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STATUS OF THE PUBLIC OYSTER FISHERY OF VIRGINIA - SPRING 1991

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SUMMARY

The Spring 1991 survey of the most productive public oyster shoals in the state of Virginia revealed that:

1. The greatest number of market sized oysters in the James River occurred at Swash and Mulberry Point (>50 per bushel); other locations in the James River had 20 per bushel or fewer. In the Rappahannock River, there were 23 oysters per bushel at Morattico Bar and 19 per bushel or fewer at the other locations sampled.

2. In the James River, small oysters exceeded 200 per bushel only at Mulberry Point. In the Rappahannock River, there were 90 small oysters per bushel or fewer at all sampling locations.

3. Counts of yearlings were highest at Horsehead and Mulberry Point in the James River (903 and 466 per bushel, respectively), indicating good survival of spat from 1990. In the portion of the Rappahannock River surveyed, there was virtually no recruitment in 1990 so there were almost no yearlings found in this survey.

4. 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.

5. In spite of the mild winter of 1990-91, prevalence of Perkinsus was low in both areas.

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[1]. 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 1991 Oyster Shoal Survey, conducted between 13 and 16 May, 1991.

METHODS

For this survey, sampling locations were limited to the primary harvesting (public) areas, 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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[1]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 sample: number of market (>3" in shell height) oysters, number of small (submarket sized) oysters, number of yearlings (1990 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)[2]. 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 22.0 °C at Dry Shoal to 24.4 °C at Horsehead. Salinity generally increased in a downriver direction, from 5.0 ppt at Mulberry Point and Horsehead to 10.0 ppt at East End.

Market oysters (>3") were most numerous at Swash and Mulberry Point, where 58 and 52 per bushel were found, respectively. Average counts of market oysters per bushel were 20 at East End and Long Rock, 17 at Horsehead, 13 at Point of Shoals, and 3 at Dry Shoal. The average number of small oysters per bushel was greatest at Mulberry Point, where 281 per bushel were recovered. At Long Rock, Point of Shoals, Swash, and Horsehead, small oysters averaged between 115 and 190 per bushel, while average counts of 58 and 80 were found at East End and Dry Shoal, respectively. The greatest number of yearlings per bushel were found at Horsehead, decreasing to 466 at Mulberry Point, 367 at Point of Shoals, 151 at Long Rock, and 145 at Swash. Dry Shoal and East End had 80 and 58 yearlings per bushel, respectively.

The number of old boxes ranged from 11 per bushel at Horsehead and Point of Shoals to 75 at Swash, while the number of new boxes ranged from 3 per bushel at Swash and East End to 8 per bushel at both Horsehead and Mulberry Point. Recent mortality was 4% or less at all stations.

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[2]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 Perkinsus was 0% at both Horsehead and Point of Shoals, the only stations examined.

Rappahannock River

At the five stations surveyed in the Rappahannock River, bottom temperature ranged from 22.0 °C at Smokey Point to 24.2 °C at Ross Rock. Salinity increased in a downriver direction, from 4.0 ppt at Ross Rock to 10.0 ppt at Smokey Point.

Counts of market oysters per bushel were 23 at Morattico Bar, decreasing to 19 at Bowlers Rock, 15 at Smokey Point, 11 at Long Rock, and 8 at Ross Rock. The average number of small oysters per bushel were 90 at Ross Rock, 78 at Morattico Bar, 71 at Long Rock, 51 at Smokey Point, and 29 at Bowlers Rock. Yearlings were almost non-existant at the locations sampled.

The number of old boxes per bushel ranged from 3 at Ross Rock to 26 at Morattico Bar, and the number of new boxes per bushel was 0 or 1 at all stations; recent mortality was thus only 2% or less.

Prevalence of Perkinsus increased generally in a downriver direction, from 0% at Ross Rock to 36% at Smokey Point.

