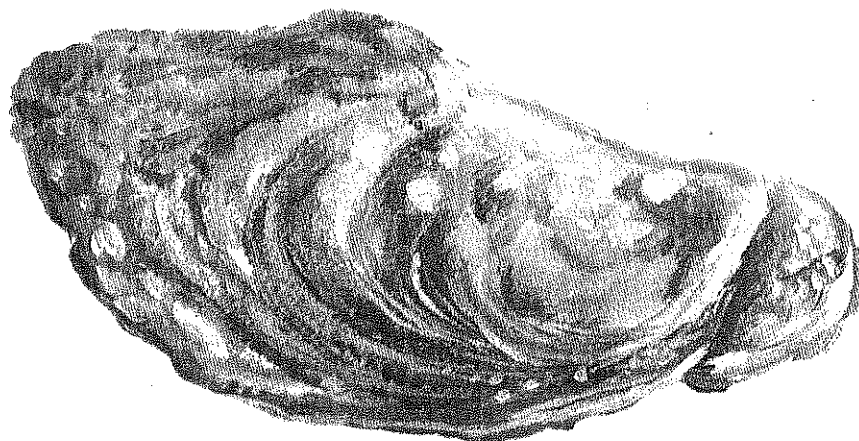


A Profile of the Oyster Industry

Northeastern United States



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Virginia Institute of Marine Science

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A Profile of the Oyster Industry

Northeastern United States

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This report is published by the Maryland and Virginia Sea Grant Marine Advisory Programs. The project was funded by the National Marine Fisheries Service, Northeast Region, under Grant Number NA90AA-A-FM740 and NA90AA-D-FM743. Additional support was provided by the Maryland and Virginia Sea Grant Marine Advisory Programs, the Virginia Institute of Marine Science, College of William and Mary, and the University of Maryland.

University of Maryland Sea Grant Marine Extension UMSGMAP-94-02

Virginia Sea Grant Marine Resource Advisory No. 54, VSG-94-08 (VSGEP-T-94-002)

February 1994

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PREFACE

This is a critical period for the future of the east coast oyster industry. This report documents the dramatic decline in industry output which has been the impetus for a publicly funded program to "revitalize" the industry. Oyster biologists argue over the severity of the decline and the cause, and also the potential remedies. Should non-native oysters, specifically *Crassostrea gigas*, be introduced into the region to replace the native oyster production? Are there ways to manage around the devastating oyster diseases MSX and Dermo? Will large populations of oysters significantly improve the water quality in currently degraded areas?

While these are important issues to address, some more fundamental question needs to be answered first: What is the nature of this industry we are trying to revitalize? What constitutes the oyster industry, and what are the economic, social and legal factors that shape this industry? This report attempts to address these most basic issues. The first thing that becomes apparent is that the oyster so familiar to biologists is only one part of the industry. Having more oysters does not constitute a revitalization of the industry. The oyster industry includes the oyster resource, the harvesters, the processors, the shuckers, wholesalers, distributors, retail markets and consumers. Typically, there is less and less information and data available about the industry as one moves from the water to the dinner table. The emphasis of this study, therefore, has been to try and obtain and analyze information on those groups we know the least about, the processors, the retailers and the consumers.

Jim Kirkley & Doug Lipton, Editors

ACKNOWLEDGEMENTS

The report was written by James Kirkley, Douglas Lipton, Ivar Strand, and Kurt Finsterbusch. Also contributing were Phillippe Berry, Amy Buss and Diane Illig. Financial assistance was provided by the National Marine Fisheries Service, Northeast Region, under Grant Numbers NA90AA-D-FM740 NA90AA-D-FM743. Additional support was provided by the Sea Grant College Programs of Maryland and Virginia.

We would like to thank the many watermen, processors and other oyster industry members for their assistance. Dick Schween and Steve Koplín of the National Marine Fisheries Service assisted in providing data.

THE HARVESTING SECTOR

Harvest Levels

The most well-documented part of the decline of the East Coast oyster industry is the decline in harvests. This is due to the extensive efforts of states and the National

Marine Fisheries Service (NMFS) to collect landings data for management purposes. In the Fisheries of the United States for 1988 (NMFS, 1989), NMFS published tables giving the breakdown of oyster landings by species and geographic region from 1929-1988. These have been updated to include landings data through 1991 and are presented in Figure 1.

Table 1. Ex-vessel prices.

STATE	PRICE
<u>Crassostrea virginica</u>	
CT	\$6.42
MA	\$11.74
RI	\$5.22
DE	\$3.11
NJ	\$3.26
NY	\$3.27
MD	\$3.11
VA	\$2.74
FL	\$2.60
GA	\$1.97
NC	\$3.88
SC	\$2.68
AL	\$1.77
LA	\$2.78
MS	\$1.53
TX	\$2.52
<u>C. gigas</u>	
CA	\$2.94
OR	\$3.37
WA	\$2.00

Although most of the attention has been focused on the decline in harvests in the Chesapeake region, there are some encouraging signs in New England and Middle Atlantic states due mainly to successful private aquaculture operations. The New England harvest in 1991 was the highest since 1953, reflecting the development of oyster culture in Connecticut.

Ex-Vessel Prices

Figure 2 shows the historical trend in ex-vessel oyster

Figure 1. Northeast oyster landings.

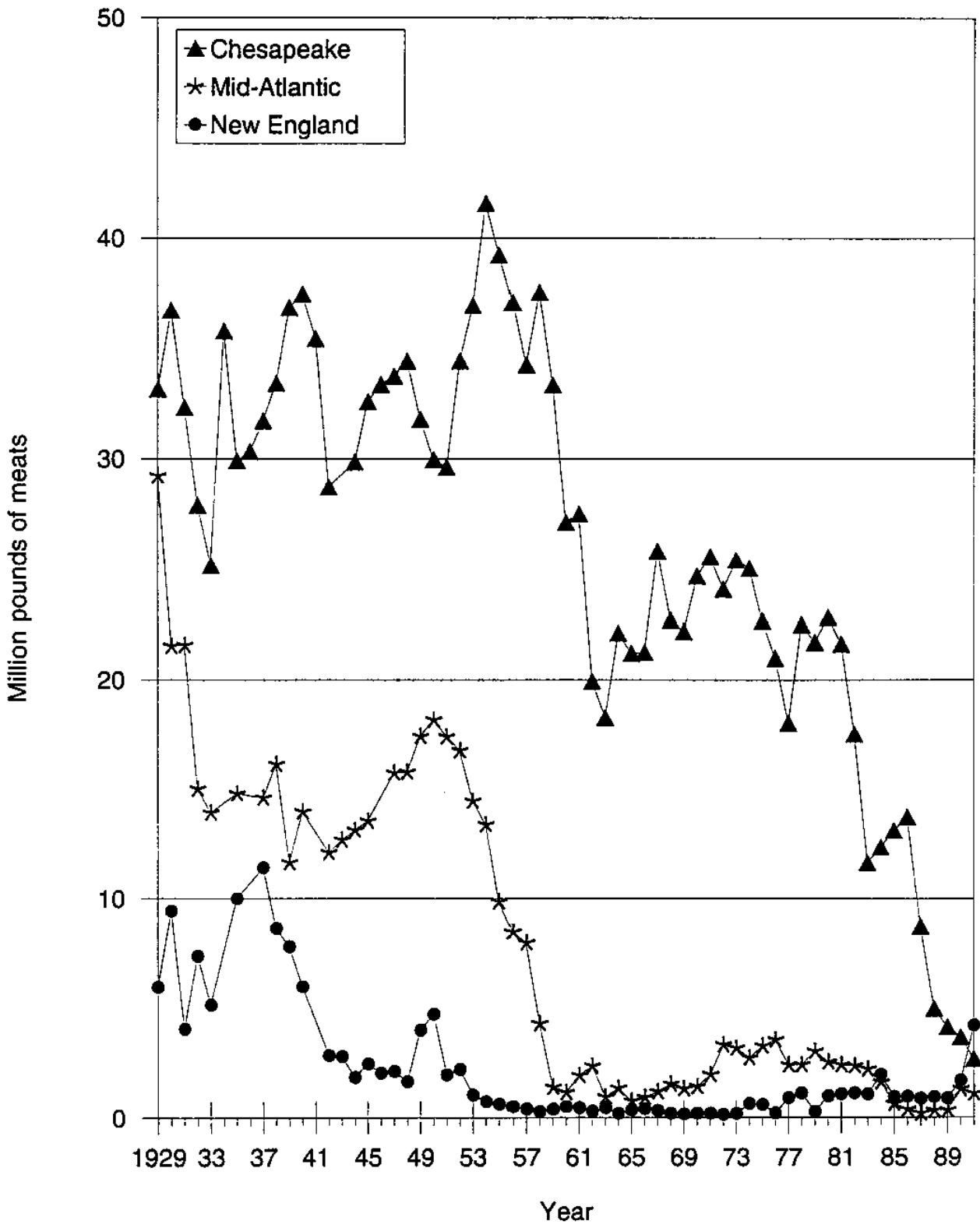
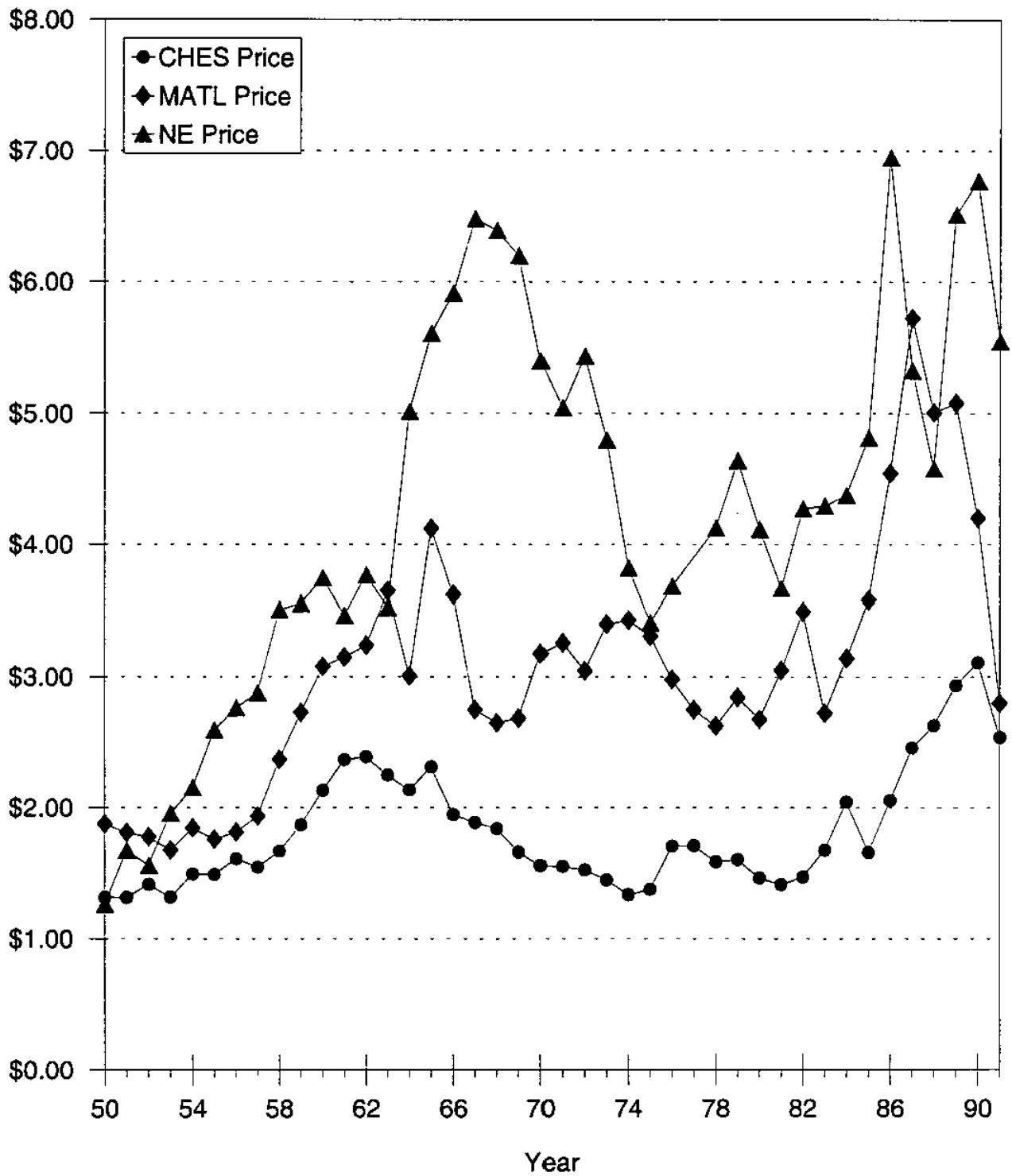


Figure 2. Northeast oyster prices paid to harvesters. (Real, 1982=1.00)



prices in the three NMFS reporting regions in the Northeast. The New England states, which have traditionally been the smallest producers pay the highest prices to watermen for oysters followed by the mid-Atlantic states, and the highest volume but lowest price Chesapeake states. The price differences reflect the fact that a large percentage of Chesapeake Bay oysters are bought by shucking houses for processing, whereas, in the more northern states with low volumes and little shucking activity, most of the oysters are destined for the high-value half-shell trade. Prices in all three reporting regions reflect the scarcity of oysters that developed during the 1980's. Prices peaked in 1990, and although total oyster production in the United States continued to decline in 1991, prices at the ex-vessel level fell significantly.

The preliminary average 1991 ex-vessel price for all oysters harvested in the United States was \$3.08 per pound of meats. *C. virginica* prices were \$3.47, while *C. gigas* averaged only \$2.19. Prices varied greatly depending on the state, from a high of \$11.47 per pound for a small volume in Massachusetts to a low of \$1.53 in Mississippi (Table 1).

The Harvesters

Enumerating oyster harvesters, and particularly the change in numbers over time proved to be a difficult task. Our attempts to interview oystermen also proved difficult because they are hard to locate, and even then, usually unwilling to cooperate in a detailed survey. Surveys were distributed at the 1991 Mid-Atlantic Fishermen's Trade Show, through the *Maryland Watermen's Gazette*, during a meeting with Smith Island watermen and a meeting with the Working Watermen of Virginia. A copy of the survey

instrument is included in the Appendix. In total, 41 usable surveys were returned with varying degrees of completion, 75% from Maryland oystermen, 23% from Virginia oystermen and 3% from New Jersey oystermen.

Survey respondents ranged from 19-66 years of age. The median age was 37 years old, and the mean 39. Since there is probably sample selection bias (i.e., certain age groups may not be proportionally represented in the sample), it would be improper to state that the median age of oystermen is 37. Nonetheless, the age distribution of the respondents calls into question the commonly held notion that the oyster industry consists of a lot of old-timers and that younger fishermen are not interested in becoming oyster fishermen.

There is still a strong family tradition among oystermen as sixty-six percent of the respondents are sons of oystermen. Twenty-four percent of the respondents are married, and of these, 19% of their wives do not work, 46% of the wives work part time and 35% fulltime.

The surveyed oystermen had a fairly good level of education for a craft occupation. Only 28% did not graduate from high school, 25% were high school graduates, 31% had some college, and 16% were college graduates (6% with master degrees).

Seventy-seven percent of the watermen who are currently oystering fish full time, the other 23% earned, on average, 47% of their income in none fishing pursuits. However, 31% of the sampled oystermen (having oystered in the 1980's) have stopped oystering. Of the dropout oystermen, 18% receive income only from fishing, 27% receive income only from other work, and 55% combine fishing and other work with 56% of their

income coming from the other work on average. The income range for the sampled oystermen who earned income only from fishing was from \$9,000 to \$75,000 and the average income was about \$30,000. Undoubtedly this is higher than average for all Chesapeake Bay watermen because 89% of this sample owned their own fishing boat and the other 11% captained the boat that they used.

Oystering is not the main source of income for full time fishermen in this sample. Only one made more than 50% of his income from oystering and on average these fishermen made only 30% of their income from oystering in 1990.

