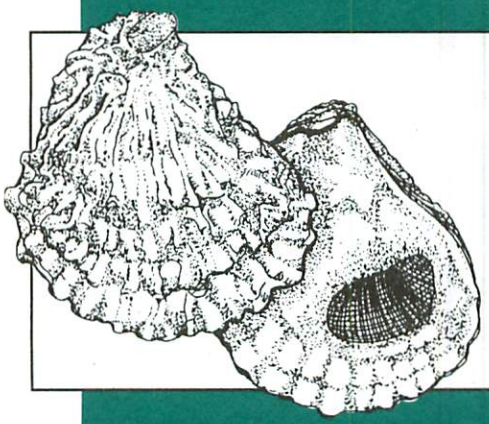

THE NORTH CAROLINA OYSTER SUMMIT

Summary and Recommendations

Sponsored by
N.C. Sea Grant and
N.C. Division of Marine Fisheries

In cooperation with Joint Legislative Study Commission on Seafood and Aquaculture • N.C. Marine Fisheries Commission • N.C. Fisheries Association • N.C. Aquaculture Association • N.C. Department of Agriculture • N.C. Farm Bureau Federation • N.C. Rural Economic Development Center • N.C. State University College of Veterinary Medicine • Southeastern North Carolina Waterman's Association • University of North Carolina at Chapel Hill Marine Sciences Program • Atlantic Coast Conservation Association of North Carolina

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Carla B. Burgess

Foreword

In response to the decline of East Coast oyster production, N.C. Sea Grant and the N.C. Division of Marine Fisheries sponsored the North Carolina Oyster Summit on April 29, 1994. The conference was held at the University of North Carolina at Wilmington. Experts from North Carolina and elsewhere (see Acknowledgments, page 6) were assembled to assess their experiences and to discuss directions for improving the state's oyster program.

Sen. Marc Basnight challenged the General Assembly to address the problems of oyster production and restoration of a viable industry. The issues of overharvesting, water quality and disease deserve priority attention. Basnight committed his efforts to interconnect the best scientific information, fishermen's ideas and needs, and state policy to move toward restoration over the next five years.

Gov. James B. Hunt added his commitment to protect the coastal environment and restore the fishery. He stressed that we must simultaneously protect the oyster fishery and economic development. To make progress, he says, the state must protect existing habitats; protect estuarine water quality; explore ways to restore oyster production (in the wild and through aquaculture); and develop strategies to deal with diseases and parasites.

With the summit as a first step, Hunt will propose to the General Assembly that we give special attention over the next three years to increased research, planning and management activities in the coastal area to restore its fishery production and our public resource.

This report is a summary of the N.C. Oyster Summit and a resumé of recommendations that it spawned.

The State of the Oyster in North Carolina

Used to be, along Lockwoods Folly River at autumn low tides, only one thing eclipsed the bounty of oysters protruding from the exposed mud and rock. That was the strong backs of oystermen bending to handpick or rake the harvest of succulent shellfish. Nearby, the town of Varnum would prepare for a community oyster roast to showcase the indigenous harvest and celebrate its heritage. There and in similar settings throughout eastern North Carolina, you couldn't steam enough oysters to satisfy the hordes that came to sample this local delicacy.

Today, a different picture has emerged throughout the sounds and embayments of coastal North Carolina. The local oyster is seldom the center of community gatherings. The shellfish served at Tar Heel oyster roasts today likely traveled from Louisiana or Washington. Fewer bodies bend in silhouette to gather a shrinking harvest of *C. virginica*. Recruitment, or new population

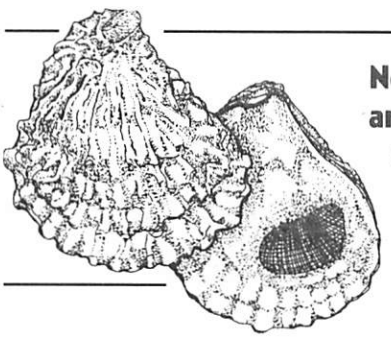
of oysters each season, is languishing. Insidious intrusions — disease and polluted waters, combined with poor management and overexploitation of the oyster fishery — have tainted this once prolific resource.

