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**PUBLIC OYSTER SHOAL SURVEY - SPRING 1992**

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### SUMMARY

The most productive public oyster shoals in the state of Virginia were surveyed in May 1992. It was found that:

1. The greatest number of market sized oysters in the James River occurred at Swash and Mulberry Point (>20 per bushel); other locations in the James River had 15 per bushel or fewer. This represents a further decline in the James River resource. In the Rappahannock River, there were 39 market oysters per bushel at Bowlers Rock, 25 per bushel at Morattico Bar, and fewer than 15 at the other locations sampled. Overall, this was a slight increase over the numbers recorded in 1991.
2. In the James River, the average count of small oysters was 958 per bushel at Horsehead as the result of a good set in 1990; all other stations had fewer than 350 small oysters per bushel. In the Rappahannock River, there were 52 small oysters per bushel or fewer at all sampling locations, which is a decline compared to the 1991 survey results.
3. Counts of yearlings were highest at Wreck Shoal, Dry Shoal, and Horsehead (140, 129, and 120 per bushel, respectively), reflecting spatfall patterns observed in 1991. In the portion of the Rappahannock River surveyed, there was virtually no recruitment in 1991 so there were almost no yearlings found in this survey.
4. Prevalence of Perkinsus marinus (Dermo) was greater in both the James and Rappahannock Rivers in May 1992 than in May 1991. Based on current numbers of small oysters and yearlings, and depending upon disease mortality this summer and next, market harvest may increase in the James River and decrease in the Rappahannock River in the short term.
5. Due to sustained removal of oysters and the decreased production of new shell material, the oyster shoals themselves are slowly deteriorating and becoming buried by sediment, thus becoming less suitable as cultch.

## INTRODUCTION

Oysters have been harvested from Virginia waters as long as humans have inhabited the area. Depletion of natural stocks in the late 1880's led to the establishment of regulations by public fisheries agencies. A survey of bottom areas in which oysters grew naturally was completed in 1896 under the direction of Lt. Baylor, USN. These areas (over 243,000 acres) were set aside by legislative action for public use and have come to be known as the Baylor Survey Grounds or Public Oyster Grounds of Virginia, and are presently administered by VMRC, the Virginia Marine Resources Commission (Haven et al., 1978).

Since 1960, oyster production from public shoals has declined dramatically, as shown in Figure 1. Two oyster pathogens, Perkinsus marinus (Dermo) and Haplosporidium nelsoni (MSX) have decimated stocks in the higher salinity regions (>15ppt) of Chesapeake Bay and its tributaries (Hargis and Haven, 1988). Thus much of the public oyster ground is non-productive and the small portion that remains productive is being intensely harvested (Barber and Mann, 1990).

Twice a year the Virginia Institute of Marine Science (VIMS) conducts a survey of selected public oyster bars (shoals) in Virginia waters for the purpose of assessing the status of the resource. Surveys conducted in the spring concentrate on grounds that are currently productive and provide information about over-winter mortality and relative fishing pressure from the current harvesting season<sup>1</sup>. Surveys conducted in the fall cover a larger area and provide information about spatfall or recruitment, summer (disease) mortality, and the status of each shoal as a source of seed or market oysters prior to the beginning of the harvesting season.

This report summarizes the findings of the Spring 1992 Oyster Shoal Survey, conducted between 11 and 14 May, 1992.

## METHODS

For this survey, sampling locations were located in the primary harvesting (public) areas of the upper James River and the upper Rappahannock River. Three 0.5 bushel (25 quart) samples of bottom material were taken at each shoal using a 24 inch dredge having 4 inch teeth. The shoals sampled are shown in Figure 2 (James River) and Figure 3 (Rappahannock River). Loran coordinates and the date each location was sampled are given in Table I.

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<sup>1</sup>Oysters may be harvested from public shoals in Virginia between 1 October and 1 June with the exception of the seaside of the Eastern Shore, where harvesting is restricted to the period from 1 November to 1 April.

The following data were obtained for each replicate sample: number of market (>3" in shell height) oysters, number of small (submarket sized) oysters, number of yearlings (1991 recruits), number of recent boxes (inside of shells clean; dead a month or less), and number of old boxes (inside of shells dirty; dead a month or more). Bottom water samples were obtained at each location for temperature (°C) and salinity (ppt) determination. Where possible, 25 oysters were collected for disease analysis (prevalence of Perkinsus marinus)<sup>2</sup>. In addition, observations were made regarding the condition of the bottom at each shoal: bottom material, predators, and fouling organisms.

