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A Survey in the Lafayette River for Oysters, Clams and Shell in the Vicinity of the Colley Avenue Bridge in the Lafayette River, Norfolk, Virginia

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by

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INTRODUCTION

The purposes of this study are: 1) to survey populations of oysters, Crassostrea virginica, hard clams, Mercenaria mercenaria, soft clams, Mya arenaria, and shell in the immediate vicinity of the Colley Avenue Bridge prior to its widening; 2) to evaluate the present and the possible future opportunity of the area for shellfish culture; and, 3) to estimate the value of the existing stocks of shellfish.

The study was conducted by the Virginia Institute of Marine Science on December 1 and 3, 1976 and February 23, 1977. Collection of field data was under the direction of Mr. Kendall, and the final report was prepared by Mr. Haven and Mr. Kendall.

There are no Baylor bottoms (public oyster grounds) in the vicinity of the bridge. There were two tracts of leased oyster planting ground in the vicinity: a 9.39 acre tract and a 68.73 acre tract. Both are leased by Edwin T. and R. D. Holland. A portion of each tract was included in the study area. The remainder of the river bottom in the study area was unassigned public ground.

Our study was restricted to the bottom to the east of the bridge because there were no leased grounds west of the bridge. The study area began at the bridge and extended east for 720 feet (Figure 1).

The following acreages within the study area are defined for reference purposes:

Area	Acres
Outer edge of bridge to boundary of leased oyster planting ground	2.5
Leased area surveyed	13.5

A DESCRIPTION OF THE AREA

The Colley Avenue Bridge spans the mouth of a short inlet off the Lafayette River where depths ranged from four to six feet at mid-tide. The land area in the vicinity of the bridge contains numerous residences and businesses. Along the south shore, marsh grasses occur in spots; behind are several houses. A portion of the north shore has been bulkheaded with rocks, and along the shore are several residential houses.

Salinities in the area are similar to those encountered in other areas around Hampton Roads (18 to 24 $^{o}/_{oo}$).

Over most of the area surveyed, the bottom was soft mud, such that a pole could easily be pushed 2 to 3 feet into the bottom. When oysters did occur, they lay on top of oyster shells which helped support them above the mud.

Since the Lafayette River is in an industrialized region with much boat traffic and several sewerage outfalls in its lower portion, the harvest of oysters is restricted by the Virginia Department of Health. Shellfish grown there may not be marketed directly for human consumption. They may be marketed, however, if they are first harvested and replanted during the approved

season on State approved bottoms for a period of 15 days with water temperatures above 50 F. This cultural practice is expensive since it means a double harvest; seldom is it feasible to recover more than about 70% of the replanted oysters. Therefore, relaying of market-sized oysters is today regarded as economically impractical by most oyster growers.

The oyster disease MSX is present in the Lafayette River as it is throughout lower Chesapeake Bay where salinities average above 15 parts per thousand. MSX entered the bay in 1960 and made the growing of market-sized oysters from planted seed unprofitable in the high salinity regions. In years characterized by heavy rainfall salinities in lower Chesapeake Bay similar to the Lafayette River may drop to the level when MSX becomes inactive. Therefore, oyster culture may become temporarily practical in these locations. With the return of high salinities, however, mortalities may again become excessive.

In summary, the study area in the Lafayette River is located where it is not economically feasible because of MSX and pollution to culture oysters from seed to market size. The area has been subject to below average salinities during the past 4 to 5 years. As a result, mortalities due to MSX seem to have been low, and this has allowed scattered populations of oysters to develop.

The area, for reasons which will be shown in this report, does not seem satisfactory for growing seed oysters.

METHOD OF COLLECTING SAMPLES

Samples were collected with oyster tongs at 115 foot intervals along transects marked by stakes spaced 100 feet apart and nearly parallel with the bridge. Therefore, each sample was collected within a grid square totaling 0.264 acres (100' x 115'). Rows of stations (running East and West) were designated with letters of the alphabet, while transects (running North and South) were numbered; each station, then, has a unique designation (Figure 1). At each location one "lick" or grab was made with the tongs; if oysters or shells were present, another "lick" was made and the results averaged.

Calibration of the tongs was accomplished by attaching a rope near the head so that the tongs opened exactly two feet at the head (toothed) end. Since the head was 37 inches wide, each "lick" covered about 6.17 square feet on the bottom.

