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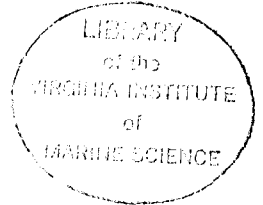
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A Survey of the Shellfish Resources Adjacent to
Croaker Landing in the York River, Virginia.

by

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From 7 March 1978 through 14 March 1978, an area of the bottom in the York River around Croaker Landing was studied to define the existing shellfish resource. The study was conducted at the request of the Division of Parks of the Virginia Department of Conservation and Economic Development in conjunction with the construction of the York River State Park. Comparison of this study with a post-dredging assessment will provide a measure of the possible impact of dredging activities on the surrounding bottom.

Ecological Aspects of the Area

Croaker Landing is located about six miles below West Point on the south shore of the York River. It is within the zone of commercial oyster production, but salinities in the area often fall below optimum levels for adequate growth each spring. Therefore, growth rates of oysters are slower than in the downriver areas.

The mortality rates of oysters in the Croaker Landing area are below average for the York River. The reasons being that known oyster predators and diseases have a minimal impact in this region. The oyster drill (Urosalpinx cinerea), a small gastropod which drills a hole through oysters and ingests their meat, does not occur in this area. Additionally, the two oyster diseases, Dermo (Dermocystidium marinum) and MSX (Minchinia nelsoni), which cause extensive mortalities in high salinity regions of the lower York River, seldom cause significant mortality in this upriver region.

Natural recruitment (setting rates) of oysters is low in this area. Records at the Virginia Institute of Marine Science indicate that a set of commercial size (over 50 spat per bushel) has occurred only twice since 1960 (1964 and 1977).* Because of this aspect, areas of leased bottom typically must be planted with seed oysters to be productive.

The study area off Croaker Landing is shallow with depths ranging from one foot inshore to six feet offshore (MLW). The bottom is typically soft to firm mud, but oyster shells were present in some areas.

There are no restrictions placed by the Virginia Department of Health on harvesting shellfish from these waters. The nearest restricted area is about three miles away in an upriver direction.

*Data based on observations made at Bells Rock 2-3/4 miles from the Croaker Landing site.

METHODS

The study was conducted in an area 350 feet on either side of the center line of the proposed channel, plus 100 feet beyond the end of the proposed channel (Figure 1). This encompassed 12.63 acres.

The bounds of oyster leases and other important locations in the vicinity of the proposed channel were established prior to our study and marked with stakes by personnel of the Virginia Marine Resources Commission (VMRC). Using the stakes (stakes I, II, IV, V, VI, VII & VIII on Figure 1) as guides and also a chart showing the channel and oyster leases provided by the Division of Parks, the study area was gridded into squares 100 feet on each side. For the field work, letters of the alphabet were assigned to horizontal rows of stations and numbers to the vertical columns (Figure 1); in this way, each grid square had a unique designation (ex: A7, B3). Later, using a towed 100 foot line and the bounds established by the VMRC, the 100 foot squares in the study area were marked with stakes. Stakes IX and X on Figure 1 are two which are shown since they are also used to indicate locations of fathometer transects on Figure 2.

To determine shell or oyster density and bottom type, two samples of the bottom were collected by an experienced tonger at the center of each square (a station) using oyster tongs (Figure 1).

The shafts of the tongs were tied so that the heads opened the same distance every time. By this means, a known area of the bottom was covered by each grab of the tongs. The tongs used in this study covered (when tied) 4.87 square feet. For analysis, the data obtained in the two samples were totaled.

At each station the following data were noted: numbers and lengths of live oysters; numbers of boxes (hinged but empty oyster shells); numbers of shells buried in the mud or resting on top; nature and extent of vegetation, if any; animals (fouling) attached to oysters or oyster shells; and type of bottom.

The bottom of the study area was profiled along several transects (Figure 2) using a Raytheon Model DE-719 Survey Fathometer. This instrument recorded its signals on a strip of paper as the boat moved at a constant speed between known points. In this way a permanent tracing of the bottom profile was made which could be compared to that made at a later time after the channel is completed.

