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A study of some leased oyster planting grounds adjacent to the James River bridge, Newport News, Virginia : conducted for the Virginia Dept. of Highways and Transportation, Project 0017-046-102, B-605

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by

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ABSTRACT

A study of portions of two leased oyster planting grounds adjacent to the construction site of the additional lanes of the James River Bridge was conducted in October 1980. Sampling with patent tongs indicated that on one lease oysters existed in medium commercial density while the other lease had no oysters. The fathometer showed a fairly even bottom with no evidence of large holes. Audio gear was used to indicate the nature and the contents of the bottom between patent tong sampling sites.

Background

In October of 1980, the Virginia Institute of Marine Science made a study of the shellfish populations on some leased grounds adjacent to the James River Bridge near the Southern or Isle of Wight end. The work was done at the request of the Virginia Department of Highways and Transportation in conjunction with Project 0017-046-102, B-605.

Purpose

The purpose of the study was to look at two private oyster grounds. One was leased by Ballard Fish and Oyster Company and the other by W. D. Melzer. Both were adjacent to the James River Bridge and might be affected by activities associated with construction of additional lanes of the bridge. The study will provide a data base against which later data can be compared to evaluate possible impacts.

Description of the Area

The James River, where the study area is located, is the largest seed oyster-producing region on the East Coast of the United States. Oysters set naturally here on areas of shelly bottom. In the 1979-80 season, the quantity of seed oysters harvested from public oyster grounds in the river was 310,062 bushels; landings of shucking oysters in the same season were 68,354 bushels. Public grounds in the James River have supplied seventy-four percent of the seed planted in Virginia in recent years.

Since 1960 there has been a major decline in spatfall in the James River, and this decreased level of set has persisted to the present. Since 1972, however, spatfall has shown a slight improvement due to lowered salinities (which have pushed MSX, Dermo and drills farther downstream), and perhaps an increase in acquired resistance to MSX. However, salinities in 1980 were high; if they remain at that level future setting and survival of spat will probably be adversely affected. Spatfall during 1980 was again very low over most of the seed area.

The South side of the lower James, where the study area is, has no restrictions placed on the harvest of shellfish by the Department of Health.

Sampling Methods

The area chosen for sampling was the area where possible effects would most logically occur. Accordingly, an area out to a distance of 500 ft from the right-of-way line upriver of the bridge and 1,000 ft from the right-of-way line on the downriver side of the bridge was selected for this study. This included the leased area approximately from 7 to 800 ft upriver of the additional lanes to 13 to 1400 ft downriver. The corners of the study area were staked by surveyors of the Virginia Marine Resources Commission.

Stations where samples were to be taken were evenly spaced so that one station was made about every 6 acres; three

additional stations (B12, B13 and B14) were added on Ballard's lease (Figure 1). Stations were located in the field by reference to the VMRC-placed stakes and radar ranges from the bridge. A floating line trailed behind the boat was used to measure distance between stations. Buoys were used to mark stations for later sampling. At each station four samples were collected by taking a grab from four different spots around a station. Patent tongs were used to take the samples because they retain shellfish larger than one inch and sometimes smaller. For each lease, the acres surveyed in the study area, the number of stations, and the number of samples are shown in Table 1.

At each station the following observations were recorded:

Bottom type;

Vegetation;

Numbers of oysters;

Measurements of the lengths of oysters;

Depth of the water; and,

Other animals present.

The percentage of the catch which was market and small oysters was calculated from the length measurements. The volume of all oysters caught was measured; this, together with the numbers of oysters was used to calculate the number of oysters per bushel (Table 2).

