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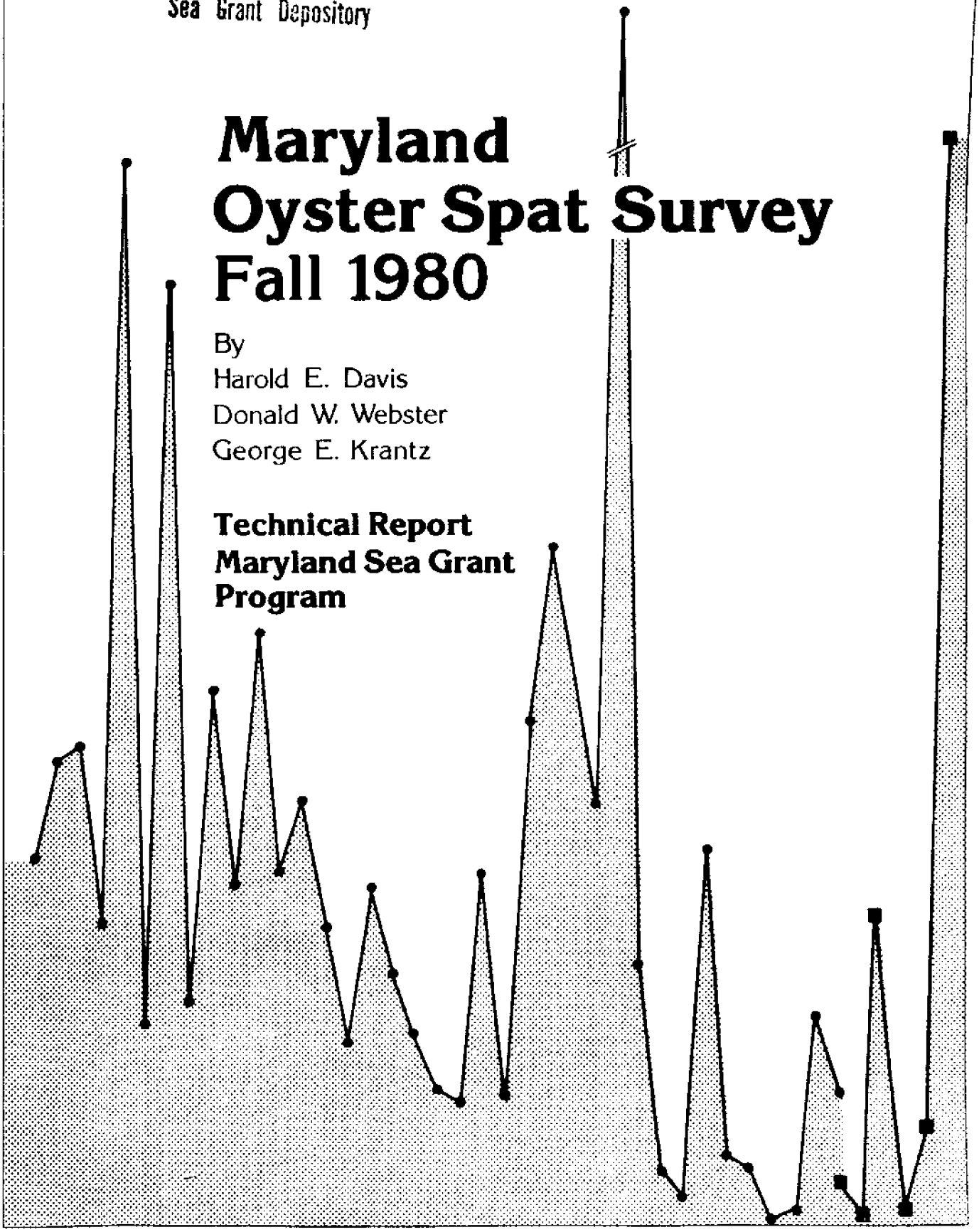
Technical Report
Maryland Sea Grant Program



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Contents

Preface

The American oyster (*Crassostrea virginica*) is Maryland's most valuable seafood. Gathered up from Chesapeake Bay bottom since the Indians first settled the area, then tonged and dredged by Marylanders who have followed the water as a way of life for generations, the oyster figures centrally into the culture and the economy of those who live by the estuary.

But overharvesting and poor reproduction have decreased oyster populations in the Bay, requiring rigorous efforts by the Maryland Department of Natural Resources to plant shell and spread seed oysters to bolster production. Poor natural spat sets in recent years have made their job even more difficult.

This year, things took a turn for the better as natural oyster reproduction got a boost from a big spatfall. The 1980 spat survey cruise hauled up bushel upon bushel of shell covered with young oysters, revealing a spat set equal to the three highest spat counts since records began in 1931.

Although most bars on the western shore continued to show poor spatfall (with the exception of the lower Potomac River), the Eastern Shore tributaries had a boom year. The Little Choptank River led the way, along with the Choptank--especially behind Tilghman Island--closely followed by the Tred Avon, the Honga, the Miles, and upper Tangier Sound. Some of these areas, like the Tred Avon, had not seen heavy spatfall for many years.

Statistics recording and evaluating fluctuations in spatfall come from a test of certain key bars, a system which enables researchers to gather the greatest amount of information in the most efficient way. Sampling this year also includes tests for oyster diseases and oyster parasites. Using highly sophisticated Raydist navigation equipment, the research vessel Aquarius pinpointed the location of even small oyster bars and shell plantings.

And since the Aquarius can accommodate many, invitations for participation in the cruise went out to watermen, resource managers and media specialists. This year's survey drew even more spectators than last year's cruise, and virtually every paper in Maryland--and a good number outside Maryland--carried news of the Bay's bumper crop of baby oysters.

With a healthy spatfall coating many of the Bay's bars, researchers and managers face the task of monitoring growth, development and mortality of the oysters as they mature--or fail to mature. Wise management will require that many seed oysters be moved to bars where they will prosper and be ready for harvesting in two to three years. This report suggests some strategies for transferring seed oysters, strategies which could help the state make the best of a good thing.

Introduction

The 1980 fall survey of natural oyster bars and planted oyster shell in the Maryland portion of Chesapeake Bay revealed a very encouraging level of spat settlement on many of the productive oyster bars and State seed areas. Spat settlement in these areas was as high as the three highest spatfalls recorded since 1931 (Fig. 1).

The 1980 spat set survey, a cooperative effort by the Tidal Fisheries Division of the Department of Natural Resources, the University of Maryland Marine Advisory Program and the University of Maryland Center for Environmental and Estuarine Studies, used the University of Maryland R/V AQUARIUS to conduct investigations of Maryland oyster bars. The survey took place during the first week of October and employed the field assessment techniques developed by oyster biologists who began surveying the oyster bars in the mid-1930s. During the seven-and-one-half-day cruise period, samples were collected from 181 oyster bars in the Maryland portion of the Chesapeake Bay. At each sample site an oyster dredge was used to collect bottom material from a previously selected spot on a natural oyster bar, shell planting, or state seed area.