In addition to the tonged samples, the bottom between selected stations was probed every 10-20 feet with tongs. The presence or absence of shell material and bottom type was recorded in the field notes.

RESULTS AND DISCUSSION

The study area, as previously described, was 12.63 acres in extent. It included the following leased bottoms and unassigned areas:

1. 9.90 acres of a lease held by J. W. Ferguson Seafood Incorporated.
2. 0.39 acres of a lease held by the Chesapeake Corporation.
3. 2.34 acres of unassigned bottoms.

The results from each of the three areas will be discussed separately.

I. Hand Tong Samples

J. W. Ferguson Seafood Incorporated (part of VMRC tract 127)

Hand tong samples were taken at 35 stations on the 9.90 acres of leased bottom in this area. The offshore portion was largely soft mud, and the shallower, inshore portion was stiff mud. No vegetation was observed. At most of the stations (24) shell was negligible (less than $\frac{1}{4}$ quarter per station) or non-existent. At these same 24 stations no large oysters and only one spat were collected (Table 1).

The remaining eleven stations were on the deeper portion of the study area (Tables 1 and 2). Here oyster shell occurred at a higher density (varying between 0.6 and

6.3 quarts per station). An estimated 29% of the shells raised by the tongs were classed as not buried (exposed). Only four boxes were obtained in all the shell material collected at the 35 stations. At the eleven stations where shell was more abundant, 30 spat were seen on the exposed shell (Table 2).

Only two large oysters were found at one of these eleven stations; one was market size (80.1 millimeters or 3.2 inches); the other was under market size (68.5 millimeters or 2.7 inches).

It was determined by probing the bottom between the eleven stations that the shell material existed as three discrete areas (see the areas within dotted lines on Figure 1). Two were about one-quarter acre in extent each, and the larger was approximately 1.33 acres. An estimation of the total quantities of oysters and shells was calculated (Table 2). Those estimations are:

live oysters -- negligible

shell (buried & exposed) -- 464 Virginia bushels

Chesapeake Corporation's Lease (part of VMRC tract 1)

Two stations were sampled on 0.39 acres in this area (Figure 1). The bottom was soft mud. No vegetation was found. No live oysters and very little shell (an average of one-quarter of a quart at each station) were found here (Table 1).

Unassigned Ground

No living oysters were found at twelve stations on 2.34 acres. A negligible amount of shell (about one-tenth of a quart per station, on the average) was recovered (Table 1). Most of the bottom was inshore and composed of stiff mud; at offshore stations, the bottom was soft mud. No vegetation was observed.

II. Fathometer Survey

Four transects (a, b, c & d) crossed the proposed channel, one (g) covered the centerline, and two (e & f) paralleled the channel at 100 to 150 feet from the centerline (Figure 2). The recordings produced by the fathometer (Figures 3 & 4) provide profiles of the bottom along the transects covered.

Transect a: This transect was entirely on Ferguson's lease. Starting downriver of the proposed channel at stake number V, this transect was run to stake II marking the centerline of the channel, then to stake VI on the upriver side of the proposed channel (Figure 2). The fathometer's trace of the bottom profile (Figure 3) indicates a gradual upward slope of 1 to $1\frac{1}{2}$

feet from stake V to stake II, then a flat bottom between II and VI. No holes were indicated.

Transect b: All of this transect was on Ferguson's lease. This transect began at stake VI and went downriver across the area of the proposed channel to stake IV (Figure 2). The bottom along this transect is almost flat; it deepens toward stake IV in the amount of one-half foot in 550 feet. There were no holes indicated (Figure 3).

Transect c: This transect was run along a portion of the inshore boundary of Ferguson's lease (between stakes IV and VII), then across a portion of that lease from stake VII to stake IX (Figure 2). The bottom was smooth with the exception of "something" 3 to 6 inches higher than the surrounding bottom near stake IV; this could have been a pile of oyster shells, but it would have been small since a negligible amount of shell was noted when the bottom was probed around this stake. The bottom sloped from 6 feet at stake IV upward to 4½ feet at VII and was flat between VII and IX (Figure 3).