At the turn of the century, North Carolina produced almost 2 million bushels of oysters each year. By the 1920s and '30s, annual production had declined to about 300,000 bushels. During the past three years, the state's feeble production has barely reached 50,000 bushels, reports the N.C. Division of Marine Fisheries (Figure 1).

In his constituent county of Dare, says state Sen. Marc Basnight, "One McDonald's will gross more than all the oyster catch in the state of North Carolina."

Neighboring states aren't faring much better. The oyster harvest in Maryland and Virginia, which traditionally has been much higher than North Carolina's, has declined recently to about the same level. Total U.S. production in 1992 (the latest available data) was almost 30 million pounds, with about 25 percent from the West Coast — mainly Washington, about 30 percent from Louisiana, about 20 percent from Connecticut, and the remainder from the East Coast and Gulf of Mexico.

North Carolina embraces a large area — about 1.8 million acres — available for oyster production (Figure 2), second only to Louisiana. Yet the state has never ranked above fifth in U.S. oyster harvest. This disparity between availability of water and harvest can be attributed to two factors. North Carolina has significantly less "oyster rock" or reef area than Virginia and Maryland (Figure 3). Also, the shellfish leased acreage in North Carolina is comparatively low — about 2,600 acres — although about 500,000 acres are suitable for cultivation. Both Virginia and Louisiana achieved high production through active lease programs.



North Carolina embraces a large area available for oyster production, second only to Louisiana. Yet the state has never ranked above fifth in U.S. harvest.

Management of oyster production in North Carolina has lagged behind that of other states. Oyster seed beds under state management are very small. Thus, the availability of seed oysters is limited. Oyster rock is on a very thin foundation; the addition of cultch — the hard substrate to which young oysters attach — has been limited. Additionally, individuals who lease shellfish bottom from the state are given little protection from poachers, which limits private investment in oyster production.

And unfortunately, humans aren't the only creatures with an appetite for oysters. During the past five years, the ubiquitous oyster diseases Dermo and MSX have hurt oyster viability. These ravenous protozoan or one-celled parasites first appeared on North Carolina's estuarine landscape in the late 1980s. Both Dermo and MSX thrive in warm, salty waters typical of tidal creeks and sounds during drought conditions. Harmless to humans, the parasites attack and eventually kill oysters. In 1989, the diseases ravaged North Carolina's oyster harvest, and according to scientists, are here to stay.

What Have Other States Done?

The three states that have increased oyster production — Washington, Louisiana and Connecticut — have developed some type of culture/lease system. Washington allows a nonnative or exotic species, *C. gigas*, to be cultured on private leases, which has significantly increased production. Louisiana has about 360,000 acres in private leases and provides considerable state protection for the private leaseholder. Most of Connecticut's production is held by one large company on a private lease.

Maryland appointed a roundtable of oystermen, scientists, culturists, environmentalists, legislators, seafood dealers and managers to develop a plan for restoring oyster production. Maryland's Oyster Roundtable considered sociopolitical issues as well as technical information and came up with a policy that values oysters for their economic and ecological benefits. Roundtable results included: recommendations for a pilot permit program for oyster aquaculture, establishment of oyster recovery areas, production of seed, placement of reefs (cultch) in nontraditional areas, and creation of a nonprofit corporation to develop and apply restoration techniques (with funds raised from bonds and surcharge from harvests). It will take several years to realize production levels previously achieved.

Louisiana has a large and active leasing program. The state maintains large public seed grounds that provide an important source of "spat" or young oysters ready to be "set" on cultch. The industry pays for a strike force to prevent poaching on the 360,000 acres of leases. A lease rate of $2 per acre is part of funding for cultch planting (supplemented by state funds) based on hydrology, spat set monitoring and industry needs. The 2,400 leaseholders must be state residents. Leases are limited to 1,000 acres per individual holder; corporations may lease up to 2,000 acres. Industry pays for marketing and outreach to elevate consumer confidence.