Gathering the Data

Following procedures currently employed by the Tidal Fisheries Division, biologists sorted a random sample of one half of a Maryland bushel of material from the oyster bar to determine the number of market oysters, small oysters, oyster spat, shell, recent mortality, new and old boxes, and oyster meat condition. Observations were also made on the fouling community that inhabits the oyster bars. Biologists of the Maryland Department of Natural Resources recorded all observations, the field sheets retained on file in their department. These observations formed the statistical basis for determining the number of spat per bushel of material on natural bars, as well as the spatfall on dredged oyster shell and fresh oyster shell that was placed on seed areas or at various locations in the Maryland portion of Chesapeake Bay.

The data used for the calculated 1980 spatfall in Figure 1 was based on 52 key oyster bars. These key bars (Fig. 2) are equally distributed throughout the major river systems of the Maryland portion of the Bay to give a quick and equal sampling of spatfall in a given year. Although there was some discrepancy--the arithmetic mean of the spatfall on key bars was 192.3 spat per bushel, whereas the mean collected from 181 oyster bars

that were sampled during the fall cruise was 144 spat per bushel--this difference was due to a higher number of samples taken in marginal and poor areas, an effort to accurately delineate the boundaries of spatfall in the upstream portions of the Potomac, Patuxent, Chester and Choptank Rivers.

The relatively large quantity of spat produced in 1980 should begin entering the Maryland oyster harvest by 1983, and an abundance of oysters will be available in many areas of the Bay by 1984. Spatfall was the highest in Harris Creek, Broad Creek, the Little Choptank and the waters near the mouth of the Potomac River (Fig. 3). Other areas of the Bay received a moderate amount of spatfall similar to the 1977 spatfall (Fig. 4) now sustaining 1980-1981 oyster harvests in Tangier Sound, the Choptank River, and Eastern Bay. Some portions of Chesapeake Bay did show poor spatfall in 1980. These were the upper areas of the Potomac, Patuxent, and Chester Rivers; the Anne Arundel County portion of the Western shore; and the areas above the Chesapeake Bay Bridge. Some natural or perhaps man-induced factors may have influenced spat settlement in these areas, since the salinity in these waters (8-14 parts per thousand) was more than adequate for the development of larvae as well as the settlement and good survival of spat.

To more clearly perceive some of the changes in the patterns of spat settlement that occurred in 1980, compare Figure 3 to Figure 5, which represents the geographical distribution of spatfall from 1975-1979. During the past decade, many heavily worked Maryland bars received a spatfall of less that 25 spat per bushel of bottom material. Spatfall in Tangier Sound and Eastern Bay during 1980 was only slightly higher than in the past decade, but several other river systems received a very heavy spatfall exceeding 200 spat per bushel. In the areas of highest spatfall, both the natural oyster bars and the state-managed seed areas received abundant levels of spat.

An important research objective of the 1980 cruise was to compare spatfall data collected from "key bars" to the spatial distribution and density of spatfall found on natural bars and seed areas in a given year. The key bar concept is being developed to provide an inexpensive, early management advisory on the status of recruitment into the Maryland oyster population. However, this methodology must be standardized and be proven a useful predictive tool before it is adopted by the state management agency. The number of samples required to develop the key bar profiles requires much less expenditure of manpower, fuel, transportation, and boat time than does the collection of data from a large number of bars and seed areas that have been surveyed annually during the past 50 years. In 1979 (Krantz and Webster) and again in 1980, the key bars closely reflected the geographical distribution of Bay-wide spat set (Figures 2 and 3).

One subject of concern among researchers and administrators alike has been the determining of exact locations of planted oyster shell, natural oyster bars, and key bars. Maryland Department of Natural Resources personnel are currently using an electronic navigation system (Raydist) to position their vessels over bars. During the 1980 fall cruise a great amount of effort was devoted to coordinating the navigational accuracy of the Raydist

equipment with the radar/echosounding navigation techniques routinely employed by the University of Maryland's research vessels. The extremely accurate Raydist equipment helped locate very small plantings of oyster shell and positioned the research vessel at very precise locations. This equipment recorded sites of key bars used in the research effort, enabling monitors to return consistently to exact locations.

While data from key bars and natural oyster bars were being collected, researchers made comparisons between spatfall on fresh shell and spatfall on dredged shell planted by the Department of Natural Resources during 1979 and 1980. Sampling took place in approximately 50 sites where shell had been planted; the results are shown in Figure 6. (Table 1 compares spatfall on adjacent natural oyster bars.)

For many years Maryland watermen and many oyster biologists have held that fresh shells collected a greater amount of spat than dredge shells at any given site--and newly planted fresh and dredge shells were thought to collect more spat than the substrate of natural oyster bars. Both predictions seemed to hold true at locations sampled during 1980. The only exceptions to this occurred in Broad Creek, Harris Creek, Honga River, and the Little Choptank River (Figure 5), where spatfall was extremely high and the natural bars seemed to collect more spat than the planted shell.

Some of the oyster shells planted in the Bay are to be used as a source of seed. In particular, the Mulberry Point seed area in Broad Creek contains about 200,000 bushels of high quality seed that could be moved in the spring of 1981. McKeil's Point and Town Point seed areas in the Little Choptank River contain over 150,000 bushels of seed that could be moved. A small shell planting in Holland Straits contained 113,000 bushels, 184 spat per bushel. This discrete planting could be used to provide seed for local waters. The density of oysterson the planting would then be reduced so that their future growth would allow them to have a greater market value. There were several shell plantings in Eastern Bay that received a very heavy set.

Most of 1979-1980 shell plantings were intended to rehabilitate productive oyster bars that have been heavily harvested in Eastern Bay, the Choptank River system, Tangier Sound, and the Honga River. Some of these planted shells could be moved as seed if sufficient State management funds are available. However, a better source of seed oysterscould be obtained from some of the natural bars that received relatively heavy spatfall in 1977, 1978, and again in 1980.

Deep Neck in Broad Creek, McKeil's and Town Point in the Little Choptank, and Mill Bar in Harris Creek contain in excess of 500 spat and small oysters per bushel of material. Oysters on these bars are so crowded that their future growth will be very poor and they will be of little value to the industry unless they are moved in the spring of 1981-1982 as part of the seed program. At these three locations alone, the combined amount of seed probably exceeds one million bushels. In areas where both hand tongers and power

dredge boats move seed, the hand tong vessels could move the oysters from the natural bars. Use of hand tongs on the natural bars should eliminate the criticism that dredging would damage the structural integrity of the bottom. This would allow the more efficient and higher capacity power dredge boats to work the heavily planted areas.