DISCUSSION

The portions of the upper James and upper Rappahannock Rivers that were surveyed comprise the entire area 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 this relatively small area, 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 1988-89 harvest season, the number of market oysters per bushel in both areas has remained around 20, with slight increases between spring and fall and slight decreases between fall and spring. In the James River, market counts at Point of Shoals decreased from 27 to 13 per bushel between the Fall 1990 and Spring 1991 surveys, indicating

that this area was heavily fished during the most recent harvest season. This is the lowest market count ever recorded at Point of Shoals. At Mulberry Point and Swash, however, there were relatively high (>50) numbers of market oysters. Unfortunately, these areas are not as extensive as other shoals in the upper James River. In the Rappahannock River, there was a decrease in market counts between the Fall 1990 and Spring 1991 surveys at Bowlers Rock, but an increase at Morattico Bar, probably reflecting differences in fishing pressure at these two locations. In spite of decreases in numbers of market oysters since the 1986-87 harvest season, densities in most areas have leveled off at around 20 per bushel, which may represent a balance between recent trends in recruitment and harvest effort, which in turn is driven to some extent by the market price of oysters.

The overall decline in larger (market) oysters may be affecting recruitment by effectively reducing the reproductive potential of the populations. 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.

In spite of the odds and longterm trends, 1990 was a good year for recruitment. These oysters are represented as the yearling class of the Spring 1991 survey. There were over 900 yearlings per bushel at Horsehead, 466 per bushel at Mulberry Point, and 367 per bushel at Point of Shoals. Growth and survival of these oysters to market size will take 3-5 years and will depend upon environmental conditions, predation, and disease prevalence and intensity. In the upper Rappahannock River, spatfall was virtually non-existant in 1990. In addition, the number of small oysters was 90 or less per bushel at all stations surveyed. Thus there is little indication that market oysters will increase in density in the Rappahannock River in the near future.

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 reef structure or profile, which provides a self cleansing mechanism by being higher in the water column than the

surrounding bottom, is also being reduced. This was seen during this survey, especially in the Rappahannock River, where there has been little recruitment for several years. In the Rappahannock River, the shell base that does exist is primarily larger, older shell (both oyster and clam) that is deteriorating; at Smokey Point the shell was anoxic and heavily fouled with sea squirts (Mogula). At Bowlers Rock and Ross Rock in the Rappahannock River and Horsehead and Point of Shoals in the James River, the substrate was comprised primarily of small pieces of shell (shell hash), which is characteristic of areas that have been heavily worked by oyster tongers.

The low recent mortality seen in both rivers indicates that there was little over-winter mortality. This was verified by the fact that of the 1091 spat per bushel found at Horsehead in the James River in the fall of 1990, there were still 903 yearlings per bushel found during this survey. Prevalence of Perkinsus was relatively low in both rivers, and unlikely to have caused additional mortality, especially in the smaller oysters. Perkinsus generally decreases in prevalence over the winter, but increases in prevalence in the summer as water temperature increases.

ACKNOWLEDGEMENTS

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TABLE I

Station Locations and Dates Sampled - Spring 1991

Station	Date/Time	Depth (ft)	Loran Coordinates	
James River				
Mulberry Point	13 May/1233	7.6	27347.4	41341.5
Horsehead	13 May/1400	4.8	27346.0	41333.2
Long Rock	14 May/1004	6.0	27338.4	41312.9
Swash	13 May/1039	12.0	27339.4	41328.5
Pt. of Shoals	14 May/1050	5.8	27344.0	41310.6
East End	13 May/0945	10.0	27331.0	41315.0
Dry Shoal	14 May/0925	6.6	27332.5	41302.3
Rappahannock River				
Ross Rock	16 May/1100	2.5	27496.8	41897.8
Bowlers Rock	16 May/1020	8.0	27472.4	41847.3
Long Rock	15 May/1110	15.0	27465.6	41841.2
Morattico Bar	15 May/1038	12.0	27447.0	41820.0
Smokey Point	15 May/0950	12.0	27418.5	41780.1