Production of oysters in France, particularly the Normandy and Brittany coasts, exceeds 100,000 metric tons per year on about 50,000 acres and is steadily increasing. The cultured oysters are nearly all *C. gigas*, also known as the Pacific or Japanese oyster. The French government has established a highly organized

leasing system, with the growers paying back into the system from harvest proceeds. Potential growers must complete a certified training program to get a permit. The management agency requires specific production techniques and monitoring in designated culture zones, and the state provides protection from poaching through fees paid by the growers. Water quality is protected in the culture zones. The management agency maintains a sanctuary for brood stock and seed production.

Research Results

Disease. Research on oyster diseases has gained some momentum in the past few years with revived funding. And in a major research breakthrough, Virginia Institute of Marine Science is able to culture Dermo in a laboratory. Scientists can now try to learn how to control the disease and circumvent it. Through selective breeding, some progress has been made in developing an oyster resistant to MSX. But the weight of the research so far has focused on Dermo, a more tenacious and widespread parasite, according to Eugene Burreson with the Department of Fisheries Science at VIMS.

• In the past two or three years, scientists at VIMS and Rutgers University have tested the Japanese oyster's resistance to Dermo and MSX. The oyster, for which no large-scale mortality has been reported, successfully withstood Dermo when challenged in the laboratory. It is only lightly infected and doesn't die. A challenge with MSX was trickier since scientists still don't know how this parasite attacks oysters. In spring of 1993, a field challenge was conducted in sites within the Chesapeake and Delaware bays using triploid Japanese oysters to avoid displacing the native oyster. Triploids have been genetically manipulated with a third set of chromosomes so that they produce too few gametes to successfully reproduce. Experiments so far show that *C. gigas* does not get MSX at all. Unfortunately, this oyster prefers cooler water temperature and is not a hardy species here. It is also susceptible to a type of mud blister that, although harmless, renders the oyster unfit for the half-shell trade.

Figure 1.
Comparison of Regional Oyster Landings 1880-1993

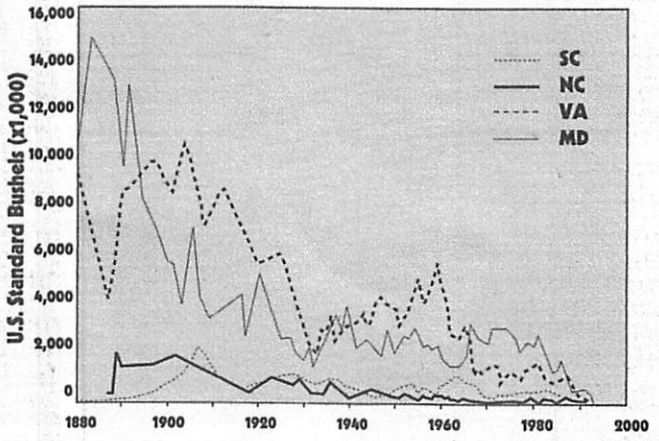


Figure 2.
Approved Shellfishing Waters 1990

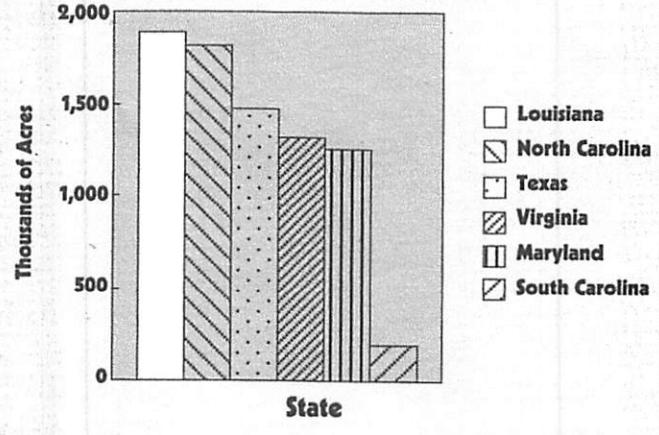
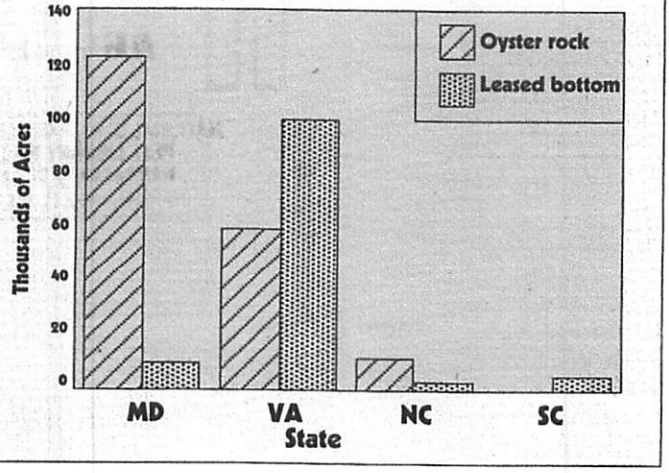