From the distribution of the 1980 spatfall on natural oyster bars (Fig. 2) and the recent historical distribution of spatfall (Figs. 3 and 4), it is obvious that there are many productive oyster bars in Maryland waters that require seed during 1980. Most of these oyster bars lie in the following areas; along the western shore of the Bay, in the Chester, in some of the upstream portions of the Choptank River, in certain areas in Tangier Sound, in the Patuxent River, and in the tributaries of St. Mary's County that drain into the Potomac River. Fortunately, for the first time in 15 years, the 1980 natural spatfall has provided an abundance of seed oysters to satisfy this demand.

Until we determine the cause of the reproductive failure in areas which did not receive spatfall in 1980, substantial management efforts should be made to maintain the existing viable oyster bars.

Boosting Public Awareness

The 1980 fall spat cruise once again mounted a well-planned effort aimed at having members of the industry and other interested persons join the cruise. Since the Research Vessel AQUARIUS can accommodate a good number of people, representatives of local watermen's groups, local government, the news media, members of the State Oyster Committee, administrators from the Department of Natural Resources, and interested citizens were able to accompany the biologists during data collection. The daily schedule for each cruise (Appendix 1) enabled these individuals to return to their point of embarkment at the end of that day's activities. A list of 1980 cruise participants may be found in Appendix 2.

In this way resource managers, reporters, watermen, and others were afforded a unique opportunity to better understand field oyster research and to discuss pertinent issues concerning the viability of the Maryland oyster industry with the University scientists, state oyster biologists, and state management officials responsible for the future of Maryland's oyster resources. Judging from the numerous newspaper articles and television coverage of the 1980 cruise, it was obvious that Maryland citizens received a good explanation of management practices employed by the Department of Natural Resources. By the end of the cruise news of the abundant spat set appeared in virtually every newspaper in the state of Maryland and in many neighboring mid-Atlantic states.

Participation by industry representatives was up 40% over last year's cruise. Media representation increased by 160%. At least one member of the Maryland Watermen's Association participated on each day's cruise. On several days, members of both the county oyster tongers and oyster dredge boat committees participated. In addition to joining in the location and sampling of oyster bars, these individuals obtained better information about the spatfall in their local waters and gained a better comprehension of Department of Natural Resources' 1981 plans for management of those waters.

Participation in this cruise will help transfer information to Maryland watermen and will affect acceptance of Department of Natural Resource management plans. In the past the logistics of handling large numbers of persons on the fall oyster survey prevented this type of information exchange. Many of these logistical problems were worked out during the industry participation of the 1979 cruise and improved upon this year. The agenda and logistic support provided by the University of Maryland's Sea Grant Program and the size of the University of Maryland's R/V AQUARIUS made the extension activity a great success. During the seven-and-half-day cruise, the R/V AQUARIUS carried her passengers 833 miles.

The technique of enabling the public to make their own observations on the water, along with their interaction with well-informed scientists, provides an extremely useful tool for increased cooperation among resource managers, industry members, and local government officials. Environmental science and resource management practices thus become demystified and most individuals develop a better understanding of others' points of view. In fact, during the two years of these cooperative surveys of oyster bars there have been numerous resolutions of polarized viewpoints on management practices, environmental zoning, and other subjects of great interest to the lay public. The sheer number of participants on the 1979 and 1980 fall cruises attests to the interest which exists in Maryland about the Bay and its problems. The field seminar technique that developed on these cruises should be carefully evaluated for use in other types of marine research and other areas of natural resources management where the transmission of information about the resource is the key to successful management application.

Monitoring Oyster Diseases

In addition to the public relation effort and collection of biological data on spatfall, samples were also taken from selected oyster bars to describe the geographical extent and prevalence of oyster diseases and parasites in Maryland waters. The survey of oyster disease distribution was begun in 1958 by the National Oceanic and Atmospheric Administration lab in Oxford, Maryland and is being continued as a cooperative project between the Maryland Department of Natural Resources Tidewater Administration and personnel of Horn Point Environmental Laboratory. Emphasis is being placed on determining the distribution of "dermo disease" and "MSX disease," which are very dangerous pathogens on oysters in Maryland. During the 1960's both diseases killed large numbers of oysters in Tangier Sound and Pocomoke Sound. These diseases virtually disappeared during the 1970's, but "dermo disease" was detected in 1974 at a very high prevalence in Tangier Sound. The duration, prevalence, and geographical extent of this disease is a topic of scientific interest as well as useful management information.

During the 1975 dermo epizootic, the disease was located predominantly in Tangier Sound and at the mouth of the Potomac River (Fig. 7). Recently, the disease has undergone a slight reduction in its range of infection and has decreased in prevalence. During 1980, "dermo disease" was found to be at lower levels of infection on most bars, with no major changes in the areas infected by the disease. A few specific bars in the Patuxent River,

Tangier Sound, and the mouth of the Potomac River still have epizootic levels of this disease, which may kill a substantial portion (20-40%) of the harvestable population.

Representatives of the Maryland Department of Health and Mental Hygiene also joined the cruise to conduct a survey for the presence of heavy metals, chlorinated hydrocarbons, and bacteria in oysters over the entire range of the Maryland portion of the Bay. Similar data were collected in 1979, and the comparison of these data provides an invaluable reference for changes in environmental water quality.

Concurrent with the examination of oyster bars for spat, selected materials were collected by other investigators from the University of Maryland who are studying the distribution of sea nettle polyps, variation in glycogen levels in oyster tissue (a Sea Grant-funded project), the shell structure of spat in various portions of the Bay, and the spatial distribution of the boring sponge *Cliona* in Maryland oysters. While the oyster samples were being sorted by these investigators and the survey crew, numerous observations were made on the oyster-fouling communities. Details of these observations are recorded on the standard field sheets and are on file in the Department of Natural Resources. Those individuals who are interested in specific information about benthic fouling organisms in the Maryland portion should be referred to Mr. Harold Davis of Tidewater Administration of the Maryland Department of Natural Resources.

