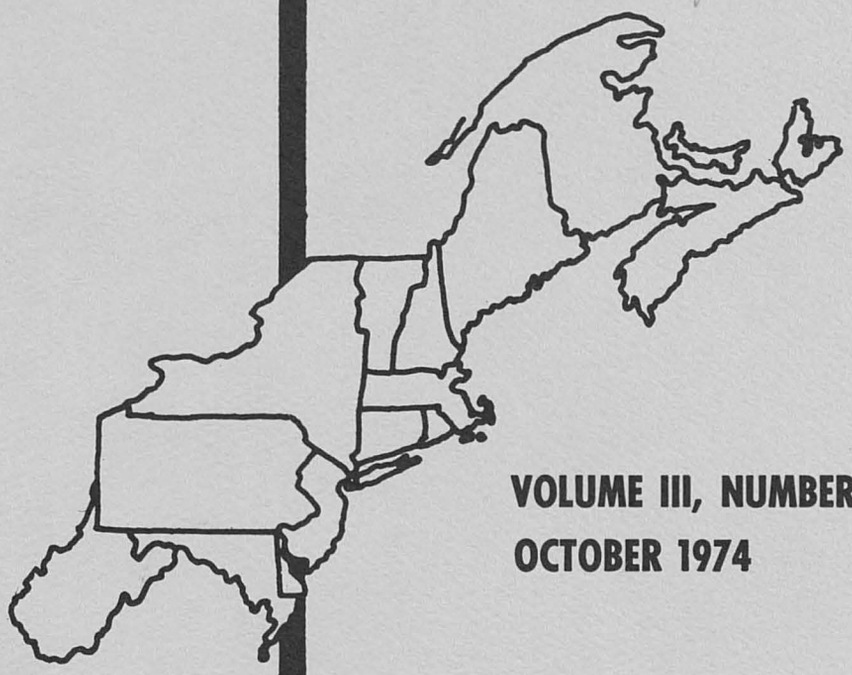

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THE FEASIBILITY OF MARKETING MAINE RAISED OYSTERS

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At the present time the value of oyster production in Maine is minimal because the native species, Crassostrea virginica, will not survive in economic numbers, through the larval stage in Maine's cold waters. There is some indication that Ostrea edulis (the European oyster) can withstand colder temperatures and may in fact thrive in Maine's cold waters, offering an alternative for coastal economic growth. This species is raised on a scale and under continuous culture from juvenile to marketable size in other parts of the world. These factors all favor the establishment of a fishery for Ostrea edulis in Maine by adapting the proven hatchery, rearing, and mariculture techniques for this species to Maine's cold water environment. As other scientists began looking into the biological and engineering aspects of raising oysters in Maine it became necessary to consider the marketing aspects of such a venture.

The primary purpose of the study reported in condensed version here was to investigate the feasibility of developing profitable markets for Maine raised Ostrea edulis.

More specifically the objectives were to:

1. Evaluate trends in oyster supplies, including landings, imports, and exports in the United States, Canada, and France.

2. Analyze trends in oyster consumption in the United States, Canada, and France and develop a predictive equation based on factors influencing consumption in each of these areas.

3. Evaluate the economic feasibility of developing a half-shell oyster market for Maine raised oysters.

Procedure

Data on landings, imports and exports were collected for the United States, Canada, and France on the most recent years for which reliable data were available. These data were analyzed to determine if significant trends were present. Through use of a multiple linear regression technique, predictive equations for the demand for oysters in the United States, Canada, and France were estimated. Secondary data was utilized for this phase of the study.

Six purposive samples were chosen to obtain information on volumes of supply of half-shell oysters in Boston, Montreal, and Paris. These areas were chosen to represent the most likely markets for Maine raised oysters. These samples represented shellfish wholesalers, brokers, and restaurants in these cities. The basis for selecting each sample was the likelihood, in the opinion of the researcher, that they handled half-shell oysters.

Questionnaires and personal interviews were conducted with four trucking companies and with officials at the Bangor International Airport and Logan Airport in Boston. The information thus obtained provided the basis for the analysis of marketing costs and returns to would-be Maine producers of half-shell oysters.