Figure 3.
Natural and Privately Maintained Oyster Habitat



• Oysters' primitive immune systems don't respond to vaccines as a method of disease control. Some work has been done with anti-protozoan drugs on cultured oysters, but none are suitable for use on food organisms.

• The disease infection cycle raises the possibility for innovative management to avoid mortality from Dermo, which is a slow killer compared to MSX. Dermo will cause near total mortality in a crop of oysters infected for two summers. But where oysters reach market size in 18 months, some culturists have reversed the traditional planting cycle to limit exposure to Dermo, a mostly warm season phenomenon. Spat planted in the fall gets its first growth period as the water is cooling and Dermo is declining. The following spring, oysters pick up Dermo but aren't killed. The oysters are harvested at the onset of the second spring and spared lethal exposure.

Consistent funding, time and realistic public expectation and support are primary requirements for sustained and successful disease research.

Production. Research is under way in North Carolina to test methods to enhance management for increased oyster production. Charles Peterson with the University of North Carolina at Chapel Hill's Institute of Marine Sciences is studying the structure and hydrology of oyster reefs. For example, by manipulating the profile of oyster reefs, water or current flow may be sped up, possibly helping these filter feeders grow faster and avoid disease.

Building reef systems (particularly for seed production) will require innovative responses to hydrology, water quality and physical-biological coupling. A coordinated program of testing the efficacy of reef placement, selective harvests, sanctuaries and planting schedules needs to be implemented over a long period to evaluate and maximize management results.

Recent research evidence indicates that the filtering capacity of oysters helps maintain water quality. A single oyster can filter 25 gallons of water a day. The restoration of oyster production could improve coastal water quality. More research is needed.

Marketing and Safety

Oysters suffer from an image problem. Major buyers shy away from purchasing oysters because of the fear of product contamination and consumer illness. Recent seafood safety reports and proposed inspection programs distinguish raw oysters as the most problematic product in terms of recurring seafood-borne illnesses. Despite rare and debated incidences, the public remains cautious and sensitive to negative press. Future market acceptance and success will depend upon product safety assurances.

Meanwhile, industry technology can already produce more oysters than can be sold. The market is not driven by supply but by consumer confidence, says Florida Sea Grant food scientist Steve Otwell. We need to devote attention to buoying oyster appeal.

Alternative processing is one option to clean up the oyster image. For example, oysters can be placed in clean water and allowed to purge themselves of potential toxins or viruses before harvest. But getting a permit for this "depuration" process is tedious, and the treatment is suspect for such recalcitrant contaminants as *Vibrio vulnificus*. This particular bacteria can be deadly for people who have liver ailments or compromised immune systems if they eat infected oysters that are raw or partially steamed. Yet properly cooked, oysters contaminated with *Vibrio vulnificus* pose no threat even to people with underlying illnesses.

Not only must we develop a "safe" product, we must also commit to educate the public and marketing channels of its acceptance. Otwell ominously predicted the untimely reaction many entrepreneurs might have to Basnight's earlier statistic.