Figures

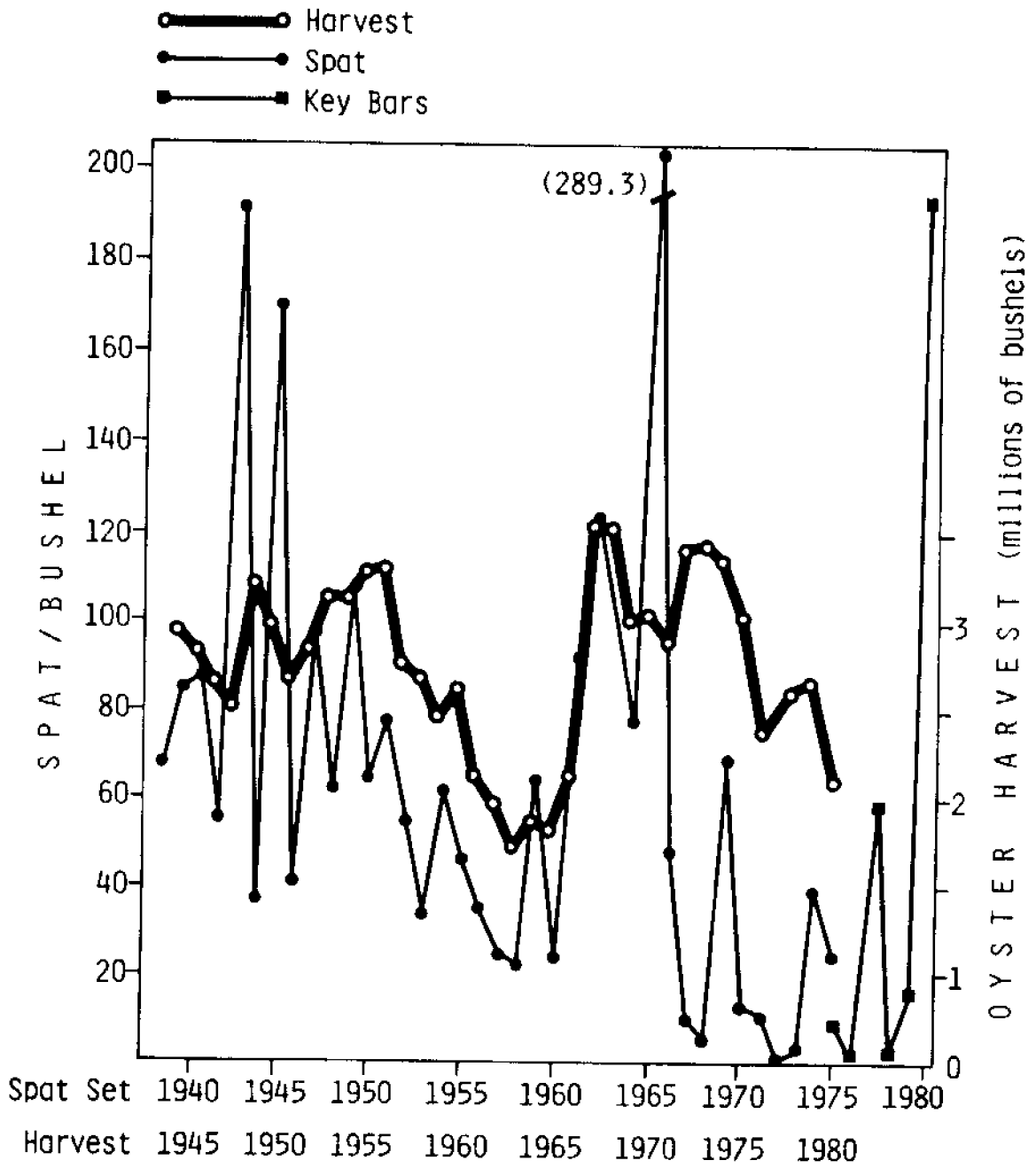

Figure 1. Comparison of oyster spat set on natural cultch (lighter line) to commercial harvest statistics adjusted to 5 years in time (heavier line). Data from key bars are indicated by squares on spat line, 1975 through 1980.

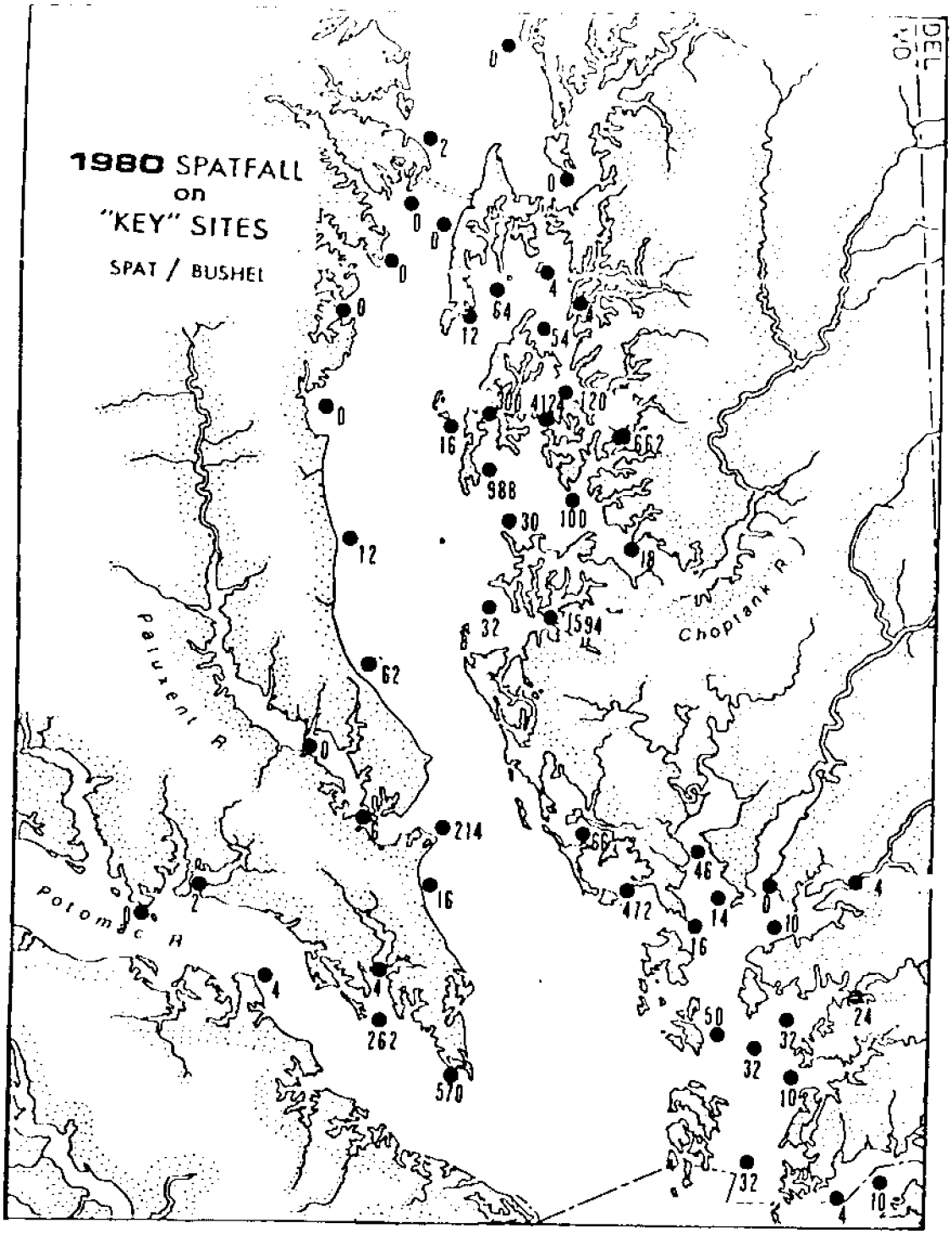

Figure 2. Spat set per bushel of bottom material taken from selected natural oyster bars ("Key Bars") during early October 1980.