TABLE II

Results of Public Oyster Shoal Survey - Spring 1991

STATION	TEMP.	SAL.	AVERAGE NO. OYSTERS PER BUSHEL				BOXES		% RECENT	
Perkinsus Prev.)	(°C)	(ppt)	Market	Small	Yearling	Total	Old	New	MORTALITY	(%
James River										
Mulberry Pt.	24.2	5.0	52	281	466	799	31	8	1	---
Horsehead	24.4	5.0	17	190	903	1110	11	8	<1	0
Long Rock	22.5	7.0	20	115	151	286	29	7	2	---
Swash	22.7	7.0	58	135	145	338	75	3	<1	---
Pt. of Shoals	22.8	7.0	13	133	367	513	11	7	1	0
East End	22.3	10.0	20	58	68	146	19	3	2	---
Dry Shoal	22.0	8.0	3	80	82	165	29	7	4	---
Rappahannock River										
Ross Rock	24.2	4.0	8	90	0	98	3	0	0	0
Bowlers Rock	23.0	6.0	19	29	1	49	9	1	2	8
Long Rock	23.8	7.0	11	71	0	82	9	1	1	0
Morattico Bar	23.0	8.0	23	78	1	102	26	0	0	21
Smokey Point	22.0	10.0	15	51	1	67	5	1	1	36

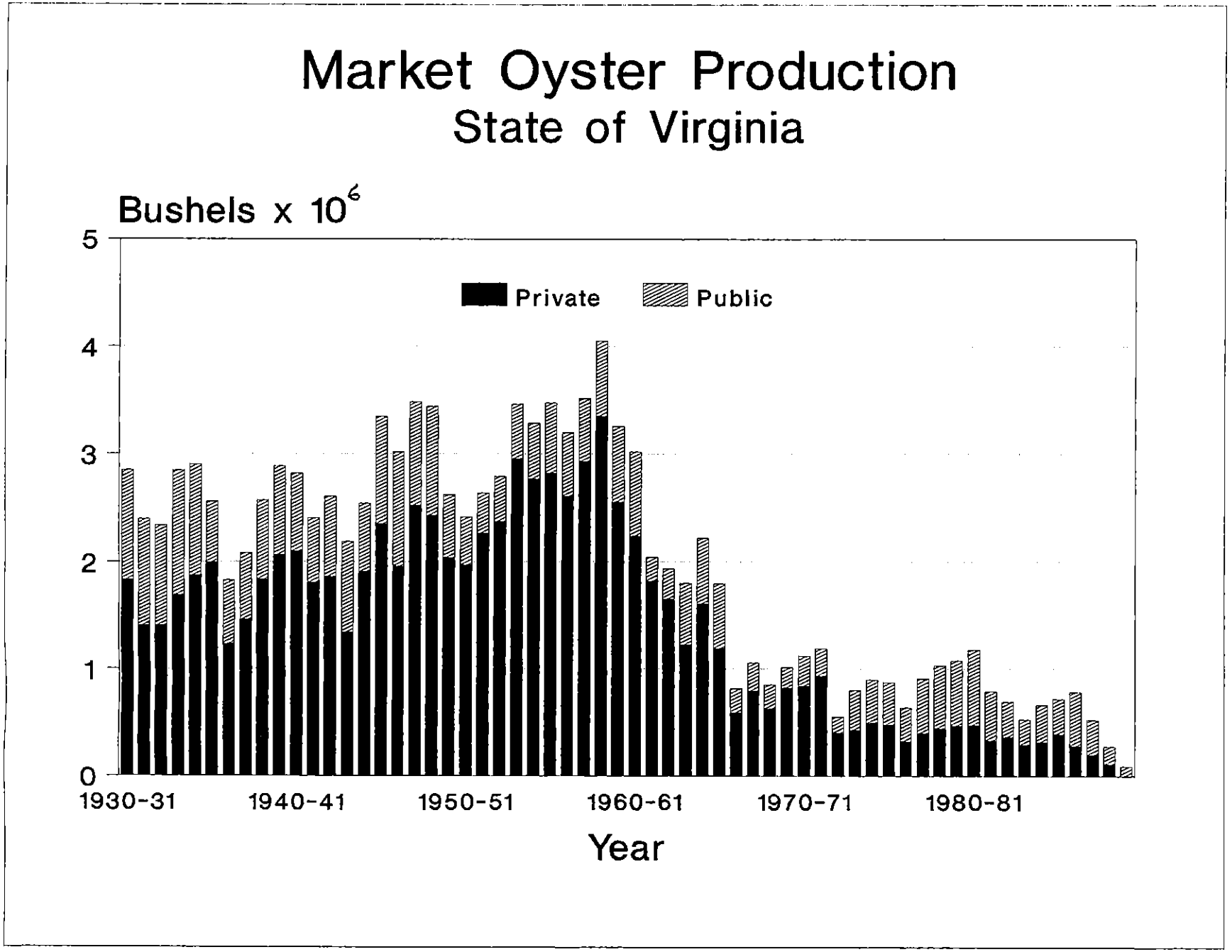

Figure 1. Market oyster production (public and private) in the state of Virginia, from 1930-31 to present.