"If one McDonald's hamburger joint can make as much money as the whole oyster industry in the state of North Carolina," says Otwell, "I would venture to say there's going to be a very strong contingent of people who'll say, 'Let's build another McDonald's.'"

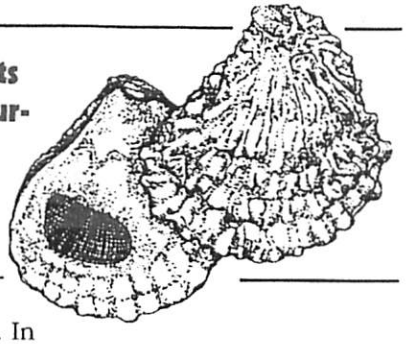
Value-added products — such as frozen oysters ready to be microwaved or skewered shellfish with barbecue sauce — could increase profits and ensure better acceptance.

Aquaculture

The technology of aquaculture can substantially increase oyster production. Other states and countries are enhancing production through shellfish culture. Washington, Louisiana, Connecticut and New York — as well as France, Italy and Japan — have introduced and encouraged culture technology. Culturing offers the advantage of producing high-quality oysters free of contamination.

Several techniques used elsewhere do not work well in North Carolina. In some areas, rack-and-bag devices are placed in the zone between low and high tide so that oysters are dried periodically, reducing the attachment of fouling marine organisms. Rack-and-bag culture is limited in North Carolina because of lack of tidal flux. Long-lines, which are suspended from floating racks and used to attract oysters, are popular in deep water habitats and therefore not suitable to our oyster environment.

North Carolina has developed its own innovative method of culturing oysters off the bottom with a grow-out system that resembles a floating ladder.



North Carolina has developed its own innovative method of culturing oysters off the bottom with a grow-out system that resembles a floating ladder. The "chub ladder" method, developed by N.C. Sea Grant specialist Skip Kemp and a metal clip manufacturer, has been enhanced by cooperation of the N.C. Division of Marine

Table 1. Preliminary chub ladder economics

Variable costs (per 100,000 seed)	
Oyster seed	$2,500
Chub materials	$2,045
Estimated cost of labor, lease and capital	?
Estimated returns (70 percent in second year)	$6,900

Fisheries and 30 private oyster growers. The oysters grow at the surface in individual mesh bags sealed at both ends until harvest. This "Jiffy Pop" method of culturing oysters offers the advantages of low labor requirements; the system is mobile and easily retrievable. The chub ladder is also adaptable to onshore assembly-line construction and a labor-saving routine of air-drying to prohibit the growth of fouling organisms such as sponges, barnacles and tube worms. Oysters can survive a long time out of water. By taking advantage of this trait, growers can selectively kill certain fouling organisms and some parasites.

Chub oysters reach market size in about 18 months, nearly half the time it takes in the wild. And because they grow near the water's surface, where oxygen and food are more plentiful, they tend to be healthier and less susceptible to diseases. The chub ladder offers the production of safe, high-value oysters with a greater meat-to-shell ratio than wild stock.

This technique needs to be tested on a commercial scale to prove its efficacy, but preliminary work indicates great potential (Table 1).

Conclusions and Recommendations

Oyster production in North Carolina is in a crisis. Harvest is the lowest since the beginning of record-keeping and is in steady decline. If we are to reverse the trend, new approaches will be required and tough policy questions will need to be addressed. A coordinated program of combined inputs from research, management, oyster harvesters, processors, environmentalists and consumers is needed to empower the state to make the necessary changes.

It is urgent that a "blue-ribbon committee" be established to map out a plan to deal with oyster production for the future. This committee must represent all interests so that a workable plan can be developed. The membership should include, but not be limited to, commercial oystermen, culturists, shellfish researchers, fisheries commission members, economists, social scientists, processors, legislators, marketing experts, consumer interests, resource managers and environmentalists. The committee will need to address at least the following issues.

Rehabilitation. Restoration of natural oyster populations will require careful attention to the development of cultch planting to increase recruitment. Peterson is researching the technology needed to develop oyster beds. His results will need to be considered for managing the cultch planting program now in progress. The technology used in other states must be adapted to North Carolina waters.