The percent of income earned in oystering has declined substantially in the 1980's even for those who continue to oyster. Seventy-eight percent of practicing oystermen experienced a decline in the percent of their income derived from oystering, on average the decline was 21 percentage points. Six percent experienced no change and 17% went against the trend and experienced an increase in the percent of income derived from oystering (an increase on average of 17 percentage points) due mainly to an increased move into full time fishing. When all are averaged together the decline in percent of income that derives from oystering for full time fishermen who still oyster declined 14 percentage points.

In summary, the sample presented here is probably biased toward the younger, better educated, boat owning, and higher income oystermen. Nevertheless, this study suggests that oystermen are having an increasingly difficult time earning a satisfactory income from oystering with incomes from oystering generally declining and a substantial number of oystermen dropped out of oystering altogether.

The remainder of the study examines the attitudes of oystermen toward various aspects of the oyster industry. Table 2 presents the percentage distribution of the respondents on 20 attitudes on the causes of the decline of the oyster industry and on actions that might revive it.

Questions 1-3 sought to determine watermen's beliefs about the causes of the decline in oyster abundance. It is the perception of the watermen interviewed that diseases are the principal cause of the decline of oyster stocks, followed by pollution and then overfishing a distant third explanation. In fact, only 16% of the watermen stated that overfishing has contributed to a decline in oyster stocks. This information may be of importance to managers who feel fishing effort must be controlled. Most watermen do not appear to admit to a connection between declining stocks and harvest patterns.

Questions 4 and 5 examine watermen's perception of the demand for oyster products. Seventy-seven percent of the respondents did not disagree with the statement that oyster demand is increasing. On the other hand 80% did agree that shellfish safety issues were hurting the industry.

Questions 6-9 seek to determine what kinds of activities to manage around oyster diseases the watermen believe will help the industry. They believe overwhelmingly that increased repletion (seed and shell) will help improve the industry's situation. They are supportive, but less enthusiastic about disease-resistant and faster-growing native oysters. These results are surprising, and we believe most oyster biologists would reverse the order of preference.

Table 2. Attitudes of East Coast Oystermen on the Oyster Industry.

STATEMENTS ¹	Percent of oystermen with attitude				
	Strongly agree	Agree	Neutral	Disagree	Str. Disagree
1. Oyster stocks are reduced due to overfishing.	16	0	24	18	42
2. Oyster stocks are reduced due to disease.	65	23	3	5	5
3. Oyster stocks are reduced due to pollution.	39	21	15	15	10
4. Market demand for oysters is increasing.	15	28	33	8	15
5. Concern about safety of shellfish is hurting industry.	56	23	13	3	5
6. Increased seeding will improve the industry.	72	8	15	0	5
7. Increased shelling will improve the industry.	68	13	8	5	5
8. Disease resistant native oysters will improve the industry.	31	23	26	5	15
9. Fast-growing cultured oyster will improve the industry.	26	21	33	5	15
10. Increased oyster population will help clean the Bay.	28	21	28	5	18
11. Oyster programs should be run by watermen.	49	26	18	3	5
12. It is more difficult to find crew for oystering.	18	16	45	5	16
13. I will oyster even if I could make 50% more otherwise.	29	13	21	16	21
14. I will stop oystering soon if conditions do not improve.	24	29	21	11	16
15. I support introduction of Japanese oyster	15	5	10	3	67
Maryland respondents	7	0	7	0	86
Virginia respondents	50	33	0	17	0
16. Introduction of Japanese oysters is risky to native populations.	56	10	13	8	13
Maryland respondents	64	7	11	7	11
Virginia respondents	17	17	17	17	33
17. Japanese oysters will bring much lower prices.	32	24	32	5	8
Maryland respondents	37	22	30	4	7
Virginia respondents	17	17	33	17	17
18. Too much government involvement in the industry.	23	21	44	3	10
Maryland respondents	30	22	41	4	4
Virginia respondents	0	29	29	0	43
19. Too much oyster bottom is leased for aquaculture.	29	16	34	11	11
Maryland respondents	33	11	37	11	7
Virginia respondents	0	17	50	17	17
20. Oyster industry will recover on its own if left alone.	10	10	23	13	44
Maryland respondents	4	11	29	11	46
Virginia respondents	33	17	0	17	33

¹Note that the statements have been rearranged from the order in the questionnaire in Appendix A to facilitate discussion of the findings. The statements here are abbreviated. See the questionnaire for the precise wording.

Question 10 asks about the role of oysters in reducing pollution and 49% were confident that increased oyster populations would significantly reduce pollution. Only 23% thought that they would not help much. Question 11 asks whether the watermen or the government should run the oyster programs. Not surprisingly 75% think that the watermen should run them and only 8% think that the government should.

Questions 12 to 14 explore the commitment of oystermen to oystering and the difficulty of getting crews. Commitment seems to be fairly high since 42% said that they would continue to oyster even if they could make 50% more money doing something else. Nevertheless, many recognize that they may soon have to quit. Fifty-three percent said this is what they would do if conditions do not improve soon, and only 27% felt that they would continue even without any improvement. On the issue of the commitment of oyster crewmen, only 34% of these oyster boat captains said that it is more difficult to find crews.

Questions 15-17 relate to the controversial topic of introducing *Crassostrea gigas*, the Japanese or Pacific oyster to the east coast. Here there was, as expected, a sharp division between Maryland and Virginia watermen with Maryland watermen opposing the introduction (86%) and Virginia watermen supporting it (83%). We expected this divergence in opinions because of greater devastation of the oyster resource in the more saline Virginia portion of the Chesapeake Bay as compared with Maryland. In other words, Virginians have less to lose in terms of native oysters than do Marylanders if *C. gigas* would somehow negatively impact native oysters. Accordingly, 71% of Maryland oystermen compared to 34% of Virginia oystermen viewed the introduction of the

Japanese oyster as risky, and 59% of Maryland oystermen as compared to 34% of Virginia oystermen thought the Japanese oyster would bring lower oyster prices.

The last three questions (18, 19, 11 and 20) relate to public administration of oyster programs. Only 13% of oystermen disagreed with question 18 that there was too much government involvement with the oyster industry. Notably, a high percentage (43%) of the small sample of Virginia watermen did strongly disagree with the statement which is probably related to their support of introducing *C. gigas*. Question 19 shows that Maryland oystermen are much more opposed to bottom leasing for aquaculture than Virginia oystermen (44% vs. 17%). Finally, Question 20 shows that most oystermen believe that the oyster industry will not recover without some intervention, but even on this issue Maryland and Virginia oystermen disagree with only 15% of Marylanders compared to 50% of Virginians disagreeing with the statement. In fact, these disagreements are quite public and widely recognized in the industry.

THE PROCESSING SECTOR

Numbers of Processors

In 1990, 11 states reported processing fresh shucked oysters. We focus on this product form as it is by far the dominant product. Virtually all plants that handle oysters produce fresh shucked product along with other product forms. The number of plants producing fresh shucked oysters is down from as many as 17 states in 1974. The total number of plants has declined by 48% from 345 in 1974 to 167 plants in 1990. The number of processors in the Northeast Region has not declined as rapidly as the nation as a whole, declining 34% from 153 firms to 52 over the period.

The decline in the number of shucking plants is not indicative of

Table 3. Number of processors producing fresh shucked eastern oysters, by state.

STATE	1974	1990
Alabama	22	24
California	1	0
Connecticut	1	0
Delaware	1	0
Florida	53	19
Georgia	2	0
Louisiana	34	41
Maryland	58	20
Mississippi	17	9
New Jersey	7	3
New York	1	0
North Carolina	23	8
Pennsylvania	4	1
Rhode Island	1	0
South Carolina	11	2
Texas	29	12
Virginia	80	28
Totals	345	167

a trend towards larger plants, as the production of fresh shucked oysters has fallen by 51%. Production in 1974 was almost 35 million pounds of product. but less than 18 million pounds in 1990.

Product Mix

The number of different types of products being produced from Eastern oysters has declined. In the 1970's there were typically about 15 unique products that were sold, but in 1991, only six products were produced. Processed oysters are now almost exclusively fresh raw product. In 1970, 76% were processed into fresh raw oysters, now 92% are processed as fresh raw oysters (Figure 3). The only other significant processed product made from Eastern oysters are fresh and frozen breaded oysters, either raw or pre-cooked.

Fresh Shucked Oysters

Raw fresh shucked oysters are the most important product of the oyster processing industry. Although the industry has gone to almost exclusively fresh shucked production, the volume of product has decreased 47% since 1970, from 34 million pounds to 18 million pounds in 1990 (Figure 4).

Some of the decline in fresh shucked eastern oysters has been compensated for by an increase in fresh shucked Pacific oysters. Fresh shucked Pacific oyster production increased 57% from 1970 to 1990, and has gone from accounting to 14% of the market to 33% of the fresh shucked market. But that increase in market share is of a decreasing

Figure 3. Market share of different eastern oyster products, 1970 & 1990.

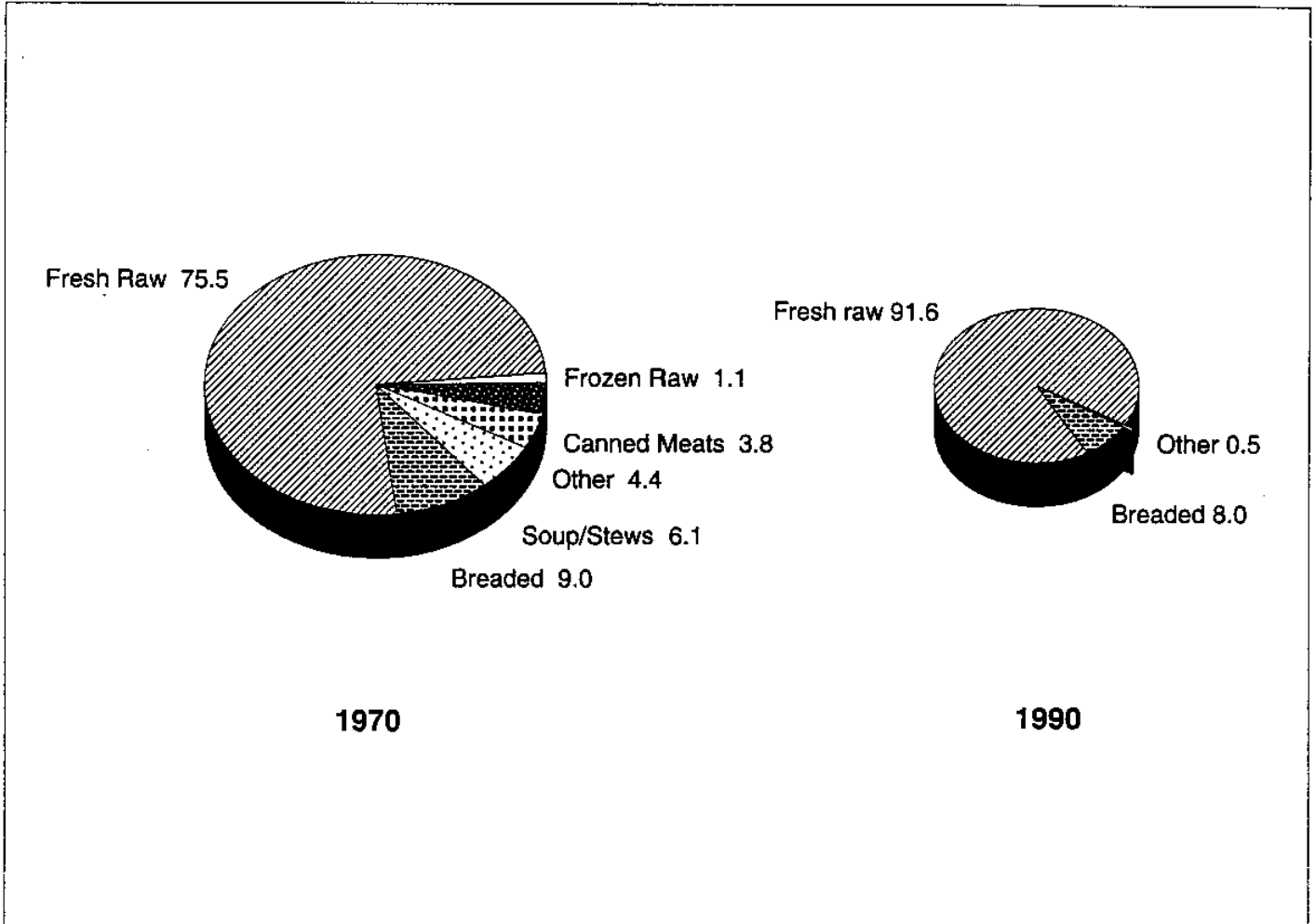
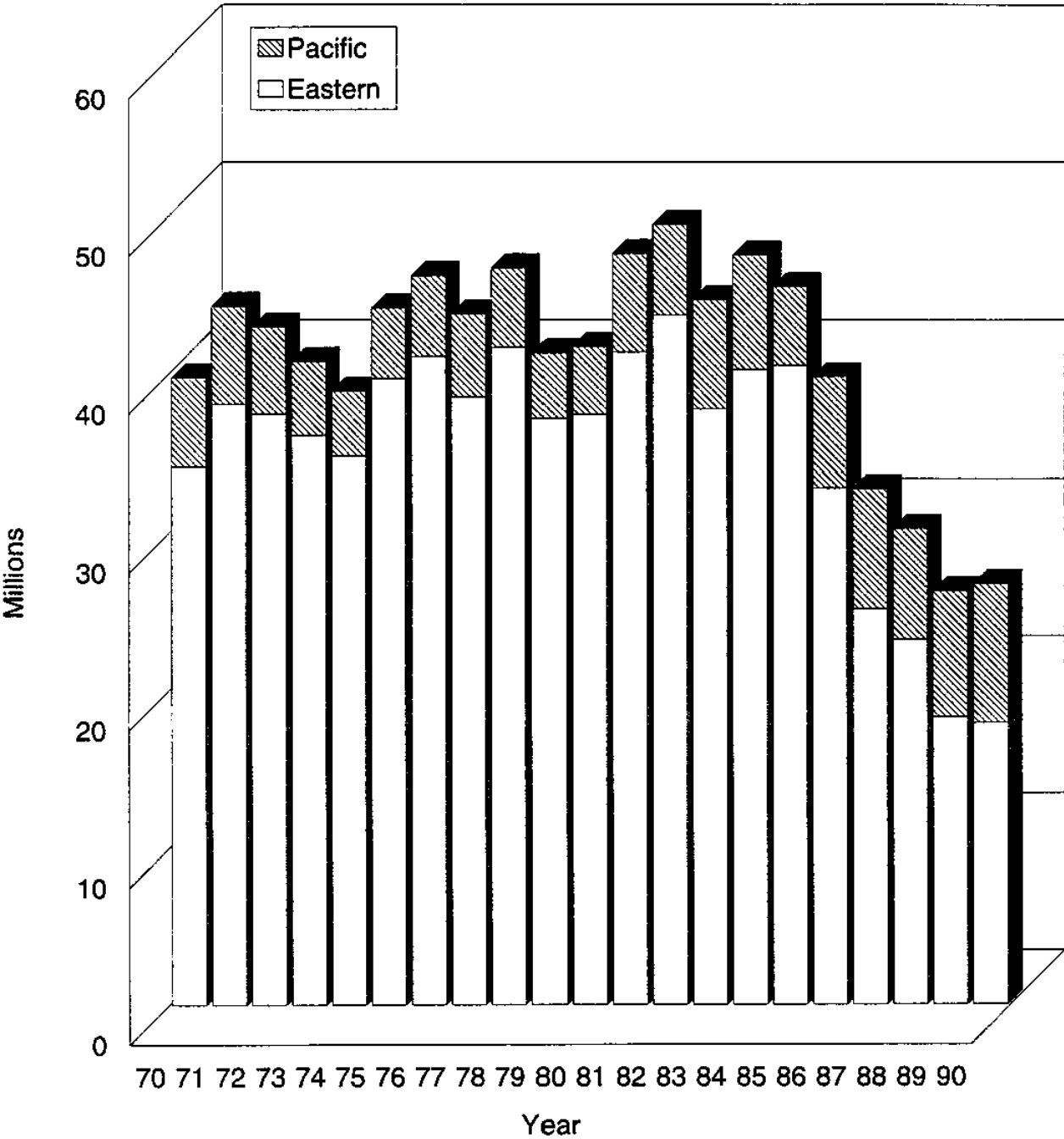


Figure 4. Volume of fresh shucked eastern and Pacific oyster production.



total market which declined 49% from around 40 million pounds in 1970 to under 27 million pounds in 1990.