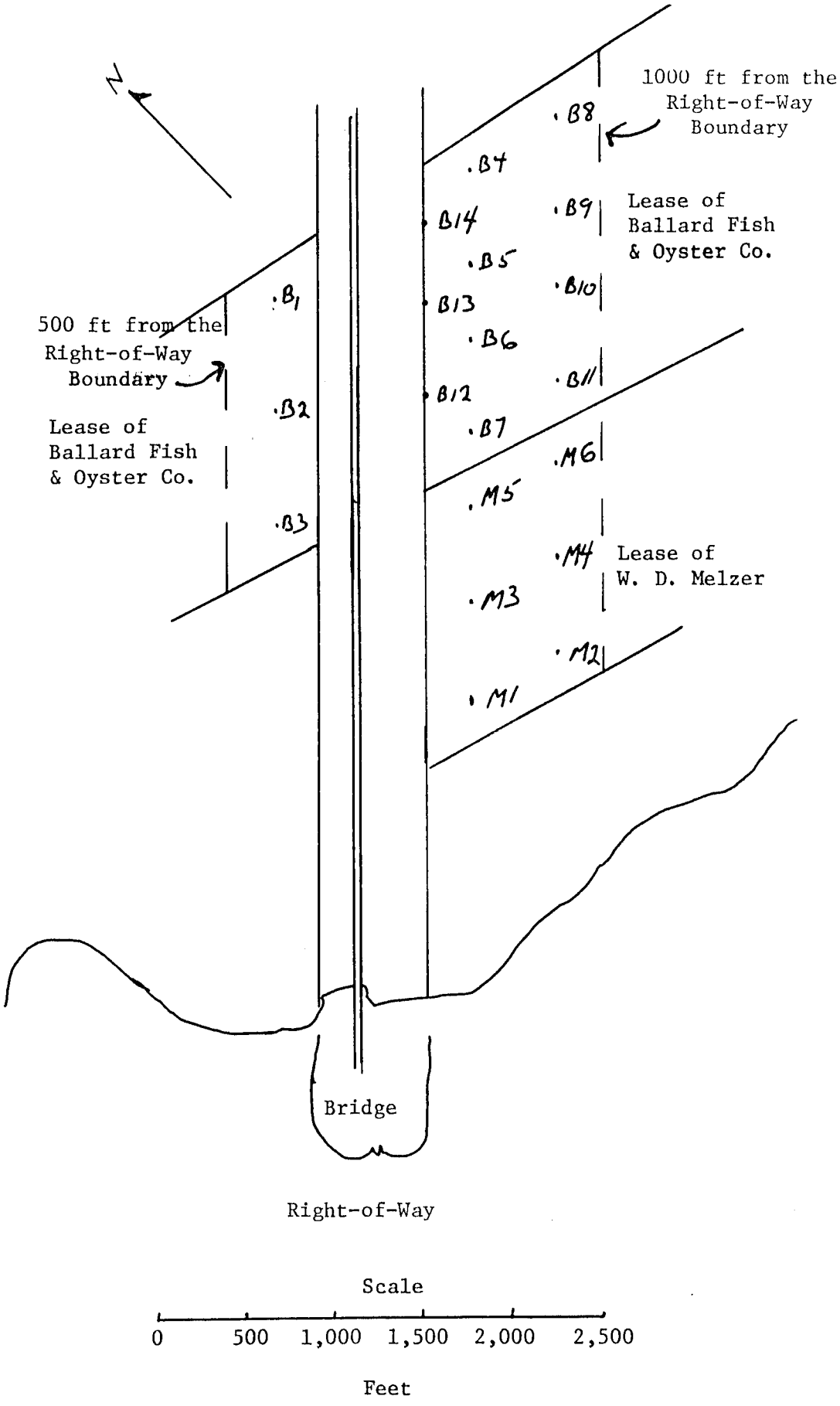


Figure 1. Leased oyster ground near the Southern end of the James River Bridge, with dots showing stations around which samples were taken by patent tongs in October 1980.

Table 2

Methods of Calculating Average Density of Live Oysters and Shells.

1. Each grab of the patent tongs covered 1.2 square yards in area on the bottom. Four grabs were taken at most stations; therefore, the area of the bottom which was covered was four times the above figure.

2. There are 4,840 square yards in an acre.

3. The following size distribution and number of oysters per bushel were recorded from counts and measurements of oysters in our samples:

	W. D. Melzer	Ballard F. & O.
Number per bu	--	578
Percent Market Oysters	--	23%
Percent Small and Yearling Oysters	--	77%

4. The shell that we recovered counted on the average 20 shells per liquid quart (1000 per bushel).

5. An example of how the estimated densities of oysters and shell were calculated is illustrated below:

For example, using sampling results from station B4 (Table 3), the calculations are as follow:

$$\frac{\text{40 oysters recovered at station B4}}{\text{4.8 yd}^2\text{ covered at sta.}} \times 4{,}840\ \text{yd}^2/\text{acre} \div$$

578 oysters/bushel = 69.8 bushels/acre

and

$$\frac{\text{8.2 quarts of shell at station B4}}{\text{4.8 yd}^2\text{ covered at sta}} \times 4{,}840\ \text{yd}^2/\text{acre} \div$$

50 quarts/VA bushel = 165.4 bushels/acre

Each grab of the patent tongs covered 1.2 yd^2. Since the patent tongs cover a known area of bottom, these samples give a quantitative indication of the population. From these samples estimates of the total population can be made using methods shown in Table 2.