Transect d: Starting at stake IX which was upriver of the proposed channel and on Ferguson's lease, this transect went until stakes IV and V were in line, which was on the downriver side of the proposed channel and on unassigned ground (Figure 2). The fathometer suggested a broad, shallow depression (no more than 6 inches deep) on Ferguson's lease near stake IX (Figure 3).

Transect e: This transect ran across the current parallel to and 150 feet downriver from the centerline of the proposed channel (Figure 2). Starting at stake X, the bottom sloped gradually downward from $4\frac{1}{2}$ to 7 feet over about 270 feet, then leveled off for the remainder of the distance (about 144 feet) to the end of the transect on a line between stakes II and V (Figure 4). No holes were indicated.

Transect f: This transect lay on the upriver side of the proposed channel and roughly paralleled it at a distance of 90-150 feet (Figure 2). All of the transect was on Ferguson's lease. Starting on an extension of the line between stakes II and V, the bottom sloped 3 feet upward in a distance of about 380 feet, then

rose more gradually to a depth of 3½ feet at stake VIII (Figure 4). No large holes were indicated.

Transect g: Starting at the offshore end (stake II) this transect covered the centerline of the proposed channel (Figure 2). The first half covered was on Ferguson's lease and the second half lay on unassigned ground. Again, as on the two previous transects, the bottom sloped upward from 7 feet to 4½ feet over a distance of about 300 feet, then sloped upward more gradually to a depth of 3½ feet (Figure 4). No holes were indicated.

VALUE OF THE SHELLFISH RESOURCE

At no station in the study area was oyster density sufficient to support commercial harvesting.

Shells were found in three patches on Ferguson's lease. On the basis of the quantity recovered with tongs, they had an estimated value of about \$148 (Table 2). This calculation is based on conversations with people in the oyster industry which indicated that 32¢ per bushel was an average price for planting shell.

It is possible, but not likely, that more shell existed at depths in the mud not reached by tongs. However,

if these buried shell deposits existed, they could not serve as sites for the attachment of oyster larvae.

SUMMARY

Oysters were extremely scarce in the Croaker Landing study area; the area may be classed as barren. At no station were there indications that a harvestable oyster crop of commercial size existed.

The extreme scarcity of boxes (a total of 4 at all stations) indicated that the absence of live oysters was not the result of a recent natural mortality of a pre-existing population. Probably the observed barren conditions of the bottom has been the case for at least several years. A second possibility is that an existing crop was recently harvested.

While the Croaker Landing site has a moderate potential for growing planted seed oysters on areas of mud which have been "firmed" or stiffened with shell, it has a low potential, on the average, for growing oysters naturally, that is, where a commercial crop depends on a natural set or strike on exposed shell.

Some shell was found on the portion of the study area leased by J. W. Ferguson Seafood Inc., and could form a basis for cultivation there; the value of this shell (on the bottom) is estimated at \$148.48.

No hard clams or other commercially valuable shellfish were noted.

Table 1

Results of hand tong sampling in March, 1978 off Croaker Landing.
(Numbers are total collected in two grabs with tongs.)

Area & Station	Number of Oysters			Quarts of Shell ¹			Total	Length of Large & Small Oysters (mm)
	Live Lg & Sm	'77 Spat	Boxes	Buried	Exposed Blank	With Spat		
Lease of J. W. Ferguson Seafood (9.90 acres sampled)								
A1	0	0	0	0.0	0.0	0.0	0.0	--
A2	0	0	0	0.0	0.0	0.0	0.0	--
A3	0	0	0	0.1	0.0	0.0	0.1	--
A7	0	0	0	0.0	0.0	0.0	0.0	--
B1	0	0	0	0.0	0.0	0.0	0.0	--
B2	0	0	0	0.0	0.0	0.0	0.0	--
B3	0	0	0	0.1	0.0	0.0	0.1	--
B7	0	0	0	0.0	0.0	0.0	0.0	--
C1	0	0	0	0.0	0.0	0.0	0.0	--
C2	0	0	0	0.3	0.0	0.0	0.3	--
C3	0	0	0	0.1	0.0	0.0	0.1	--
C7	0	0	0	0.0	0.0	0.0	0.0	--
D1	0	0	0	0.1	0.0	0.0	0.1	--
D2	0	0	0	0.2	0.1	0.0	0.3	--
D3	0	1	1	0.0	0.0	0.1	0.1	--
D4	0	0	0	0.0	0.1	0.0	0.1	--
D5	0	0	0	0.1	0.1	0.0	0.2	--
D7	0	0	0	0.0	0.1	0.0	0.1	--
E1	0	0	0	0.2	0.2	0.0	0.4	--
E2	0	0	0	0.2	0.2	0.0	0.4	--
E3	0	0	0	0.1	0.1	0.0	0.2	--
E4	0	0	0	0.2	0.2	0.0	0.4	--
E5	0	0	1	0.3	0.3	0.0	0.5	--
E6	0	2	2	0.4	0.4	0.1	0.8	--
F2	0	2	0	2.0	3.3	0.2	5.4	--
F3	0	0	0	1.3	0.0	0.0	1.3	--
F4	0	6	0	4.0	2.0	0.4	6.3	--
F5	0	3	0	2.2	0.2	0.1	2.4	--
F6	0	0	0	0.8	0.0	0.0	0.8	--