Data were summarized for each shoal as the average number of market, small, yearling, and total oysters per bushel and percent mortality, calculated as : [recent boxes and gapers/oysters + recent boxes and gapers] x 100.

## RESULTS

The results are summarized in Table II.

### James River

Seven shoals were sampled in the James River. Bottom temperature ranged from 17.2 °C at Dry Shoal and Wreck Shoal to 21.8 °C at Point of Shoals. Salinity generally increased in a downriver direction, from 3.0 ppt at Mulberry Point and Horsehead to 10.0 ppt at Wreck Shoal.

Market oysters (≥3") were most numerous at Mulberry Point and Swash, where 23 and 21 per bushel were found, respectively. Average counts of market oysters per bushel were 15 at Point of Shoals, 11 at Long Rock, 7 at Horsehead, 6 at Dry Shoal, and 2 at Wreck Shoal. The average number of small oysters was greatest at Horsehead, where 958 per bushel were recovered; at Point of Shoals there were 344 small oysters per bushel. Small oysters averaged between 150 and 264 per bushel at all other stations. The greatest number of yearlings per bushel were found at Wreck Shoal (140 per bushel), Dry Shoal (129 per bushel), and Horsehead (120 per bushel). All other locations averaged between 62 and 104 yearlings per bushel.

The number of old boxes ranged from 40 per bushel at Point of Shoals to 141 at Swash, while the number of new boxes ranged from 9 per bushel at Long Rock to 29 per bushel at Wreck Shoal. Recent mortality thus ranged from 1.5% at Horsehead to 9.0% at Wreck Shoal.

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<sup>2</sup>More complete disease data, including prevalence and intensity of both MSX and Perkinsus in Virginia waters, are available from the VIMS disease monitoring program.

Prevalence of P. marinus varied from 8% at Horsehead to 36% at Wreck Shoal.

### Rappahannock River

At the five stations surveyed in the Rappahannock River, bottom temperature ranged from 17.1 °C at Smokey Point to 19.0 °C at Ross Rock. Salinity increased in a downriver direction, from 4.0 ppt at Ross Rock to 11.0 ppt at Morattico Bar and Smokey Point.

Counts of market oysters per bushel were 39 at Bowlers Rock, decreasing to 25 at Morattico Bar, 14 at Long Rock, 13 at Ross Rock, and 6 at Smokey Point. The average number of small oysters was greatest at Ross Rock (52 per bushel), followed by 21 per bushel at both Bowlers Rock and Smokey Point, 17 at Morattico Bar, and 8 at Long Rock. Yearlings were almost non-existent at the locations sampled.

The number of old boxes per bushel ranged from 1 at Ross Rock to 35 at Morattico Bar, and the number of new boxes per bushel was 0 at Ross Rock, increasing to 7 per bushel at Smokey Point. Recent mortality thus ranged from 0% at Ross Rock to 20.0% at Smokey Point.

Prevalence of P. marinus was 0% at Ross Rock and 44-48% at all other locations.

### **DISCUSSION**

The portions of the upper James and upper Rappahannock Rivers that were surveyed comprise the primary areas of commercially harvested public oyster ground in Virginia, exclusive of the seaside of the Eastern Shore. In fact, about 90% of all oysters harvested from public grounds are from the upper James River. With the public fishery concentrated in these two relatively small areas, fishing pressure is quite high.

Recent trends in the number of market oysters per bushel are illustrated for the James River (Point of Shoals and Horsehead) and the Rappahannock River (Bowlers Rock and Morattico Bar) in Figures 4 and 5, respectively. Since the harvest season extends from October through May, any decrease in the number of market oysters per bushel between fall and spring surveys is most likely attributable to fishing pressure. Especially large (statistically significant) decreases were seen at Point of Shoals between Fall 1986 and Spring 1987 (t-test,  $P \leq 0.05$ ) and at Horsehead, Point of Shoals, and Morattico Bar between Fall 1987 and Spring 1988 (t-test,  $P \leq 0.05$ ). In the James River, these were the first two years of harvest under the "clean cull" law, which lowered the legal size of market oysters from 3.0" to 2.5" (effective October 1986). Since the Fall 1988 survey, counts of market oysters at both Horsehead and Point of Shoals have been

generally decreasing (Figure 4). In the Rappahannock River, counts of market oysters have been fluctuating around 20 per bushel since the Fall 1987 survey (Figure 5).

