

2002 LEASEHOLDER SURVEY

Background

A great deal of biological information about oysters exists, but little concerning attitudes of those who grow and harvest them. However, defining needs is a primary step in organizing outreach education and effective Extension programs. The information derived from this survey was designed for wide-ranging use among educators, policy-makers, and politicians.

In 2002, the University of Maryland (UM) and Maryland Department of Natural Resources (MDNR) cooperated in a mailed survey of oyster leaseholders. This was an effort to gain information on the extent of the industry, as well as its problems and potential after the disastrous disease epizootics of the past two decades.

The survey was conducted by contract with the UM Opinion Research Center (ORC) at College Park. It consisted of a two-round mailed survey interspersed with a postcard reminder. The initial survey was sent with a letter explaining the need for the survey and that all responses would be coded and kept confidential, with no individual identification possible. Two weeks following the initial mailing, a postcard reminder was sent asking recipients to complete the survey. Two weeks following that, a mailing of the survey form was done to those who had not responded. The ORC compiled the results and submitted them to the project managers for analysis.

Comparison With 1979 Industry

The 2002 survey sought to characterize many of the same factors as the 1979 survey. The 1979 questionnaire was given to 112 participants who attended the conference and identified themselves as having leases. Of these, 100 returned completed surveys.

The data from the two surveys has been useful in showing differences in the industry between 1979 and 2002. No assertion is made as to the statistical validity of the 1979 survey, but it was the only instrument of its type for many years. The assumption may be made that those who attended that conference were more optimistic about their business than those who did not, since invitations were sent to all leaseholders at the time.

Leaseholders attending the 1979 meeting were from all oyster-producing counties of the state, but many marginal growers probably were not represented. This may have skewed the data. Comparisons are useful not only in showing changes that occurred in the industry but that the similarities regarding problems remained congruent.

River System or Geographic Area	Number of leases
Magothy River	2
West / Rhode Rivers	11
Herring Bay / Chesapeake Bay	3
Patuxent River	12
Potomac River	25
Chester River	5
Eastern Bay / Miles River	3
Choptank / Little Choptank Rivers	22
Nanticoke River	6
Wicomico River	17
Tangier Sound	5
Coastal bays	3
TOTAL	114

Table 1. Geographic location of 2002 Survey respondent leases.

Leaseholders responding to the 2002 survey held leases in a variety of river systems. Roughly half were on either side of the Bay, with 53 leases (46%) on the western side and 58 leases (51%) on the Eastern Shore. The coastal bays had 3 leases, slightly less than 3% of the total. 76% were located in higher salinity regions that included St. Mary's County and Somerset, Wicomico, and Dorchester. This distribution assisted in broadening survey results since it assured grounds in all areas were included.

Survey respondents were distributed across the range of areas where leases occur, with the exception of a single lease in Cecil County, which was never active. Respondents were asked to identify the rivers where their leases were located rather than the county since many counties touch more than one river or area. Dorchester, for example, has borders on the Choptank and Wicomico Rivers, and contains areas of the Little Choptank, Fishing Bay, and Honga River. River systems thereby provided a better means of identifying distribution of leases.

In the 2002 survey, 114 leaseholders responded, although some did not include all requested information. Section I profiled operations to find the contribution of private production to the oysters in Maryland.

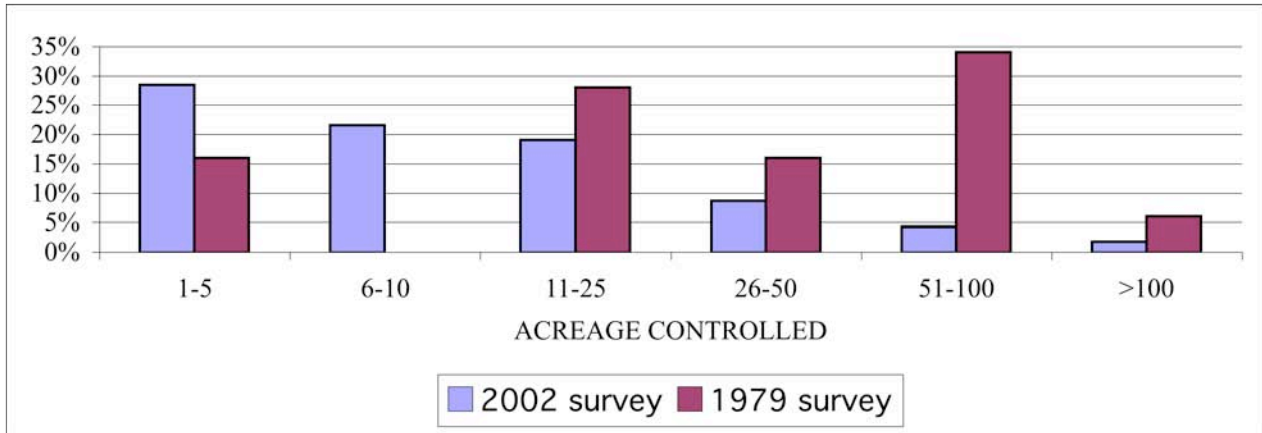


Figure 1. Amount of acreage controlled. This figure compares the amount of leased bottom acreage held or controlled by contract by respondents in 2002 and 1979.

Asking for the acreage that respondents leased or controlled by contract (Figure 1) provided a range showing that groups answering in 2002 decreased as the acreage numbers increased. This would be an expected distribution. In 2002, only 6% reported more than 50 acres of lease and 70% held no more than 25 acres.

Attendees at the 1979 conference were more often those holding higher amounts of acreage. Approximately 40% of the 1979 attendees claimed to have rights to 50 acres or more, with 6% claiming over 100 acres. This contrasts to the '02 survey that showed a greater number of leaseholders with smaller acreage. This may also reflect the decline of large holdings in the Bay, as some large growers left the business and others did not pick up these tracts. Often, large leaseholders aggregated leases by purchasing them from small operators who had decided not to continue.

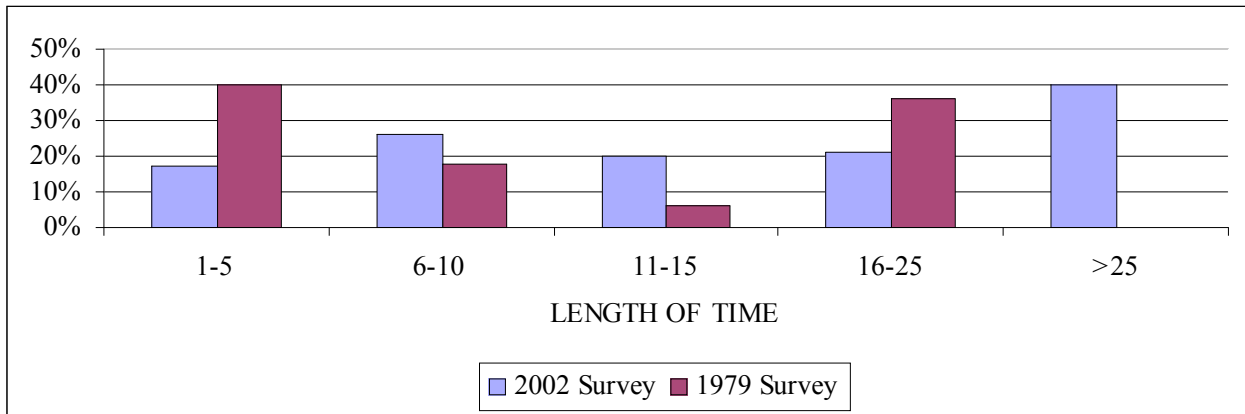


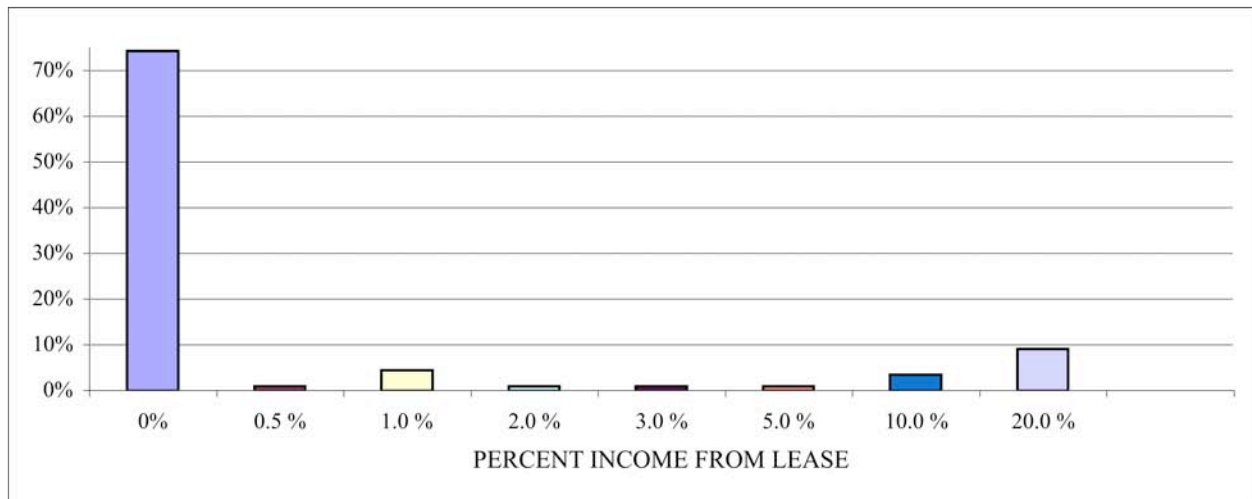
Figure 2. Longevity of leases. Respondents reporting years holding leases across surveys.