This study was severely hampered by a lack of relevant historical information. Data on oysters were not partitioned into the various market classifications. Data on the half-shell trade was practically non-existent.

Oyster Supplies in Selected Countries

The United States, Canada, and France experience many similar supply problems. Pollution, predation, disease, lack of technical innovation, antiquated laws governing the use of the resource, competition from imports, acts of nature, and the disorganized state of the industry apply to the oyster industry in each of these countries.

The domestic landings of oysters in the United States exhibited a gradual downward trend from 1956-1969 with upturns in landings from the immediately preceding year experienced in five of the fourteen years cited (1961, 1963, 1964, 1966, 1967).

The Spearman Rank Correlation Coefficient was used to test for a statistically significant trend in landings. The null hypothesis of a random time series was tested against the alternate hypothesis of a definite trend in landings. The rank correlation coefficient was calculated to be -.7033 and found to be statistically significant as the .005 level of probability.

Oysters imported into the United States from 1956-1970 showed a definite upward trend. In only three of the fifteen years during this time series did imports decrease from the previous year (1964, 1968, 1970). The rank correlation coefficient of total oyster imports during this fifteen year period was calculated to .9321 and found to be statistically significant at the .005 level of probability.

The export of oysters from the United States has decreased over the period from 1956-1970. The rank correlation coefficient of total oyster exports from the United States for this period was calculated to be -.9339 and found to be statistically significant at the .005 level of probability.

Trend analyses, similar to those performed for the United States, were also conducted for Canada and France. The results of the analyses for all three countries are presented in Table 1.

Analysis of Demand

From 1950 to 1971 per capita oyster consumption in the United States exhibited a marked downward trend. Deflated retail price showed a definite upward trend from 1950 to 1967 when deflated prices rose from $0.89 to $1.88 per pound (edible weight). From 1967 to 1971 prices leveled-off fluctuating between $1.64 to $1.69 per pound.

Table 1

Summary of Analyses of Trends in Oyster Landings, Imports, and Exports for the United States, Canada, and France

Years	Supply	R_s*	Significance Level
United States			
1956-1969	Landings	-.7033	.005
1956-1970	Imports	.9321	.005
1956-1970	Exports	-.9339	.005
Canada			
1956-1969	Landings	.5648	.010
1956-1970	Imports	-.2786	N.S.
1956-1970	Exports	-.5946	.005
France			
1956-1969	Landings	.1099	N.S.
1963-1970**	Imports	-.2976	N.S.
1956-1970	Exports	---------Negligible-----	

*Spearman Rank Correlation Coefficient

**Not an adequate number of observations

N.S.=Non-significant at the .100 level of probability

A linear demand function was estimated for oysters in the United States. Per capita consumption of oysters was hypothesized to be a function of deflated price of oysters, deflated per capita disposable

personal income, deflated price of shrimp, and deflated price of crab, that is:

$$Q = a + b_1 P_1 + b_2 Y + b_3 P_2 + b_4 P_3$$

where:

Q = the per capita consumption of oysters,
P_1 = the retail price of oysters divided by consumer price index,
Y = the per capita disposable personal income divided by the consumer price index,
P_2 = the retail price of shrimp divided by consumer price index, and
P_3 = the ex-vessel price of crab divided by consumer price index.

Economic theory suggests that the expected relationships between a commodity and its price is inverse, a commodity and income is direct, and a commodity and the price of substitute goods is direct. Therefore, the expected signs of the regression coefficients would be $b_1 < 0$, $b_2 > 0$, $b_3 > 0$, $b_4 > 0$.

Of the four independent variables used, two of them had the anticipated signs for the regression coefficient (price of oysters and price of crab), while income and the price of shrimp had the opposite signs.

The following equation shows the calculated values for the parameters.

$$Q = 0.7555 - 0.1296 P_1 - 0.0001 Y - 0.0709 P_2 + 0.3774 P_3$$

The squared multiple correlation coefficient was calculated to be .87 and the equation was found to be significant at the .005 level of probability. Of the four independent variables only the regression coefficient for the price of oysters was found to be significant at the .05 level of probability.