As would be expected from the ex-vessel prices presented in Table 1, the average wholesale price for fresh shucked Pacific oysters is significantly lower than the price for Eastern oysters (Figure 5). For the period from 1976-1986, the real price spread fluctuated slightly around an average of \$0.80 (in 1982 dollars). There has been tremendous volatility in the price spread since 1986, peaking to around \$1.50 in 1988 and then dropping dramatically to \$0.46 in 1990. The difference in nominal prices in 1990 was \$0.54. There appears to have been a delayed reaction to the scarcity of fresh shucked Eastern oysters in the market for shucked Pacific oysters, which accounts for the huge price spread in 1987. Eventually shucked Pacific oyster prices responded and reached an all-time high in 1990.

On a regional basis, the Gulf states have taken over from the Chesapeake region as the major producer of fresh shucked eastern oysters. Until 1983, the Chesapeake Bay states were the major producers. In 1990, the Gulf states accounted for 59% of fresh shucked eastern oysters and Chesapeake states 35%, almost a complete reversal in market share since 1980 (Figure 6).

Breaded Oysters

Production of breaded oysters, fresh or frozen, cooked or raw, from Eastern oysters fell dramatically in 1989 and again in 1990 (Figure 7). Production since 1970 had typically been well over 3 million pounds of product, but was less than 1.6 million pounds

Figure 5. Real prices of fresh shucked eastern and Pacific oysters.

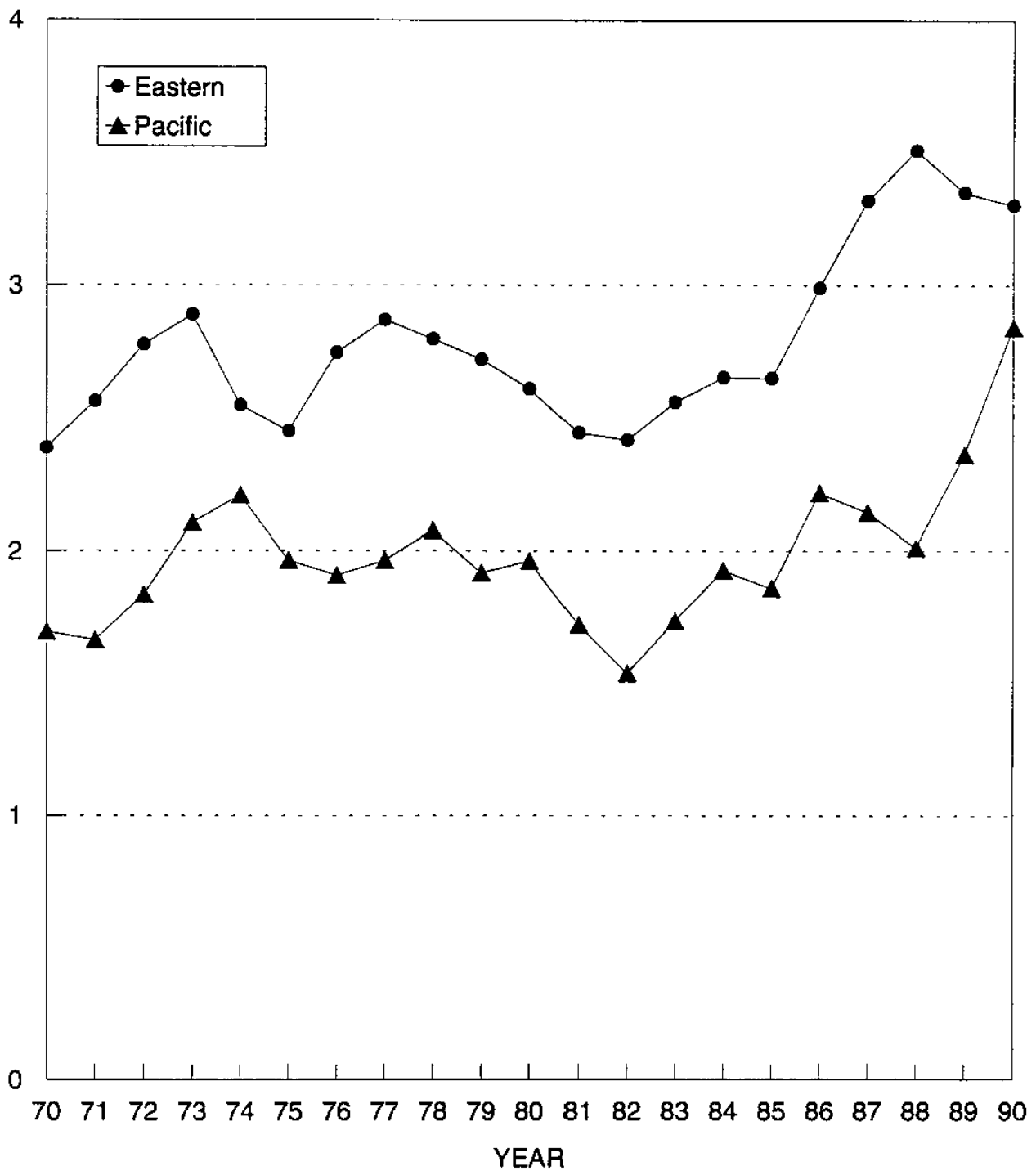


Figure 6. Fresh shucked eastern oyster production by region, 1980-1990.

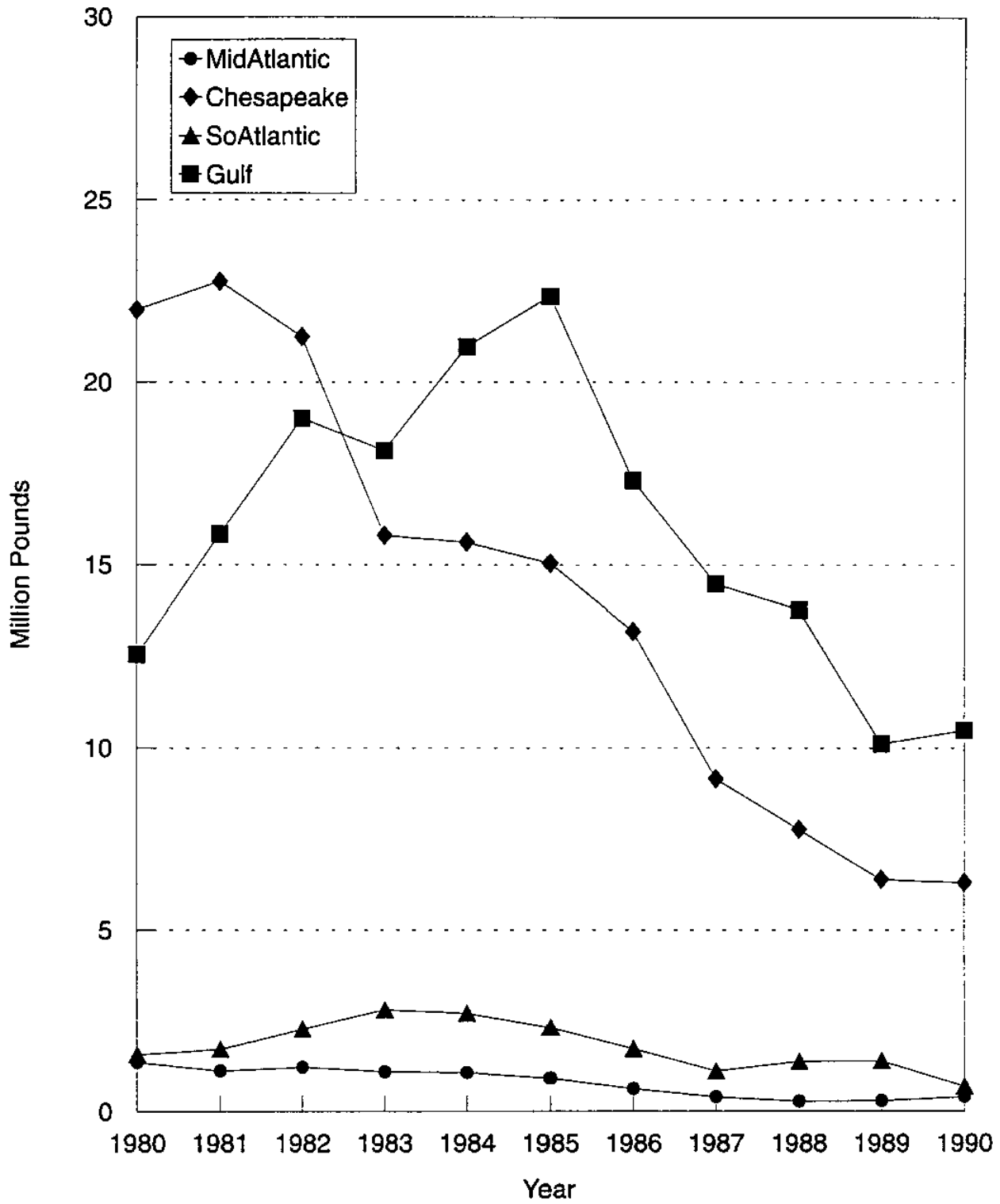
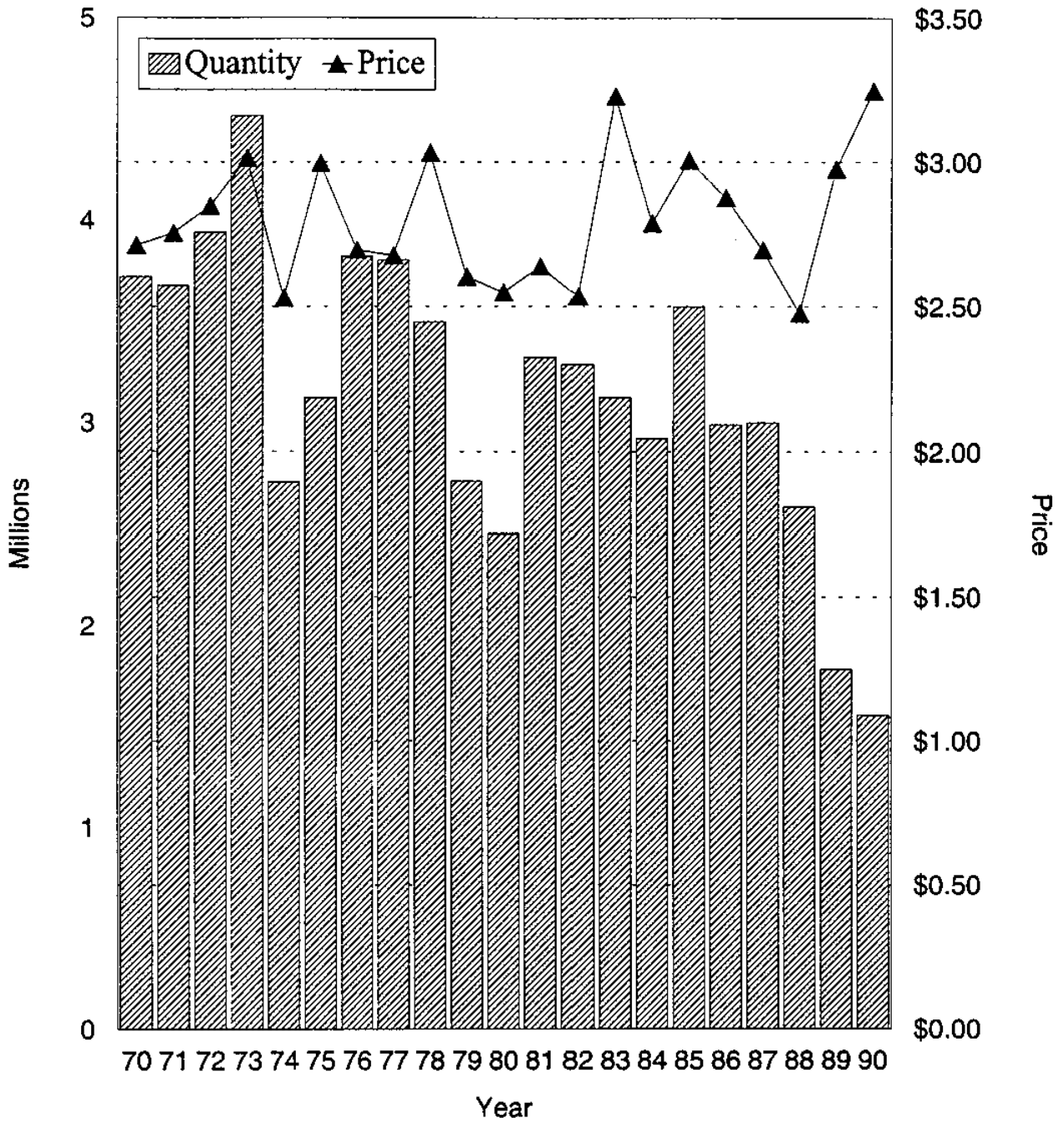


Figure 7. Quantity of eastern oysters processed as breaded, fresh or frozen.



in 1990. Although real price was at its highest level in 1990, this only represents a 17% increase over the twenty year average, while production was 50% below the twenty year average. As a result, real revenues from breaded oyster production were well below average in 1990.

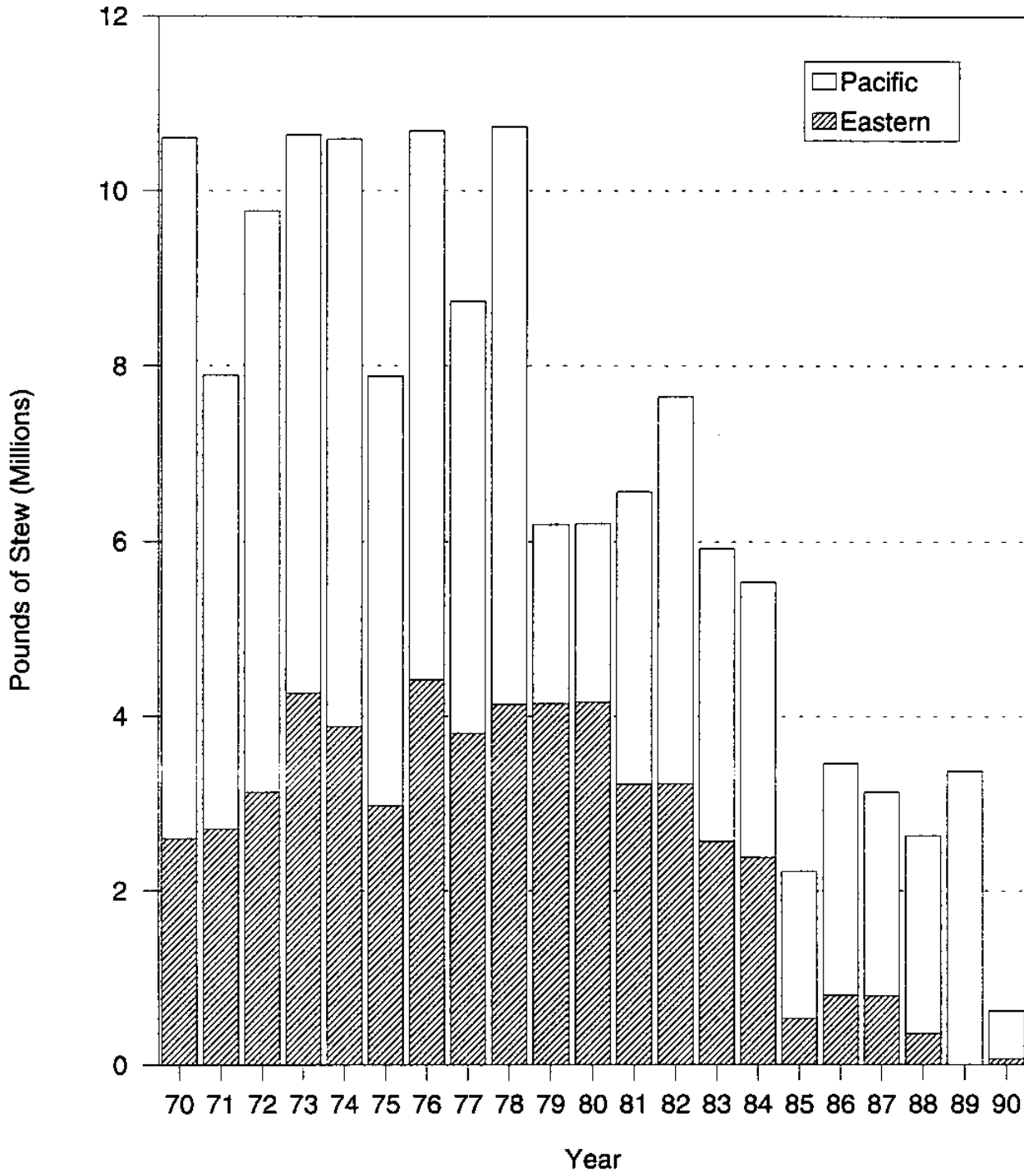
Oyster Stews

Production of canned stews from domestic oysters has virtually disappeared. In the 1970's about 10 million pounds a year were produced from both Pacific and eastern oysters, but in 1990, that number had fallen to less than a half million pounds of product (Figure 8). An inconsequential amount of eastern oysters were reported as being used for canned stews in 1990. Apparently, stews are being made increasingly with imported oysters. The declining domestic oyster production is being reserved for the more high-valued uses such as fresh shucked product, and the halfshell market.