A recording fathometer was carried over seven transects (Figure 2) to obtain profiles of the bottom. Audio indicating gear was towed along the same seven transects; this gear consisted of a microphone which was in contact with the bottom and connected to earphones on the boat. The sounds produced in the earphones were evaluated as being oysters, shell, sand or mud.

Results

Results of patent tong sampling are shown in Tables 3 through 6. Copies of the tracings produced by the fathometer are in the appendix to this report. The distribution of shell as indicated by the audio gear is shown in Figure 3.

1. Lease of Ballard Fish and Oyster Company

On 63 acres of Ballard's lease samples were taken at 14 stations. Four samples were taken at each of eleven stations; at three stations on the downriver right-of-way, two samples at each were taken.

In all, 41 oyster spat (young oysters which had just set in the summer months) and 368 larger oysters were

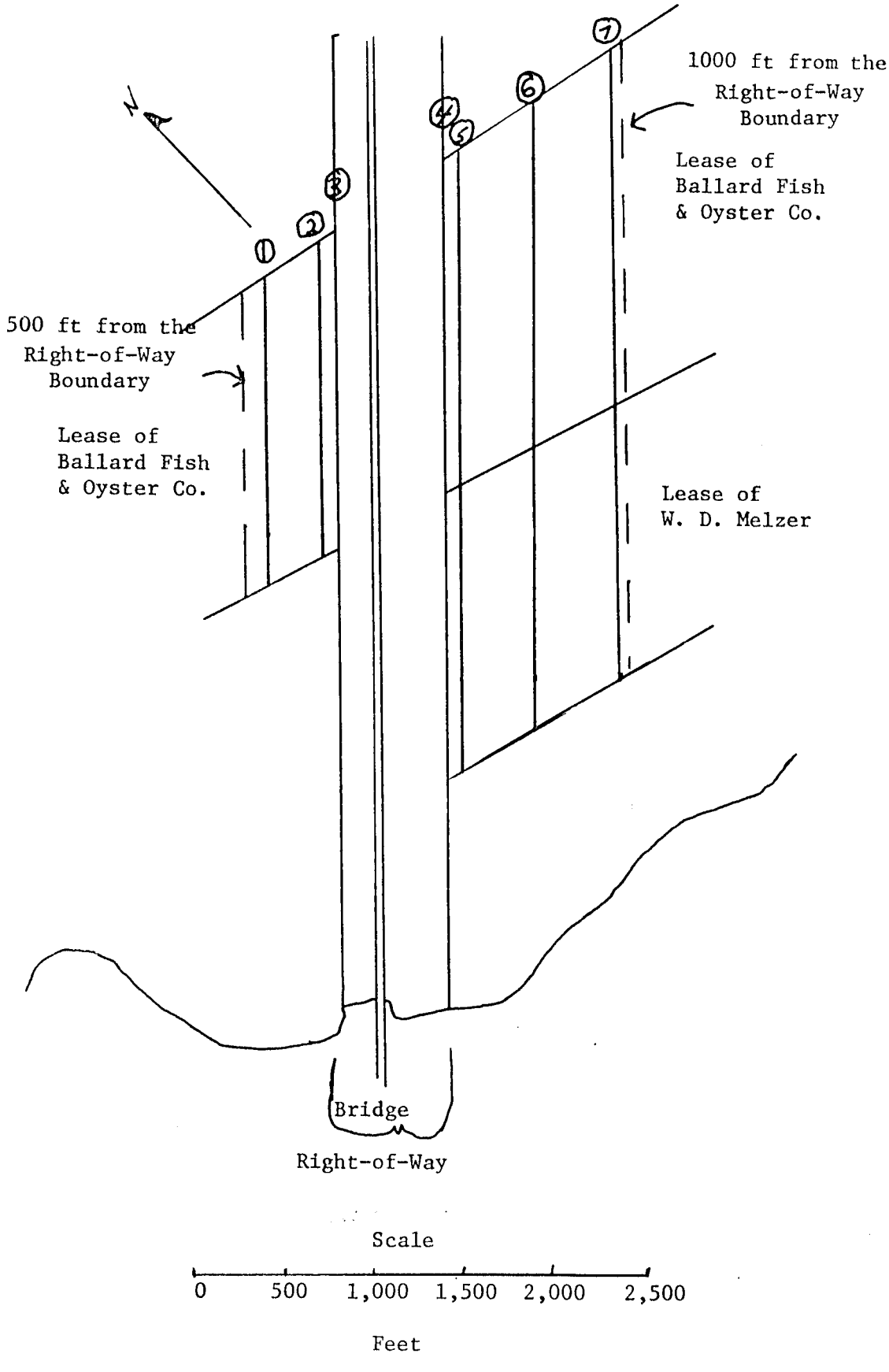


Figure 2. Leased oyster ground near the Southern end of the James River Bridge, with numbered lines indicating the transects covered with fathometer and audio gear in October 1980.