The overall decline in larger (market) oysters since the 1986-87 harvest season may be the result of a combination of overharvesting (see Barber and Mann, 1990) and a resultant decline in recruitment. Market oysters, because of their size, are more important as broodstock (spawners) than smaller oysters. The relationship between number of broodstock and number of spat the following fall is unclear because there are so many other factors affecting the recruitment process. It is obvious, however, that **fewer oysters produce fewer eggs**, thus reducing recruitment potential, with all other factors being equal. This is especially critical in small, isolated areas such as the upper James and Rappahannock Rivers that are unlikely to receive recruitment from other areas.

Besides broodstock, another (perhaps even more critical) factor controlling recruitment success is cultch availability. Cultch is the term given to substrate (usually oyster shell) that small oysters (spat) attach to when they settle. The oyster shell that makes up the oyster "reefs" has been gradually removed over years of harvest. This shell, for the most part, is not being replaced, as the number of living oysters is declining. In effect cultch is being removed faster than it is being produced, and the old shell that is remaining is deteriorating and slowly being buried by sediment, thus becoming unavailable as cultch. The net effect is that the relatively smaller numbers of larvae being produced have less substrate upon which to adhere.

Counts of market oysters in the James River decreased between the Spring 1991 and Spring 1992 surveys at all stations except Point of Shoals. In contrast, the average number of small oysters was greater at all but one station in Spring 1992 than in Spring 1991. Counts of yearlings were lower at 5 of 7 stations in 1992 than in 1991. Numbers of boxes (both old and new) increased; calculated mortality rates were greater in 1992 than in 1991 at all stations.

Thus it would appear that in the James River, even though there is presently an all time low number of market oysters, market harvest could increase within the next two years because of the large number of small oysters present. This is especially true at Horsehead Bar, where the large number of spat (1091 per bushel) found in the Fall 1990 survey resulted in 903 yearlings per bushel in the Spring 1991 survey and 958 small oyster per bushel in this survey. The major unknown at this time is the impact that P. marinus will have on oysters in this portion of the river. Recent trends indicate that disease levels are increasing in the James, and the results of this survey show an increase in mortality since last year.

At 4 of the 5 shoals sampled in the Rappahannock River, there was an increase in the number of market oysters between the

Spring 1991 and Spring 1992 surveys. This, however, was offset by a decrease in the number of small oysters at all stations over the same time period. There were virtually no yearlings found on the shoals surveyed because there was very little recruitment in 1991. As in the James River, there were more boxes (both old and new) found in the Rappahannock River in 1992 than in 1991.

In the Rappahannock River, the increase in market oysters since the Spring 1991 survey may be short lived, as there was also a decrease in the number of small oysters at all shoals sampled and virtually no yearlings were found. The increase in P. marinus prevalence and recent mortality would also suggest that future market harvests in the Rappahannock will decline.

#### ACKNOWLEDGEMENTS

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TABLE I

## Station Locations and Dates Sampled - Spring 1992

Station	Date/Time	Depth (ft)	Loran Coordinates	
<u>James River</u>				
Mulberry Point	14 May/0931	8.0	27347.4	41341.5
Horsehead	14 May/1054	7.0	27346.0	41333.2
Pt. of Shoals	14 May/1245	6.5	27344.0	41310.6
Long Rock	12 May/1328	5.0	27338.4	41312.9
Swash	12 May/1410	10.0	27339.4	41328.5
Dry Shoal	12 May/1204	6.0	27332.5	41302.3
Wreck Shoal	12 May/1130	8.0	27326.0	41301.8
<u>Rappahannock River</u>				
Ross Rock	11 May/1115	3.5	27496.8	41897.8
Bowlers Rock	11 May/1156	7.5	27472.4	41847.3
Long Rock	11 May/1125	8.5	27465.6	41841.2
Morattico Bar	11 May/1053	13.0	27447.0	41820.0
Smokey Point	11 May/1020	13.0	27418.5	41780.1