Smoked Oysters

Only one processor reported producing smoked eastern oysters in 1990. In contrast, eight firms produced smoked oysters from Pacific oysters, resulting in about 39 thousand pounds of product. Smoked eastern oyster prices were significantly higher than the Pacific counterpart (actual prices can not be released in order to preserve confidentiality requirements). This is one area where there appears to be wide open market for Eastern oyster producers.

Figure 8. Oyster stew production from eastern and Pacific oysters.



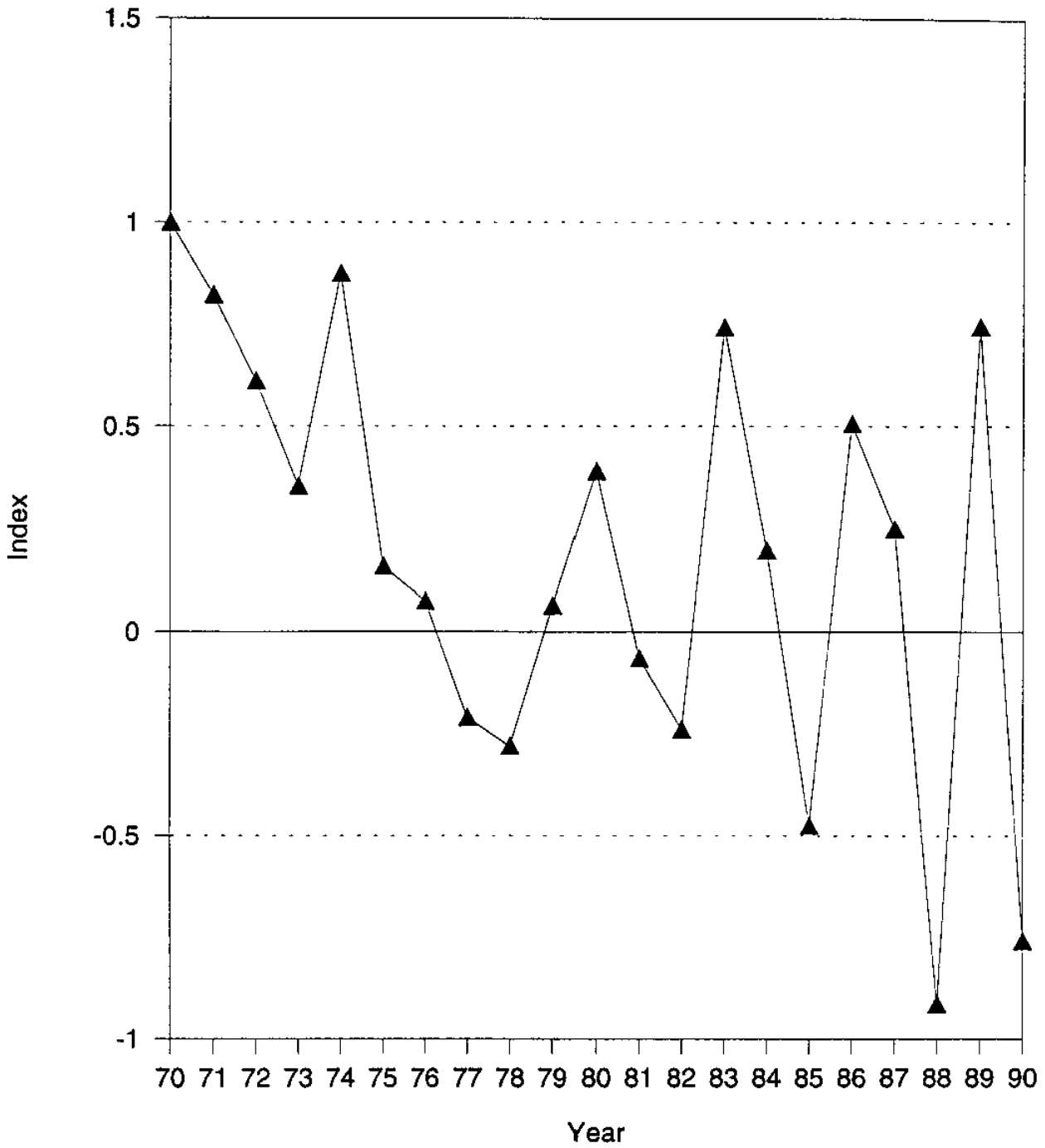
The Halfshell Trade

No data is kept on halfshell oyster production, because these oysters are not processed in any significant way. To get around this lack of data, we developed an index of estimated activity in the halfshell market. First, all processed products were converted to meat weight using NMFS conversion factors. The meat weight of processed products was then divided by the meat weight of landed products. One minus this ratio, is an index of the percentage of landings not processed, presumably sold for the halfshell oyster trade. The reason an index is used rather than an absolute estimate is because the processed products estimates are high, and in some cases exceed the landings (resulting in a negative value for the index). This may be due to reprocessing from one product form into another resulting in double counting in the data.

Using 1970 as the base year, it is apparent that the halfshell market has declined as a percentage of the total oyster market (Figure 9). The index also indicates that the halfshell market has become very volatile, perhaps responding to negative publicity about the safety of eating raw shellfish.

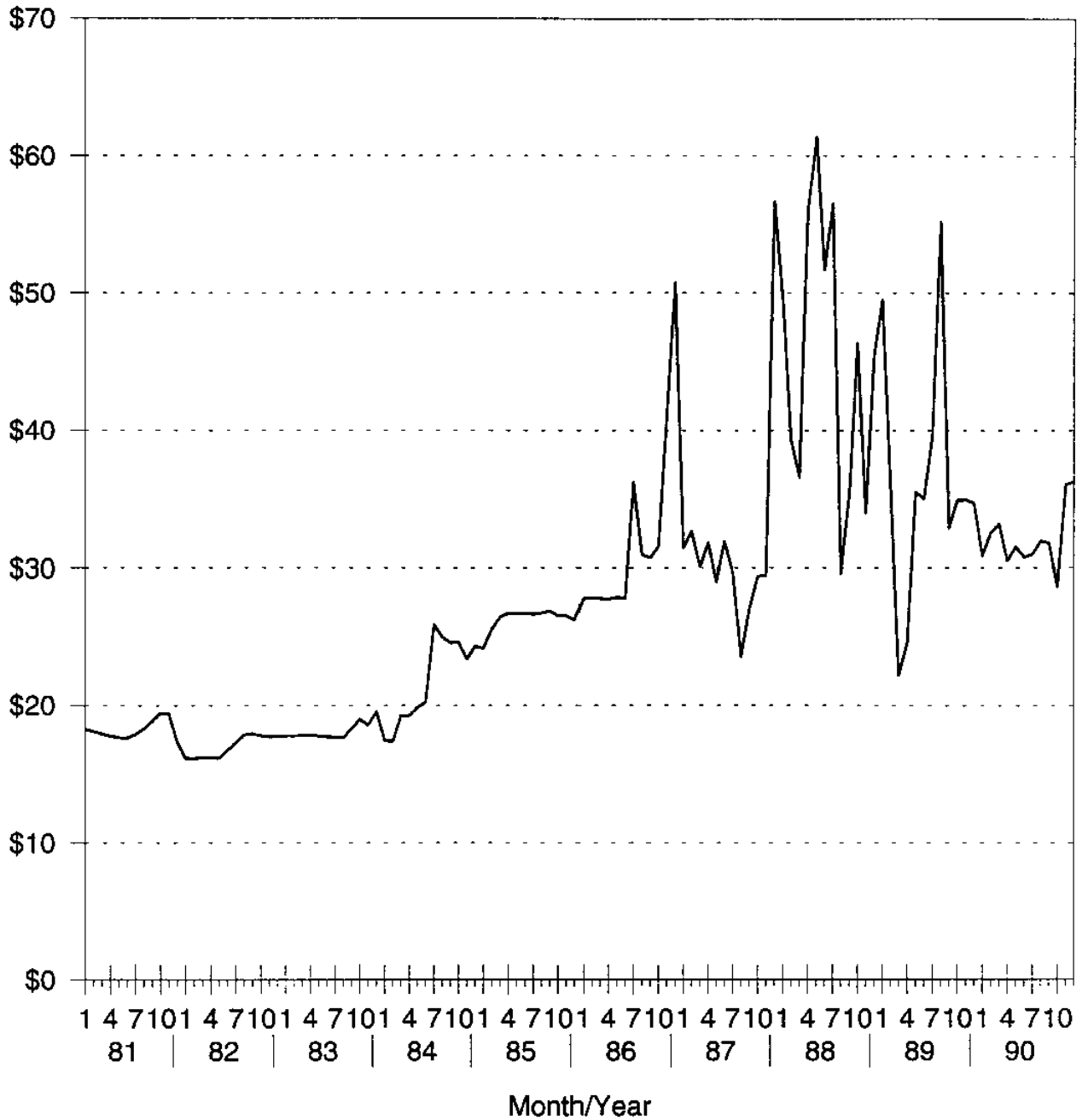
An indication of prices for whole oysters can be obtained from NMFS data collected from the Fulton Fish Market "green sheets". Monthly Fulton prices started showing tremendous volatility in the 87-88 and 88-89 oyster seasons, but have since leveled off (Figure 10). The data does indicate some increase in real prices due to the shortage of oysters, but the increase appears to be far below that necessary to compensate producers for the decline in production as indicated by the production index.

Figure 9. Halfshell market index.



Index is 1 minus the percentage of landings reported processed converted to meat weight.

Figure 10. Fulton Market real monthly oyster prices per 100 count (1981-1990).



Imports

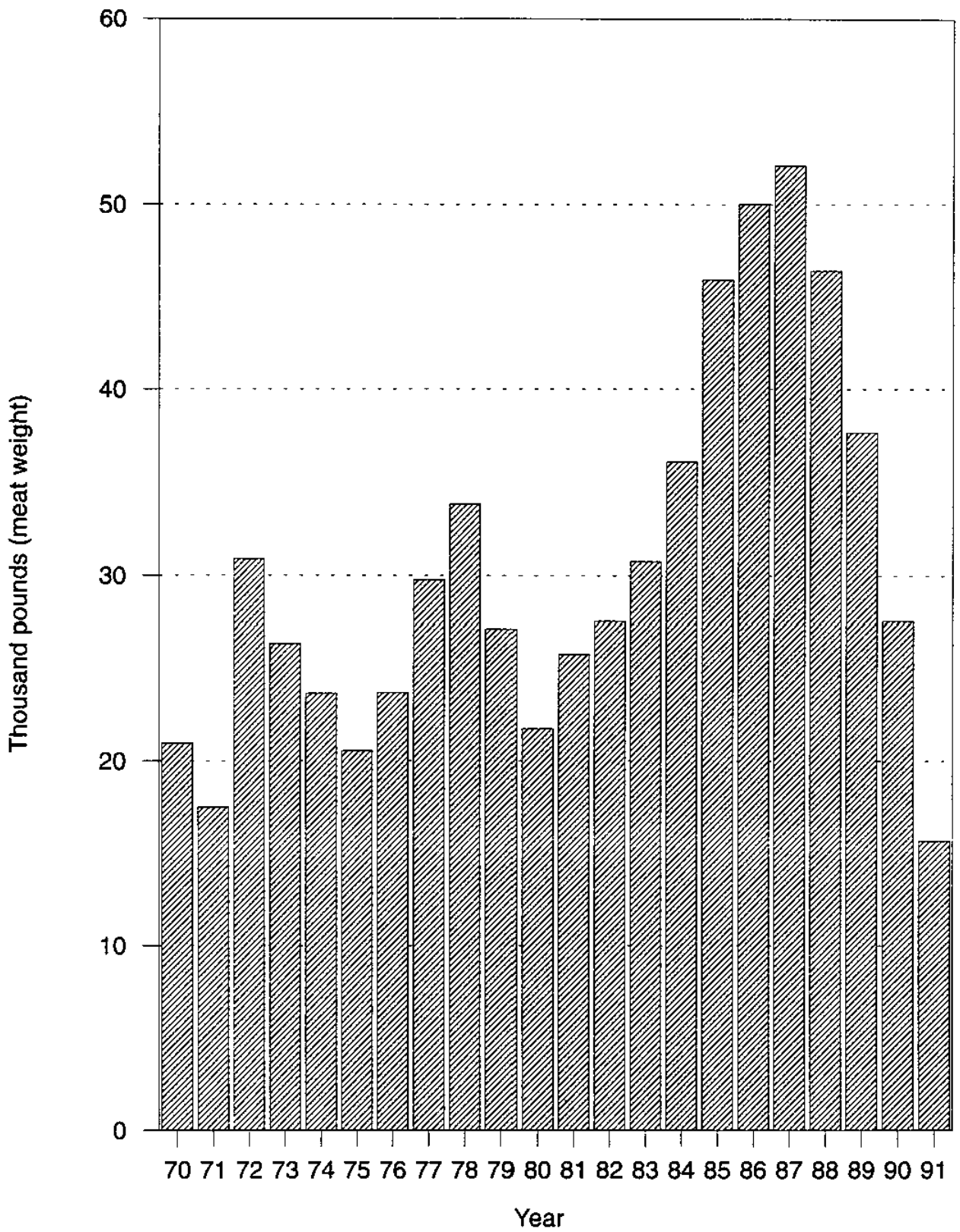
Oyster imports are mostly canned and canned smoked Pacific oysters. In 1991, canned product made up 73% of imports. Imports were a record 52 million pounds in 1987, but this run-up in product quickly fell to a 20-year low of 15.7 million pounds (meat weight) in 1991 (Figure 11). The increase in imports up to 1987 may have been an industry response to declining domestic oyster production. Obviously, this response was not sustainable, as domestic production continued to fall and then stabilized from 1987-1991, oyster imports fell dramatically.

Korea, which is now the world's leading producer of oysters is also the major exporter to the United States. In 1988, Korea accounted for 61% of the oysters imported into the United States (De Franssu 1990). Hong Kong is also a major supplier of imported oysters.