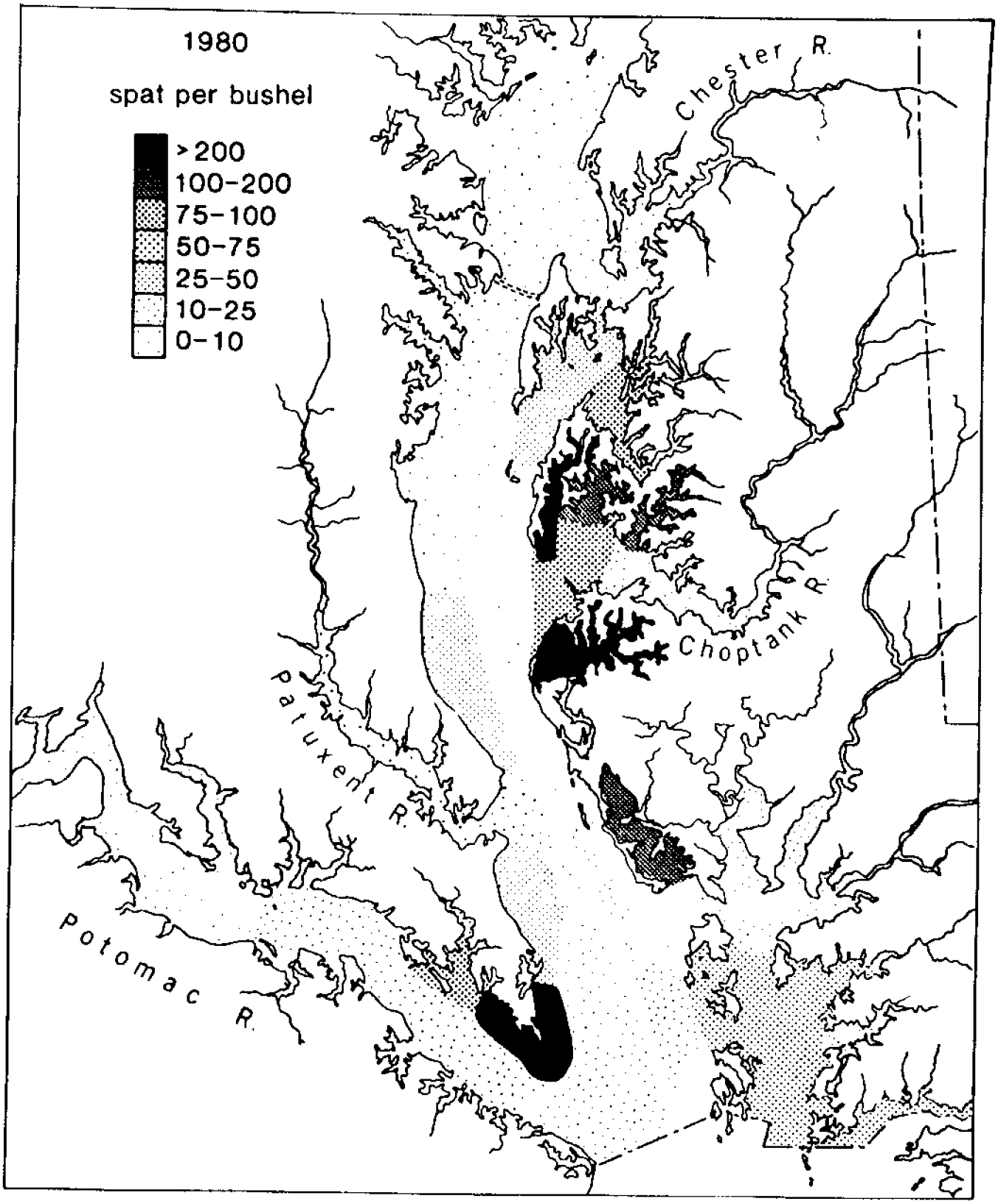

Figure 3. Geographical distribution of spat set on natural oyster bars in the Maryland portion of the Chesapeake Bay in the Fall of 1980.