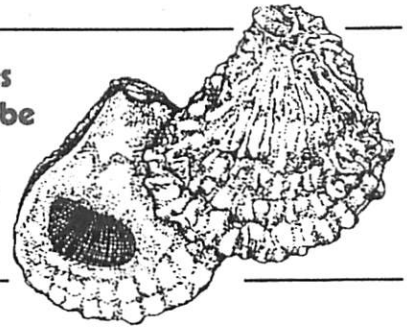
Leasing and water access. The bottom and water column leasing program must be re-examined to accommodate new technology and encourage oyster farming. The states that have significant oyster production also have a very active and effective leasing program. Leaseholders will need training and certification in oyster management, marketing and harvesting. The current 2,600 acres of active leases can and must be expanded; in view of the large amounts of suitable area available, leasing should expand.

Bottom leasing doesn't prohibit passage, but water column leasing does. Policy issues will include finding appropriate zones for aquaculture and affording the leaseholder protection from disturbance, water quality degradation and poaching.

Seed availability. Culture zones, oyster sanctuaries and managed seed beds need to be established, perhaps through a nonprofit corporation. They could eventually be funded by those who gain from the proceeds.

If the state supported the planting of hatchery-reared seed as a best management practice that filters coastal waters, oyster production through leasing would be encouraged. Initial funding for new oyster management to increase seed availability should come from the state until progress is made, says Mike Marshall, resource enhancement section chief with the N.C. Division of Marine Fisheries. It is doubtful that many people would invest in wild oyster management until they see improvements. There has already been much discussion over private hatcheries contracting for seed supply to the state. We should be sensitive to that possibility, Marshall says. Either a state or private hatchery could supply oyster seed at a low price.

Culture zones, oyster sanctuaries and managed seed beds could be funded through a nonprofit corporation sustained by those who gain from the proceeds.



Disease research. Research on the nature and control of oyster diseases and parasites needs to be sustained over a long period. The N.C. State University College of Veterinary Medicine has researchers particularly suited for consistent research in this area. Cooperation and coordination with ongoing oyster disease research at the Virginia Institute of Marine Science should be continued.

Aquaculture research. More oyster culture research and demonstration is needed. Sea Grant's Kemp has demonstrated the potential of the chub ladder technology for production of high-quality oysters. It needs to be tested for commercial viability.

Improved management. Based on the recommen-

dations of the blue-ribbon committee, the Division of Marine Fisheries will need to increase and improve its management activities. Research results and the needs of the industry must drive the management program.

Public image and marketing. Oysters have a bad reputation in the marketplace. Many oystermen have difficulty selling their harvest because of consumer fears. Producers in states with plenty of oysters say they could harvest more if the market was available. North Carolina will need to produce a "safe" oyster and then educate consumers to use it through innovative marketing.

Acknowledgments

The N.C. Oyster Summit planning committee included: • Sherri Evans-Stanton, staff attorney, research division, N.C. General Assembly • Dirk Frankenberg, professor, Marine Sciences Program, UNC-Chapel Hill, and chairman, shellfish subcommittee, N.C. Marine Fisheries Commission • David Green, seafood technology specialist, N.C. Sea Grant • William Hogarth, director, N.C. Division of Marine Fisheries • Skip Kemp, regional mariculture specialist, N.C. Sea Grant • Jay Levine, associate professor, NCSU College of Veterinary Medicine • Mike Marshall, resource enhancement section chief, N.C. Division of Marine Fisheries • James D. Murray, director, N.C. Sea Grant Marine Advisory Service • Charles Peterson, professor, Institute of Marine Sciences, UNC-Chapel Hill • Jerry Schill, executive director, N.C. Fisheries Association • Melvin Shepard, president, Southeastern North Carolina Waterman's Association.

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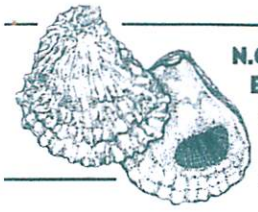

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