Table 3

Quantities of Live Oysters, Shell and Boxes Found at Each Station on a Portion of a Plot of Oyster Planting Ground Adjacent to the James River Bridge and Leased by the Ballard Fish and Oyster Company.

Station	Area Covered by Sampling (Sq Yds)	Live Oysters (Number)		Boxes (Numbers)	Shell (Quarts)	
		Spat	Other		Surface	Buried
B 1	4.8	0	0	2	0.0	1.5
B 2	4.8	1	5	3	0.4	3.7
B 3	4.8	3	40	3	1.4	3.9
B 4	4.8	2	31	4	0.7	7.5
B 5	4.8	2	4	4	0.6	4.4
B 6	4.8	17	57	0	5.8	5.9
B 7	4.8	4	56	3	1.9	4.1
B 8	4.8	0	4	0	2.0	7.5
B 9	4.8	3	74	7	7.5	11.0
B10	4.8	4	63	6	5.0	6.0
B11	4.8	2	12	5	0.7	1.0
B12	2.4	3	22	2	2.0	3.0
B13	2.4	0	0	5	<0.1[1]	3.5
B14	2.4	0	0	0	0.2	0.6
Totals	62.0	41	368	44	28.3	63.6

[1] < means "less than".

Table 4

Estimated Densities and Quantities of Live Oysters and Shell at Each Station on a Portion of a Plot of Oyster Planting Ground Adjacent to the James River Bridge and Leased by Ballard Fish and Oyster Company.

Station	Bottom Type[1]	Density of Live Oysters (bu/acre)	Density of All Shell (bu/acre)
B 1	SM	--	30.2
B 2	SM	8.7	82.7
B 3	SM	69.8	106.9
B 4	SM	54.1	165.4
B 5	SM	7.0	100.8
B 6	MS	99.4	236.0
B 7	MS	97.7	121.0
B 8	SM	7.0	191.6
B 9	M	129.1	373.1
B10	SM	109.9	221.8
B11	M	20.9	34.3
B12	SM	76.8	201.7
B13	SM	--	141.2
B14	SM	--	32.3
Average		49.7	143.5
Estimated bushels on area sampled		3,131.0 bu	9,040.0 bu

[1]SM = soft mud; MS = muddy sand; M = mud.

Table 5

Quantities of Live Oysters, Shell and Boxes Found at Each Station on a Portion of a Plot of Oyster Planting Ground Adjacent to the James River Bridge and Leased by W. D. Melzer.

Station	Area Covered by Sampling (Sq Yds)	Live Oysters (Number)		Boxes (Number)	Shell (Quarts)	
		Spat	Other		Surface	Buried
M 1	4.8	0	0	0	0.0	0.0
M 2	4.8	0	0	0	0.0	0.0
M 3	4.8	0	0	0	0.0	0.0
M 4	4.8	0	0	0	0.0	0.4
M 5	4.8	0	0	0	0.2	0.7
M 6	4.8	0	0	0	0.0	0.2
Totals	28.8	0	0	0	0.2	1.3

Table 6

Estimated Densities and Quantities of Live Oysters and Shell at Each Station on a Portion of a Plot of Oyster Planting Ground Adjacent to the James River Bridge and Leased by W. D. Melzer.

Station	Bottom Type[1]	Density of Live Oysters (bu/acre)	Density of All Shell (bu/acre)
M 1	S	--	--
M 2	S	--	--
M 3	S	--	--
M 4	MS	--	8.1
M 5	MS	--	18.2
M 6	MS	--	4.0
Average		--	5.0
Estimated bushels on area sampled		0 bu	175.0 bu

[1]S = sand; MS = muddy sand.