Figure 2 indicates distribution of longevity similar throughout the lower and middle ranges, showing that there had been movement in the buying and selling of leases over the years. The category "more than 25 years" indicates those holding leases for a long time with, in some instances, transfer within families.

The only county where new leases had been granted in over a decade was Worcester. Hard clam growers had begun to lease areas here in recent years, hoping to begin a productive industry. Others were leases that had been transferred between older lessees leaving the business and newer producers wanting to grow oysters. Some growers likely purchased leases for speculation, hoping they would become productive again while they assumed the state would not authorize new areas for lease in the future.

Terms of lessees occupied both ends of the strata, with 40% being new leaseholders of less than 6 years while 36% had leased lands for more than 15 years. This followed the analysis made of attendance at the 1979 conference, which showed older growers present, seeking to find new information to increase production. New entrants were similarly interested in learning about making their ventures successful.

Figure 3. Percent income in 2002 from leases. Income went from 0% to no more than 20%.



Disease's most devastating effect on leases has been its impact on the income of growers. Virtually all those responding to this question indicated that the financial contribution of their leased grounds was either non-existent or very low as shown in Figure 3. While seafood producers are normally reluctant to divulge income in surveys, when combined with the level of harvest reported to the MDNR, this information is verified.

Bottom type affects lease management and profitability. Since leases must be on "barren bottom", as defined by law, it is usually necessary to prepare the bottom to catch natural seed or to hold planted seed. The predominant type of leased bottom is mud. This is frequently planted with shell to provide substrate for oysters. Sand is not usually a good bottom type to plant oysters but is useful for the hard clam *Mercenaria mercenaria* in the seaside bays.

The survey asked for the types of bottom found on respondent's lease. Data showed a range of bottom types from soft mud and shell to sand.

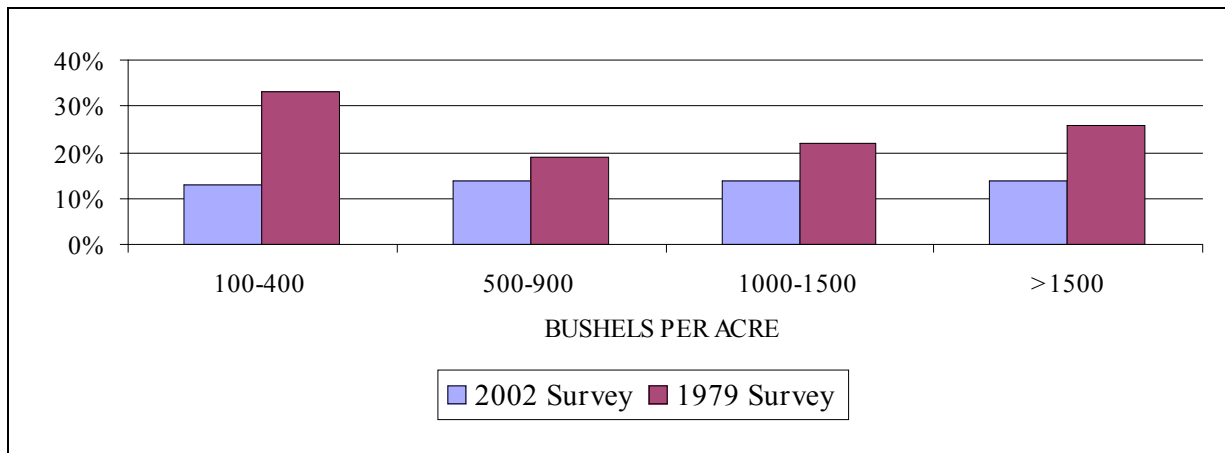


Figure 4: Bushels of shell needed to stabilize bottom in bushels/acre. Comparison of responses in 2002 and 1979.

Shell from shucking plants was formerly used for bottom stabilization but is increasingly scarce. With the loss of processing plants, the amount of shell available for stabilizing bottom has fallen drastically. The only large source was from deposits in the upper Bay. These shells were dredged, washed, and carried by barge to planting grounds. They were expensive for planters to purchase and the depth of water on leases frequently made it difficult, if not impossible, for barges to offload shell directly onto lease. With the removal of permits for that dredging, this source has also become unavailable for renovating grounds.

More shell is usually required on soft bottom to provide support for oysters. This made it expensive for growers to develop a lease. Sediment overburden that developed over the years also made it necessary to periodically add shell to the lease to remain productive. Volumetrically it takes over 2,200 bushels of shell to cover one acre of ground one inch deep (Webster and Meritt, 1988).

Results of the 1979 survey showed that 86% reported a need to plant shell to stabilize bottom compared to 58% in 2002. This difference likely derived from the number of non-responses to the recent question versus all responding in 1979. Increasing shell cost may have made this a function of economics. Growers may have found themselves unable to profitably absorb the cost of delivered shell.

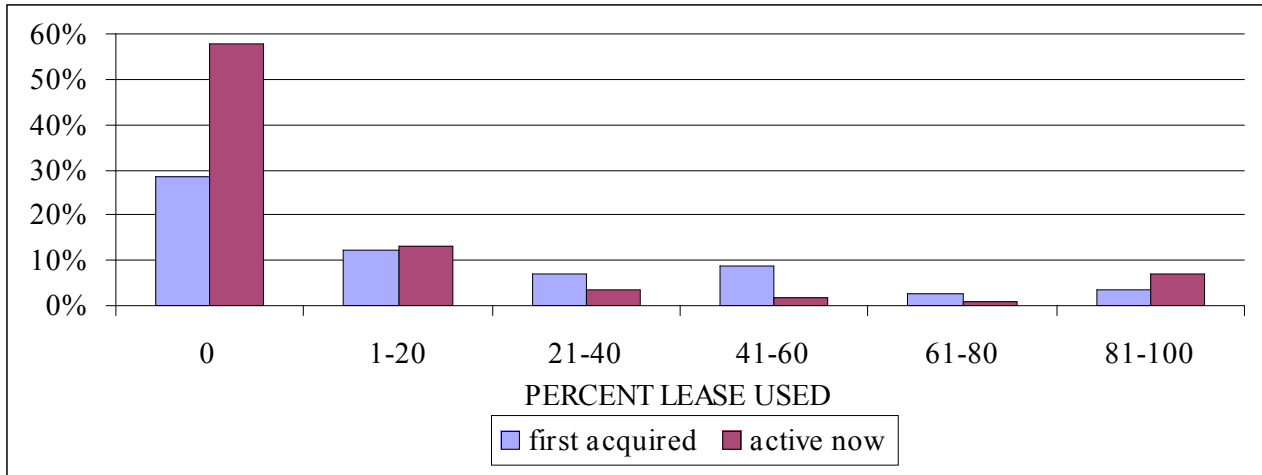


Figure 5. Percentage of leased ground worked when acquired and currently.

Figure 5 provides insight into the use of the leases when the respondents first acquired their grounds compared to their current use. This was an open-ended question that sought to demonstrate the decline in usage that has occurred.

When leaseholders first acquired their grounds, many used them. This reflected the year they obtained grounds and how long they had been holding the leases. The high number responding that they had not used their grounds in the first year probably corresponds to leases obtained after the epizootics of the 1980s had begun and the lack of sufficient seed and shell as raw materials with which to plant the grounds. Once diseases established themselves and began killing oysters before they attained legal size, many grounds were effectively rendered useless.

Disease and lack of natural recruitment has had an effect on the use of leases over time. Few respondents work their grounds today, and less than 9% reported activity on half or more of their leases.

Oyster growers traditionally placed shell on their grounds to provide a place for larval oysters to attach, thereby obtaining their seed from natural set. With lack of shell and fewer oysters present to spawn and provide larvae, Figure 5 shows that grounds have fallen into disuse. Few leaseholders reported having a natural spat set on their grounds in at least half of the years in the decade.