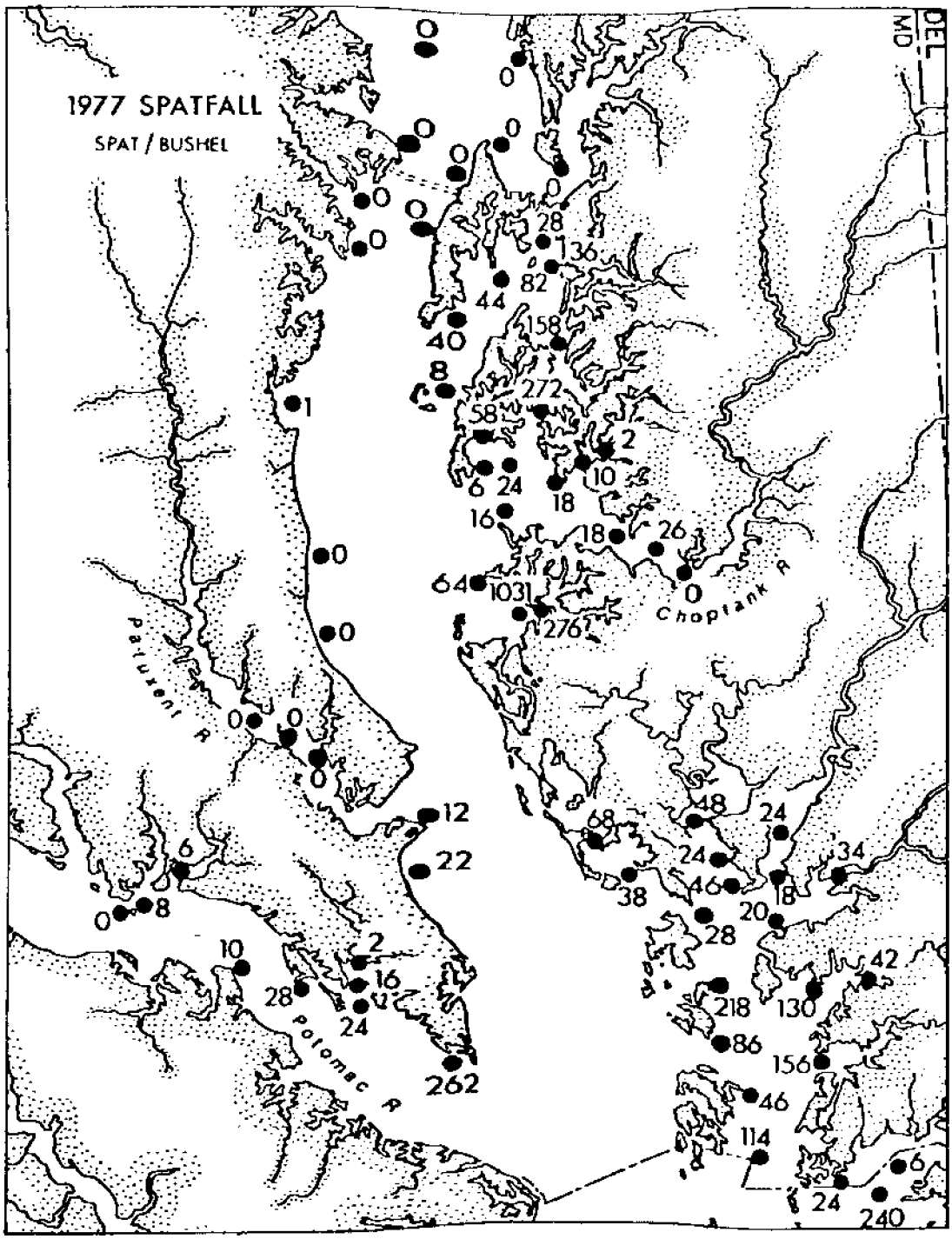

Figure 4. Spat set per bushel of material taken from natural oyster bars during early October 1977.

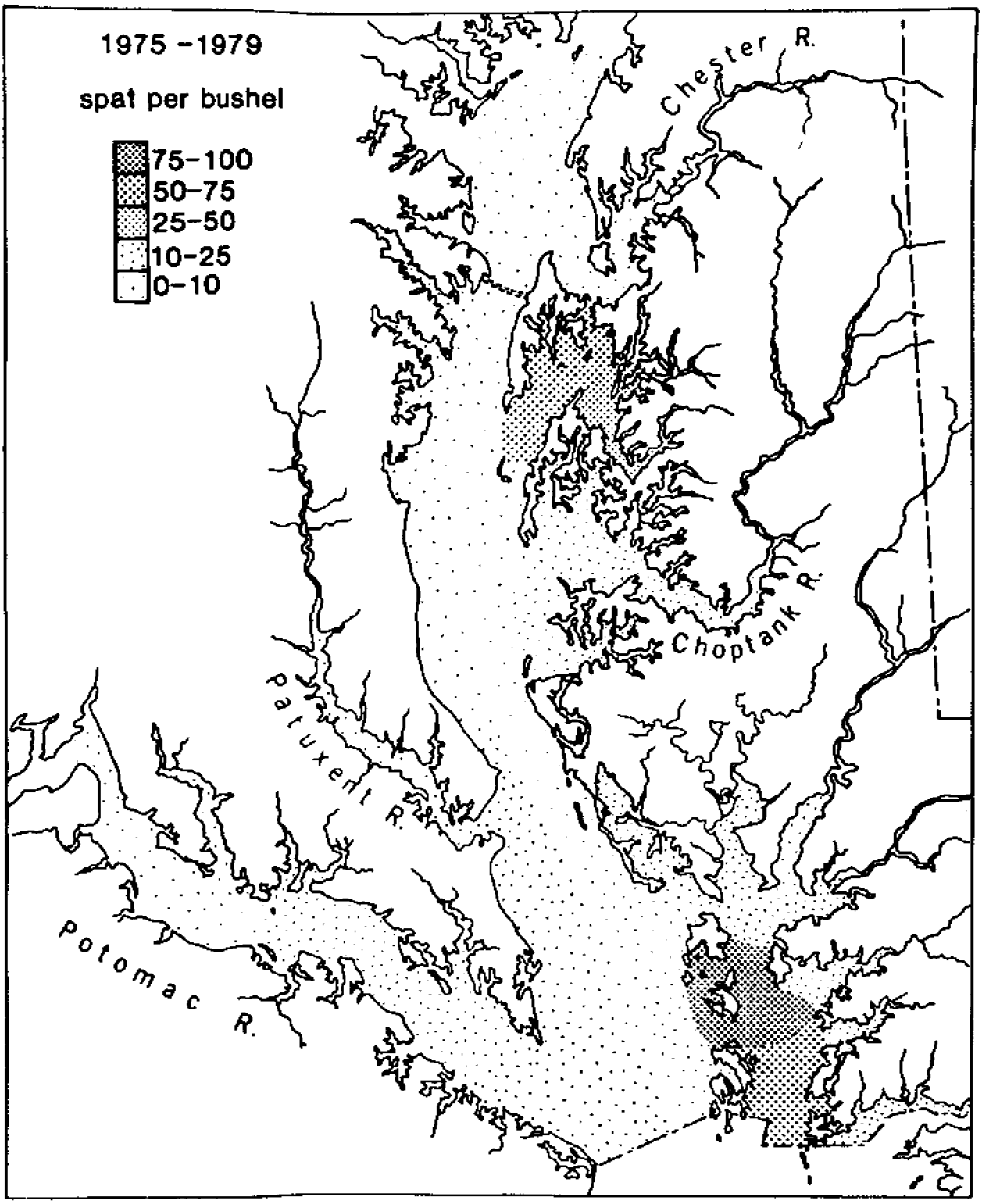

Figure 5. Distribution of spatfall on natural oyster bars between 1975 and 1979. This level of recruitment is presently sustaining Maryland's oyster harvest.