TABLE II

## Results of Public Oyster Shoal Survey - Spring 1992

STATION	TEMP. (°C)	SAL. (ppt)	AVERAGE NO. OYSTERS PER BUSHEL			BOXES		% REC. MORT.	Perk. (%Prev.)	
			Market	Small	Yearling	Total	Old			New
<u>James River</u>										
Mulberry Pt.	21.0	3.0	23	183	63	269	49	19	6.6	---
Horsehead	20.2	3.0	7	958	120	1085	58	17	1.5	8
Long Rock	17.3	5.0	11	264	82	357	60	9	2.5	---
Swash	17.7	5.0	21	227	104	352	56	15	4.1	20
Pt. of Shoals	21.8	3.5	15	344	62	421	40	11	2.5	16
Dry Shoal	17.2	8.0	6	136	129	271	138	24	8.1	---
Wreck Shoal	17.2	10.0	2	150	140	292	141	29	9.0	36
<u>Rappahannock River</u>										
Ross Rock	19.0	4.0	13	52	2	67	1	0	0	0
Bowlers Rock	18.0	8.0	39	21	1	61	13	1	1.6	44
Long Rock	18.0	10.0	14	8	1	23	9	2	8.0	44
Morattico Bar	17.7	11.0	25	17	1	43	35	4	8.5	44
Smokey Point	17.1	11.0	6	21	1	28	22	7	20.0	48