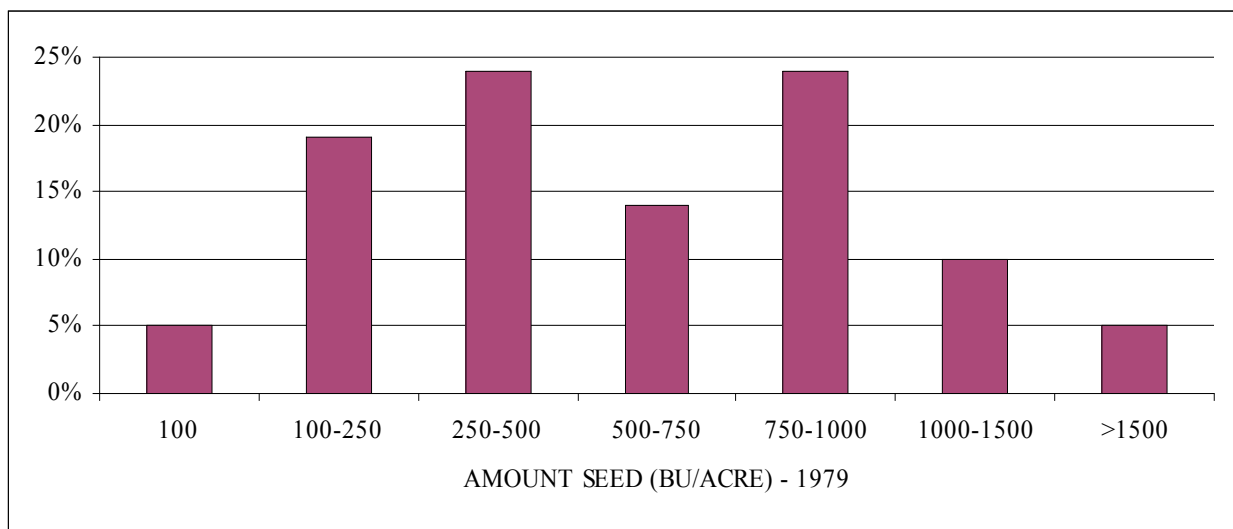
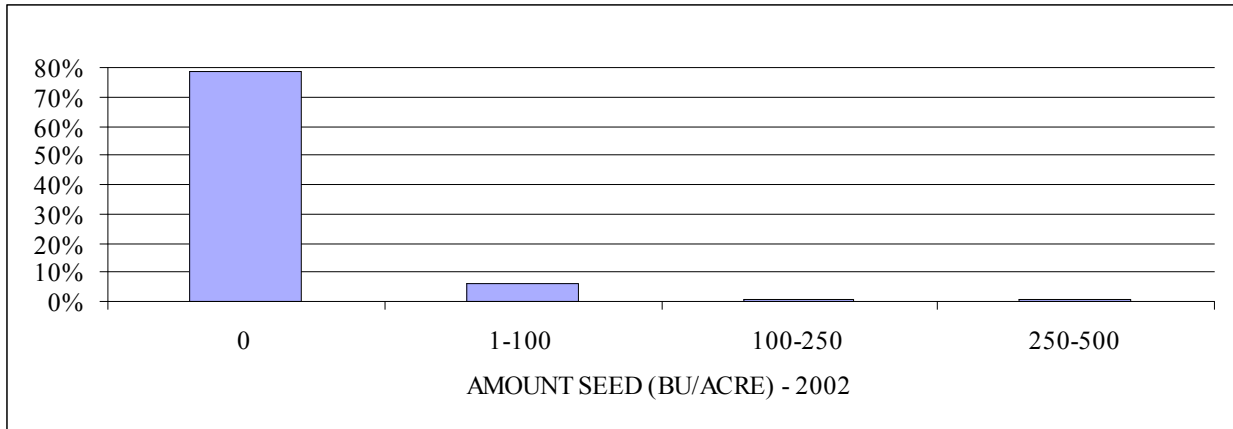


Figure 6. Amount of seed in bushels per acre required in 2001 and 1979. Respondents reporting how much seed they planted on grounds in two surveys. Figures provided as separate charts because of differences in reporting categories between surveys.

Shellfish seed is a primary requirement for successful aquaculture. It is the raw product that is needed to plant the lease. When grown, it is harvested and becomes the product that is sold to earn a profit for the grower.

Seed is available by catching spat from oysters spawning naturally; by purchasing from natural seedbeds; or from hatcheries. Hatchery seed is the principal source now, when low natural recruitment cannot be counted on to provide consistent seed. Low response of those no longer planting their grounds may indicate several potential causes:

- Viable seed was not available from James River or Maryland seed grounds
- Not enough hatcheries were in business to produce seed that could live to return a profit to the growers
- Expense of the seed was too great for growers who were earning little from their businesses
- Disease had affected lease causing it to be futile to grow where mortality would take a great toll

In 1979, oyster production was based either on natural seed or purchased from the James River. Growers at that time were planting at fairly high rates, with many emplacing 1 million or more seed oysters per acre (assuming 1,000 count seed per bushel planted). Contrast between periods shows that lack of seed is a key current problem. Lack of seed, with the mortality that is likely in most areas, seems to be the major causes of decline in the oyster aquaculture industry.

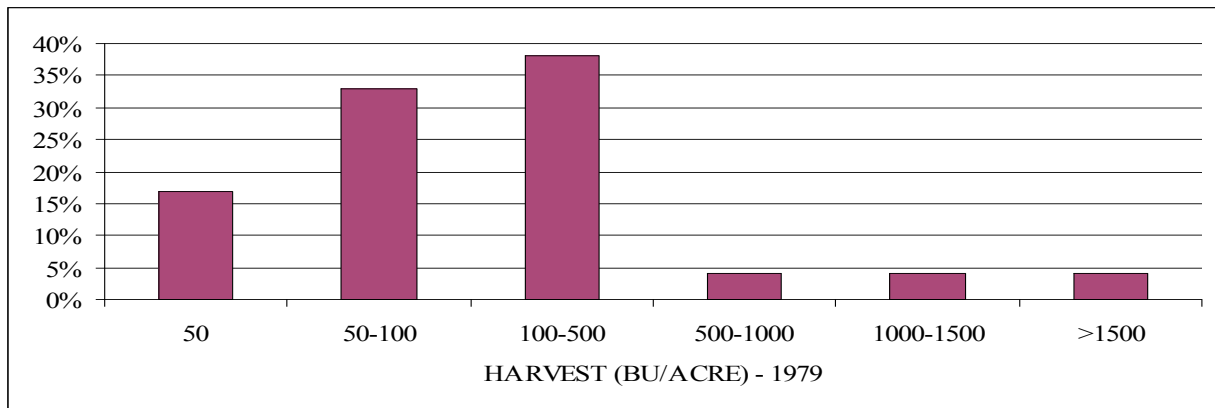
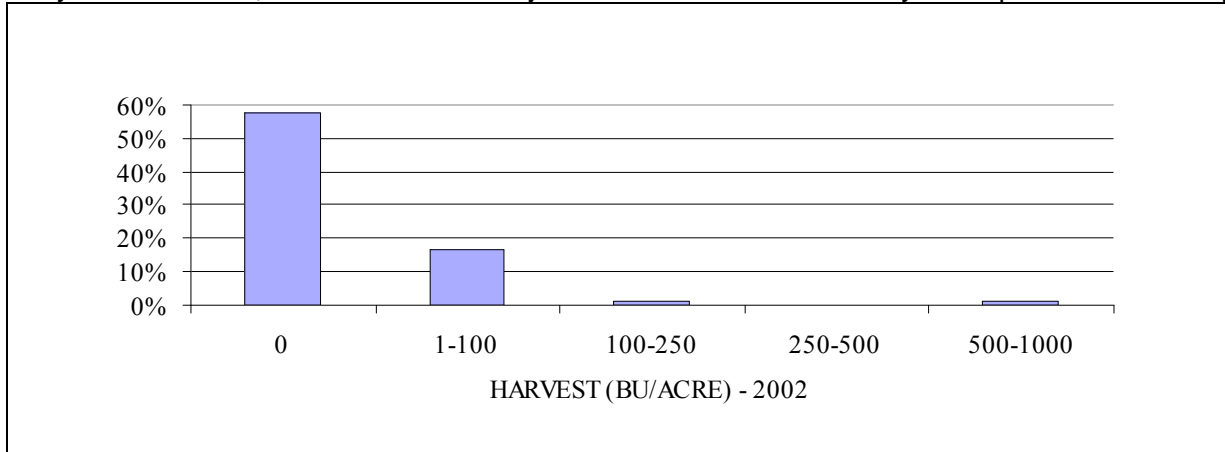


Figure 7. Harvest from leases in 2002 and 1979 in bushels per acre. Respondents reported harvest in defined ranges from their leases.

Prior to disease epizootics, it was not unusual for growers to report harvests of 250 to 500 bushels per acre. Currently, most are not harvesting their grounds and less than 2% are harvesting above 100 bushels per acre.

In the 1970s, harvests of up to 500 bushels per acre were not unusual. Some growers were producing far more than that, probably those able to afford higher levels of seed purchase and with more productive grounds. Some in the 1979 survey reported harvests exceeding 1,500 bushels per acre (Figure 7).