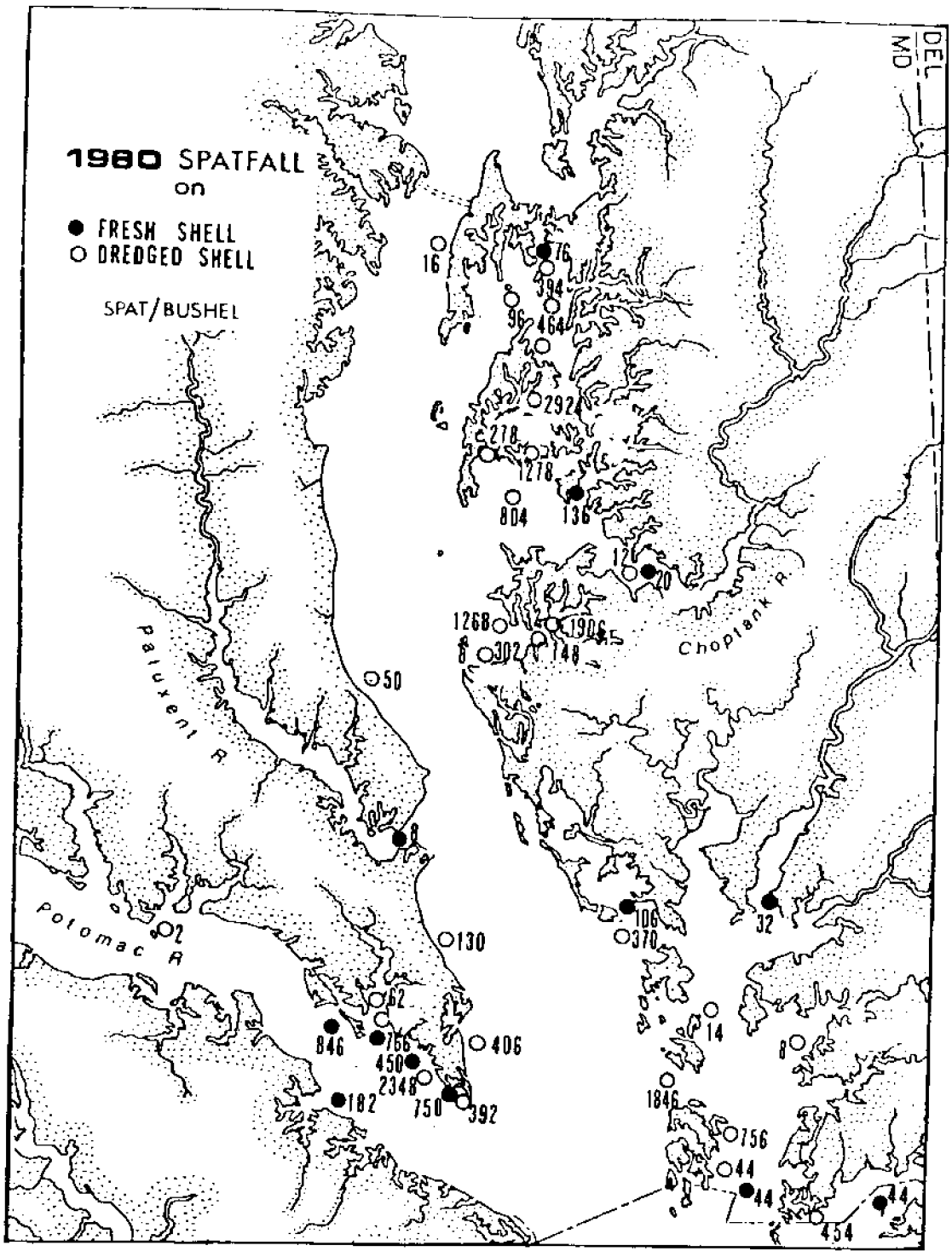

Figure 6. Spat set on recently planted fresh oyster shell and dredged oyster shell in October 1980.

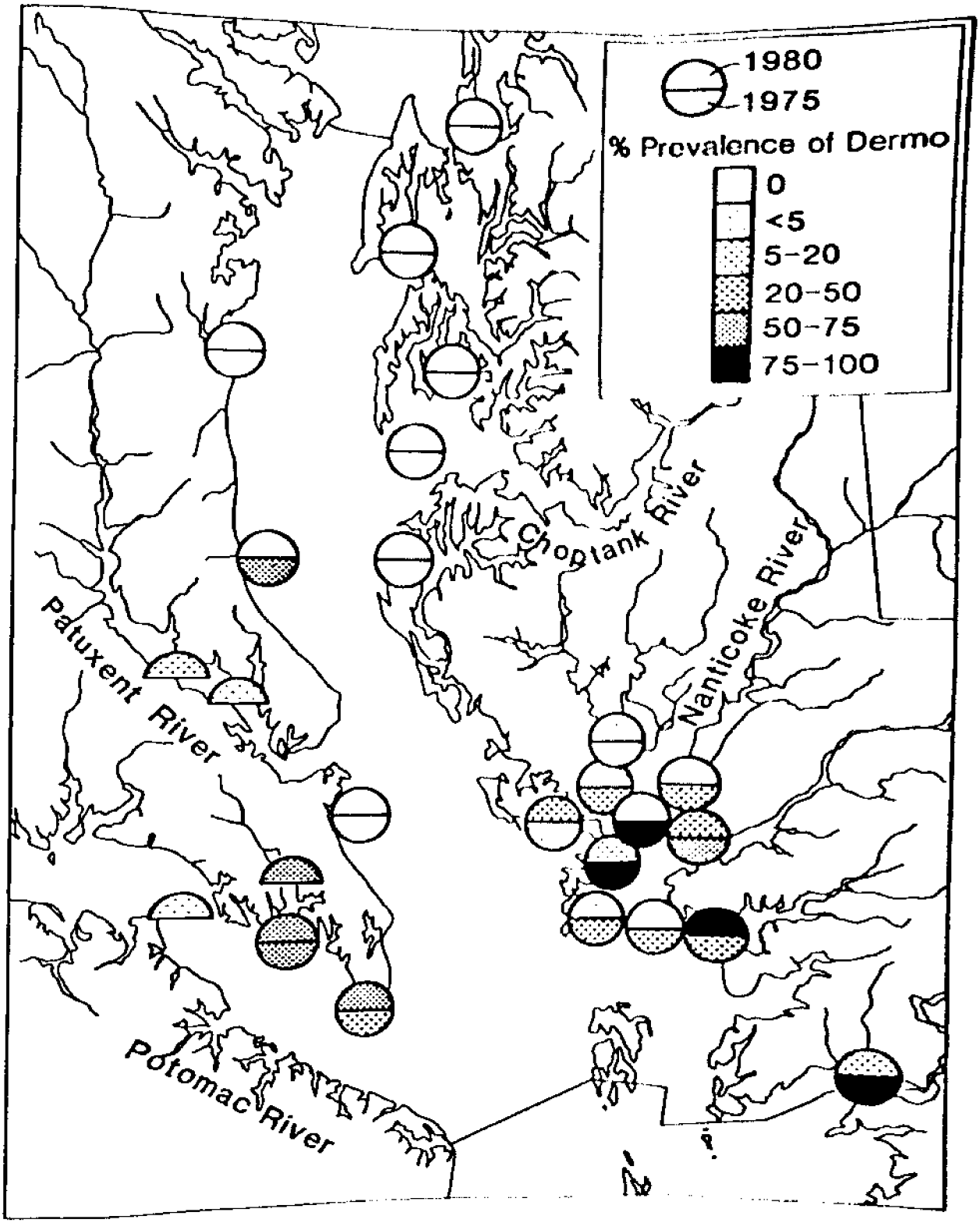

Figure 7. A comparison of the geographical distribution of "Dermo Disease" in Maryland oysters between the epizootic of 1975 and the present disease status.