Regression analyses, similar to that performed on the data for the United States, were also conducted for Canada and France. The same variables as those used for the United States were used for Canada. However, for France the per capita consumption of oysters was hypothesized to be a function of deflated price of oysters, per capita disposable personal income, and deflated price of Portuguese oysters.[1/] The results of these analyses are contained in Table 2.[2/]

1/ Portuguese oysters (Huitre portuguaise) was hypothesized to be a substitute for oysters (Huitre plate).

2/ Ex-vessel prices were used because retail prices were unobtainable.

Table 2

Estimated Demand Equations and Related Statistical Values
for Oysters in the United States, Canada, and France

Country	Years	a	b_1	b_2	b_3	b_4	R^2
United States	1950-1971	0.7555	-0.1296* (0.0542)	-0.0001 (0.0001)	-0.0709 (0.0793)	-0.3774 (0.6404)	.87*
Canada	1950-1970	0.1909	-0.0079 (0.0113)	0.00001 (0.00005)	-0.0002 (0.0042)	-0.0013 (0.0056)	.07
France	1956-1969	0.8873	-0.3178* (0.1367)	-0.00002 (0.00006)	0.1536 (0.4606)		.35

*Significant at .05 level of probability

a = intercept.

b_1= regression coefficient for price of oysters.

b_2= regression coefficient for per capita disposable personal income.

b_3= regression coefficient for price of shrimp for the United States and Canada, regression coefficient for price of Portuguese oysters for France.

b_4= regression coefficient for price of crab.

Since the regression coefficients for price of oysters in the United States and France proved significant at the .05 level of probability, price elasticities were calculated for these countries. Using mean values for the price of oysters and the consumption of oysters in the United States for the period 1950 to 1971, and the regression coefficient for price of oysters, which was previously found significant at the .05 level of probability, the price elasticity for oysters was calculated to be -0.66.

The demand for oysters appears to be relatively inelastic and, as anticipated, the sign is negative. From 1950 to 1971, as the retail price of oysters rose, the per capita consumption of oysters was declining.

Using a similar procedure for the data from France, the price elasticity of demand for oysters was calculated to be -0.95. This indicates that the price elasticity of oysters is only slightly inelastic.

An interesting result obtained from the demand analyses showed an inverse relationship between the per capita consumption of oysters and per capita disposable personal income for both the United States and France. It is generally believed that most shellfish are normal goods,[3/] that is, that income elasticities are positive.

If this assumption is accepted, the shift in the oyster demand curve can be explained by either:

1. A positive income effect and an offsetting negative shift in consumer preference or

2. A positive income effect and an inability of people to obtain oysters because of diminishing supplies to market.

Either of these explanations would have caused a forced negative correlation between consumption of oysters and income. On the other hand, if it is assumed that consumer preference did not change during the periods under review and that supplies of oysters were readily available, there is an indication that oysters represent an inferioe good. Neither of the income regression coefficients for the United States or France, however, proved to be statistically different from zero using the two-tailed test at the .05 percent level of probability.

In the case of those shellfish that were hypothesized to be substitute goods for oysters, it was found that many of the cross-price coefficients had signs contrary to expectations, but none were statistically significant. Therefore, based on the data used, none proved

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3/ A normal good is one for which the income effect is positive. Quantity demanded always varies inversely with price.

to be substitutes for oysters in either the United States, Canada, or France.

The estimated demand equation for the United States proved to be highly significant. However, the only regression coefficient found to be statistically significant at the .05 level of probability was the price of oysters.

In view of the poor results obtained concerning the demand analysis of oysters for Canada, an attempt was made to explain further the fluctuations of per capita consumption of oysters for the period 1950 to 1970 by introducing other variables into the equation. Prices of clams and quahaugs, prices of lobsters, and prices of scallops were all included. The results of this analysis, however, did not differ significantly from the results obtained in the original analysis (See Table 3). On the basis of these results, it appears that the consumption of oysters in Canada is almost totally unrelated to own-price, disposable income and the prices of other shellfish. Further analysis would be necessary to isolate those variables that do influence the consumption of oysters in Canada.