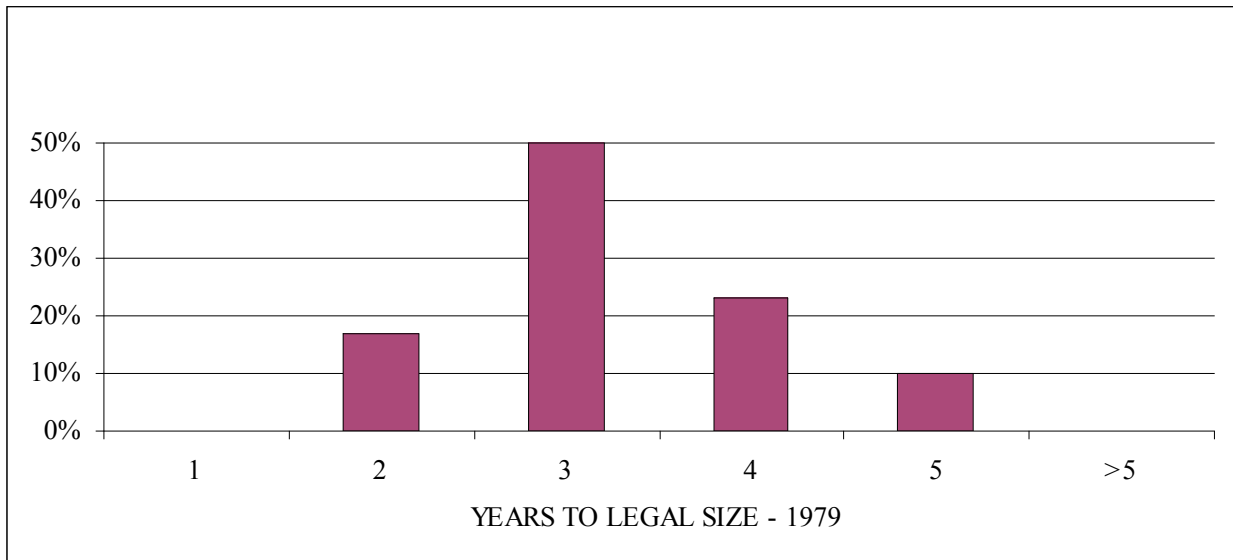
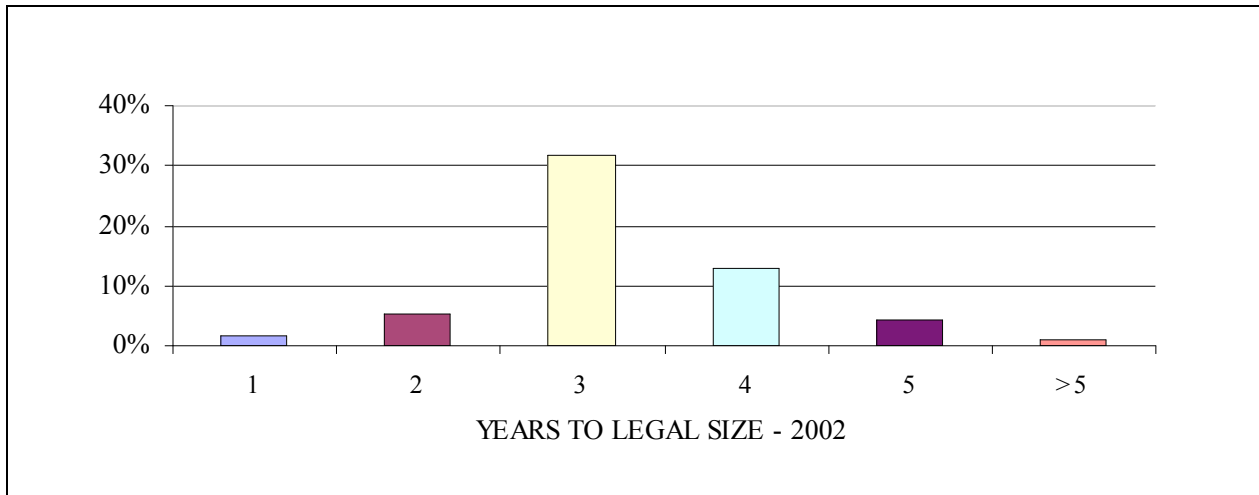


Figure 8. Years for planted oysters to reach market size.

Years from planting to harvest is important in calculating cash flow and potential profitability of an aquaculture venture. *C. virginica* generally requires at least three years to reach legal size of three inches. While some oysters may grow faster, the harvest generally begins in that year, with most oysters being harvested in the third and fourth years. Growers and researchers often investigate ways to accelerate oyster growth to get animals to market as quickly as possible. This is seen as a way of "outgrowing" diseases and bringing positive cash flow to businesses more quickly, resulting in higher probability of success.

Similarities between '02 and '79 are seen in Figure 8. Growers reported the same general rate of growth of oysters on their grounds. This showed that harvests peaked in the third year and continued for about two years afterward.

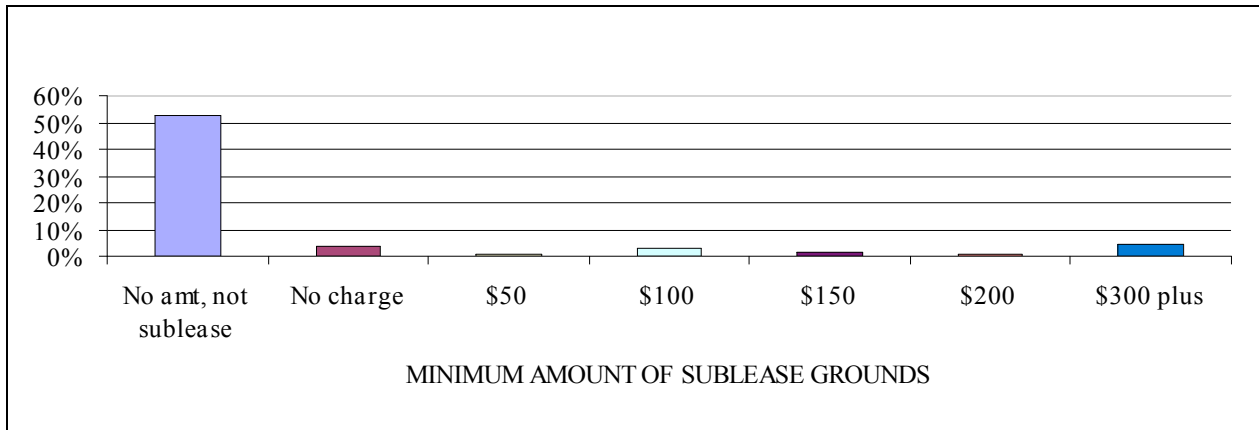


Figure 9. Minimum amount respondents would ask to sublease. Shows percent of respondents citing a minimum price they would charge per acre/year for others to sublease grounds.

Interesting responses were garnered to the question, "If you were going to sublease your grounds to others, what is the minimum that you would charge per acre per year?" The first choice was, "No amount. I would not sublease my grounds." This was the choice of 52.6% of respondents. This indicates that, while little activity is currently going on with most leases, their value to the grower is still high. This may indicate why few grounds have been returned through voluntary termination over the years, even with low production.

Problems Affecting Leaseholders

Survey participants were provided a suite of options, along with an open-ended question, to elicit and rate the major problems faced in the operation of their business.

Category	Response (%)				
	Always	Sometimes	Rarely	Never	No response
<i>Mortality</i>	38.8	19.8	4.3	2.6	34.5
<i>Seed availability</i>	28.4	12.1	7.8	6.0	45.7
<i>Lack of financing</i>	21.6	16.4	2.6	12.9	46.6
<i>Theft</i>	19.0	18.1	6.9	8.6	47.4
<i>Pollution</i>	17.2	12.1	14.7	8.6	47.4
<i>Bottom type</i>	11.2	11.2	12.9	12.9	51.7
<i>Poor or slow growth</i>	6.0	12.1	18.1	12.9	50.9
<i>Available markets</i>	0.9	8.6	12.9	17.2	60.3
<i>Market price</i>	2.6	12.1	13.8	15.5	55.2

Table 2. Problems defined by leaseholders in 2002 as being primary concerns.

Problems faced by leaseholders are production oriented, not market oriented. Lack of seed and shell, high mortality (principally caused by disease), and theft of product remain the primary ones.

Qualitative responses shown in the table were numerous (31). Many identified theft as well as hydraulic clam harvesters either working on their grounds in violation of the law, or nearby which affected their grounds. Several felt that silt loads suspended by dredging had a detrimental impact on their grounds.

Another was pollution with the respondents identifying sources. One spoke of chicken manure runoff from adjacent cropland. Others identified wastewater treatment plants, while others said development in their watershed were reasons they thought grounds had been affected. One grower noted that, "Pollution closed my beds completely in the mid '90s. Disease/Mortality finished our production in 1987. I planted hatchery stock in 1990, '91 & '92. This all died." For another, this came as just another problem as he stated, "Pollution has kept lease closed for 13 years. We experienced massive theft when area was open to harvesting!"

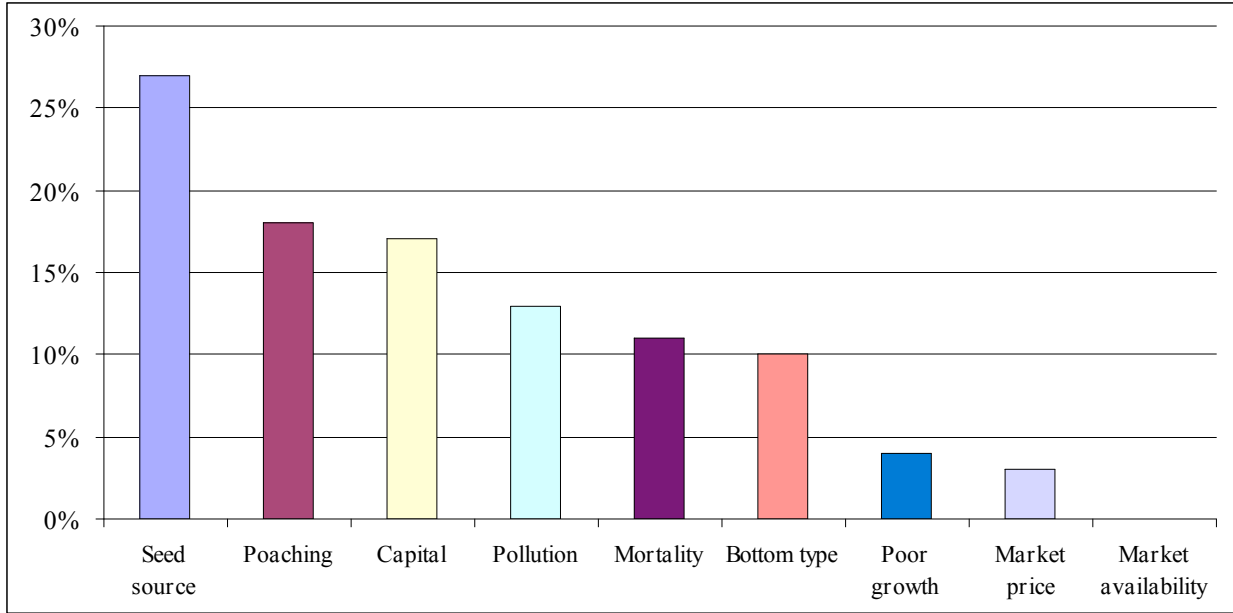


Figure 10. Problems respondents faced in 1979 in operating their leases.