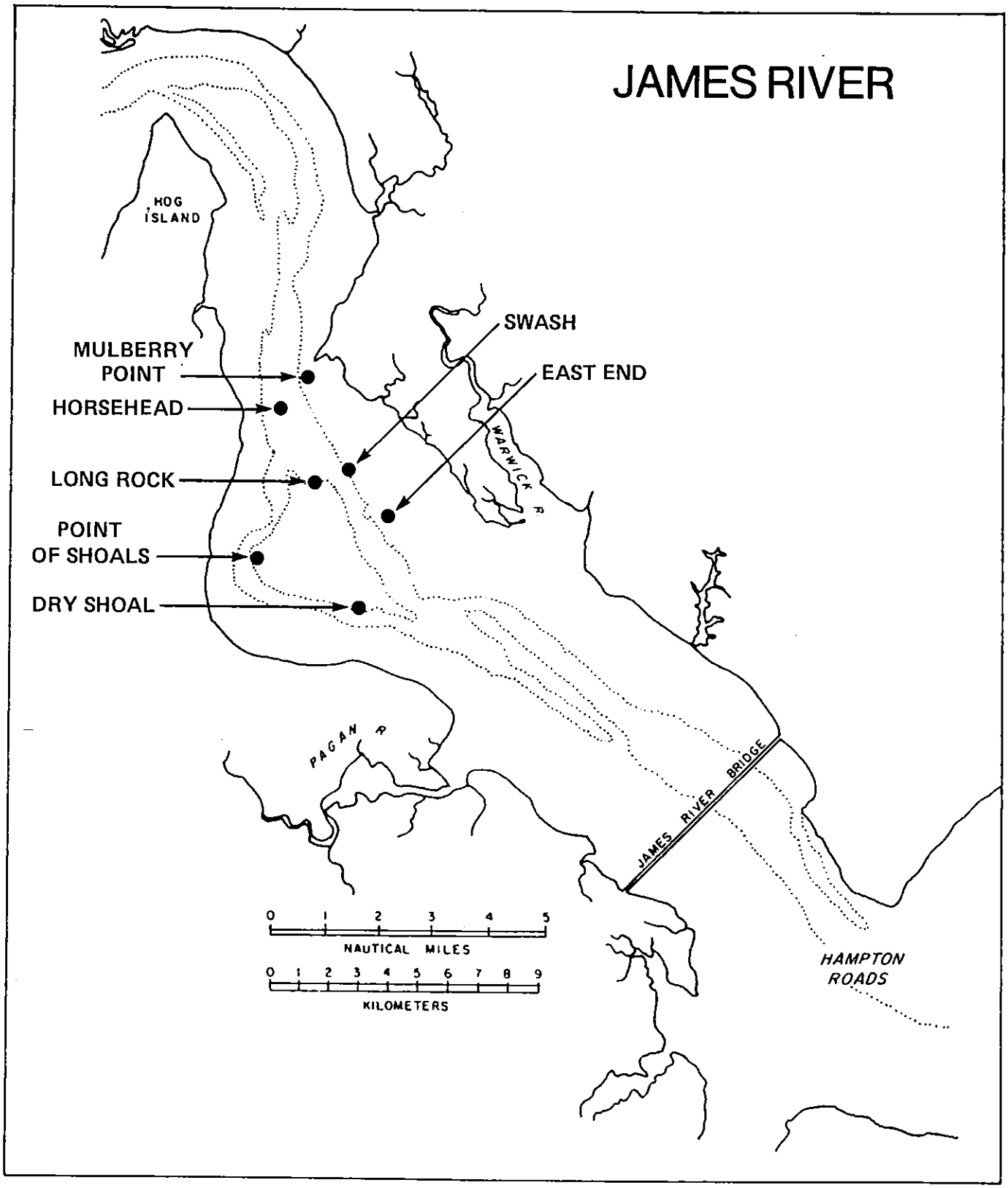

Figure 2. Location of stations sampled in the James River, spring 1991.