Data used in this demand analysis of oysters in France were derived from gross F.A.O. statistics and do not take account of changes in inventories, imports, and exports. Therefore, the basis for the conclusions drawn are much weaker than those used in the analysis of demand for the United States and Canada. Referring to Table 2 appears that the per capita consumption of oysters in France is negatively related to own-price, but is almost totally unrelated to disposable income, and the price of Portuguese oysters. The equation itself was found non-significant at the .05 level of probability. Because of this, another analysis was performed where the only independent variable included was price of oysters. This resulted in an equation that proved significant at the .05 level of probability (See Table 3).

The Half-Shell Oyster Market - General Considerations

The half-shell oyster appears to offer the best economic choice to consider if an industry was to develop in the State. Marketing costs considered in this analysis include import duties, value added tax, and transportation costs.

Import duties and value added tax. There are no quantitative restrictions on the importation of oysters into Canada from the United States or any other country.

Oysters in the shell of the type "European flat oysters weighing not more than 40 grams each" imported into France from the United States enter duty-free. All other types imported into France are charged with an 18 percent ad valorem duty on c.i.f. (cost, insurance, and freight) value. In addition, there is a seven percent value added tax assessed on the

Table 3

Revised Estimate Demand Equations and Related Statistical Values for Oysters in Canada and France

Country	Years	a	b_1	b_2	b_3	b_4	b_5	b_6	b_7	R^2
Canada	1950-1970	0.2095	-0.0067 (0.0128)	-0.00006 (0.0002)	0.0122 (0.0248)	-0.0011 (0.0099)	0.0003 (0.0044)	0.0004 (0.0011)	-0.0007 (0.0051)	.15
France	1956-1969	0.9697	-0.3065* (0.1231)							.34

*Significant at the .05 level of probability.

a = intercept.

b_1= regression coefficient for price of oysters.

b_2= regression coefficient for per capita disposable personal income.

b_3= regression coefficient for price of clams and quahaugs.

b_4= regression coefficient for price of crabs.

b_5= regression coefficient for price of lobsters.

b_6= regression coefficient for price of scallops.

b_7= regression coefficient for price of shrimp.

c.i.f. duty-paid value (if the item enters duty-free, the tax is levied only on the c.i.f. value).4/

Transportation costs. In estimating transportation costs the following assumptions were made:

1. Oysters in the shell would be shipped by road as refrigerated, bulk shipments from two potential Maine production areas - Jonesport and Rockland.

2. These weekly shipments from Jonesport and Rockland would occur for forty weeks of the year. None would be shipped during the spawning season (June, July, and August).

3. These oysters would be sent by road from Jonesport and Rockland to Bangor, Maine; Boston, Massachusetts; and Montreal, Canada.

The Boston Half-Shell Market

From the responses contained in the questionnaires, half-shell oysters were found to be available in the Boston trade during the months of September through May with only a limited number available during the summer months. Sources of supply of these oysters were Long Island Sound, Massachusetts, Chesapeake Bay, and New Jersey. A recent wholesale price paid for half-shell oysters in this market was 6.9 cents per oyster.

Respondents in Boston expressed satisfaction with the quality of the oysters that they are currently receiving. They also were satisfied with the uniformity of pack and the availability of the oysters. A few expressed concern over prices, although most respondents seemed satisfied. Prices have remained fairly stable during the previous two years. Nevertheless, the possibility exists that individual producers might be able to gain higher prices based on quality and service, according to responses of traders in the Boston market.

Transportation costs were based on trucking costs from two proposed production areas in Maine (Jonesport and Rockland) to Boston. Estimated shipping costs were found to amount to 1.1 cents per oyster. Assuming the validity of the recent wholesale price of 6.9 cents per oyster and the shipping cost of 1.1 cents per oyster, this would leave 5.8 cents per oyster to cover production costs and profit for the Maine producer (See Table 4). Based on the preceding information, if the would-be oyster producers in Maine are able to meet the following criteria, the Boston half-shell restaurant trade offers an economic outlet for their

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4/ Mullelly, E.F., Acting Director, European Regional Affairs and Trade Regulations Staff, Office of International Marketing, U.S. Department of Commerce, Bureau of International Commerce, Washington, .D.C. Personal correspondence, May 7, 1973.