Table 1 (Contd.)

Area & Station	Number of Oysters			Quarts of Shell ¹			Total	Length of Large & Small Oysters (mm)	
	Live Lg & Sm	'77 Spat	Boxes	Buried	Exposed Blank	With Spat			
G2	0	0	0	1.0	0.1	0.0	1.1		--
G3	2	14	0	4.0	1.0	0.8	5.8	68.5	80.1
G4	0	0	0	3.0	0.4	0.0	3.4		--
G5	0	1	0	1.4	1.3	0.1	2.8		--
G6	0	2	0	0.4	0.2	0.1	0.6		--
G7	0	0	0	0.3	0.2	0.0	0.4		--
TOTALS	2	31	4	22.8	10.5	1.9	34.5		
Lease of Chesapeake Corporation (0.39 acre sampled)									
E7	0	0	0	0.2	0.2	0.0	0.4		--
F7	0	0	0	0.1	0.0	0.0	0.1		--
TOTALS	0	0	0	0.3	0.2	0.0	0.5		--
Unassigned Ground (2.34 acres sampled)									
A4	0	0	0	0.0	0.0	0.0	0.0		--
A5	0	0	0	0.0	0.0	0.0	0.0		--
A6	0	0	0	0.0	0.0	0.0	0.0		--
B4	0	0	0	0.3	0.0	0.0	0.3		--
B5	0	0	0	0.0	0.1	0.0	0.1		--
B6	0	0	0	0.0	0.1	0.0	0.1		--
C4	0	0	0	0.1	0.0	0.0	0.1		--
C5	0	0	0	0.0	0.1	0.0	0.1		--
C6	0	0	0	0.0	0.0	0.0	0.0		--
D6	0	0	0	0.0	0.1	0.0	0.1		--
F1	0	0	0	0.3	0.0	0.0	0.3		--
G1	0	0	0	0.3	0.0	0.0	0.3		--
TOTALS	0	0	0	1.0	0.4	0.0	1.4		--

Table 1 (Contd.)

Notes:

1. 11 shells = 1 quart
2. May not agree with figures on right due to rounding.

Table 2

Oyster and shell density and value on a portion of the
lease of J. W. Ferguson Seafood - March 1978.

Area & Station	Number of Oysters			Quarts of Shell			Total	Lengths of Large & Small Oysters (mm)	
	Live Lg & Sm	'77 Spat	Boxes	Buried	Exposed Blank	With Spat			
E6	0	2	2	0.4	0.4	0.1	0.8	--	--
F3	0	0	0	1.3	0.0	0.0	1.3	--	--
F4	0	6	0	4.0	2.0	0.4	6.3	--	--
F5	0	3	0	2.2	0.2	0.1	2.4	--	--
F6	0	0	0	0.8	0.0	0.0	0.8	--	--
G3	2	14	0	4.0	1.0	0.8	5.8	68.5	80.1
G4	0	0	0	3.0	0.4	0.0	3.4	--	--
G5	0	1	0	1.4	1.3	0.1	2.8	--	--
G6	0	2	0	0.4	0.2	0.1	0.6	--	--
TOTALS	2	28	2	17.5	5.5	1.6	24.2		