In the 1979 survey, the question asked was, “What are the major constraints encountered in the operation of your lease?” At that time seed was a problem to 27% of growers and small planters often weren’t able to afford purchases from the James River. Theft was a significant threat to 18%.

According to the results in Figure 10, approximately 17% of growers raised the issue of capital, probably since many were new to the business. To begin as a grower, the purchase of seed and shell was often required. This expense frequently required borrowed funds.

Disease had not caused widespread problems up to 1979. During the ‘60s and ‘70s it was normally in higher salinity areas of Tangier Sound. Significantly, markets were not deemed to be a problem at that time either, even with harvests exceeding 2.5 million bushels per year.

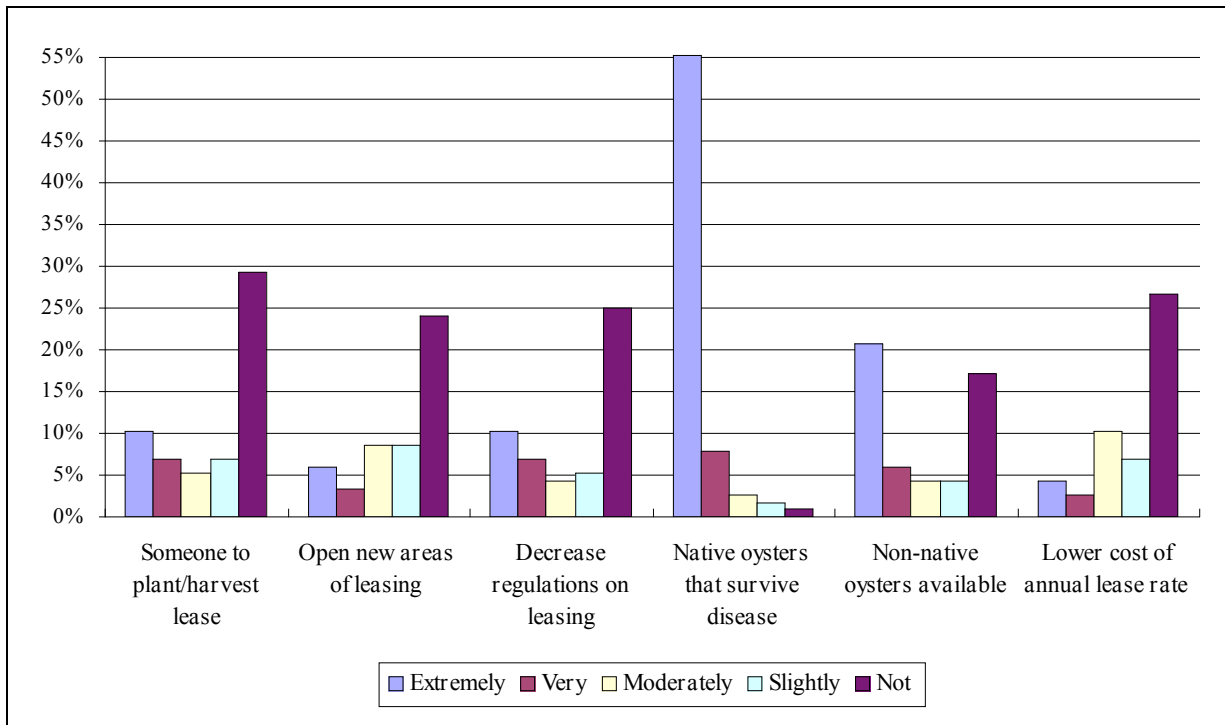
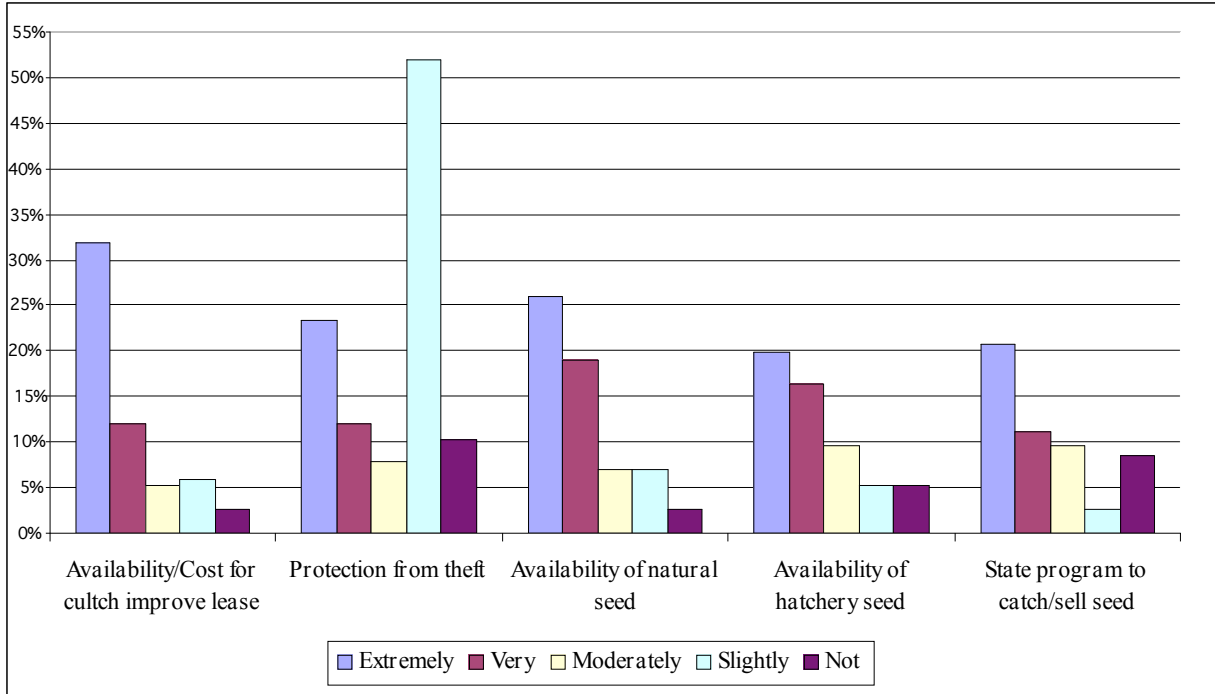


Figure 11. Respondents' opinions on improving lease productivity. Responses gauge opinions about improving productivity in their shellfish aquaculture leases.

The most important feature of lease improvement is solving disease. While lack of seed was deemed important, it must live to reach market to turn a profit. Interestingly, current participants do not look at non-availability of new grounds as a problem. This infers that they would use current grounds if a way of keeping animals alive could be found. The current annual lease rate of \$3.50 per acre was not deemed to be a problem by respondents.

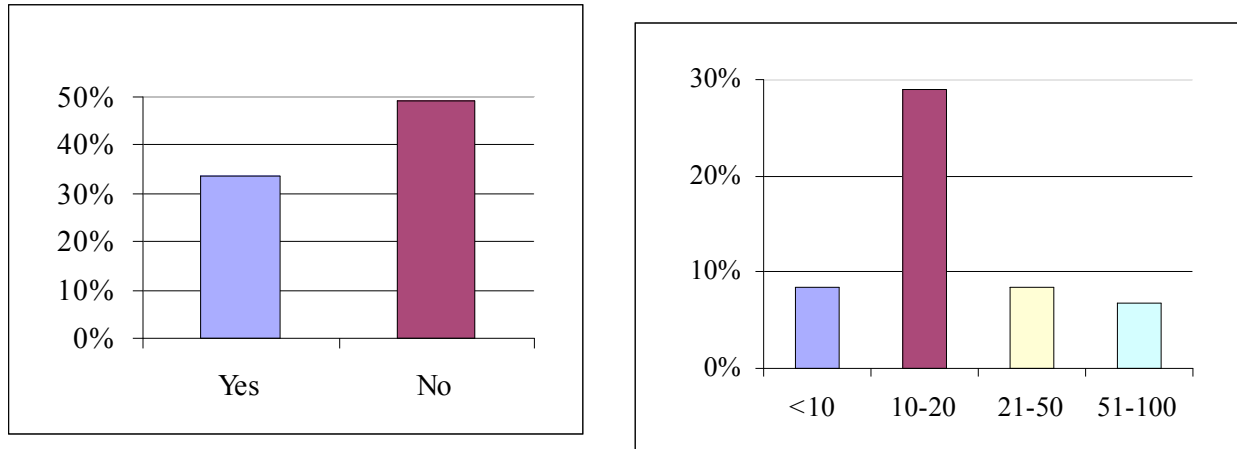


Figure 12. Respondent interest in obtaining new leased grounds. Shows those wanting to obtain new leases (left graph) if available and additional acreage interested in gaining (right graph).

This question (Figure 12) was asked to see if respondents would obtain new areas or expand existing ones. It differs from the previous section that defined lack of new grounds as a problem. While a third of the respondents would obtain more if available, half would not. This reflects the amount of ground that leaseholders possess and is another way of assessing whether they consider mortality to be their most pressing issue.