# Market Oyster Production State of Virginia

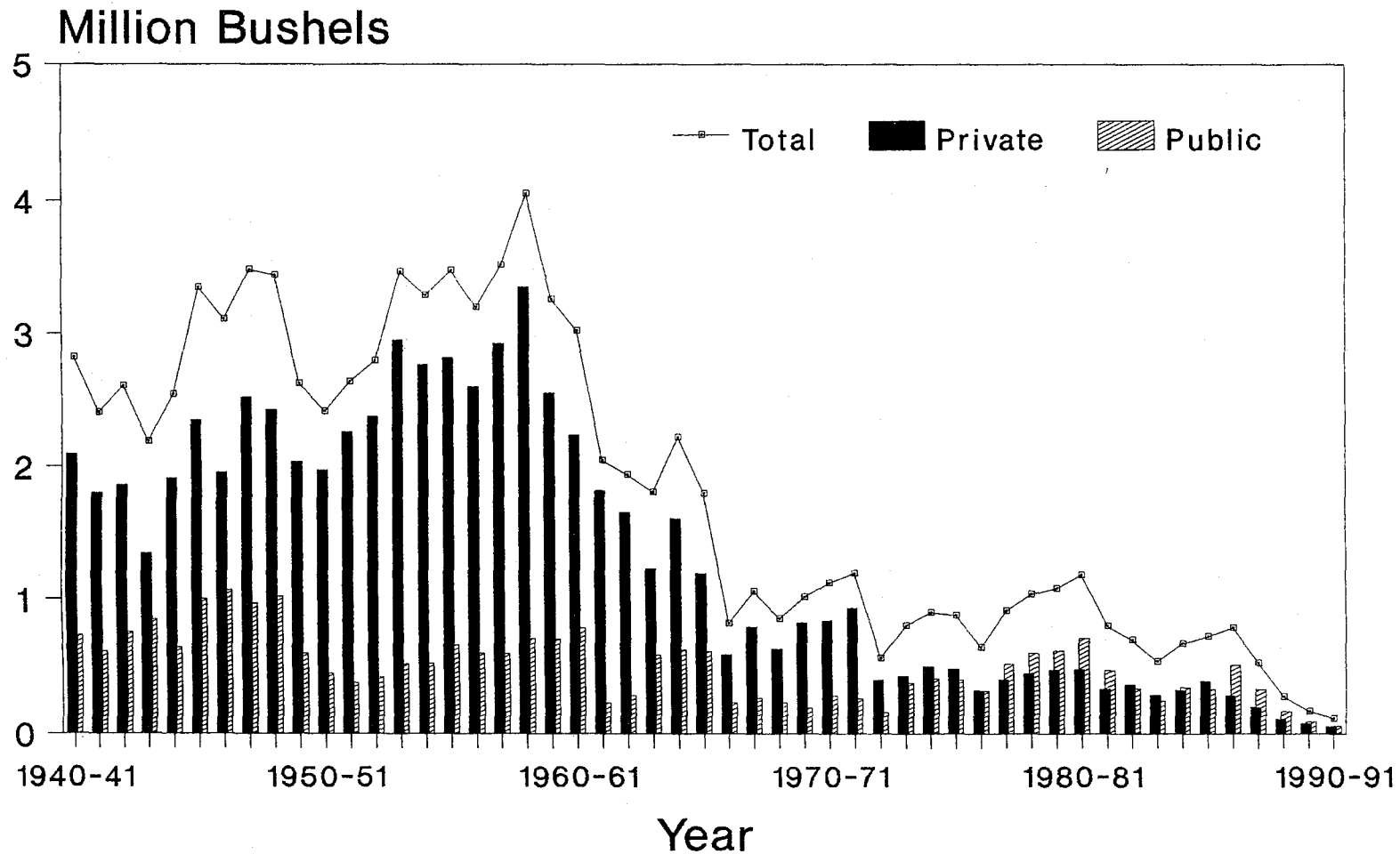


Figure 1. Market oyster production (public and private) in the state of Virginia, from 1940-41 to present.