Recent Dramatic Decline

This study sought to determine the current condition of processors in the Northeast. It began with a list of 68 oyster processors in the Northeastern region as of 1988-1989. All were sent a survey and all processors who did not respond were interviewed by telephone if they were reachable. We estimate that 23 of these or 34% went out of the oyster processing business by the summer of 1992. This was indicated by undelivered mail or mail returns that said they had stopped processing oysters (2), lack of a telephone listing or a disconnected telephone (12), or by a statement in a telephone interview (9). This rate of decline in the number of processors is much greater

Figure 11. Imports of oyster products.



than the slow decline that was occurring during the 1970's and indicates the great stress in the industry. Furthermore, the 45 companies that continue to process oysters report a bleak picture for the Northeast region except for some highly productive leases off Connecticut and in Virginia. Of the 39 companies that supplied sufficient data 20 showed a decline of 321 workers while 7 showed an increase of 239 workers, and 12 showed no change. Most of the increase in workers (200) was provided by three companies: Tallmadge in Connecticut (85), Bivalve Packing in New Jersey but dependent on leases off Connecticut (60), and Stubb's Seafood in Virginia (55).

Peak labor figures, however, do not accurately reflect the condition of the industry because when the work falls off most producers do not lay off workers but shorten the work hours for everyone. Perhaps a better indicator is the judgments of the processors about the future of the industry as presented in Table 4. Half the owners or managers of the processing companies judged the future of the oyster industry to be very bad and another quarter judged it to be bad. Meanwhile, only 10% believed in a positive future for the industry. The two that judged it in very positive terms had very successful leases that have not been hit with diseases.

The next question in the table shows that the processors judged the financial health of their own companies more favorably than the industry as the whole. As one processor said, "So many others have gone out of business and I am still here so I am managing ok." Some of the survivors are benefiting from the removal of competitors. This benefit also applies to the supply of shuckers. We expected to find processors having large problems getting and keeping shuckers because most shuckers are getting

Table 4. Results of oyster processor survey

Statement	Percentage distribution of responses				
	Very Bad	Bad	Moderate	Good	Very Good
1) How would you rate the future prospects for the oyster industry?	50	26	13	5	5
2) How would you rate the financial health of your company	33	15	33	8	10
3) How much of a problem is there in getting and keeping shuckers?	8	8	24	21	39
4) How great a difficulty do you have in obtaining oysters to fill your orders of obtaining orders for the oysters you already have? ¹	18	21	24	29	8

¹For question 4, a good response means that there are difficulties getting orders for the oysters they have.

old and the young people are not following their parents' generation into this line of work. This problem, however, has not surfaced because the shucker workforce is declining at rates that are similar to or slower than the decline in the oysters stock to shuck. As one processor put it, "It would be a larger problem if there were more shell oysters available. Both shuckers and shell oysters are declining together." Therefore, only 16% said that finding shuckers was a large problem.

Finally, processors were asked which was the greater problem, getting oysters or getting orders for oysters. The availability of the resource has declined but so has the demand for oysters. It turns out that among Northeast processors the two declines balance out somewhat except that some processors have started importing inexpensive Gulf Coast oysters to fill their orders. The breakdown on where these processors get their oysters is as follows: 54% use only Northeastern oysters, 15% use 80-99% Northeastern oysters, 21% use 11-79% Northeastern oysters, and only 10% use only 0-

10% Northeastern oysters. The market niche that Northeastern processors have depends in most cases on the superior quality of the Northeastern oyster.

The remarks of the processors are important for understanding the state of the oyster industry in the Northeast. The major complaint of the processors is with the media coverage of the health hazards of eating oysters. One processor said "The constant adverse publicity for the seafood industry from consumer, environmental and media groups is devastating for marketing." Many of the real problems are with Gulf Coast oysters but the media does not differentiate between varieties nor do the customers. Also the media announce that diseases plague the Chesapeake Bay oysters and scares off customers even though the disease are not harmful to humans. The second largest complaint of processors is about the pollution of the bay which they blame in part for the decline in the oyster industry. Not only do they believe that pollution harms the oysters but also they attribute some of the health concerns of customers about oysters to the pollution of the Bay which is frequently brought to the attention of the public by the media.

Another prevalent complaint of processors is with the government policies and management of the industry. They are blunt about what they believe are incompetent policies, adverse regulations, and poor management. One thing that they agree on, however, is that the greatest need is to solve the disease problem and to improve local stocks. Some processors would also go so far as to advocate the introduction of new species in the Bay. As one processor said, "What do we have to loose? The local oyster has died out." There is, however, much disagreement on this potential policy.

Additional remarks that are frequently stated and are worth noting are as follows:

1. "The West Coast oyster has a bad taste and is giving oysters a bad name."
2. "We must produce a cheaper oyster so people will buy them again. We are pricing ourselves out of the market."
3. "We need properly labeled oyster cans so Gulf oysters are not sold as Chesapeake oysters just because they are packed here."
4. "The help that we need are for programs that improve the market."
5. "A 100% mark up at the store level is the big problem."
6. "My orders have fallen way off because my prices are too high. I am underpriced by the Gulf oysters. If the supply of Bay oysters greatly increases and the price drops, then we could sell them."
7. "This has gone from a bustling occupation to nearly zilch. It is not profitable to leave the docks." (He quit)
8. "Consumer tastes have changed. The younger generation do not eat oysters."
9. "Shuckers are dying out. My youngest is 45 and my oldest is 90."

MARKETING ISSUES

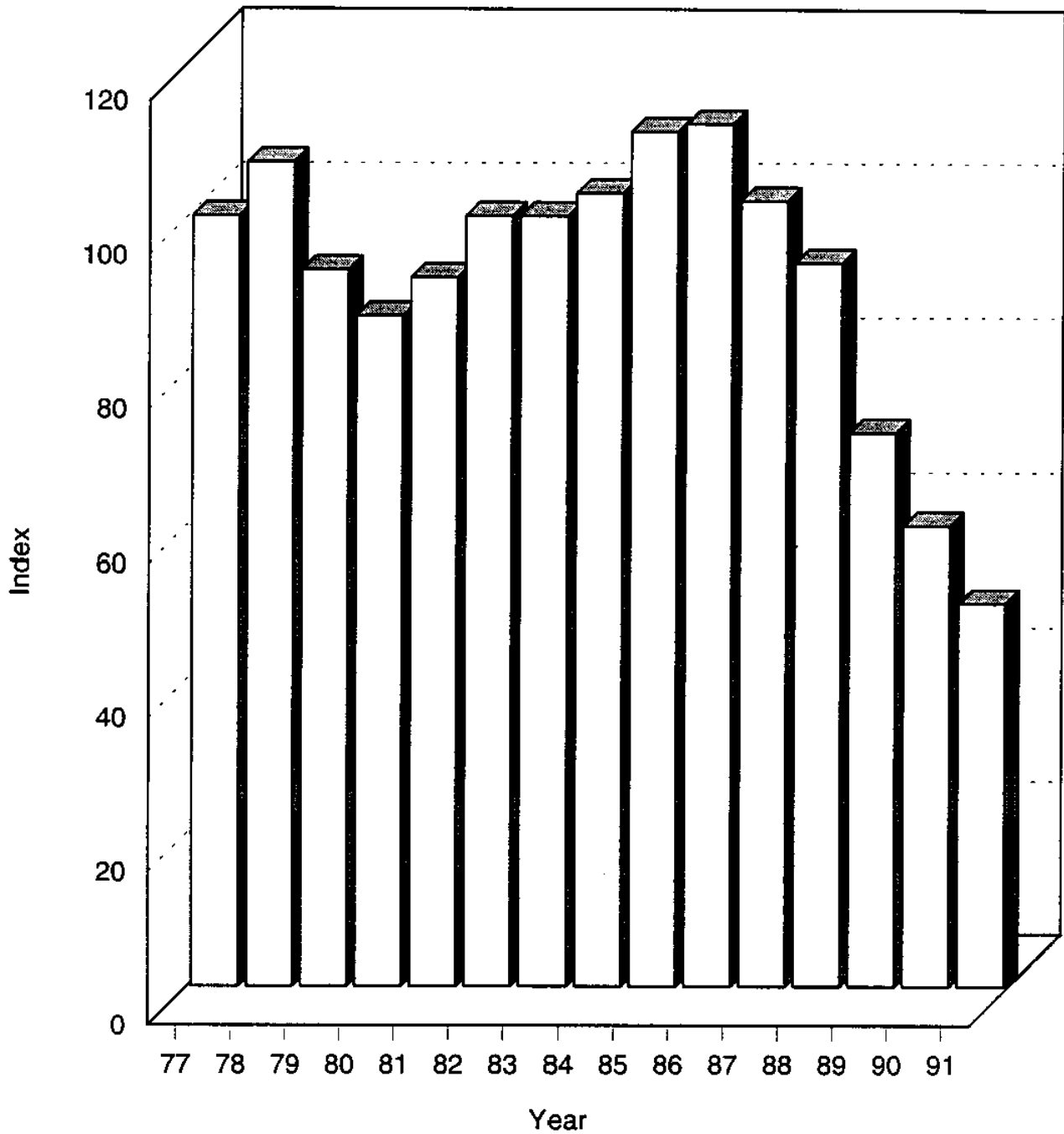
Oyster Demand: Status and Problems

Since 1977, the total domestic supply of oysters has declined 47%. Domestic production of eastern oysters has declined 49%. Mortality caused by MSX, Dermo, and overfishing is thought to be the primary reason for the decline in the production of eastern oysters *Crassostrea virginica*. There is evidence, however, that also indicates that the demand for oysters has dramatically declined during the past 7 years. It is thought that major reasons contributing to the decline in demand are consumer concerns over product contamination, health and nutrition, and reduced disposable income associated with the recession of the past few years.

Apparent per capita consumption of oysters declined approximately 48% between 1977 and 1991 and 54% since 1986 (Figure 12). The effect of consumer concerns about product contamination and health on oyster demand has not been demonstrated; concerns about contamination and health, however, are believed to be quite substantial. Henderson and Adelaja (1991) and Lin et al. (1991) found evidence that consumers were particularly concerned about becoming ill from consumption of shellfish. Henderson and Adelaja, however, also found that price was likely the major factor affecting shellfish consumption. Lin et al. did not examine the economic factors affecting demand, but instead focused on consumers' perceptions of product safety. Lin et al. found conclusive evidence that negative media publicity significantly affected the demand for oysters.

In the past few years, there has been extensive publicity about dangers of

Figure 12. Index of per capita consumption of oysters.



Source: National Marine Fisheries Service, Fisheries of the United States, selected issues, 1985-1991.

consuming shellfish, particularly raw molluscan shellfish (e.g., the west coast broadcast "Death of the half-shell" and the February 9, 1990, "20/20" show on dangers of consuming raw shellfish). The National Academy of Sciences issued a report in 1991 advising consumers not to eat raw shellfish; the report also indicated that fish and shellfish were nutritious, but reporters focused on areas of risk (American Seafood Institute Report, 1991). Even the trade magazine *Seafood Leader* (p. 58, 1991) cautioned consumers not to eat raw oysters. Moreover, legislation passed in California and Louisiana requiring warnings about consuming either raw oysters or shellfish.

Consumer concerns may have significantly affected the demand for oysters, but so also may have the recession of the past few years. Seafood has traditionally been viewed as a luxury commodity, and thus, the demand for seafood is likely to be quite sensitive to changes in income. Shabman and Capps (1986) demonstrated that the demand for oysters was quite sensitive to income levels; declining incomes would, therefore, cause the demand for oysters to decrease.

Increased availability of substitute species such as mussels and hard clams may have also affected the demand for oysters. In addition, supplies of other shellfish such as snow (tanner) crab have substantially increased in recent years which may have affected the demand for oysters. The actual nature of product substitutability between different shellfish has not been documented; it is likely, however, to be substantial.

A major concern for restoring the oyster resource and fishery, thus, is whether or not the demand for oysters is sufficient to warrant increased production of oysters. The limited evidence available suggests that the demand for oysters has dramatically declined

in the past ten years as a result of health/nutrition concerns, product safety, water pollution, economic fraud (adulterated product), media publicity, and reduced incomes caused by recession. Restoration of the industry will, therefore, likely require restoring consumer confidence in the product.

Intermediate Market-Level Survey

A comprehensive survey of consumers, retailers, restaurants, and wholesalers is necessary to precisely assess the demand for oysters and develop policies and programs to enhance demand. Limited funds and resources, however, precluded such an ambitious survey program. We, therefore, restricted our attention to assessing wholesalers' perceptions about the demand and market conditions for oysters. This sector supplies the other market levels and has extensive first-hand knowledge about changes in oyster sales and demand. Thus, information obtained from this sector should provide guidance for restoring the industry.

Using the National Marine Fisheries Service list of wholesalers, processors, and dealers, it was determined that 863 companies sold oysters or unclassified shellfish in 1991. After extensive field testing, a survey questionnaire consisting of 9 major questions was determined to provide necessary responses and information (Appendix 2). The primary emphasis of the survey was to develop market-related information for the purpose of restoring the oyster industry.

Survey Results

A total of 863 questionnaires were mailed to dealers in 25 states (Table 5). There was a 24% (208 responses) response rate with the highest number of returns coming from California (28 responses) and Washington State (45 responses). No responses were received from Alaska and Connecticut. A 24% response rate is relatively low for many surveys, but based on prior experience, is quite high for a survey of wholesalers and fish dealers.

Marketing and expected future sales:

Of the 208 responses received, 199 firms indicated they had, at some time, sold oysters. Six of the 199 firms stopped selling oysters in either 1990 or 1991 and two firms stopped selling in 1985. One-hundred and ninety firms indicated they sold oysters in 1992 and 179 firms indicated they definitely intended to sell oysters in 1993. Four firms indicated they will not sell in 1993 and 15 firms were uncertain they would sell in 1993. Thus, there is a potential decrease of approximately 10% in the number of firms willing to sell oysters in 1993.

Among the eastern states of Delaware, Maryland, Virginia, New Jersey, New York, North Carolina, and Pennsylvania, 10.5% of the firms indicated they will not or may not sell oysters in 1993. These states are primary producing or distributing states for the eastern oyster, *Crassostrea virginica*. Approximately 9.5% of the firms in Maine, Massachusetts, New Hampshire, and Rhode Island indicated they will not or may not sell oysters in 1993. In the Gulf states of Alabama, Louisiana, Mississippi, and Texas,

approximately 22.6% of the firms indicated they either will not or may not sell oysters in 1993. Approximately 4.8% of the firms in the southeastern states of Florida, Georgia, and South Carolina indicated they may not sell oysters in 1993. Approximately 5.3% of the firms in the west coast states of California, Oregon, and Washington State indicated they will not or may not sell oysters in 1993.

Oysters sold by region:

Tabulation of responses to question 2 about type of oyster sold revealed a strong linkage to resource availability and type of oyster sold (Table 6). For example, 100% of the Washington State firms responding to question 2 sold Pacific or west coast oysters, *Crassostrea gigas*. Interestingly, of the 190 firms selling oysters in 1992, 53% indicated they sold eastern oysters or *Crassostrea virginica*; 38.9% sold gulf coast, *Crassostrea virginica*, oysters; 42% sold Japanese or Pacific oysters (*Crassostrea gigas*). California had the largest percentage (60.7%) of west coast firms selling eastern oysters; Washington State, a major aquaculture producing state of Japanese or pacific, *Crassostrea gigas*, oysters, had one firm that sold eastern oysters. Eleven-percent of all firms reported they sold some other type of oyster, and only 1.6% of the firms indicated they did not know the type of oyster they sold.

Geographical-based product preferences:

A major concern of the survey was to obtain information for assessing market preferences for a species or geographical area (questions 3 and 8). Approximately 88.4%

of the respondents indicated they preferred to buy oysters produced in a particular state or body of water (Table 7); 71% of the firms indicated they also preferred to sell a brand name, particular species, local, or regional oyster. An important ramification of this preference pattern is that increased sales will primarily depend on increased local or regional production of oysters (e.g., 60% of the firms selling oysters in Virginia prefer locally or regionally produced oysters).

Seasonality in sales:

Another major consideration for restoring the oyster industry is seasonality of sales. Oyster sales have traditionally been highly seasonal and surveys of restaurants selling seafood have indicated a preference for year-round sales of a product. If legal or biological harvest seasons are out of sync with consumer demand, restoration efforts may not succeed. Tabulation of responses to question 4 revealed seasonality in sales but many firms selling oysters in all months of a year (Table 8).