The 1979 question asked was, "If legislative action permitted the acquisition of more leased bottom, how much bottom would you wish to lease?" Respondents indicated a wide range of requests, up to 600 acres. In total, they would have liked to acquire 1,740 acres of new bottom. The mean number of acres requested was 64, a large amount. This showed the optimism that existed in the industry at the time. It further reflected the availability of shell and seed and lack of intense disease pressure on growers at that time.

Research Priorities of Growers

Along with the prioritizing problems, research initiatives were sought. With many pathways available to restore the oyster industry, attitudes about direction are critical in performing a needs assessment for research and extension programs. This section of the survey instrument was designed to identify these priorities.

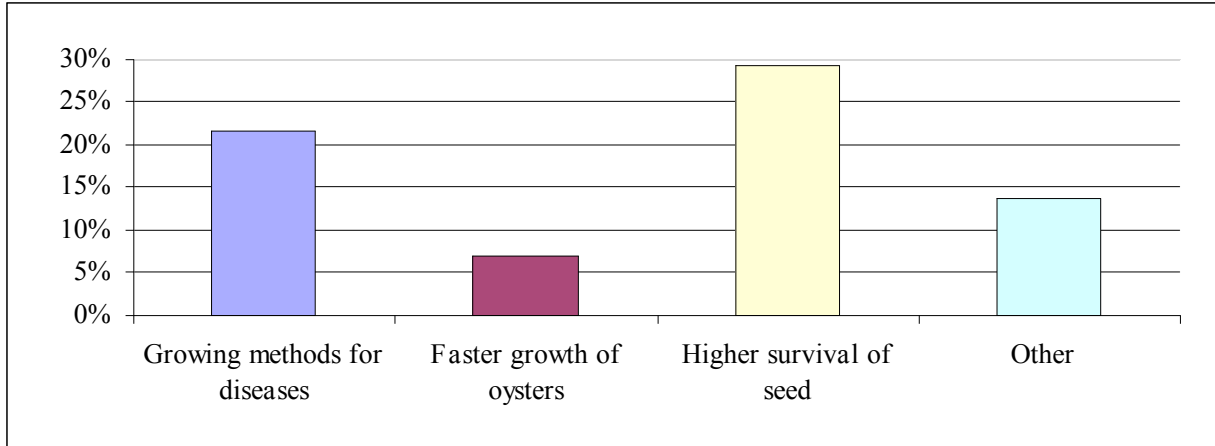


Figure 13: Research priorities deemed most beneficial to expand oyster aquaculture.

Pathways to expansion were seen in developing growing techniques for disease intense areas and by increasing survival. These are related and, when added to qualitative comments, yield a high need for solving disease problems. Six specifically mentioned disease resistance as the priority most critical. One grower summarized the problem when he said, "Find an oyster that will live the 4 years it takes to reach market size."

Suitability of Current Extension Programs

The UM Sea Grant Extension Program has worked for many years with oyster aquaculture. However, it was not known how many people were being reached with program information. This section of the survey instrument was devoted to extension and outreach topics.

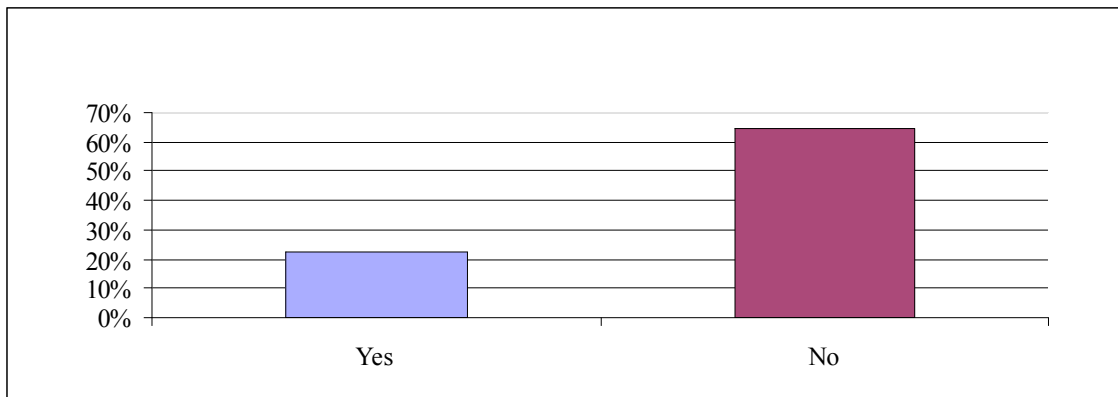


Figure 14. Respondents indicating contact with UM extension services.

Results show that almost two-thirds of the respondents had not contacted UM extension while less than one-quarter had. This is likely because of the decline in lease use and contraction of programs designed to reach growers. It indicates major opportunities for outreach in shellfish aquaculture to provide programs solving industry needs.

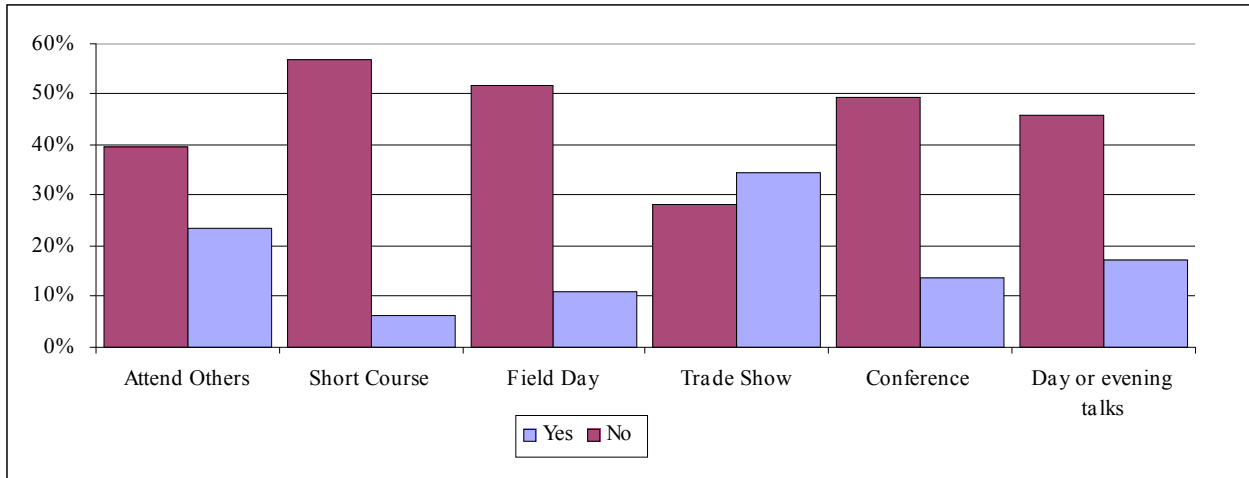


Figure 15. Extension programs or activities attended. Percent having attended defined types of Extension programs or activities during the time they had their leases.

Many noted the East Coast Commercial Fishermen's and Aquaculture Trade Expo held annually in Ocean City as a source of educational programs. This is likely because that venue has continued to provide seminar programs aimed at the industry. Several respondents specified using published articles for knowledge.

Pathways for Extension Programs

Extension programs should reach educational goals of the audience, meet the challenge of identified problems, and provide information to be used by attendees. In using "Bennett's Hierarchy" or the contemporary "Logic Model" in designing extension programs, the sequence of steps must provide material suitable to the audience and the problem. Several queries were designed to find the most successful pathways for providing information to the audience.

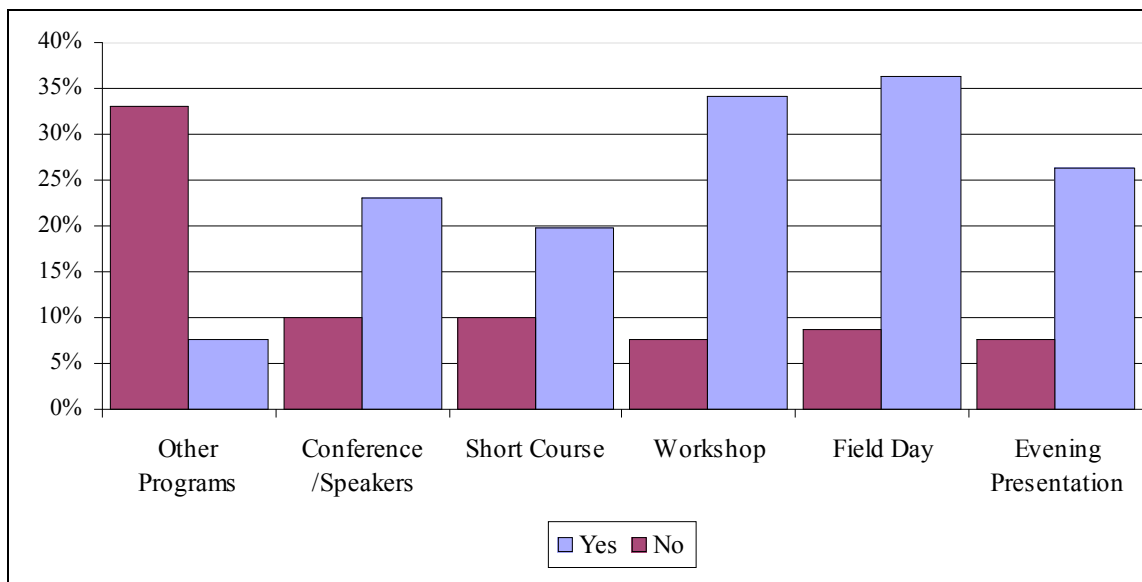


Figure 16. Types of preferred Extension programs. Percent in 2002 indicating the types of Extension educational programs they would prefer for training.