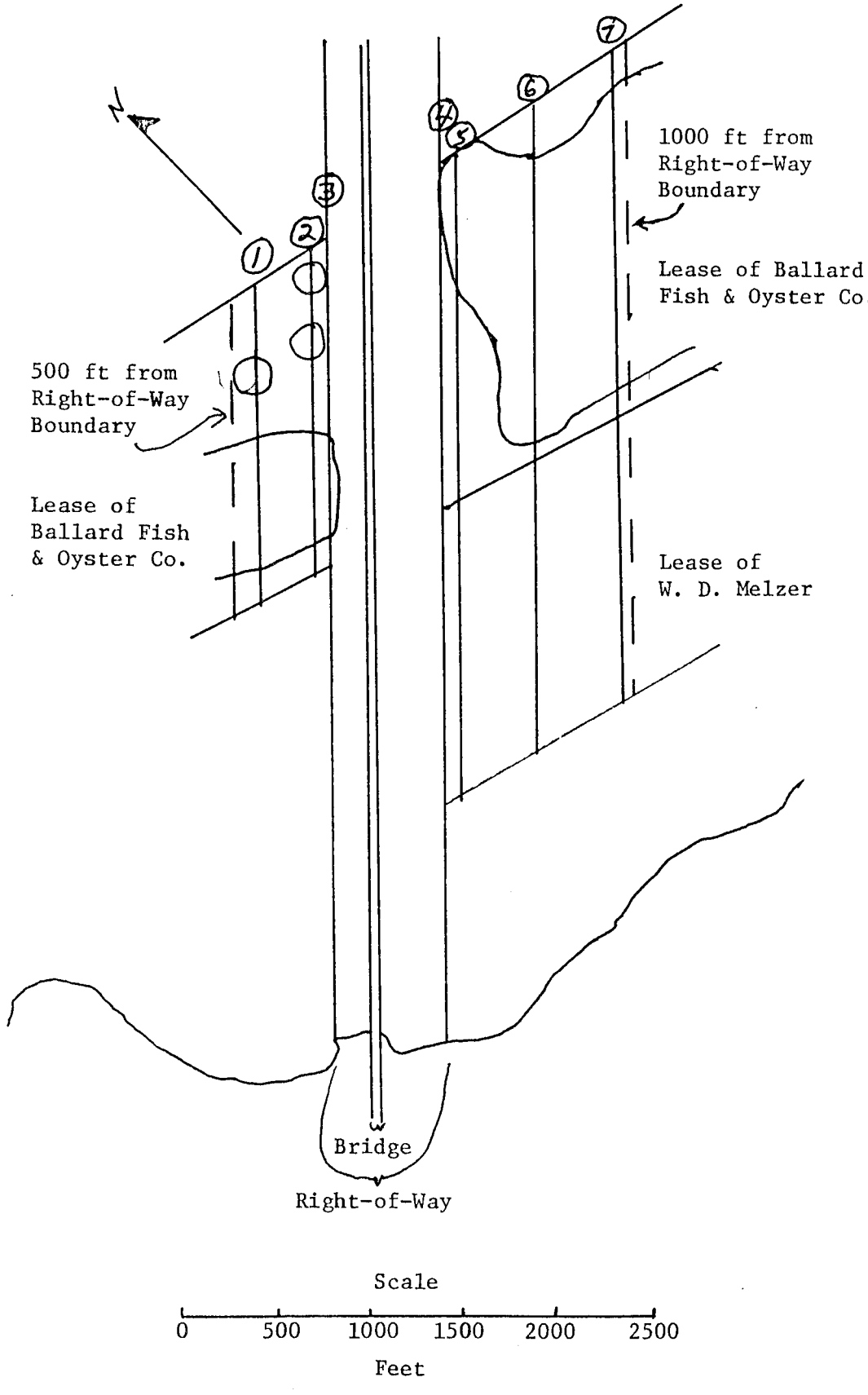


Figure 3. Distribution of oyster shell as indicated by audio gear; October, 1980.

recovered by the tongs. Twenty-three percent of the live oysters were market oysters (i.e. 3 inches or more in length). From these data estimated average densities of oysters and shell on the portion of Ballard's lease surveyed were calculated to be 49.7 and 143.5 bushels per acre, respectively (Table 4). Of the 44 boxes[1] found three were recent. Approximately a third of the 91.9 quarts of shell recovered had been on the surface of the bottom before the tongs grabbed it; the remainder was buried in the bottom substrate (Table 3). No hard clams were seen.

Seven passes or transects across Ballard's lease and parallel to the bridge were made with the fathometer and the audio gear (Figure 2). On three transects upriver of the bridge the fathometer showed an even, very gradually sloping bottom with the exception of a small oyster rock and a small patch of shell on Transect 2; no holes were seen. The bottom along Transects 4 and 5 below the bridge were even and fairly smooth. On Transects 6 and 7 the fathometer showed low mounds which, based on evidence from the patent tong samples and the audio, were determined to be concentrations of oysters and shells (Appendix).

[1]When both valves or parts of the oyster shell are joined by the hinge, but are empty of meat it is a box.

The audio gear indicated the presence of shell, not only at patent tong stations, but between the stations as well. From this record an estimated distribution of shell was drawn up (Figure 3).