Area: 1.33 acres

Avg Density of shell: $\frac{24.2 \text{ qts}}{9 \times 9.74 \text{ ft}^2} (43.560 \text{ ft}^2/\text{ac}) \div 50 \text{ qts/Va bu} = 240 \text{ bu/ac}$

Estimated Quantity: 240 bu/acre X 1.33 acres = 319 bushels

F2	0	2	0	2.0	3.3	0.2	5.4	--
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Area: 0.25 acre

Estimated Quantity of Shell: $\frac{5.4 \text{ qts}}{9.74 \text{ ft}^2} (0.25 \text{ ac} \times 435.60 \text{ ft}^2/\text{ac}) \div 50 \text{ qts/Va bu} = 121 \text{ bushels}$

G2	0	0	0	1.0	0.1	0.0	1.1	--
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Area: 0.25 acre

Estimated Quantity of Shell: $\frac{1.1 \text{ qts}}{9.74 \text{ ft}^2} (0.25 \text{ ac} \times 435.60 \text{ ft}^2/\text{ac}) \div 50 \text{ qts/Va bu} = 24 \text{ bushels}$

Table 2 (Contd.)

Total Estimated Quantity of Shell: 464 bushels

Value

Oysters	negligible
Shell	\$148.48

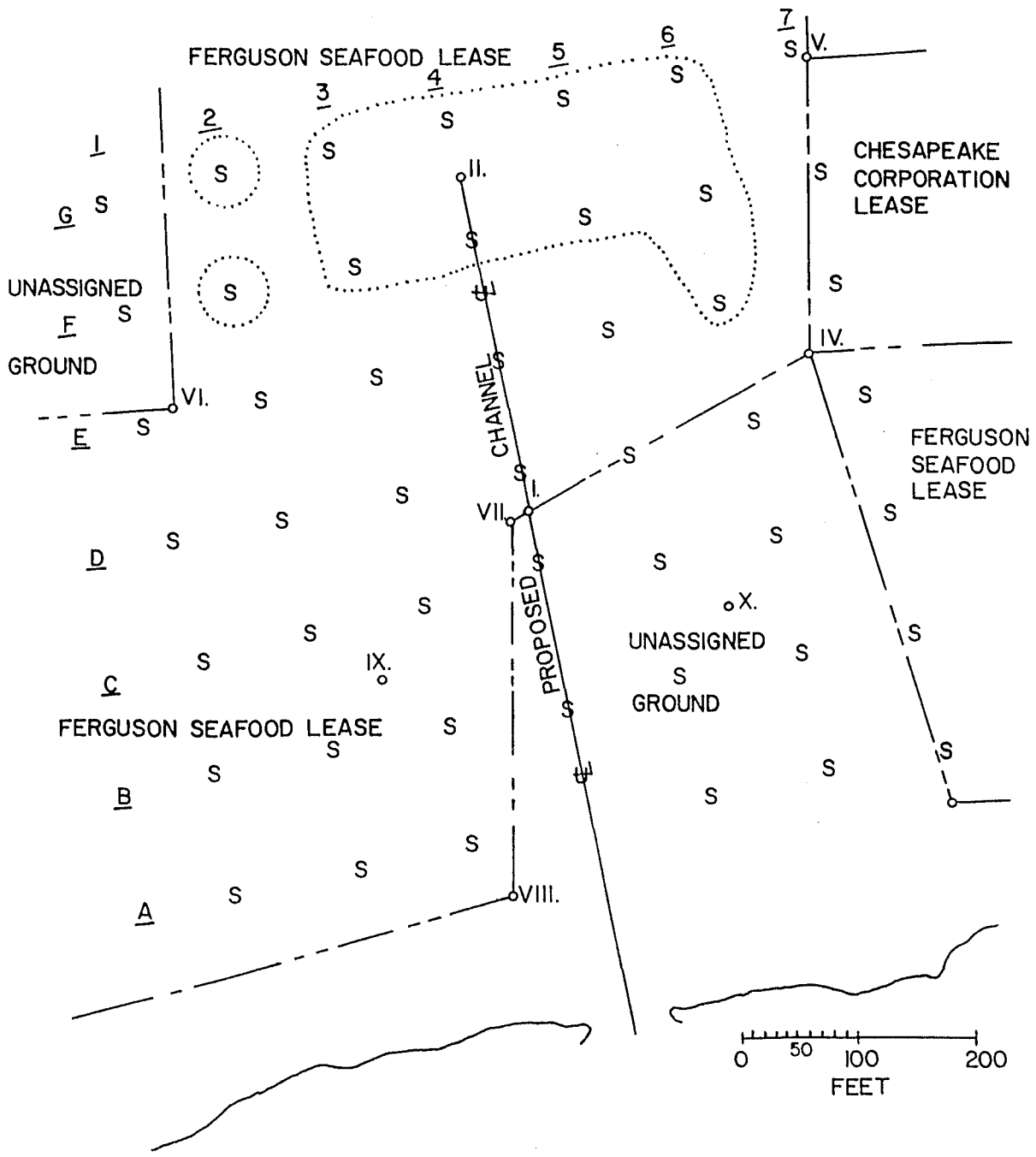


Figure 1

Chart of study area off Croaker Landing showing locations of sampling stations (S) in relation to the proposed channel, boundaries of leased grounds (dashed lines), stakes (roman numerals), and outlines of areas where highest density of shells was found (dotted lines). VIMS, March 1978.