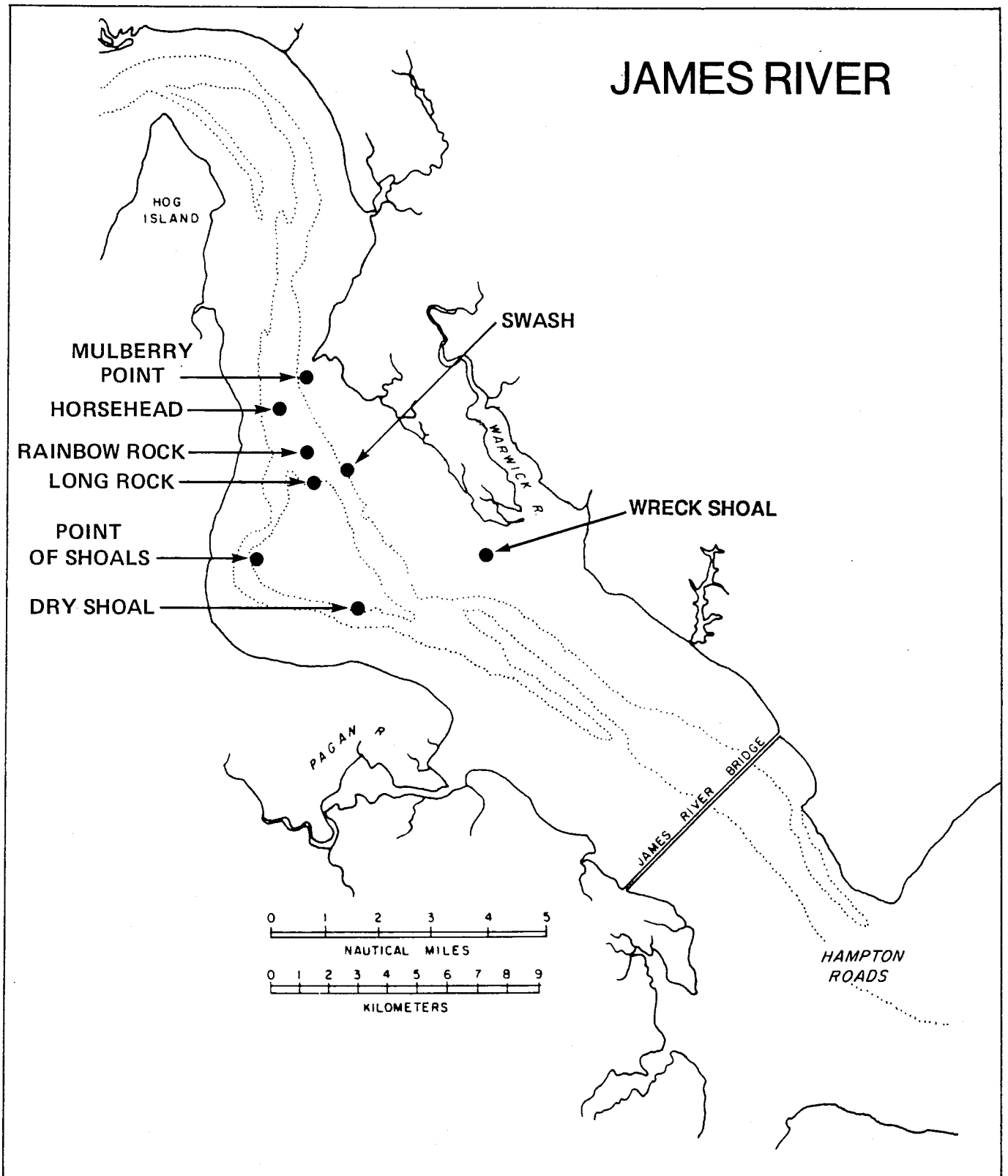


Figure 2. Location of shoals sampled in the James River, Virginia.