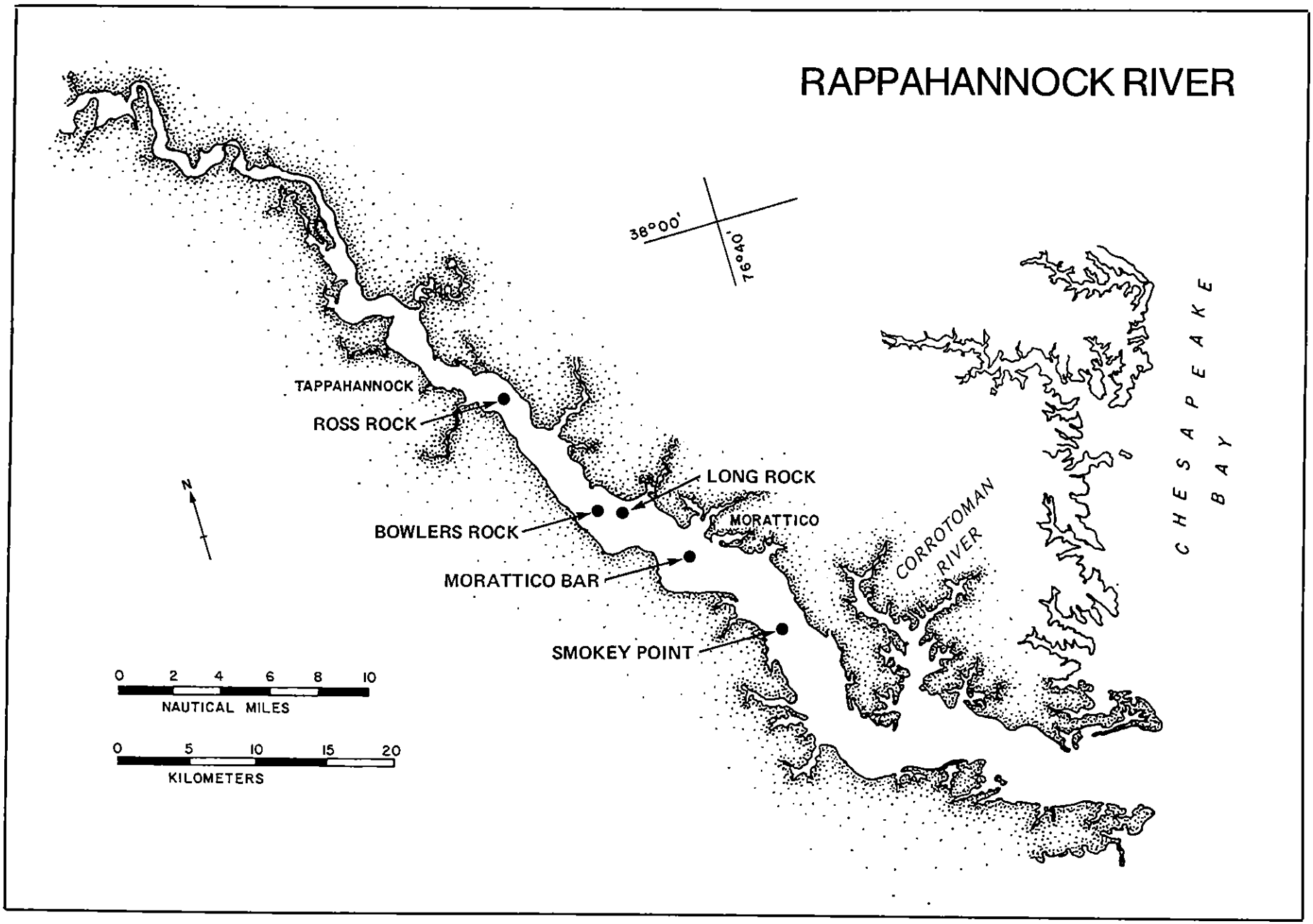

Figure 3. Location of stations sampled in the Rappahannock River, spring 1991.