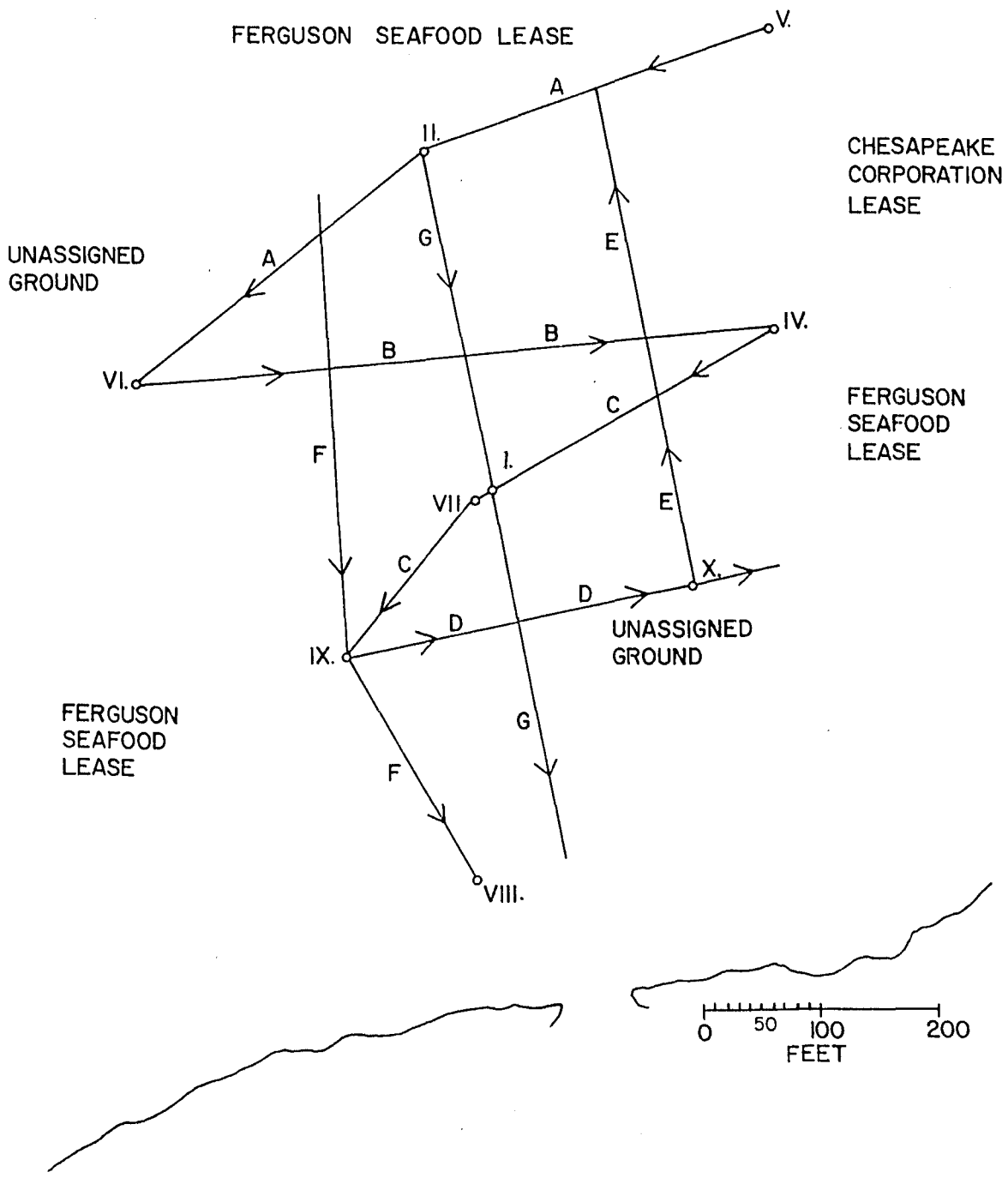


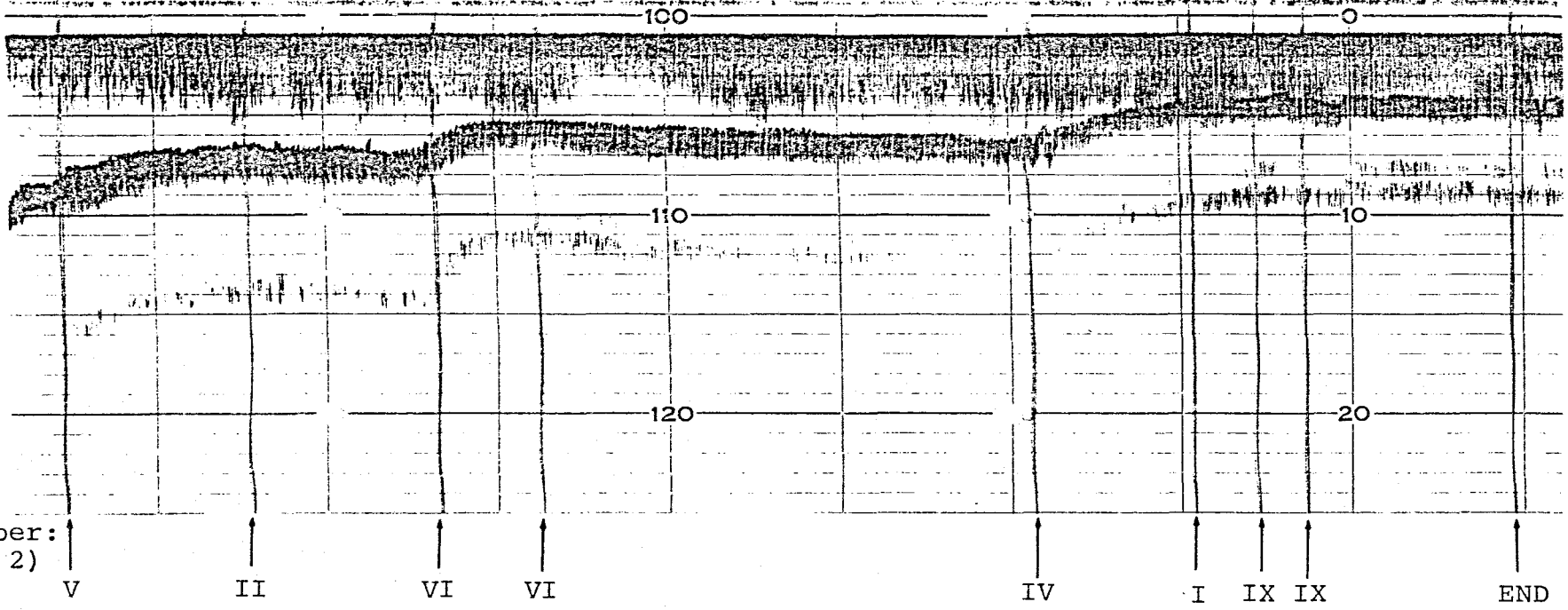
Figure 2

Chart of study area off Croaker Landing showing fathometer transects. VIMS, March 1978.