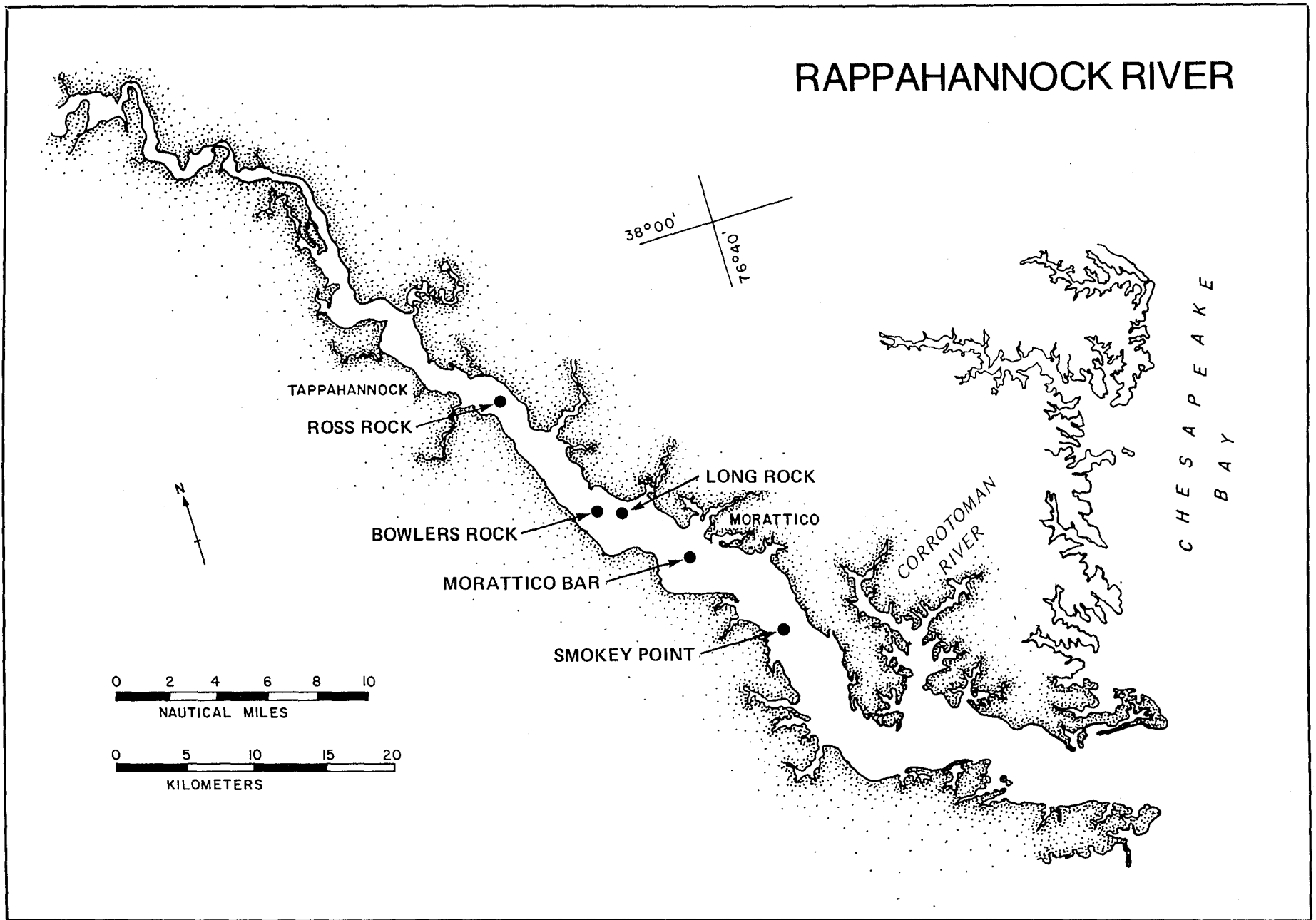
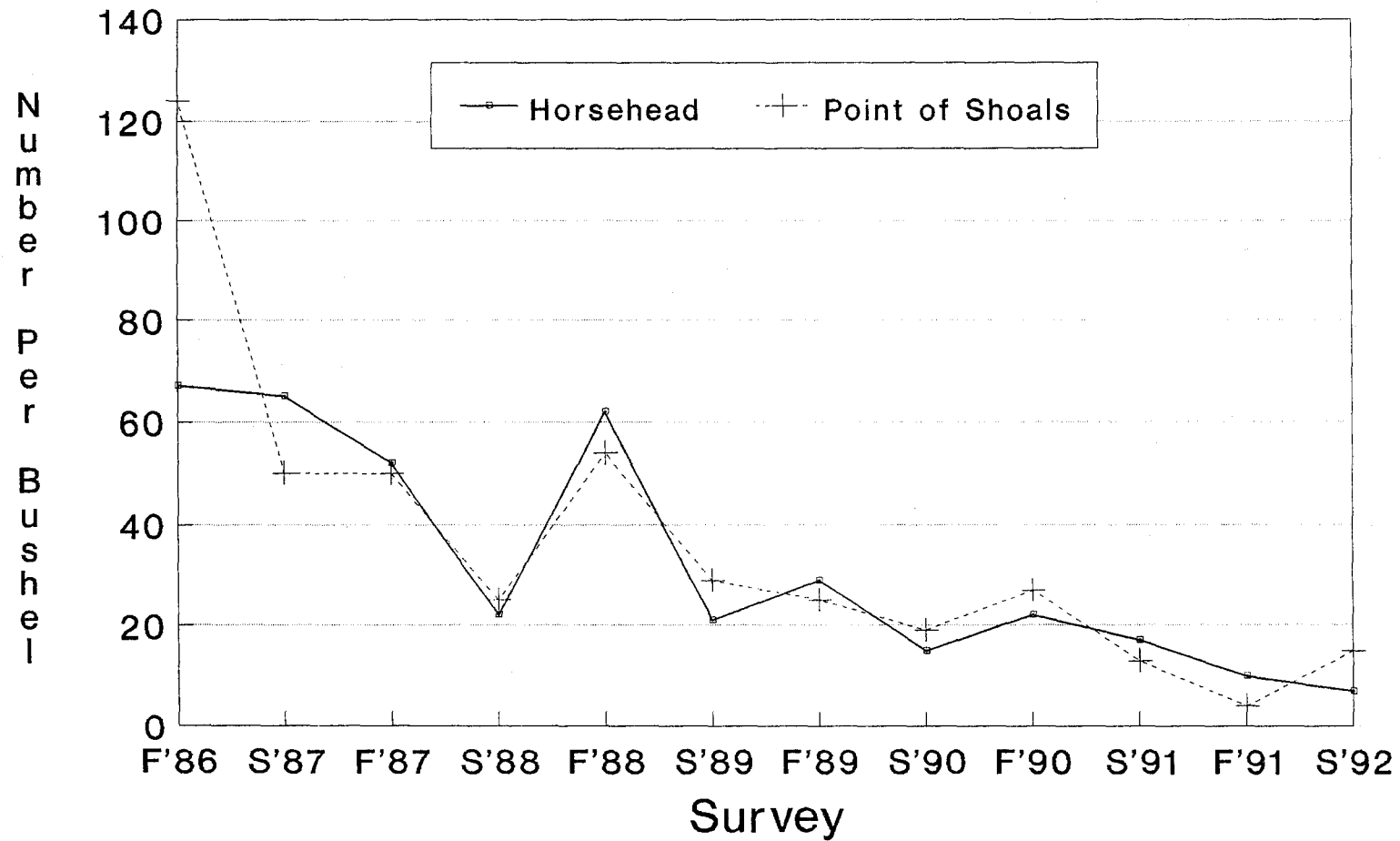


Figure 3. Location of shoals sampled in the Rappahannock River, Virginia.