The following data were collected from each tonged sample: number of live oysters; number of oyster boxes (a box is a shell which does not contain an oyster; i.e., the two valves are still hinged but are empty); volume of loose oyster shells; and number of clams. The lengths of all live oysters were measured. Observations were recorded to show whether loose shells and boxes had been buried under the bottom or were resting on it and exposed; this was determined according to the color of the shells since buried shells are blackened by the anerobic condition in the

surrounding mud, whereas shells above the mud have a lighter color.

The number of oysters per bushel was based on the finding that 53 live oysters collected on December 1 and 2 totalled one-third of a bushel. Therefore, the value of 159 oysters per bushel was used to convert numbers of oysters to bushels.

The total acreage of productive bottom in the area covered by the survey was estimated by assuming that the average densities per square foot of oysters, shells and boxes shown for each station occupied was representative of one of the grid squares (0.264 acres). The techniques used for expanding densities into volumes per acre are shown at the bottom of Table 3.

RESULTS OF THE ASSESSMENT

A detailed summary of numbers of oysters, boxes and quantity of shell taken at each station is given in the Appendix; the locations of stations and of productive areas are shown on Figure 1.

The unassigned bottom between the bridge and the leased area was soft mud without shells or oysters.

Most of the leased area sampled was soft mud devoid of shells or living oysters. However, one distinct "bed" productive of oysters was observed; this was located on shell "crust" overlaying a soft bottom for the most part. Very near the shore the bottom was sandy and harder. The oysters seem

to be the result of natural strike several years ago.

No hard clams or soft clams were collected during the study; it is doubtful that they occurred in the area in the past five years since shells of the two species were not seen in any of the samples.

Size and Appearance of the Oysters, Shell and Mussels

A sample of 73 live oysters averaged 92 millimeters long (3.6 inches) and ranged in length from 53 to 128 mm (Table 1). Eighty-one percent of the oysters in the sample were market size (3 inches or over). Mussels, barnacles, and sea squirts encrusted the live oysters and unburied shell.

Setting of oysters appears to have been erratic since few if any of the oysters or shells collected showed a 1975 or 1976 set.

In a sample of 25 mussels, Brachidontes recurvus, the mean length was 54 mm (2.1 in.) (Table 2).

Mortality of oysters in the area as shown by box counts (Appendix) was very high (35%).

About 75% of the shell tonged up had been buried in the sediments on the bottom.

Occurrence of Oysters and Shells

One distinct patch or bed of oysters was observed during sampling (Figure 1), and is described below:

Most of the live oysters in this bed (approximately 3.1 acres) were partially buried in mud and overlaid deposits of shell. A large number of oysters had apparently sunk into the mud over the past few years and died as evidenced by the finding of 40 boxes (just about all of which were completely buried. These boxes represented a 35% mortality.

Calculations showed that this area contained about 392 bushels of living oysters and an estimated 1,086 bushels of shell (Table 3). It was entirely on leased ground.

The bed of oysters previously described on leased bottom extended inshore (as a narrow band) close to shore onto unassigned state bottom (Figure 1). In this latter location, depths were very shallow and generally inaccessable to boats, but it was possible to collect three samples (N5, N4 and O5). One of these samples, N5, contained 5 oysters.

Regular samples were not taken outside the survey area (720' from the bridge), but occasional probes suggested that this area in the Lafayette River east of the survey area was largely soft mud.

DISCUSSION

Most of the bottom of the Lafayette River on the east side of the Colley Avenue Bridge out to a distance of 720 feet

was soft mud. Within this survey area, however, live oysters occurred in a discrete area where there was enough buried shell to support them above the mud.

Densities of oysters on productive bottoms averaged 7 or lower per tongful (6.17 sq. ft.). Over eighty percent of the live oysters were legal market size and the average length was 92 mm (3.6 in.). Oysters and shells which were not buried in the mud were thickly covered with mussels, sea squirts and barnacles; many of the fouling organisms were large.

Value of the Existing Resource in the Survey Area

It was established by conversation with dealers that shells cost about 32¢ a bushel delivered to the site and placed on the bottom. Oysters from unpolluted bottoms, if they are fat, would sell for about $7.50 a bushel. Those in the Lafayette River, however, are growing in a restricted area and have to be relaid prior to sale at an additional cost of at least $2.50 per bushel; therefore, oysters from this system have a maximum value of $5.00 per bushel.

Using the preceding values, the total value of the oysters in the entire survey area was estimated at $1,960 for 392 bushels. The estimated volume of 1,086 bushels of shell would be worth $348 (Table 4).