There was great interest in most types of educational programs, with field days and hands-on workshops being the clear favorites. This relates to the practical nature of growers. They often talk with each other and visit operations to observe methods and equipment others use. Strong interest was expressed in a conference on various subjects relating to the business.

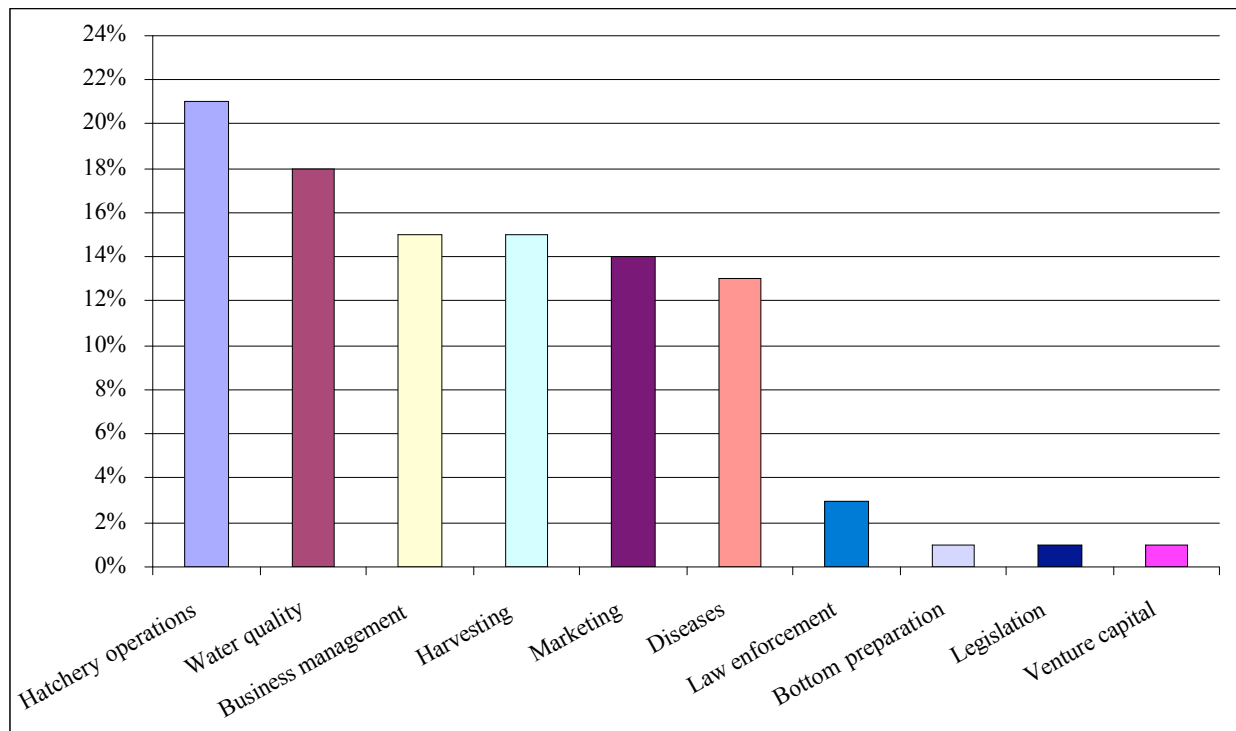
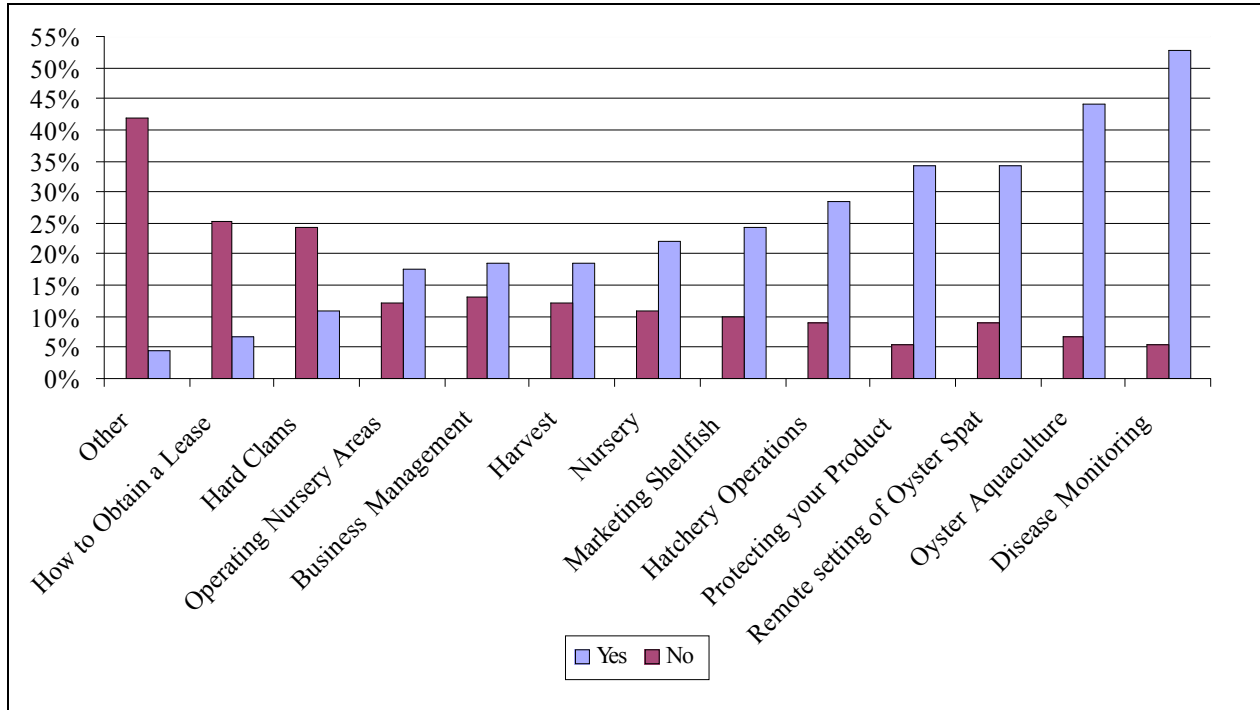


Figure 17: Defined subject area needs of leaseholders in 2002 and 1979. Response to question defining subject needs to become more productive with grounds in '02 (upper) and '79 (lower).

Subject matter requests were assessed by check-off on a variety of topics. Those of primary interest related to disease, with monitoring the most highly requested. Production methods, remote setting of spat, and protection from theft were the next most highly requested. Harvest methods and leasing procedures were ranked low, indicating that growers had sufficient information for current operations.

In 1979, the most requested topics for extension programs were hatchery operations and water quality, at 21% and 18% respectively. At that time hatchery operations were considered important due to competition for seed and the cost of transporting natural seed from Virginia. Hatchery seed was competitive in price and growers were optimistic about its use in the industry.

Other topics related to profitability and included business management, harvesting, and marketing, along with knowledge of shellfish diseases. These ranged from 13% to 15% of respondents. This reflected growth in business at that time with some mortality being known in higher salinity areas of the lower Potomac River and Tangier Sound.

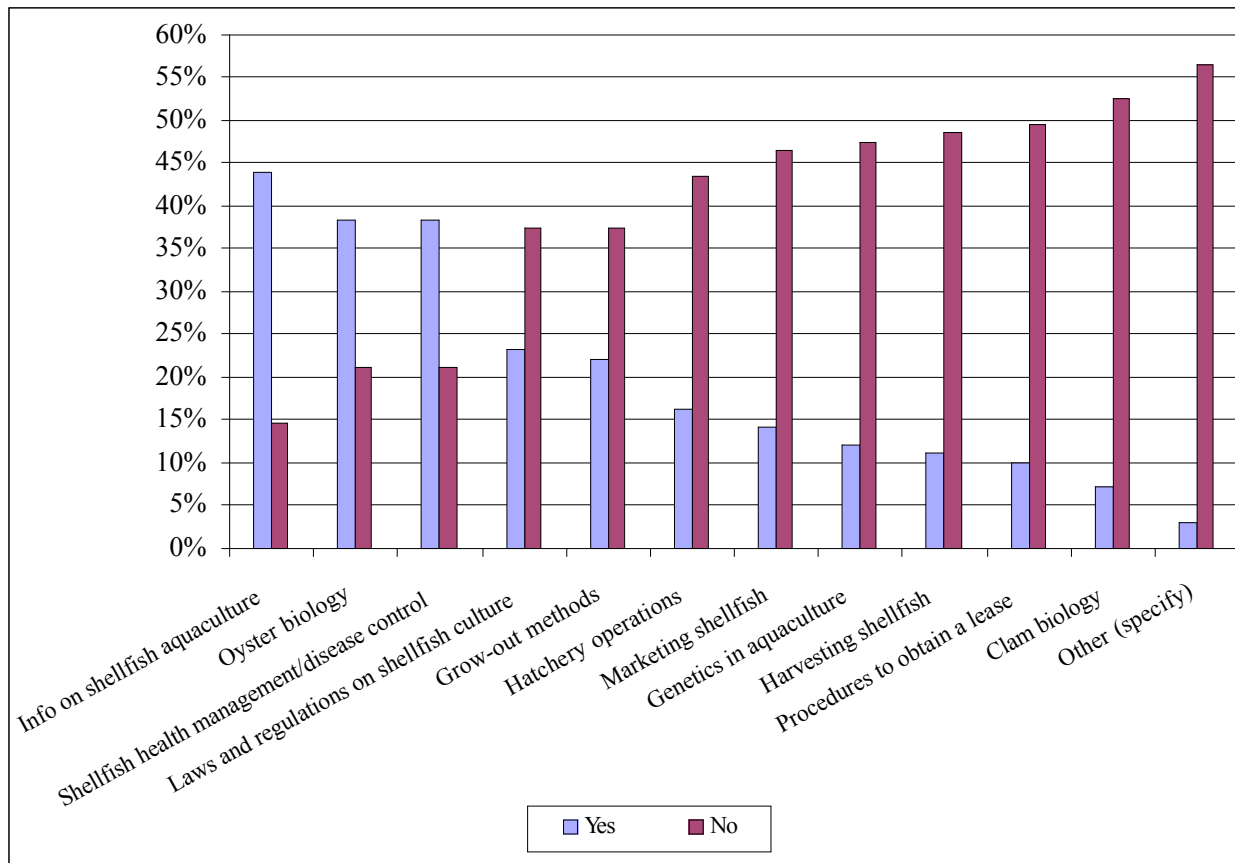


Figure 18. Extension publication topics preferred by leaseholders.