Out of 198 responses to the question on seasonality in sales, approximately 46% of the firms indicated sales of oysters were seasonal. Firms reported major months of seasonal sales were November, December, and January. Interestingly, however, firms also indicated seasonal sales in many of the non r-months (e.g, June and July); these were primarily west coast firms (California and Washington State). With respect to the east coast firms (Maine, Massachusetts, New Hampshire, Rhode Island, New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, North and South Carolina, and Georgia) that sell eastern oysters (*Crassostrea virginica*), the major sales' months were

November, December, and January. However, 48.8% of the firms in these states indicated their sales of oysters were not seasonal; 90 and 71% of the Massachusetts and New York firms indicated sales were not seasonal.

Species and product preference:

The raw bar/half-shell and shucked meat product forms are by and large the dominant product forms of oysters (Table 11). Of the 190 firms selling oyster products in 1992, approximately 95 and 72% indicated they sold raw unshucked or half-shell products and shucked meats, respectively. Sixty-one percent of the respondents indicated that raw unshucked or oysters on the half-shell accounted for most of their oyster sales in 1992; 35% of the respondents indicated that shucked meats accounted for most of their oyster sales.

If the fishery is to be restored, it is necessary to know species preferences for these product forms as well as the preferred product forms. Interestingly, even with the biases introduced by the large number of responses from Washington State, approximately 43% of the firms indicated a preference for eastern oysters to satisfy the half-shell trade (Table 9); 37% indicated a preference for eastern oysters for the shucked product business (Table 10). Fourteen percent of the firms indicated a preference for gulf coast oysters for the half-shell trade, and 21% preferred gulf coast oysters for the shucked meat business.

Tabulation of the responses, however, indicated some clear area preferences. For example, 67 and 71% of the firms in Washington State indicated the Pacific oyster was preferred for the half-shell and shucked product trades; 100 and 87% of the Virginia firms

indicated the eastern oyster was preferred for the half-shell and shucked product trades. Firms in California also indicated a preference for eastern oysters for the half-shell trade; a majority of these firms, however, indicated a preference for the pacific oyster to satisfy the shucked meat market.

These geographically-based patterns suggest that restoration activities must clearly be local or regional in nature. The market appears to be quite differentiated with respect to product form and species. Successful restoration of one species in a given area may not be possible unless there is also an expansion in the market for the product and species.

Market expansion and major problems:

In the past five years, various government agencies and industry groups have attempted to assess the problems facing the oyster industry. Disease and negative media publicity have been cited as major factors contributing to the decline of the industry, particularly for eastern oysters. The Gulf coast states have been hard hit by negative media publicity and various state laws. The west coast industry has been troubled by excess production relative to the market. Industry has also suggested that consumers are not familiar with oysters, particularly those individuals that are under 40-45 years of age. In addition, the US economy has been in a recession for the past several years; this has likely reduced the demand for oysters. It is extremely important to understand and prioritize the problems confronting the industry. In the absence of such information, large expenditures on specific research may not help restore the industry if solutions

cannot be readily obtained or the problem is only of minor importance.

Question 9 offered respondents the opportunity to indicate what they thought were the major problems for increasing oyster sales. Interestingly, tabulation of the responses revealed some marked differences about the problems than those espoused by government and industry panels. Seventy-five and eighty-five percent of the respondents indicated that product contamination or water quality and negative media publicity were major problems (Table 12). Only 22% of the respondents indicated that supplies were inadequate; firms in Virginia, Maryland, North Carolina, and Massachusetts accounted for 44% of the 22% of the firms indicating supplies were inadequate. Thirty percent of the firms responded that consumers were not familiar with oysters. Forty-three percent of the firms indicated they thought that health and nutritional concerns posed a problem.

Results of the survey also revealed that problems varied by region or type of oyster. For example, 38% of the dealers in Washington State indicated that competition from imports posed a problem; in comparison, only 25% of the dealers from Maryland and Virginia thought imports presented a problem. However, 44% of the dealers from Louisiana thought imports posed a problem for increasing domestic sales. A plurality of dealers in all states indicated that negative media publicity presented a problem. A majority of respondents in Washington State, Massachusetts, and Rhode Island indicated that product contamination and water quality posed problems. The number of responses from dealers in other states were about equal for the issues of product contamination and water quality and negative media publicity.

Interestingly, dealers in most states did not view retail, wholesale, or substitute

product prices as a major problem. A large number of dealers from Virginia, however, thought that retail and wholesale prices were too high; these dealers also indicated they could not compete with types of oysters they did not sell. A plurality of respondents from Mississippi and North Carolina also indicated they thought that wholesale prices were too high. Only a small number of west coast dealers thought price levels posed a problem.

Respondents were also asked to identify what they thought were the four major problems for increasing oyster sales. Eighty-nine and seventy-five percent of the respondents indicated that negative media publicity and consumer concerns about product contamination or water quality posed major problems (Table 13). Approximately 37% of the respondents thought that health and nutritional concerns were among the four major problems. Interestingly, only 11% of the respondents indicated they thought that state and federal standards for product weight or quality should be considered as one of the four major problems.

The four major problems identified by consensus of responses were as follows: (1) negative media publicity, (2) concerns about product contamination or water quality, (3) concerns about health and nutrition, and (4) lack of consumer familiarity with oysters. There were, however, some geographic differences in problem rankings. For example, while 80% of the dealers in Virginia indicated that negative media publicity posed a problem, 47% also thought that supplies were inadequate and wholesale prices were too high. In contrast, only 11 and 4% of the dealers in California and Washington state considered supplies to be inadequate.

Resolving problems confronting the industry will require local, regional, and U.S.-

wide solutions. Solving problems 1 and 4 requires an extensive marketing campaign which should be effective in mitigating these problems. Consumer concerns about product contamination, water quality, health, and nutrition, however, cannot be easily mitigated via a marketing campaign. Interestingly, the four major problems identified by the consensus of respondents does not suggest a need for restoring the resource; only 18.6% of the respondents indicated that supplies were inadequate. It must be remembered, however, that respondents were identifying problems relative to the status quo; that is, they identified problems subject to current market conditions. Thus, supplies could very well be inadequate if consumer demand substantially expanded through a well-developed marketing effort.

Table 5. Questionnaires mailed and received and potential sales' plans.

State	Number of survey forms mailed	Number of survey forms received	Number of firms indicating they ever sold oysters	Number of firms indicating they sold oysters in 1992	Number of firms indicating they will sell oysters in 1993	Number of firms indicating they will not sell oysters in 1993	Number of firms that may sell oysters in 1993
		PERCENT	PERCENT RESPONSE RELATIVE TO QUESTIONNAIRES RECEIVED				
Alabama	25	8	100	100	100		
Alaska	1	0					
California	81	35	100	100	100		
Connecticut	9	0					
Delaware	2	50	100	100	100		
Florida	74	15	82	82	82		
Georgia	5	60	100	67	67		33
Hawaii	9	22	100	100	100		
Louisiana	112	14	100	94	81	63	13
Maine	12	17	100	100	100		
Maryland	51	28	93	86	86	7	
Massachusetts	97	13	77	77	77		
Mississippi	20	25	100	80	100	20	
New Hampshire	2	100	100	100	100		
New Jersey	17	35	50	50	67	33	
New York	44	16	100	100	100		
North Carolina	67	16	100	100	82	9	9
Oregon	8	25	100	100	100		
Pennsylvania	6	50	100	100	100		
Rhode Island	26	15	100	50	50	50	
South Carolina	23	30	100	100	100		
Texas	32	25	100	88	63	13	25
Virginia	48	31	100	93	87	7	7
Washington DC	4	25	100	100	100		
Washington St.	88	51	100	98	91	2	7
United States	863	24	96	91	86	5 ^a	5 ^a

^aPercent of firms with respect to firms selling oysters in 1992.

Table 6. Percent of firms selling selected species of oysters

State	Pacific (gigas)	Eastern (virginica)	Gulf coast (virginica)	Other	Do not know
	PERCENT				
Alabama	0	0	100	50	0
California	71	61	32	11	0
Delaware	100	100	0	100	0
Florida	11	33	78	0	11
Georgia	0	67	33	0	0
Hawaii	100	0	0	0	0
Louisiana	0	13	94	0	0
Maine	0	100	0	0	0
Maryland	8	100	31	0	0
Massachusetts	0	100	10	10	10
Mississippi	20	0	100	20	0
New Hampshire	0	100	50	50	0
New Jersey	0	100	0	0	0
New York	29	100	29	0	0
North Carolina	0	91	36	0	0
Oregon	100	0	0	50	0
Pennsylvania	67	100	100	0	0
Rhode Island	0	100	25	0	0
South Carolina	0	86	43	0	14
Texas	0	0	100	0	0
Virginia	20	100	53	0	0
Washington DC	0	100	0	0	0
Washington State	100	2	0	4	0
United States	40	51	37	6	2

^aPercent of firms with respect to firms that ever sold oysters.

Table 7. Preference for local, regional, and brand name oyster

State	Preference: State	Preference: Water body	No stated preference	Preference: brand name		Preference: Local vs Regional		Preference: Species
				YES	NO	LOCA L	REGION AL	
	PERCENT ^a							
Alabama	50	50	50	50	50	0	0	50
California	75	36	25	57	43	32	11	14
Delaware	0	0	100	0	0	0	0	0
Florida	67	44	33	44	56	44	0	0
Georgia	100	33	0	100	0	100	0	0
Hawaii	100	100	0	50	50	0	0	50
Louisiana	94	56	6	69	31	25	38	63
Maine	100	0	0	100	0	50	0	50
Maryland	77	69	23	77	23	62	0	17
Massachusetts	100	70	0	80	20	80	0	0
Mississippi	60	20	40	100	0	20	20	60
New Hampshire	50	50	50	50	50	0	0	50
New Jersey	100	100	0	33	67	33	0	0
New York	100	71	0	100	0	57	14	29
North Carolina	91	55	9	82	18	73	9	0
Oregon	100	50	0	100	0	50	50	0
Pennsylvania	67	33	33	100	0	33	67	0
Rhode Island	50	50	50	50	50	50	0	0
South Carolina	100	71	0	57	43	57	0	0
Texas	88	75	13	62	38	25	38	0
Virginia	93	60	7	80	20	40	20	20
Washington DC	100	100	0	100	0	100	0	0
Washington St.	87	60	13	60	40	27	18	16
United States	84	56	16	68	32	40	15	12

^aPercent of firms with respect to firms that ever sold oysters.

Table 8. Percent of firms indicating seasonality in sales^a

State	Seasonality		PERCENT OF FIRMS WITH SEASONAL SALES IN MONTHS 1-12											
	YES	NO	1	2	3	4	5	6	7	8	9	10	11	12
Alabama	0	100												
California	25	75	7	4				11	18	18	41			7
Delaware		100												
Florida	27	78	23	11							11	11	11	11
Georgia	33	67	33										33	33
Hawaii		100												
Louisiana	44	56	38	6	19	13	1					6	25	33
Maine	50	50						50	50	50				
Maryland	85	15	85	8								39	77	85
Massachusetts	10	90							10	10	10			
Mississippi	80	20	80									60	80	80
New Hampshire		100												
New Jersey	67	33	33						33	33	33	33	33	33
New York	29	71	14					14	14	14			14	14
North Carolina	64	36	64	9								46	55	64
Oregon	50	50						50	50	50				
Pennsylvania		100												
Rhode Island	50	50	25	25	25	25						25	25	25
South Carolina	86	12	86	12	12							29	71	71
Texas	63	38	63	50	50								13	25
Virginia	53	47	53									47	53	53
Washington DC	100													
Washington St.	51	49	29	9	13	13	13	11	11	9	2	11	22	27
United States	46	59	34	8	8	5	4	6	8	7	3	16	27	31

^aPercent of firms with respect to firms that ever sold oysters.

Table 9. Firms' species preferences for the half-shell trade^a

State	Pacific (gigas)	Eastern (virginica)	Gulf coast (virginica)	Other	Do not know
PERCENT					
Alabama			100		
California	25	57	4	7	7
Delaware				100	
Florida		33	22		44
Georgia		33	33		33
Hawaii	100				
Louisiana		13	63		25
Maine		50			50
Maryland		85			15
Massachusetts		90			10
Mississippi		60			40
New Hampshire		100			
New Jersey		100			
New York		86			14
North Carolina		55	9	9	27
Oregon		50		50	
Pennsylvania		100			
Rhode Island		50			50
South Carolina		43	29		29
Texas			75		25
Virginia		100			
Washington DC					100
Washington State	67	4		7	27
United States	20	43	14	4	20

^aPercent of firms with respect to firms that ever sold oysters.

Table 10. Firms' species preferences for the shucked meat trade^a

State	Pacific (gigas)	Eastern (virginica)	Gulf coast (virginica)	Other	Do not know
PERCENT					
Alabama					
California	46	26	7		21
Delaware		100			
Florida		33	44		22
Georgia		67	33		
Hawaii	50				50
Louisiana		13	81		6
Maine		100			
Maryland	8	92			
Massachusetts		40	20		40
Mississippi			100		
New Hampshire		50			50
New Jersey			100		
New York		71			29
North Carolina		73	9	9	9
Oregon	50	50			
Pennsylvania		100			
Rhode Island	25	75			
South Carolina		29	43		29
Texas		13	88		
Virginia		87	7		7
Washington DC					100
Washington State	71				29
United States	25	37	21	< 1	18

^aPercent of firms with respect to firms that ever sold oysters.

Table 11. Percent of firms selling major oyster products^a

State	Raw unshucked	Shucked meats	Value added	Other	Most sales--product form			
					Unshucked	Shucked	Value-added	Other
PERCENT								
Alabama	50	100		50		50		50
California	93	75	4	7	79	18		4
Delaware	100	100	100		100			
Florida	78	67	11	11	56	22	11	11
Georgia	100	33			100			
Hawaii	100	50		50	50			50
Louisiana	88	75	6		56	44		
Maine	100	50			100			
Maryland	92	92	23		23	77		
Massachusetts	100	40	10	10	80	20		
Mississippi	80	80	20		20	80		
New Hampshire	100	50			100			
New Jersey	67	100			33	67		
New York	100	71		14	86	14		
North Carolina	91	82		9	55	36		9
Oregon	100	100		50		100		
Pennsylvania	100	100	33		67	33		
Rhode Island	100	100			75	25		
South Carolina	100	43			86	14		
Texas	75	100		13	25	75		
Virginia	93	93	7	7	47	53		
Washington DC		100				100		
Washington St.	93	42	11	11	67	24		7
United States	91	69	8	8	61	69	< 1	4

^aPercent of firms with respect to firms that ever sold oysters.

Table 12. Percent of firms indicating problems A - L are problems^a

State	A	B	C	D	E	F	G	H	I	J	K	L
	PERCENT											
Alabama		100	100		100			50		50		
California	7	75	9	32	86	14	14	14	7	18	14	4
Delaware												
Florida	11	89	67	33	89	22	11	22		11		11
Georgia		67			100			33			67	
Hawaii	50	50	50	50	100		50					
Louisiana	31	94	56	31	100	6	19	25	19	44	6	
Maine		100		50	100	50	50					
Maryland	38	62	23	31	77	31	38	15	15	31	15	
Massachusetts	30	70	20	30	60	50	20	20	10	10	30	10
Mississippi	40	100	60	20	100	40	60	20		20	20	
New Hampshire		100			100							
New Jersey	33	100	100	33	100	33	33				33	
New York	43	86	29	43	86	14	14	14	14	14	14	
North Carolina	18	73	45	9	91	36	55	18	27	18	9	9
Oregon		50	100		100						50	
Pennsylvania		100	67		100	33	33	33	33			
Rhode Island	25	75	25		75	50	25		25			
South Carolina	29	71	29	14	100	14	14	29	29	1		
Texas	13	75	63	25	75	38	25			13	13	
Virginia	60	80	47	33	93	40	73	47	33	20	13	
Washington DC												
Washington St.	20	84	40	44	82	9	11	13	13	38	20	
United States	24	81	43	30	87	22	25	18	14	23	15	2

^aPercent of firms with respect to firms that ever sold oysters.