2. Lease of W. D. Melzer

Patent tong sampling was conducted here at six stations. No live oysters or boxes and only a little shell were found. Calculations estimated the average density in the portion studied to be five bushels per acre (Table 6). No hard clams were seen.

The fathometer and the audio gear revealed a smooth, sandy bottom with negligible shells on four transects (Appendix and Figure 3).

Discussion

A large part of that portion of Ballard's lease which we studied had oysters. In fact, oysters were found at 11 of the 14 patent tong stations. At 7 of those 11 locations oysters occurred in medium density (i.e. 46 to 145 bushels per acre); density at the other 4 was low (Table 4). Shell sufficient to support this population of oysters was found. Three recent boxes were found, each indicating an oyster that had died in the preceding month or two; this was seven percent of all boxes found, and is normal. The number of spat recovered indicate that recruitment had occurred during the summer.

Comparison of data from Ballard's ground for this study with those from a 1977 study[2] show almost exact agreement concerning the average density of oysters (49.7 bu per acre compared to 49). Average density of shells found in 1980 was about half that found in 1977 (143.5 bu per acre compared to 252).

The portion of Melzer's lease which was studied had no oysters and almost no shell. This area had no oysters in 1977 as well; the average density of shells found in 1980 was about half that found in 1977 (5 bu per acre compared to 11).

Estimated Value of the Oysters in the Area Studied

The value of the shell was taken to be the cost of planting a like amount in a similar location. This price, per bushel, was determined to be 45¢. Using the above figure, the value of Ballard's shell in the study area was estimated to be $4,068. Likewise, the value of Melzer's shell was estimated at $79.

Market oysters (3 inches or over in length) in good condition may bring $9.00 per bushel while soup oysters (1 to 3 inches) may sell for $4.00 per bushel. Since oysters

[2]Haven, D. S., P. C. Kendall and W. C. Phoel. 1977. A study of leased oyster grounds adjacent to the James River Bridge, Newport News, Virginia. Conducted for the Virginia Department of Highways and Transportation. Project 0017-046-102, RW-201.

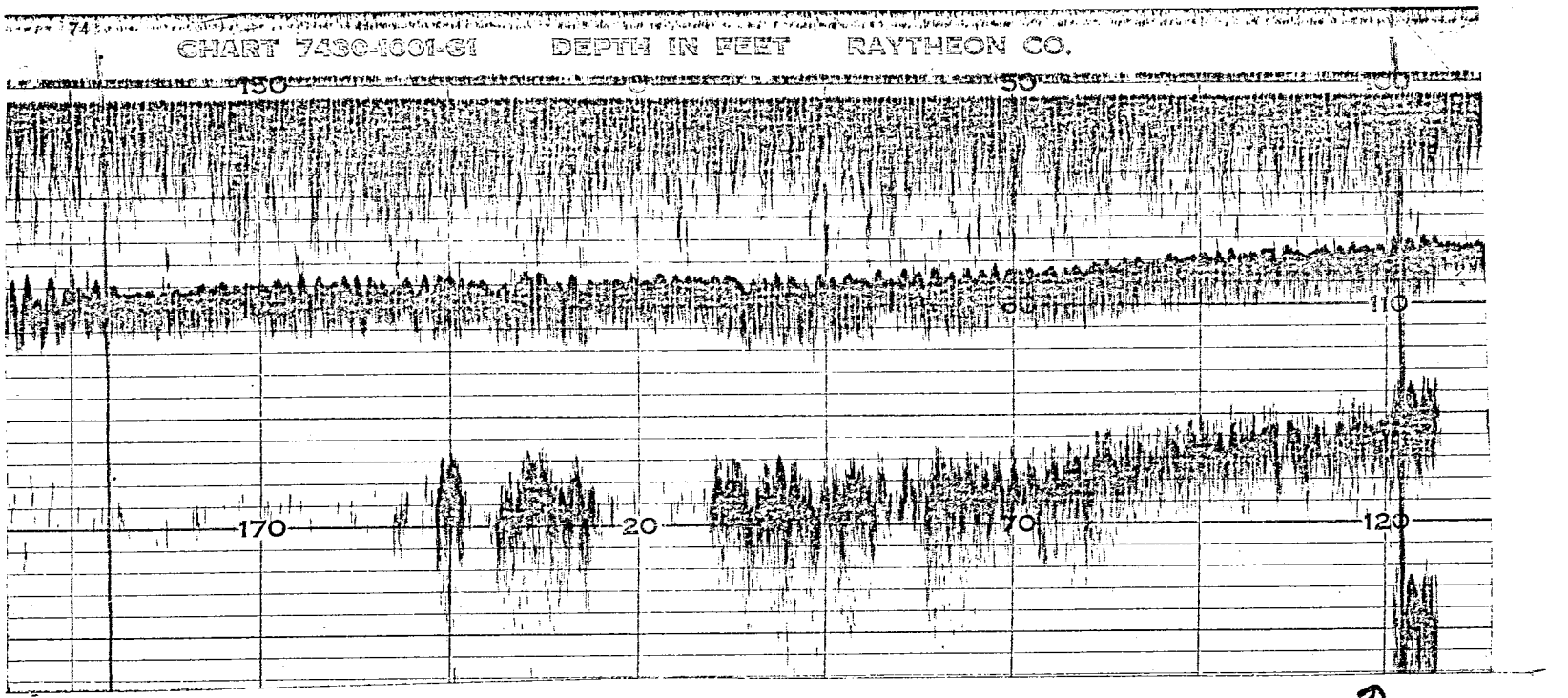
found on Ballard's lease were of various sizes but mostly under three inches, we decided to use a price of $6.00 per bushel for all oysters. The total quantity of oysters was estimated to be 3,131 bushels (Table 4) with an estimated value of $18,786; these estimates are maximal since it would be impractical to harvest more than about 75% of the crop.