IN FEET RAYTHEON CO.

CHART 7430-1001-G1

DEPTH IN FEET R



Stake Number:
(see Fig. 2)

Transect:
(see Fig. 2)

Figure 3

Fathometer tracings of the profile of the bottom along transects a, b, c, and d in the York River off Croaker Landing. Produced 14 March 1978.

CHART 7430-1001-G1

DEPTH IN FEET

RAYTHEON CO.

CHAF

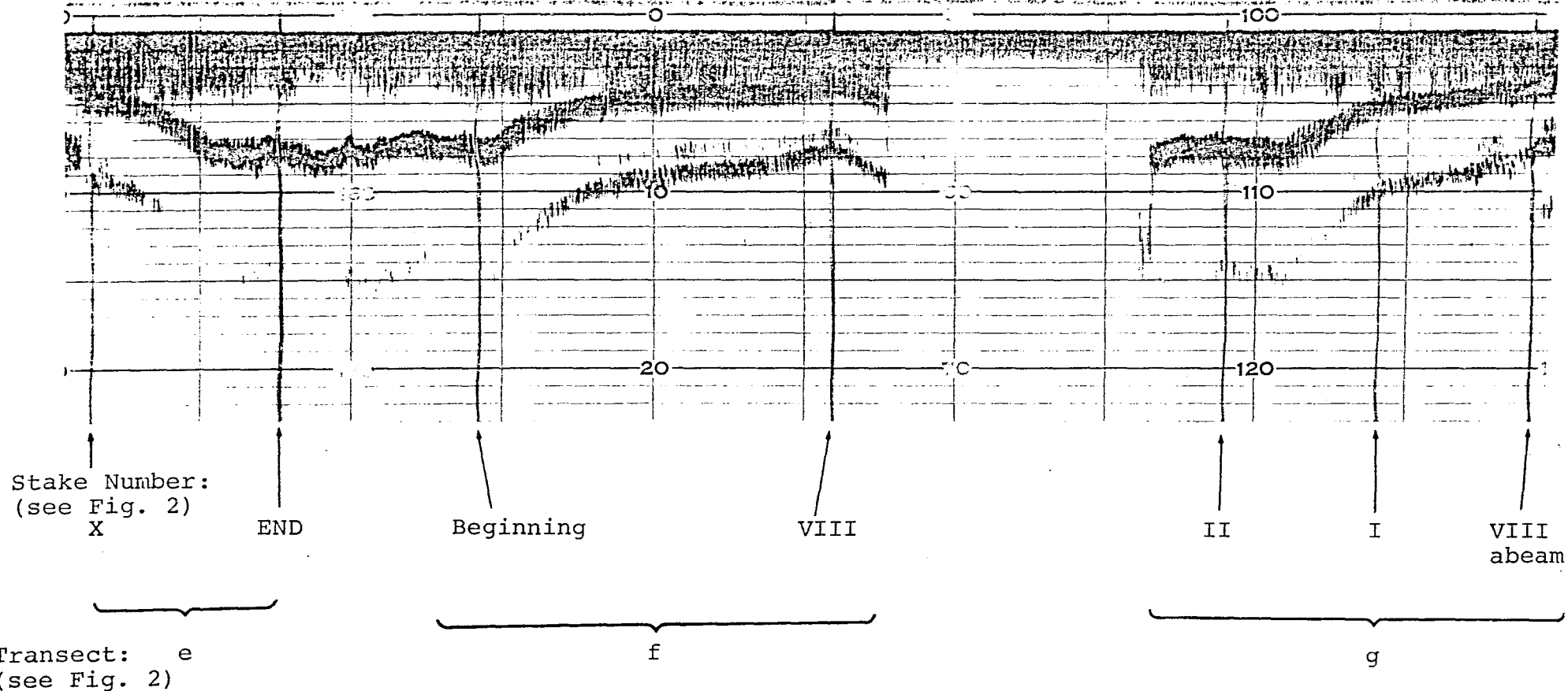


Figure 4

Fathometer tracings of the profile of the bottom along transects e, f and g in the York River off Croaker Landing. Produced 14 March 1978.