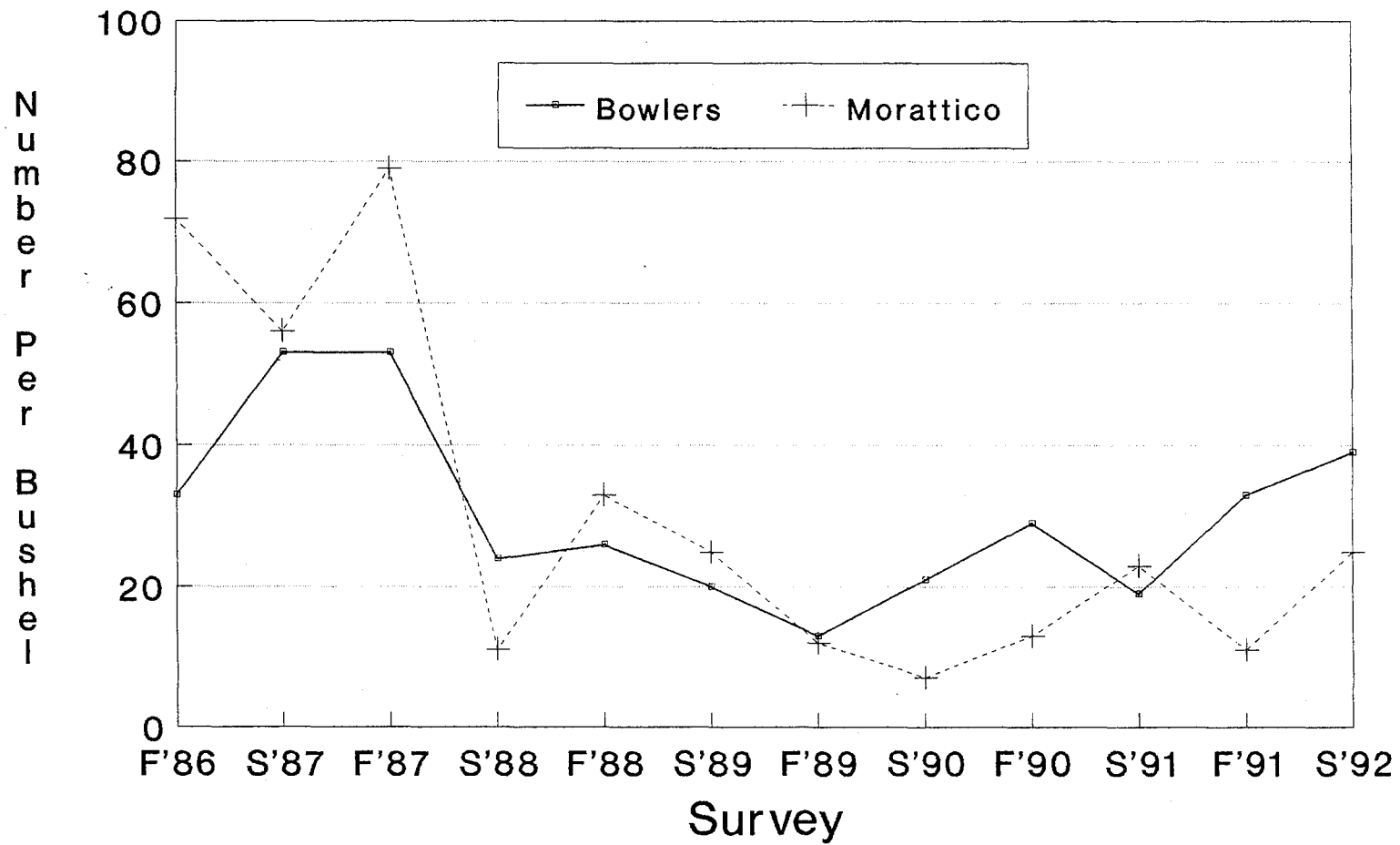
# Market Oyster Trends James River



S=Spring; F=Fall

Figure 4. Average number of market oysters per bushel on Horsehead Bar and Pt. of Shoals, James River, Fall 1986 to Spring 1992.

# Market Oyster Trends Rappahannock River



S=Spring; F=Fall

Figure 5. Average number of market oysters per bushel on Bowlers Rock and Morratico Bar, Rappahannock River, Fall 1986 to Spring 1992.