On Melzer's lease no oysters were found.

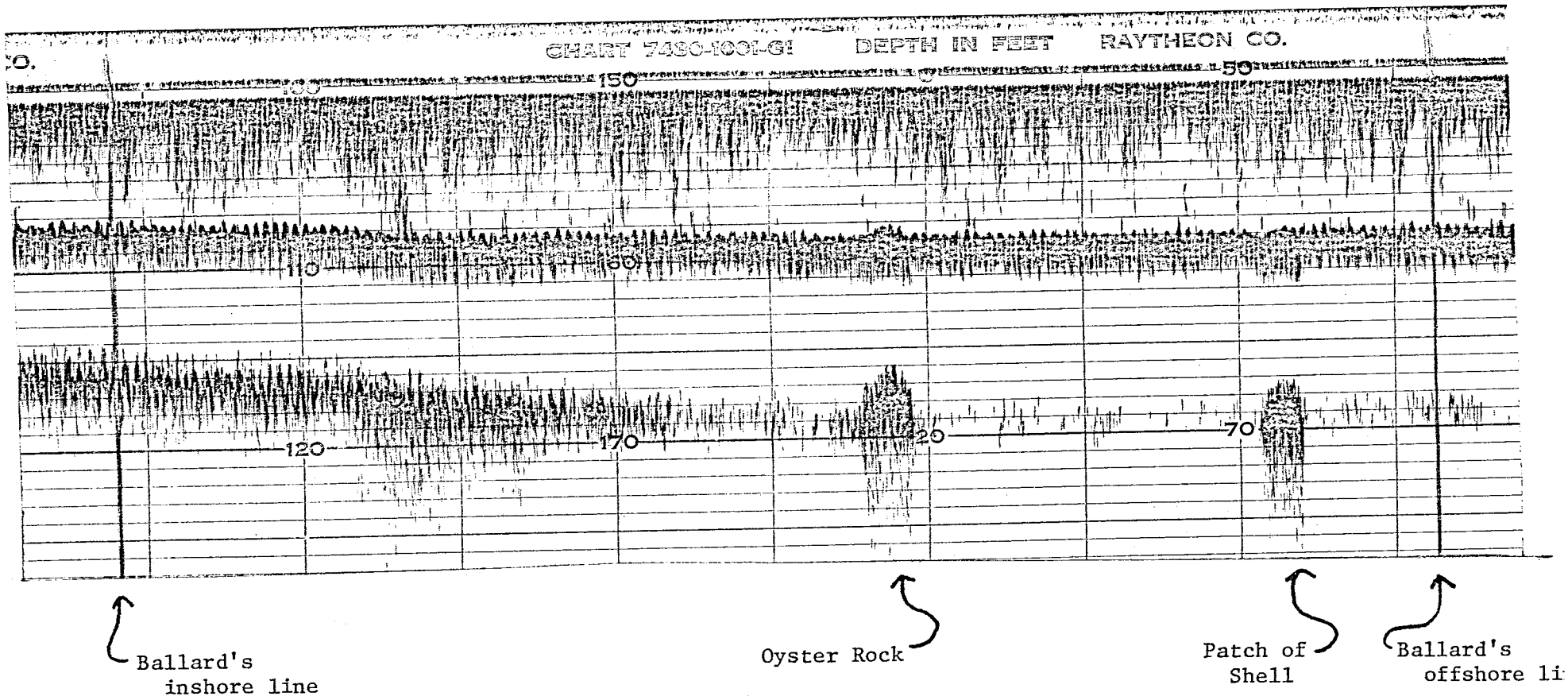
APPENDIX

Fathometer Tracings of the Bottom Adjacent to the James River Bridge; made Oct. 1980.