Potential of the Area for Shellfish Culture

In the Lafayette River shellfish harvesting is restricted by the Virginia Department of Health. Due to the density of industries and residences and the volume of boat traffic, there seems little prospect that this restriction will change in the foreseeable future. Oysters grown in this area would have to be relaid which is not considered economically feasible today.

The area does not seem to have much potential as a seed producing area since this study suggests that no set has occurred there during the past 2 years.

Most of the bottom was soft mud, and would require extensive shelling prior to planting with oysters.

MSX is still present in the area and, although a temporary lessening has allowed limited oyster populations to develop, the disease may return and it may have already, as evidenced by the very high mortality rate of 35%. MSX-resistant seed has been developed by the Virginia Institute of Marine Science but at present is not available in commercial quantities.

No hard or soft clams were taken during the study, and the potential production of these two species is low.

We conclude that the area surveyed has a low potential for future shellfish production.

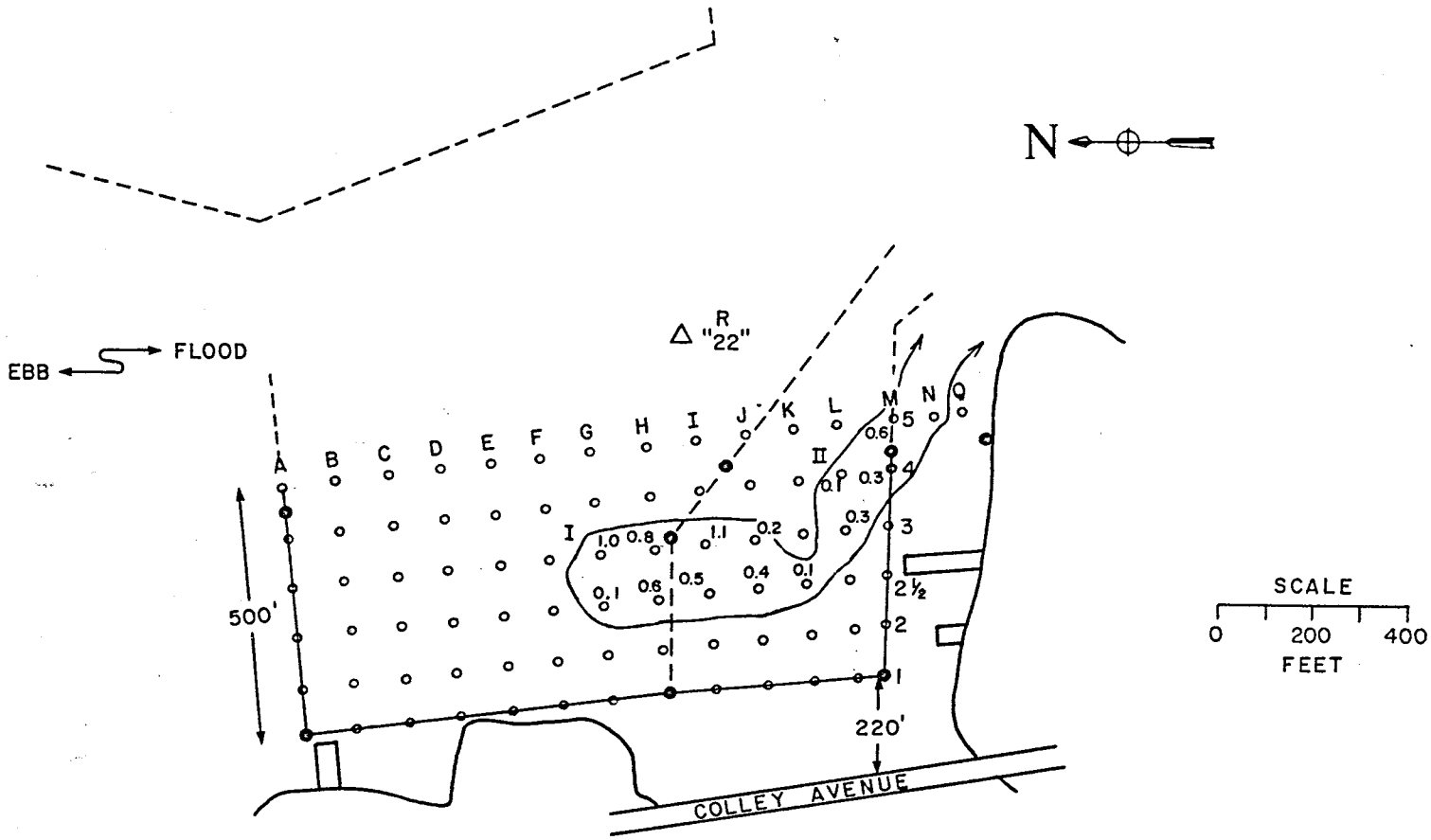

Figure 1

Locations sampled in the Lafayette River near the Colley Avenue Bridge and numbers of live oysters per square foot found - December 1976. (A dot with no number beside it means no oysters were found. Solid circles show stakes placed by VMRC surveyors. Outlines of leased oyster planting ground traced from VMRC map and shown as solid or dashed lines. Shoreline drawn by Paul Kendall.)