Question 9 from survey:

- A. High retail price; B. Consumer concerns about product contamination/water quality.
 C. Consumer resistance—health/nutritional concerns; D. Familiarity with oysters;
 E. Negative media; F. Inadequate supplies; G. High wholesale prices;
 H. Price competitions with other types of oysters; I. Inadequate state/federal regulations;
 J. Competition with imports; K. Other; L. Have no opinion.

Table 13. Percent of firms ranking A-L as one of four major problems^a

State	A	B	C	D	E	F	G	H	I	J	K	L
	PERCENT											
Alabama		100	100		100							
California	7	75	36	32	86	11	14	14	7	18	14	
Delaware		100	100		100	100						
Florida		89	67	44	89	22		11		11		
Georgia		67	33		100			33		33	67	
Hawaii	50	50	50	50	100		50					
Louisiana	19	88	38	13	94		6	13	13	44	13	
Maine		50		50	100	50						
Maryland	38	62	23	62	69	31	46	8	8	31	15	
Massachusetts	20	60	10	10	60	40	20	10			20	
Mississippi		100	40	40	100	40	20	20		20	40	
New Hampshire		100			100							
New Jersey	33	100	67		100	33					33	
New York	43	86	29	29	86	14	14			14		
North Carolina	9	64	27		91	27	18	18	27	18	9	
Oregon		50	100		100						50	
Pennsylvania		100	67		100	33	33	33	33			
Rhode Island		100	25		100	25	25		50			
South Carolina	29	71	29	14	100	14		29	29	14		
Texas	13	63	63	38	75	38	38		13		13	
Virginia	40	47	20	7	80	47	47	33	20	7	13	
Washington DC	100	100			100		100					
Washington St.	18	80	40	44	82	4	11	9	11	27	13	
United States	20	75	37	26	85	19	18	13	11	18	13	

^aPercent of firms with respect to firms that ever sold oysters.

Question 9 from survey:

- A. High retail price; B. Consumer concerns about product contamination/water quality.
- C. Consumer resistance--health/nutritional concerns; D. Familiarity with oysters;
- E. Negative media; F. Inadequate supplies; G. High wholesale prices;
- H. Price competitions with other types of oysters; I. Inadequate state/federal regulations;
- J. Competition with imports; K. Other; L. Have no opinion.

U.S. CONSUMER DEMAND FOR OYSTERS

Introduction

Seafood consumption has become an increasingly important part of the American diet over the last decade. As public warnings of the caloric and cholesterol content in red meats have increased, seafood has been viewed as a superior protein alternative. Estimated per capita consumption has grown by about 20 % in the 1980's (National Marine Fisheries Service). Even leading supermarket chains commonly feature specials on shellfish and finfish.

Oyster consumption, however, is following a different pattern (see Figure 12). A century ago, oysters were a stalwart of the U. S. fishing industry. As late as 1939, oyster production represented nearly 10% of U.S. harvested seafood value. It now represents less than 1% of the value. Imports have not offset the decline in domestic production and thus the downward trend evidenced in Figure 12. The question remains as to whether the trend in consumption is entirely a result of the observed temporal decline in the supply of oysters (due to declining oyster stocks) or whether the preferences of consumers also have changed over the years.

Except for the work of Hu (1985) and Cheng and Capps (1988) not much is known about U.S. oyster demand.² Hu found household purchases to vary directly with

²Henderson and Adelajara (1991) present some information on a very select sample of oyster consumers at a trade show. Lin, et al. (1991) present information on a sample of East Coast consumers and show the influence of their perception of risk on oyster purchases.

residence in the South, household income and the fall season. Cheng and Capps studied at-home demand for fresh and frozen seafood and explained how monthly household expenditures on oysters were influenced by economic and demographic factors. Oyster demand was characterized as being very responsive to oyster prices and not very responsive to the prices of substitute food items.

While this is useful information, we still know little regarding the at-home (AH) demand for specific forms of oyster products (i.e. canned and stews), the demand for away-from-home consumption of oysters, or the changes in oyster demand over time.³ All are useful in focusing efforts to revitalize the industry. The information concerning product forms may be useful in assessing the capacity of alternative markets available for processors. Moreover, some have argued that domestic processors should produce more canned product because foreign imports of oysters are mostly canned. Away-from-home (AFH) consumption of oysters is also important, with an 1981 estimated AFH consumption of 25% (Hu, 1985). This percentage may have risen recently as the percentage of away-from-home food expenditures has risen from 25% in 1965 to nearly 40% in 1989 (Senauer, Asp, and Kinsey, 1991). Understanding other potential trends in oyster demand is also essential. If there is not sufficient demand to absorb increased production with modest discounts in price, the industry may actually be hurt by "enhancement" due to declining revenues.

This chapter presents information on the at-home demand for three oyster products and the away-from-home demand for oysters. Much of the information is

³Hu shows that per capita consumption rose from 1969-1970 to 1979-80.

derived from the work of Berry (1992) and Buss (1991). The at-home demand for fresh/frozen oysters, canned oysters and oyster stew is characterized with regard to sociodemographic information and the relative "capacity" of the market for various oyster products to absorb greater production. Away-from-home demand for oyster consumption is characterized for a sample of heads of household residing in the fifteen East Coast states and the District of Columbia.

The household demand for oysters is estimated using three data sets: the USDA National Food Consumption Survey for 1977/1978 and 1987/1988 and the NMFS National Seafood Consumption Survey for 1980/1981. For seafood consumption, the NMFS survey of 7,430 households is superior because it focuses on seafood. It provides information on the monthly purchases of seafood, both at-home and away-from-home. The 1977/1978 USDA data that examine weekly purchases are useful because of the greater sample size (about 14,000 households). Unfortunately, the least useful is the most recent 1987/88 USDA survey of weekly purchases because of its small sample size (about 4500 households). However, all are necessary in estimating time trends in oyster consumption.

The At-home Demand for Oysters

Oysters are processed and marketed to households in many different product forms, ranging from shellstock (raw, shell-on) to specialty items. As mentioned earlier, this range has shrunk from about 15 different unique products made from the eastern oyster to only about 6. Most Americans still consume oysters at-home as an appetizer

or in a main dish. The primary main dish is a fried oyster, made from fresh/frozen shucked oysters. Relative to the other forms, the unshucked oyster is rarely purchased for home consumption.

For at-home consumption, we define three⁴ product forms for oyster consumption:

Fresh/frozen oysters- oysters shucked, whole or in pieces. Generally these are refrigerated but occasionally they are frozen;

Canned Oysters- oysters purchased in a can. Generally these are prepared by smoking or salting and kept in water or oil;

Oyster stew- processed oysters in a stew. Includes soups, chowders and sauces.

Although the first category includes frozen oysters, few (10%) of the purchases are frozen. We subsequently refer to this category as fresh. These three categories are analyzed, to the degree data availability permits, with regard to the probability that a consumer will participate in the oyster market. Participation is modeled as a two stage process, where the individual considers whether or not to purchase oysters, and then, if the purchase is made, the consumer decides the quantity to purchase.

Factors Influential in the Purchase Decision

In the decision to purchase oysters, we consider factors including oyster price, family size and composition, age, sex, race, education, region of residence, occupation, and income of household head. We also test to see if consumers have greater demand

⁴Originally, we included raw (with shell) oysters as a fourth category. Unfortunately, the sample used have too few observations to provide a meaningful analysis.

during months containing the letter "R". The probability that a household purchases oysters during a week (USDA data) or a month (NMFS data) is related to the sociodemographic factors listed above.

Table 14 contains a summary of the qualitative results from that analysis⁵. The double "plus" (minus) signs signify factors that were significant, positive (negative) determinants of the purchase of oysters whereas the single plus (minus) sign represents insignificant but positive (negative) effects.

The first factor, household income, positively affected the likelihood of fresh and canned oyster purchases but had a negative influence on the likelihood of purchasing oyster stew. Household size, on the other hand, had a negative influence on purchasing fresh and canned oysters but was positively related to oyster stew purchase. The presence of children in the household generally had a negative influence on the likelihood of any oyster purchase. Age of the homemaker was a significant positive factor- a homemaker whose age was more than 44 was more than twice as likely to purchase fresh oysters. Households whose head was male were more likely to purchase all forms of oysters. Households whose head was non-white were more likely to purchase fresh and canned oysters whereas they were less likely to purchase oyster stew.

Households were more likely to purchase fresh oysters in months containing a "R" in their spelling. The influence was not present for either canned oysters or oyster stew. There were no other seasonal influences in fresh oyster demand, but households were more likely to consume canned oysters and oyster stews during the fourth quarter.

⁵For further information, see Berry, 1992.

Table 14: Factors Related to the Probability of Participation in Purchasing Oysters, by Product Type, 1981 and 1977-78

	FRESH/FROZEN OYSTERS		CANNED OYSTERS		OYSTER STEW	
	1981	1977	1981	1977	1981	1977
Household Income	++	+	+	++	-	-
Household Size	-	-	-	-	++	+
Presence of Children	--	NA	-	NA	-	NA
Male Household Head	++	++	++	+	+	++
Non-White Household Head	++	+	++	+	-	-
Employed Homemaker ¹	+	++	-	+	-	+
Age of Homemaker	++	++	++	+	+	+
May thru August Vs. Rest of the Year	-	-	NA	NA	NA	NA
First Quarter Vs. Fourth Quarter	NA	NA	-	+	-	+
Second Quarter Vs. Fourth Quarter	NA	NA	-	-	-	+
Third Quarter Vs. Fourth Quarter	NA	NA	-	-	-	-
Rural Vs. Urban ²	++	++	++	-	-	+
Suburban Vs. Urban	++	NA	+	NA	+	NA
White Collar Vs. Retired/Unemployed	++	NA	-	NA	+	NA
Blue Collar Vs. Retired/Unemployed	-	NA	+	NA	-	NA
Price Per Pound of Oyster Product	-	-	-	NA	-	-

¹The variable used in the 1977-78 data is the employment status of the household head.

²The relationship tested for the 1977-78 data compared rural vs. urban and suburban areas.

++ positive significant ; + positive not significant

-- negative significant ; - negative not significant

NA not applicable or dropped from the equation.

Households in urban areas were, in general, less likely to purchase oysters compared to their rural or suburban counterparts. Also households whose head was a white collar worker were more likely to purchase fresh oyster compared with households where the heads were retired or unemployed. However, the latter group was more likely to consume oyster stew than households with heads who are blue collar workers.

Finally, the influence of price was, as expected, negative. Because the relative number of oyster purchases⁶ was smaller in the USDA data, we were only able to compute an average household price per season and region. The NMFS sample permitted computing a price per month and region. Thus, the prices in the NMFS sample were probably more reflective of the actual price faced by consumers. As a result, the price coefficients in the NMFS sample were generally more statistically significant.

The Quantity of an Oyster Purchase

We also examined the amount of oysters purchased, conditional on the household having decided to purchase oysters. The two factors considered were the actual purchase price of the oysters and the household's income. We could use the actual price at this stage because only purchasing households were included and thus prices were reported. This reduced the potential error in the price variables of both samples. The actual regressions are available in Berry (1992) and we only report elasticities in Table 15.

⁶Oyster purchasers were only about 1.5 % of the USDA sample (228 households out of ~ 14,000 total households) whereas they represented about 11.8 % of the NMFS sample (856 households out of ~ 7500 households). The difference relates to monthly versus weekly purchase, the different sample population and the inherent randomness in the sampling.

The next to the last column of Table 15 shows the estimated elasticities for price changes at the mean level of price. Although there is substantial variation, all price elasticities were negative and all were statistically significant. It is difficult to compare across the two samples since one is a weekly response and the other is a monthly response. However, by comparing within samples, we see that the fresh

TABLE 15: PRICE AND INCOME ELASTICITIES FOR OYSTERS, BY PRODUCT FORM AND SAMPLE SET

PRODUCT FORM	FACTOR	DATA SET	MARKET PURCHASE ELASTICITY	CONDITIONAL QUANTITY ELASTICITY	TOTAL ELASTICITY
FRESH	PRICE	1977 USDA	- 0.12	- 4.04**	- 4.15
		1981 NMFS	- 1.86**	-7.66**	- 9.53
	INCOME	1977 USDA	0.17	0.038	0.21
		1981 NMFS	0.28**		0.28
CANNED	PRICE	1977 USDA		-4.40**	-4.40
		1981 NMFS	-3.24**	-1.58**	-4.82
	INCOME	1977 USDA	0.51**	0.93**	1.43
		1981 NMFS	0.11**	0.16**	0.27
STEW	PRICE	1977 USDA	-0.27	-1.71**	-1.98
		1981 NMFS	-0.90**	-0.047	-0.95
	INCOME	1977 USDA	-0.47**	0.51**	0.05
		1981 NMFS	-0.21**	-0.016**	-0.37

**Significant at the 10% or less level.

and frozen product has the most elastic demand and oyster stew has the smallest elasticity. The oyster stew should have relatively inelastic demand because it is a holiday

"treat" and relatively inexpensive.

The income elasticity of purchased canned oysters in both data sets is positive and statistically significant. With oyster stew, we get conflicting signs, both significant. No judgment is made regarding the "truth" but we did have a greater number of observations on purchasers with the NMFS data and a slightly greater confidence in the coefficient. The difference could also arise from a change in the relationship over the four years spanning 1977 to 1981.

Trends in At-home Oyster Consumption

Although the 1977/78 data was not as revealing as the 1981 data, it has nonetheless far greater numbers of observations than the 1987/88 USDA National Food Consumption Survey. The usable observations from the 1987/88 data are approximately one-third of the usable number from the 1977/78 data. As a result, we use the most recent data in a limited fashion, hoping only to obtain some verification of our original findings.

First, the share of oyster purchases represented by each product type is shown for each data set (Table 16). The increasing share of canned oysters is apparent as is the decreasing share in oyster stew.

Next consider how the factors affecting participation in oyster purchase have changed over this decade. Again, we are limited by the sample size of the 1987/88 data set, but we can test whether the same factors influence oyster consumption. Table 17 contains a comparison of the results from the earlier period with the 1987/88 period.

Table 16: Selection of Oyster Products, 1977/78 to 1987/88

	1977/78 NFCS	1980/81 NSCS	1987/88 NFCS
Usable Observations	13,888 ¹ One week for 13,888 households	89,160 12 months for 7,430 households	4,495 One week for 4,495 households
Total Oyster Purchases	228 households	856 households	33 households
Share of Fresh/Frozen	54 %	43 %	50 %
Share of Canned Oysters	25 %	46 %	50 %
Share of Oyster Stew	21 %	11 %	0 %

¹Actual number used for each product type varied depending on the amount of information regarding observed oyster prices in a region and quarter.changed over the decade.

Table 17: Influential Demand Characteristics, 1977/78-1987/88.

Household Characteristics	Fresh/Frozen Oysters		Canned Oysters	
	1977/78 and 1981	1987/88	1977/78 and 1981	1987/88
Household Income	++ ¹	NS ²	++	NS
Household Size	NS	NS	NS	++
Male Household Head	++	++	++	NS
Non-white Household	++	++	++	NS
Age	++	++	++	NS
Months without an R	--	--		
Rural Residence	++	NS	++	++
Quarter 1			--	NS
Quarter 2			--	NS
Quarter 3			--	NS

¹ ++ indicates significance at the 10 % or less level.

² indicates the result was not significant

The most recent data for fresh/frozen oysters indicates some similarities with previous results. Households with older, non-white, or male household heads tend to consume more fresh oysters. Months without R's in their spelling have fewer oyster consuming households (although this result no longer controls for oyster prices). In contrast to the earlier surveys, household income and rural residence no longer were significant explanatory factors.

The canned oyster analysis was substantially different from the previous analysis. The only significant factors for the 1987/88 period were a positive effect of household size and rural residence.