Area/Bar	79-80 Fresh	78-80 Dredge	Adjacent Natural Bar
EASTERN BAY			
Hood	78	394	6
Bugeby	-	464	4
POTOMAC			
Kitts	766	474	80
St. Georges	846	-	-
Hog Island	182	-	32
Cornfield	-	392	536*
Jones	2364	1390	324
	750	834	324
	450	2348	324
	-	1332	324
Dukehart	-	2	-0-
ST. MARY			
Chickencock	-	802	267
Seed Area	-	62	46
Bayshore	-	406	36
Ten Acres	-	130	36
CHESAPEAKE BAY			
Flag Pond	-	50	62*
Brickhouse	-	16	-0-
MILES			
Hambleton	-	442	58
Wildground	-	96	12
HARRIS			
Mill Bar	-	278	336*
CHOPTANK			
France	-	804	50
Sandy Hill	20	12	18
BROAD CREEK			
Mulberry	-	2924	4124*
Peanut	-	722	4124*
Great Bar	-	1278	4124*
TRED AVON			
Foxhole	136	-	100
LITTLE CHOPTANK			
Ragged	-	1268	32
McKeile	-	148	1594*
Town Point	-	1904	766

Area/Bar	79-80 Fresh	78-80 Dredge	Adjacent Natural Bar
NANTICOCKE			
Tedious Creek	32	20	14
	-	346	-
HONGA			
Normans	106	370	472*
TANGIER			
Turtle Egg	-	14	50
Great Rock	44	-	32
Back Cove	-	736	32
Old Womans	-	44	32
Holland Straits	-	1846	124
POKOMOKE			
Marumsco	44	-	10
Terrapin	-	454	204
HANOKIN			
Drum	-	8	32
PATUXENT			
Middleground	8	-0-	6
N	14	36	39
Σ	5842	22,832	18,742
$\bar{x}$	417.29	634.2	480.56

*Natural bar set exceeds planting

Table 1. Comparison of the 1980 spat set on fresh oyster shell, on dredged oyster shell and on an adjacent natural oyster bar.

Appendices

Appendix 1
Itinerary

1980

Fall Oyster Bar Survey Cruise

IMPORTANT!
PLEASE NOTE:

1. AQUARIUS will leave the dock at 7 a.m. each day except for Monday, October 6, (Patuxent River) when departure will be at 8:30 a.m.

2. In most cases AQUARIOUS will return to drop you off at the place you boarded. On days when this is not possible, transportation will be provided to take you back to the starting point.

3. AQUARIUS is not equipped with Citizens Band (CB) radio. Contact may be made either by VHF-FM on Channel 16 or through ship-to-shore telephone hookup by contacting your local marine operator. Vessel call sign is WQ-4267.

4. Coffee and snacks provided throughout the day and we invite you to be our guest for lunch.

Trip Schedule

29 September (Monday) - Potomac River. Leave from Yacht Club in Colonial Beach (Va.). Work Potomac River Virginia shore, Cornfield Harbor, Jones Shore to Piney Point. Return to Colonial Beach.

30 September (Tuesday) - Potomac River. Leave from Leonardtown (dock by Wharf Restaurant). Work Potomac River, St. Marys shore and tributaries. (Brannock, Breton, St. Clements Bay, St. Marys River). Work Chesapeake Bay to Solomons. Arrive in Solomons. Transportation provided back to Leonardtown.

1 October (Wednesday) - Western Shore. Leave from Chesapeake Biological Lab (Solomons) boat dock. Work western shore of Chesapeake Bay and tributaries, Swan Point and Kent Shore. Arrive in Annapolis (City Dock). Transportation provided back to Solomons. Vessel Proceeds to Kent Island.

2 October (Thursday) - Chester River/Eastern Bay. Leave from Piney Narrows Marina gas dock (Kent Narrows). Survey Chester River, Eastern Bay, Wye River, Miles River, Poplar Island. Arrive in Tilghman. Transportation provided back to Kent Narrows.

3 October (Friday) - Choptank System. Leave from Knapps Narrows Marina (Tilghman). Survey Harris and Broad Creeks, Tred Avon, Choptank and Little Choptank. Arrive back in Tilghman. AQUARIUS proceeds to Deal Island.

Fall Oyster Bar Survey Cruise - 1980 (Cont.)

4 October (Saturday) - Upper Tangier Sound. Leave from Dept. of Natural Resources facility at Deal Island (formerly Richard Webster's plant). Survey Upper Tangier Sound, Honga River, Fishing Bay, Nanticoke and Wicomico Rivers. Arrive back in Deal Island. AQUARIUS proceeds to Crisfield.

5 October (Sunday) - Lower Tangier Sound. Leave from Somers Cove Marina, Crisfield. Survey Pocomoke Sound, Lower Tangier Sound including Manokin River. Return to Crisfield. AQUARIUS proceeds to Solomons.

6 October - Patuxent River. Leave from Chesapeake Biological Lab (CBL) boat dock, Solomons at 8:30 a.m. Survey Patuxent River to Rt. 231 bridge at Benedict. Arrive back at Solomons.

* * *

For further information or to reserve a place aboard, please call:

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GROUPS REPRESENTED ON OYSTER CRUISE '80

INDUSTRY (28):	Maryland Watermen's Association
	Virginia Watermen's Association
	Chesapeake Bay Seafood Industries Association
	Charles County Watermen's Association
	St. Marys County Watermen's Association
	Anne Arundel Oyster Committee
	Maryland Oystermen's Association
	Kent County Watermen's Association
	Talbot County Oyster Committee
	Dorchester County Oyster Committee
	Somerset County Watermen's Association
REGULATORY (80):	Maryland Department of Natural Resources
	Potomac River Fisheries Commission
	Md. Department of Health and Mental Hygiene
	Talbot County Health Department
	Virginia Marine Police
	St. Marys County government
	Kent County government
	Queen Anne's County government
	Talbot County government
	Dorchester County government
EDUCATIONAL (14):	University of Maryland
	Virginia Institute of Marine Science
	Dorchester County Schools
MEDIA (13):	WASHINGTON POST
	BALTIMORE SUN
	STAR-DEMOCRAT (Easton)
	BANNER (Cambridge)
	WBAL-TV (Ch. 11) Baltimore
	WBOC-TV (Ch. 16) Salisbury
	MARYLAND STATE NEWS
	KENT COUNTY NEWS
	SALISBURY TIMES
	ST. MARYS ENTERPRISE
OTHER (11):	Coastal Resources Advisory Commission
	interested citizens

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