Table 1

Colley Avenue Bridge Vicinity
Lengths of Oysters (in mm)

x	x	x
117.5	89.4	98.4
95.2	82.8	89.2
77.8	103.0	96.5
88.2	84.5	104.2
95.6	73.8	54.3
103.3	109.8	106.4
121.5	73.6	84.2
94.3	100.4	96.5
86.0	71.2	110.0
107.3	81.4	86.2
73.4	76.0	97.5
111.2	87.3	103.6
69.0	109.2	100.4
92.0	88.5	122.3
108.5	75.0	99.4
102.6	78.2	100.2
87.0	76.9	98.6
53.2	72.0	66.4
83.0	101.5	97.2
102.4	109.3	67.4
87.0	82.7	
95.8	70.3	
98.9	67.0	
100.6	125.8	
127.8	79.2	
95.4	95.6	
98.5		

$n = 73$

$\Sigma x = 6,716.3$ mm

$\bar{x} = 92.0$ mm $= 3.6$ in.

Table 2

Length of Mussels
(in mm)

x	x
42.3	64.5
55.4	46.3
43.5	51.2
72.4	64.5
58.6	45.3
51.2	48.6
47.5	54.2
63.4	61.3
52.5	52.5
61.4	59.6
43.5	47.4
49.6	53.5
52.5	

$n = 25$

$\Sigma x = 1{,}342.7$ mm

$\bar{x} = 53.7$ mm $= 2.1$ in.

Table 3

Average Number of Live Oysters, Boxes and Quarts of Shell in the Productive Area (size: 3.102 acres)

Station	Live Oysters Per Lick	Boxes Per Lick	Quarts of Shell Per Lick
G2-1/2	0.5	0.0	1.0
H2-1/2	3.5	1.5	2.5
I2-1/2	3.0	2.5	2.0
J2-1/2	2.5	1.5	2.0
K2-1/2	0.5	0.0	0.5
G3	6.0	5.5	8.0
H3	5.0	2.5	1.0
I3	7.0	3.0	7.5
J3	1.0	0.0	0.0
L3	2.0	0.0	0.0
L4	0.5	0.0	0.25
M4	2.0	3.5	5.0
M5	3.5	0.0	2.5
Totals	37.0	20.0	32.25

Calculation Showing Total Quantity of Live Oysters, Boxes & Shell

13 samples @ 6.17 sq ft = 80.21 sq ft covered by tongs.

11.75 grid units sampled @ 0.264 acres X 43,560 sq ft/acre = 135,123.12 sq ft.

Ratio = 135,123.12 sq ft ÷ 80.21 sq ft = 1,684.62

Estimated quantity of live oysters in area = 37.0 oysters X 1,684.62 ÷ 159 oysters/bu = 392 bushels.

Estimated number of boxes in area = 20.0 boxes X 1,684.62 = 33,692 = 35% of the total number of live oysters and boxes in the area.

Estimated quantity of shell in area = 32.25 quarts X 1,684.62 ÷ 50 qts/bu = 1,086 bushels.

Table 4

Quantities and Values of Oysters and Shell Within 720 Feet of the Colley Avenue Bridge

Size of Productive Area (Acres)	Live Oysters		Shell	
	Quantity (bushels)	Value ($)	Quantity (bushels)	Value ($)
3.102	392	1,960	1,086	348

APPENDIX

Results of Survey in Vicinity of Colley Avenue Bridge.
Numbers show the average collected per lick of the tongs.