Extension fact sheets and other written material have long been used in outreach education. The key is to provide useful information to industry. Figure 18 shows that 44% of respondents indicated a desire for more extension publications. Health management and disease control

were the most requested, while biology was mentioned by 38.4%. Laws and regulations applying to the industry were requested by 23.2%, while harvesting techniques and clam biology garnered the lowest response. This represented the small number of new clam growers in the Maryland coastal bays since most of Maryland's Chesapeake Bay is incapable of sustaining *M. mercenaria* populations.

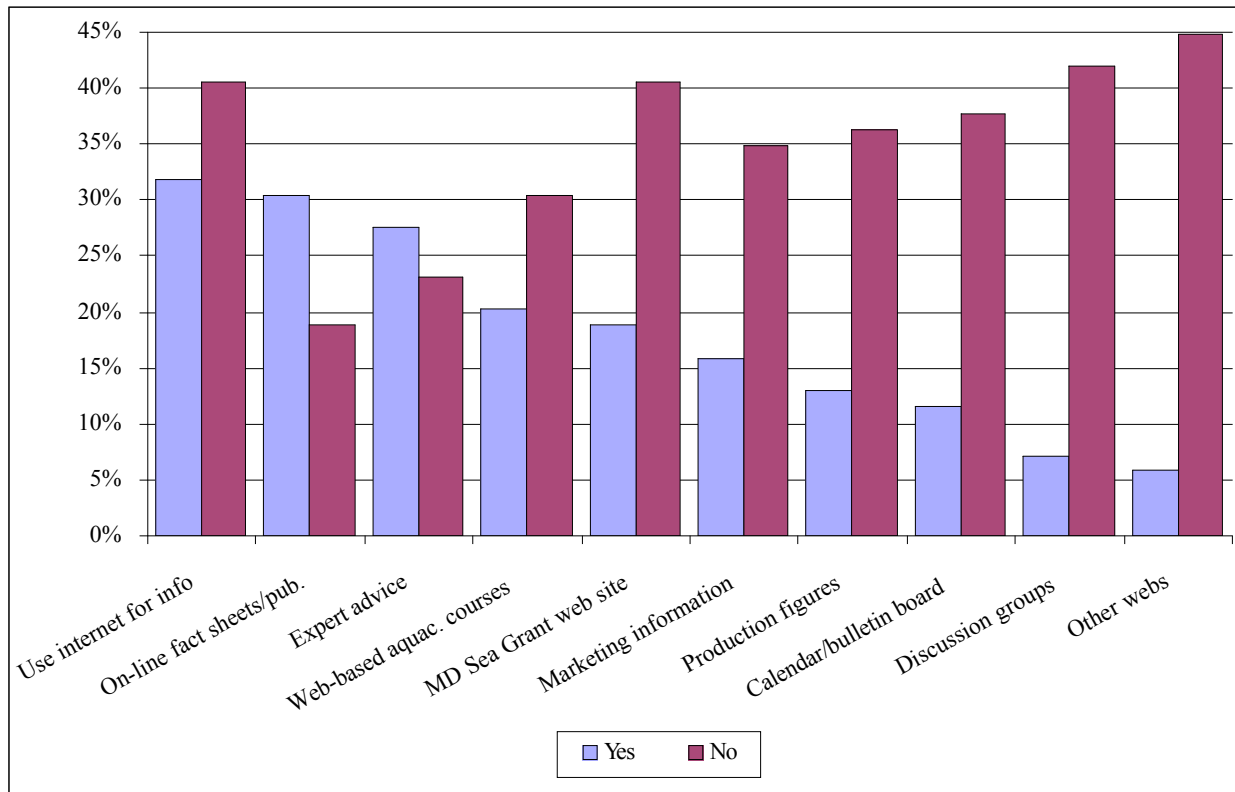


Figure 19. Web-based services preferred by leaseholders, identifying types of services that would interest them and be used in their businesses.

Approximately 31.3% of respondents currently use the Internet for information according to data in Figure 19. This represents the web's potential for disseminating educational material. However, only 11.2% have used the Maryland Sea Grant web site for information. This provides opportunity to develop this into a major source of information for oyster aquaculture. When queried about types of electronic services they would like on a site, respondent preferences were for online fact sheets and publications (30.4%) and expert advice (27.5%). The least requested services were discussion groups and bulletin boards.

Summary

Identifying Growers

Existing data sources are sufficient to identify growers. MDNR databases contain the location and size of each lease along with the address of the owner. Even in cases where multiple leases have been aggregated by one individual, it was possible to identify the person owning it for the purpose of the mailed survey in 2002.

Many leases were combined during the resurvey of the Bay in the '80s to minimize paperwork. This made it easier to determine the lessees and the lease locations. No new leases were granted in the Chesapeake Bay during the '90s although several have been finalized in the coastal bays for growing hard clams. With the potential for that species, this should grow.

Productivity of Leases

The '02 survey showed that the current contribution of private growers to oyster harvest is extremely low. This has been confirmed by MDNR harvest statistics. It is due to high mortality on grounds located within high salinity which has high disease intensity. Lack of available, cost-effective seed has further reduced the ability of growers to make a profit. Less than one percent of growers harvest at levels above 100 bushels per acre. Lack of seed causes private culture to have little effect on annual harvest or restoration of the Bay.

One respondent commented that the state should consider placing shell and seed on private leases, with concurrence from lessees, turning these areas into "private sanctuaries" that might, in time, provide a source of oysters for repopulating the area.

Many identified times when their grounds had turned a profit and looked forward to the point when they might once again do so. An obviously elderly grower finished a comment by saying, "I am anxiously awaiting the time when I can supplement my fixed income with sale of marketable oysters." Another spoke of his interest in working grounds when he noted, "With disease and predators in the bay. Sometimes I feel like just saying the heck with it but I like working on the water."

Problem Identification

Oyster growers face the same problems as the rest of the Maryland oyster industry. In short, as long as disease and resulting mortality exist, businesses will likely remain unprofitable.

Aquaculture is like any agricultural enterprise. It relies upon quality seed and the ultimate survival of enough crop to ensure economic viability. As identified by growers, major problems are lack of seed that will live to market and theft of those that have reached that stage. The latter is an old problem that has been seen wherever people attempt to grow sessile animals. Maryland authorities have long dismissed the idea that theft of shellfish as private property is a crime that needs to be controlled. Until the problem is solved, the industry will continue to falter.

Research Priorities

Research and extension education are the hallmarks of the Land Grant and Sea Grant systems in the United States. To create research tied to effective extension educational programs, problems must be clearly identified. Growers have stated that they need seed that remains alive until it is large enough for harvest.

It was shown in both surveys that, during that twenty-three year interval, the aquaculture industry thought marketing was not a problem. This likely derives from private growers, unlike those who are locked into politically mandated seasons, being free to market when demand and prices are highest. This tends to bring rational business decisions for income to be maximized.

Extension Program Priorities

Extension programs aimed at oyster growers began the conference "Oyster Culture in Maryland" in 1979 and continued for many years. Field days designed to teach remote setting

of oyster spat were held throughout the 1980s. Preference of contemporary growers for similar programs was striking. They specifically noted that programs of this type would be useful today. Conferences addressing many subjects, such as those held years ago to support the industry, were also identified as serving as an educational conduit for the industry.

As always, the 'hands-on' approach of field days and small, practical gatherings were similarly popular. These could provide demonstrations of new techniques or programs teaching methods of monitoring crops for disease.

Electronic Delivery Systems

Electronic forms of communication have revolutionized the way we obtain information and deal with each other in contemporary society. This is a pathway for extension to explore to get information to clientele quickly. Electronic access to written publications was highly regarded. UM Sea Grant has been innovative in doing this with program information and currently posts fact sheets and other materials on the web for quick download and reference. The program newsletter, *Maryland Aquafarmer*, has been archived on the web for many years and received 50,893 hits in thirteen months from January 2001 to February 2002.

This information should provide data for expansion. Growers who are 'on line' will demand electronic dissemination. This should be a priority area for the program during the next five years. These surveys provide information on the state of the private aquaculture industry and can be of value in guiding expansion in the future.

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