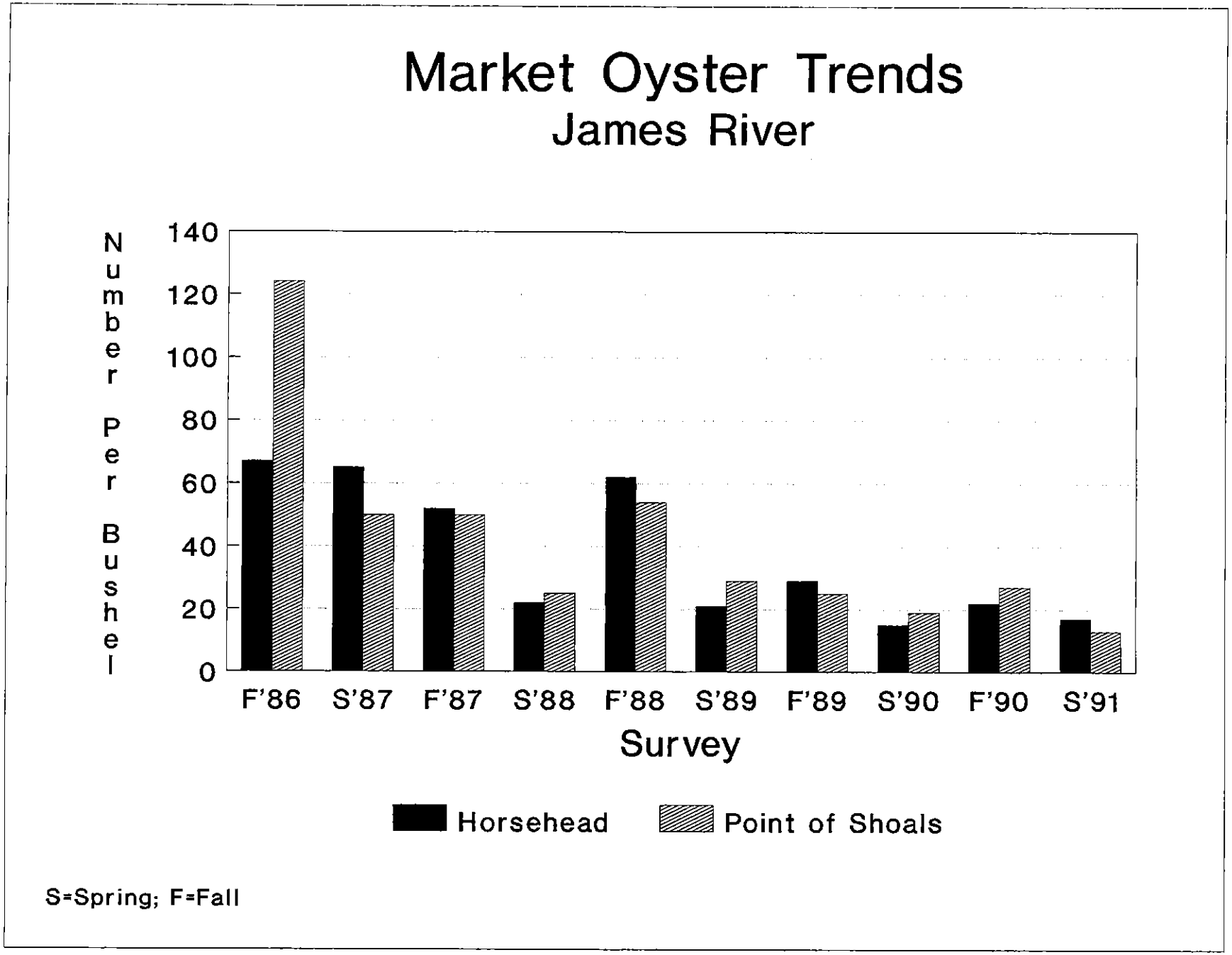

Figure 4. Average number of market oysters per bushel on Horsehead and Pt. of Shoals, James River, fall 1986 to spring 1991.