Table 4

Estimated Marketing Costs and Returns to Maine Oyster Producers Competing in the Half-Shell Oyster Trades of Boston, Montreal, and Paris

Half-Shell Oyster Market	Oyster Classification	Wholesale Price	Tariff and Value Added Tax	Transportation Costs	Margin to Cover Production Costs and Profit
		----------cents per oyster----------			
Boston	½-Shell	6.9	---	1.1	5.8
Montreal	½-Shell	9.6	0.7	1.7	7.2
Paris	American Oysters	12.0	6.4	12.4*	-6.8

*Based on trucking transportation from central production area in Maine to Boston, and from Boston by air to Paris.

production:

1. Produce oysters and receive a satisfactory return for approximately 5.8 cents per oyster.

2. Compete with the other producing areas on quality of product, uniformity of pack, and consistent availability of oysters from September to May.

The Montreal Half-Shell Market

From the information contained in the questionnaires the oyster consuming season in Montreal begins in September, peaks in December, and virtually ends in May. As with Boston, a limited number of oysters, from the United States, are available all year around.

Oysters in Montreal were found to originate almost exclusively in the Maritime Provinces of Canada and Long Island Sound in the United States. The size, uniformity, grade, and availability of the Long Island oysters were considered to be superior to those from the Maritimes. However, the oysters from the Maritimes were judged to be much better in taste. They were described as being "juicier" and "saltier" in taste than those from Long Island Sound. The taste of Maine-raised oysters is an unknown factor which may well become an important consideration in their acceptance in any of the half-shell markets.

Unlike Boston, prices in Montreal were described by almost all respondents as "too high". There seemed to be a wider range of higher prices than experienced in Boston.

Transportation costs were based on trucking costs from Jonesport and Rockland, Maine to Montreal. Estimated shipping costs amounted to 1.7 cents per oyster. Assuming the validity of the wholesale price of 9.6 cents, an import duty of 0.7 cents, and transportation costs of 1.7 cents per oyster, this would leave 7.2 cents per oyster to cover production costs and profit for the Maine producers (See Table 4).

Several conditions will determine the economic feasibility of a Montreal market for Maine-raised oysters. They are:

1. Produce oysters with a reasonable return for approximately 7.2 cents each.

2. Compete with the Maritime producers on taste, and with the Long Island Sound producers on availability, size, grade, and quality of pack.

The Paris Half-Shell Market

The market in Paris, France does not appear to be a feasible one

for Maine producers at the present time. This is due to a number of factors. Among them are the high cost of air transportation of oysters in the shell, a value added tax, an ad valorem duty on Crassostrea virginica (and Ostrea edulis over forty grams), and the relatively low price received for American oysters in Europe. However, if air cargo rates can be negotiated downwards, or if other forms of transportation such as sea transportation prove economically as well as biologically feasible, the Paris market may offer possibilities for Maine producers. This is particularly true if Maine-raised oysters grade and are priced as high as premium European oysters.

Summary and Conclusions

At present, the oyster industry in Maine is almost non-existent. The main retardent to any growth of this industry appears to be the inability of the native species, Crassostrea virginica to survive in economic numbers through the larval stage in Maine's cold waters. If this problem can be overcome, or if the introduced species, Ostrea edulis, from Europe proves to be successful, there is sufficient evidence that markets are available for Maine's oyster production.

The half-shell oyster market appears to offer the best economic choice to consider if an industry is to develop in the State. The reasons for this are:

1. Half-shell oysters command premium prices.

2. No further processing, such as shucking, is required.

3. Assuming success in the economic cultivation of Ostrea edulis in Maine, the superior appearance and uniform shape of this oyster make it a desirable oyster for the half-shell trade.

One uncertainty does exist. This deals with the acceptance, in North America, of the flavor of Ostrea edulis. However, this species is well accepted in Europe and there appears to be no serious reason why Ostrea edulis would not be accepted here.

The Montreal market appears to offer a good potential outlet for Maine raised oysters. Boston should also be a good market outlet. This, however, will depend on the entrepreneurial ability of Maine producers in developing these markets and by providing consistently high quality oysters at competitive prices. Paris, France does not appear to be a feasible market for Maine producers at the present time.