Transect	Station	Live Oysters (Avg. No.)	Boxes (Avg. No.)	Shell (Avg. No.)	Shell Volume (Quarts)	Remarks
1	G	0.0	0.0	--	0.0	Sandy mud
	H	0.0	0.0	--	0.0	Sandy mud
	I	0.0	0.0	--	0.0	Mud
	J	0.0	0.0	--	0.0	Mud
	K	0.0	0.0	--	0.0	Soft mud
	L	0.0	0.0	--	0.0	Soft mud
	M	0.0	0.0	--	0.0	Soft mud
2	A	0.0	0.0	--	0.0	Soft mud
	B	0.0	0.0	--	0.0	Soft mud
	C	0.0	0.0	--	0.0	Soft mud
	D	0.0	0.0	--	0.0	Soft mud
	E	0.0	0.0	2.5	0.2	Sandy mud
	F	0.0	0.0	--	0.0	Sandy mud
	G	0.0	0.0	--	0.0	Muddy sand
	H	0.0	0.0	--	0.0	Muddy sand
	I	0.0	0.0	--	0.0	Soft mud
	J	0.0	0.0	--	0.0	Soft mud
	K	0.0	0.0	--	0.0	Soft mud
	L	0.0	0.0	--	0.0	Soft mud
	M	0.0	0.0	--	0.0	Soft mud
2-1/2	A	0.0	0.0	--	0.0	Soft mud
	B	0.0	0.0	--	0.0	Soft mud
	C	0.0	0.0	--	0.0	Soft mud
	D	0.0	0.0	--	0.0	Soft mud
	E	0.0	0.0	--	0.0	Soft mud

APPENDIX (Contd.)

Transect	Station	Live Oysters (Avg. No.)	Boxes (Avg. No.)	Shell (Avg. No.)	Shell Volume (Quarts)	Remarks
2-1/2	F	0.0	0.0	--	0.0	Soft mud
	G	0.5	0.0	--	1.0	Soft mud
	H	3.5	1.5	--	2.5	Mud & buried shell
	I	3.0	2.5	--	2.0	Mud & buried shell
	J	2.5	1.5	--	2.0	Mud & buried shell
	K	0.5	0.0	--	0.5	Soft mud
	L	0.0	0.0	--	0.0	Soft mud
	M	0.0	0.0	--	0.0	Soft mud
3	A	0.0	0.0	--	0.0	Soft mud
	B	0.0	0.0	--	0.0	Soft mud
	C	0.0	0.0	--	0.0	Soft mud
	D	0.0	0.0	--	0.0	Soft mud
	E	0.0	0.0	--	0.0	Soft mud
	F	0.0	0.0	--	0.0	Soft mud
	G	6.0	5.5	--	8.0	Mud & sand
	H	5.0	2.5	--	1.0	Mud & sand
	I	7.0	3.0	--	7.5	Mud & sand
	J	1.0	0.0	--	0.0	Mud
	K	0.0	0.0	--	0.0	Soft mud
	L	2.0	0.0	--	0.0	Soft mud
	M	0.0	0.0	--	0.0	Mud
4	A	0.0	0.0	--	0.0	Soft mud
	B	0.0	0.0	--	0.0	Soft mud
	C	0.0	0.0	--	0.0	Soft mud
	D	0.0	0.0	--	0.0	Soft mud
	E	0.0	0.0	--	0.0	Soft mud
	F	0.0	0.0	--	0.0	Soft mud
	G	0.0	0.0	--	0.0	Soft mud
	H	0.0	0.0	--	0.0	Soft mud
	I	0.0	0.0	--	0.0	Soft mud
	J	0.0	0.0	--	0.0	Soft mud

APPENDIX (Contd.)

Transect	Station	Live Oysters (Avg. No.)	Boxes (Avg. No.)	Shell (Avg. No.)	Shell Volume (Quarts)	Remarks
4	K	0.0	0.0	1.0	0.1	Soft mud
	L	0.5	0.0	4.5	0.25	Mud & sand
	M	2.0	3.5	--	5.0	Mud & sand
	N*	0.0	0.0	--	0.0	Hard sand
5	A	0.0	0.0	--	0.0	Soft mud
	B	0.0	0.0	--	0.0	Soft mud
	C	0.0	0.0	--	0.0	Soft mud
	D	0.0	0.0	--	0.0	Soft mud
	E	0.0	0.0	--	0.0	Soft mud
	F	0.0	0.0	--	0.0	Soft mud
	G	0.0	0.0	--	0.0	Soft mud
	H	0.0	0.0	--	0.0	Soft mud
	I	0.0	0.0	--	0.0	Soft mud
	J	0.0	0.0	--	0.0	Soft mud
	K	0.0	0.0	--	0.0	Soft mud
	L	0.0	0.0	--	0.0	Soft mud
	M	3.5	0.0	--	2.5	Mud
	N*	2.5	2.5	--	8.0	Mud
	O*	0.0	0.0	--	0.0	Hard sand

* Not on leased ground