Aggregate U.S. Demand for Retail Purchases

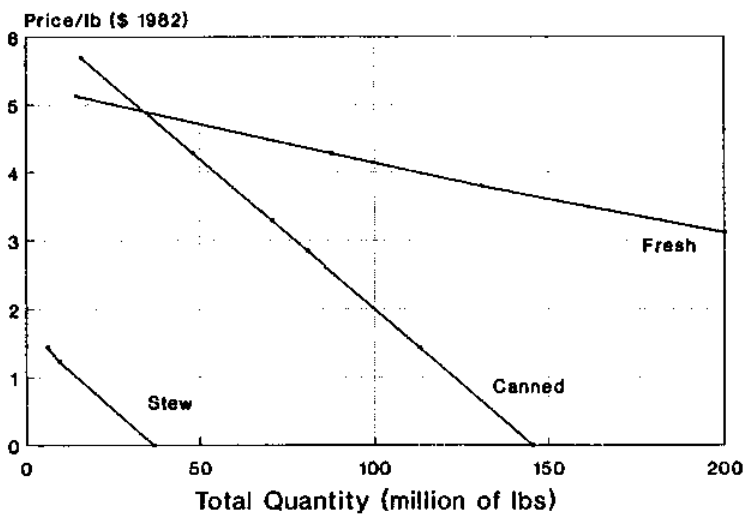
The household relationships reported on above can be expanded to provide information about the aggregate level of demand for at-home oyster consumption. Figure 13 contains our estimated 1977/78 and 1981 demands for oyster consumption at home, by product type⁷. The demand curves for each of the products decline dramatically when 1981 is compared to 1977/78. This difference may arise from actual changes in preference but it may also arise due to the differences in the lack of observations in the 1977/78 data set. At a price of \$3 per pound (in 1982 dollars), the quantity demanded would have been 200 million pounds in 1977/78, but only 60 million pounds in 1981. The same comparison for canned oysters results in a decline in quantity demanded from 75

⁷Small sample size for the 1987/88 data precluded us from making similar demand estimates for that year.

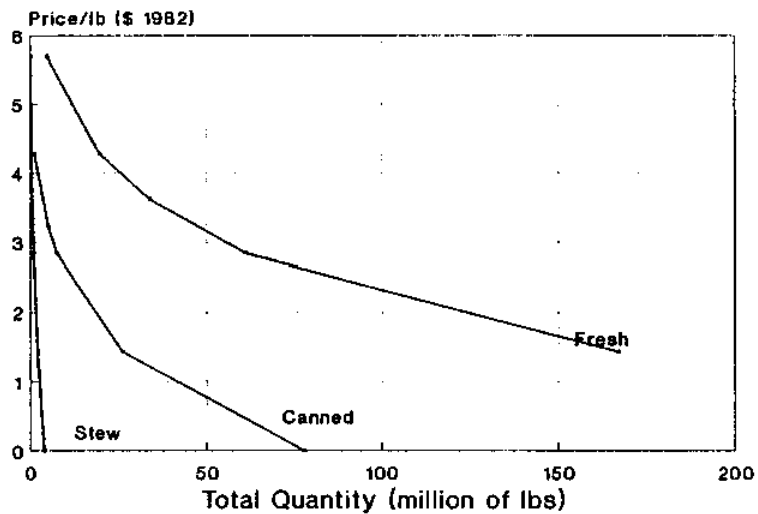
Figure 13. Aggregate demand for at-home consumption by product type

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USDA, 1977/78



NMFS, 1980/81



million pounds to only 7 million pounds.

Away-from Home Demand for Oysters

Economic information concerning AFH oyster demand is difficult to obtain. First, there are simply not many individuals who eat oysters away from home. A large sample must be obtained to observe any person who has purchased oysters away from home. Second, it is difficult to know with any precision the price of a "representative" oyster entree. Restaurants have different selections, different ambiance, and different quality of preparation. Even if we knew the price of the entree and quality of preparation, we would not necessarily know the other food items included with the entree. This problem is further complicated by the large number of non-purchasing households. These conditions help explain the paucity of literature on away-from-home purchase of oysters.

Rather than simply ignoring this form of oyster consumption, we have analyzed AFH choices in a simple fashion. The number of times⁸ a household head selects oysters AFH in a month is considered a random event, occurring infrequently. The mean number of times for a subsample, however, is considered to vary according to certain household and market characteristics. Some (e.g. Buss and Strand 1991) have had limited success in incorporating retail price as a surrogate for the entree price. This approach assumes that the retail price reflects the marginal cost of oysters in the entree.

The analysis is based on 1,174 household heads interviewed during the 1980/81

⁸ The amount of oysters in an entree is largely independent of the choice made by the consumer. We thus do not consider quantity consumed explicitly.

NMFS National Seafood Consumption Survey who reside on the East Coast. Their monthly selections of oyster entrees were analyzed using a Poisson regression technique. The factors with significant influence on the number of mean number of selections per month are shown in Table 18. Household characteristics which positively influence the times that oyster entrees are selected per month are similar to those

Table 18: Factors Influencing AFH Entree Selection

Factor	Positive Effect	Negative Effect
Household Income	✓	
Rural Residence	✓	
Suburban Residence	✓	
Male	✓	
Education		✓
New England ¹		✓
New York Metro Region ¹		✓
Mid-Atlantic ¹		✓
Retail Price ²		✓

¹ Compared with residence in the south.

² Only significant during months whose spelling does not contain an R.

influencing fresh/frozen at-home purchases. Income, rural/suburban residence, sex of the respondent are all positive influences on oyster selection.

Education, however, has a negative influence on AFH demand as does any non-Southern residence. Retail price was a negative factor but only during the oyster "off-season". At other times of the year, the retail price variable had no significant effect.

CONCLUSIONS

The purpose of this study was to describe the East Coast oyster industry as it exists today. It is clearly an industry that has declined from being a major component of the seafood industry in the region to a peripheral source of income for its dwindling participants. But the changes in the industry are more than just a decline in oyster abundance. Some things appear slow to change like the attitudes of watermen about the causes of the decline and the public sectors role in the future of this industry. Watermen are reluctant to accept the role of fishing mortality in stock declines, and this probably leads to their reluctance to support regulations of fishing activities for conservation purposes. But just as strongly as they oppose government intervention in their fishing activities, they support publicly financed repletion programs, and believe the more repletion the better.

When oysters were abundant the processing sector had to work hard to develop markets for their products. This supported diversity, and a wide variety of oyster products in the market place. Now there are basically two oyster products, whole unshucked oysters, and fresh shucked oysters. If some way is found to increase oyster production in the Northeast United States, new product forms and new markets will have to be developed in which to sell these products. The new product forms may be the same as the old products, but the market will have to be reestablished.

While there was not sufficient recent data to state conclusively that oyster demand has declined significantly, there are numerous pieces of evidence to support this claim,

most notably, the currently low oyster prices despite the low levels of production. In the case where we did have data, there was evidence of a major decline in oyster demand over just a three year period (1977/78 - 1981). With the large amount of negative publicity about the hazards of consuming raw molluscan shellfish, and pollution in coastal waters, we would expect that more recent data would document a continuing decline in oyster demand. If there is to be a public investment to see that more oysters are produced in the name of revitalizing the oyster industry, there should be a similar investment in ensuring more oysters are sold.⁹

There are some positive signs and some success stories within this declining industry. Most notable, the increasing fishery in Long Island Sound, and the high price received for oysters from that region. Part of that success, however, can be attributed to the declining Chesapeake Bay fishery. Remember how the Chesapeake Bay fishery capitalized on the failure of oyster harvests from Delaware Bay north, in the middle of the century.

More oysters will not revitalize the oyster industry alone. Increased demand and a wider variety of products will be necessary components of a "successful" industry revitalization.

⁹This assumes that it is determined that the public welfare is served by revitalizing the oyster industry (i.e., the benefits outweigh the costs of such a program).

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APPENDIX

OYSTERMEN SURVEY

Thank you for agreeing to participate in the University of Maryland/Virginia Institute of Marine Science oystermen survey. This information will be used as part of a research study to help state and federal agencies develop policies regarding the future of the oyster industry. By responding, you are ensuring that those involved in developing policies understand the oyster industry. Your responses are confidential, and only summary information will be released.

Please circle or check the answer that applies or write the answer in the space provided.

I) Employment and Income

- 1) Please indicate the amount that represents your total household taxable net income in 1990.

<input type="checkbox"/> \$0 - \$9,999	<input type="checkbox"/> \$30,000 - \$39,999	<input type="checkbox"/> \$60,000 - \$69,999
<input type="checkbox"/> \$10,000 - \$19,999	<input type="checkbox"/> \$40,000 - \$49,999	<input type="checkbox"/> \$70,000 - \$79,999
<input type="checkbox"/> \$20,000 - \$29,999	<input type="checkbox"/> \$50,000 - \$59,999	<input type="checkbox"/> \$80,000 +
- 2) Of the above amount, please indicate the percent that came from: (Total = 100%):

_____ % oystering	_____ % other fishing	_____ % non-fishing income
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- 3) What were the percentage sources of income in 1985 or earlier?:

_____ % oystering	_____ % other fishing	_____ % non-fishing income
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- 4) Which species constitute your other source of fishing income (check any that apply):

<input type="checkbox"/> hard clams	<input type="checkbox"/> soft clam	<input type="checkbox"/> hard crab	<input type="checkbox"/> soft and peeler crab	<input type="checkbox"/> other shellfish	<input type="checkbox"/> eels	<input type="checkbox"/> striped bass	<input type="checkbox"/> catfish
<input type="checkbox"/> shad and herring	<input type="checkbox"/> bluefish	<input type="checkbox"/> flounder	<input type="checkbox"/> other				
- 5) Which of the species listed above is currently your greatest source of non-oyster income? Species: _____
Income: \$ _____
- 6) Which species was your most important source of income in 1985 or earlier? Species: _____ Income: \$ _____
- 7) Are you currently engaged in other employment during the oyster season? Yes No During 1985 or earlier? Yes No
- 8) Please indicate your principal source of non-fishing employment:

<input type="checkbox"/> construction	<input type="checkbox"/> farming	<input type="checkbox"/> retail sales	<input type="checkbox"/> factory worker	<input type="checkbox"/> white collar	<input type="checkbox"/> other _____
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(specify)

II) About the Oyster Business

- 1) How much did you gross in oysters in the last year you went oystering? \$ _____ Number of bushels: _____ bu.
Year: 19 _____
- 2) Do you own a fishing boat? Yes _____ No _____ Are you the boat operator? Yes No
Number in crew? _____ Type of Crew compensation?: Wages _____ Share _____
- 3) If you own a boat, please indicate the following:
Year purchased? 19 _____ Purchased new or used?: New Used Purchase price \$ _____ Est. current value \$ _____
Hull material: Wood _____ Fiberglass _____ Aluminum _____ Other _____ Length: _____ ft. Propulsion: Gas Diesel Sail
Inboard or Outboard Engine? Inboard _____ Outboard _____ and horsepower? _____ hp Skipjack?: Yes No
- 4) Type of oyster gear (circle all that apply): Hand tong Patent tong Dredge SCUBA
- 5) In what county do you land or sell most of your oysters? _____ County State _____
- 6) In what county do you land or sell most of your other fish? _____ County State _____
- 7) Approximately how many days did you fish for oysters in 1990? _____ days fishing
- 8) What are the beginning and ending months of your oyster season? Begin _____ End _____
- 9) How many days did you oyster in a season 1985 or earlier? _____ days fishing
- 10) What were the beginning and ending months of the oyster season in 1985 or earlier? _____ to _____
- 11) Costs of All Fishing Operations in 1990:

Annual Fuel Costs \$ _____	Vessel and gear loan \$ _____
Maintenance and Repair \$ _____	Dock or slip fees \$ _____
License and Special Taxes \$ _____	Wages to crew \$ _____ or share _____ %
- 12) To Whom Do You Sell Oysters?

Direct to shucker/packing house _____ %	Direct to retail _____ %
Buyer other than packer _____ %	Other (please indicate) _____ %

- 13) Do you currently own oyster leases? Yes ___ No ___ Number of acres? _____ acres Production in 1990? _____ Bushels
- 14) Do you harvest seed oysters? Yes ___ No ___ Percent oyster income from seed oysters? _____%

III) Information About You

- 1) State of residence _____ County _____
- 2) Age _____ Sex (circle one): M F Race (circle one): White Black Hisp. Asian Other
- 3) Education (circle): no high school some high school high school graduate some college college graduate some grad school advanced degree
- 4) Marital Status (circle): Single Married Sep/Divorced No. of children _____
- 5) Does your spouse work for income? No ___ Part-time ___ Full-time ___
- 6) Was your father an oysterman?: Yes ___ No ___

IV) Attitudes About Oyster Industry

	strongly agree		neutral		strongly disagree
1) Oyster stocks are reduced due to overfishing	1	2	3	4	5
2) Oyster stocks are reduced due to disease	1	2	3	4	5
3) Oyster stocks are reduced due to pollution	1	2	3	4	5
4) There is too much government involvement in the oyster industry	1	2	3	4	5
5) Too much oyster bottom is leased for aquaculture	1	2	3	4	5
6) I support the introduction of Japanese oysters to increase production	1	2	3	4	5
7) Introduction of Japanese oysters is risky to native populations	1	2	3	4	5
8) Japanese oysters will bring a much lower price than native oysters	1	2	3	4	5
9) The market demand for all oysters is increasing	1	2	3	4	5
10) Increased seeding program will improve the oyster industry	1	2	3	4	5
11) Increased shelling program will improve the oyster industry	1	2	3	4	5
12) Disease resistant native oysters will rejuvenate the oyster industry	1	2	3	4	5
13) Fast-growing cultured native oysters will rejuvenate the oyster industry	1	2	3	4	5
14) I would continue to oyster even if I could make 50% more doing something else	1	2	3	4	5
15) Increased oyster populations will help clean up the Bay	1	2	3	4	5
16) Oyster programs should be run by the watermen, not the State	1	2	3	4	5
17) It is getting more difficult to find good crew for oystering	1	2	3	4	5
18) Concern about safety of shellfish consumption is hurting the oyster business	1	2	3	4	5
19) The oyster industry should be left alone and will recover on its own	1	2	3	4	5
20) If conditions do not improve, I will have to stop oystering soon	1	2	3	4	5

The Sea Grant Programs of Maryland and Virginia thank you for taking the time to complete this survey.

Oyster Wholesaler's Survey

1) Our company sold oysters...? (check only one)

in 1991

19__ was the last year we sold oysters

2) Which species did you sell? (check all that apply)

Japanese, pacific or west coast (*Crassostrea gigas*)

American, eastern (*Crassostrea virginica*)

American, gulf coast (*Crassostrea virginica*)

other (specify) _____

Do not know

3) Do you prefer to sell a brand name or regional (e.g., Chincoteague) oyster?

no yes (Specify) _____

4) Is your oyster business seasonal? no yes

If yes (circle 3 months of highest sales)

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

5) Do you expect to sell oysters in 1992 and 1993?

Yes _____ No _____ Maybe _____

6) In your opinion, what is the best species or type of oyster for the raw bar/half-shell/shellstock and shucked meat markets?

(check only one type for each market)

half-shell/ shucked

shellstock meats

Japanese, pacific or west coast (*Crassostrea gigas*)

American, eastern (*Crassostrea virginica*)

American, gulf coast (*Crassostrea virginica*)

Other

7) Which of the following product forms do you sell? (check all that apply)

a) raw unshucked—shellstock b) shucked meats

c) value added

d) Other (specify) _____

Which product form accounts for most of your annual sales (\$) of oysters?

(check one) a) b) c) or d)

8) When you purchase oysters, do you prefer the oysters to be from a particular state or body of water? yes no (do not care)

If yes, indicate

state _____

and/or body of water _____

9) Major problems for increasing oyster sales are...? (check all that apply)

a High retail prices relative to substitute products

b Consumer concerns about product contamination or water quality

c Consumer resistance because of health/nutritional concerns

d Consumers are not familiar with oysters

e Negative media (e.g., television) publicity about oysters/shellfish

f Inadequate supplies

g Wholesale price of oysters is too high relative to other products

h Price competition with type of oysters and products I do not sell

i Inadequate state/federal standards on product weight or quality

j Competition from imports

k Other (specify) _____

l I have no opinion

Indicate by letter what you believe are the four major problems:

1) _____ 2) _____ 3) _____ 4) _____