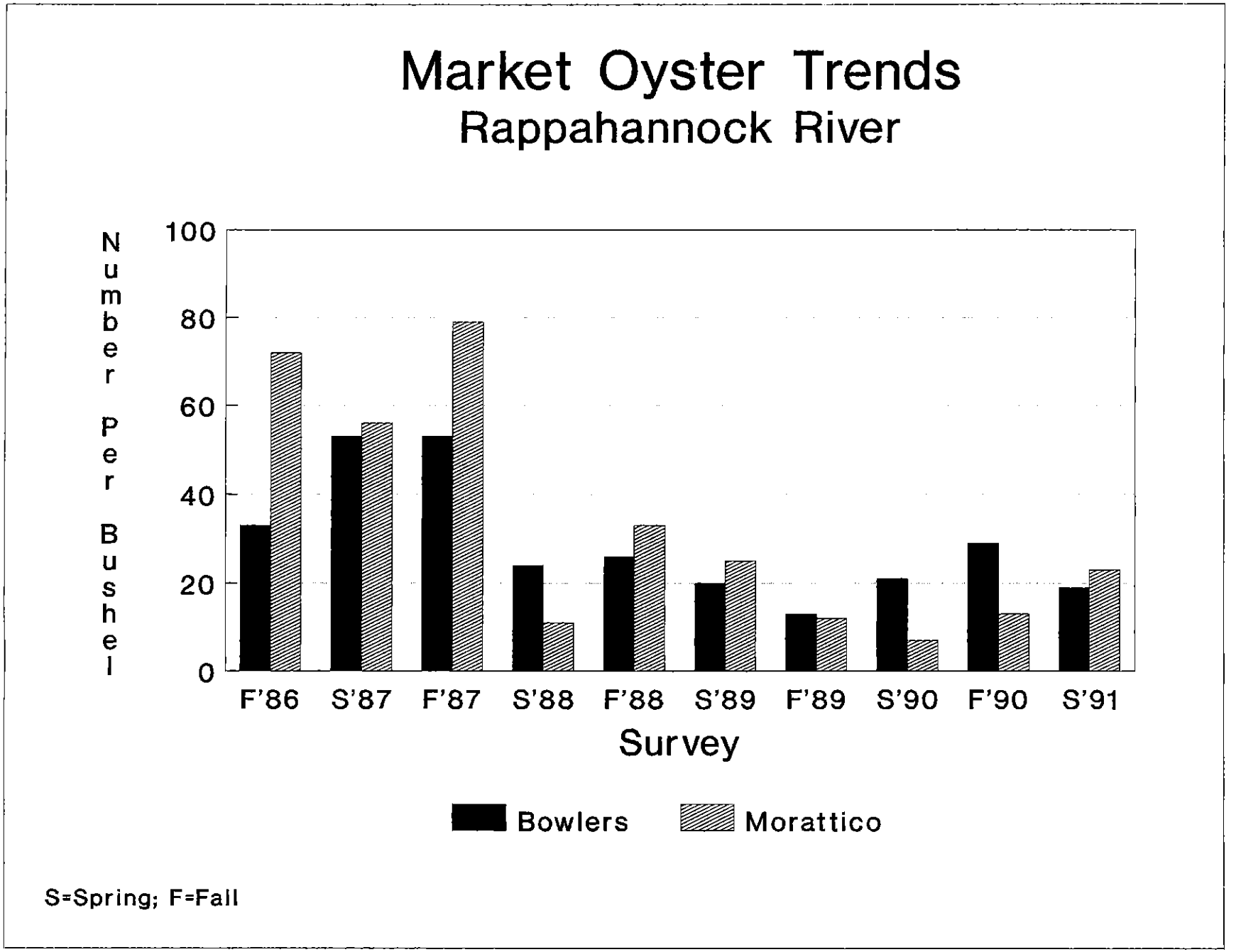

Figure 5. Average number of market oysters per bushel on Bowlers Rock and Morattico Bar, Rappahannock River, fall 1986 to spring 1991.