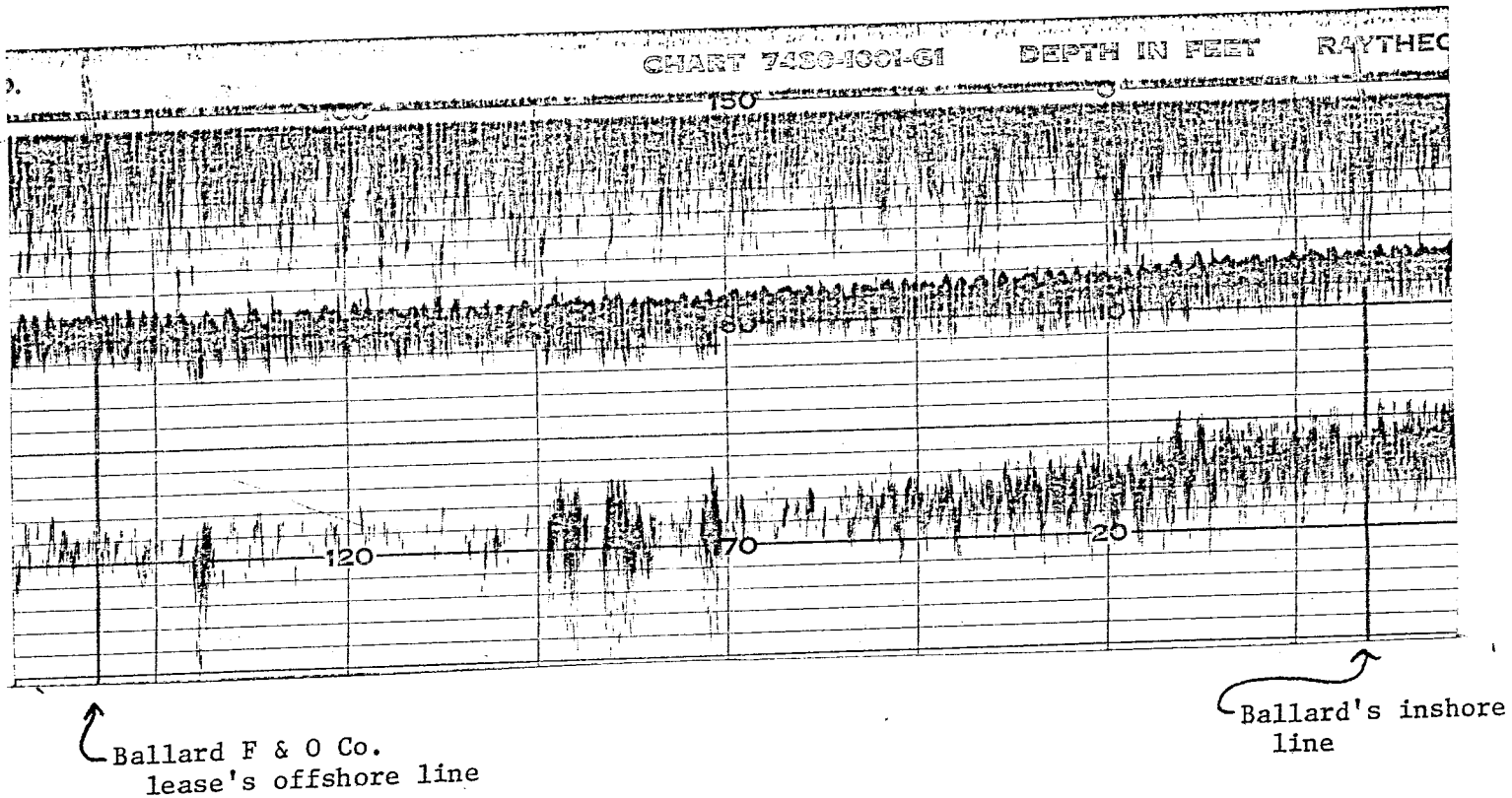
(Note: The low amplitude [$\sim$ 1/16" high], frequent modulation in the tracings of the bottom indicates choppy waves on the surface of the water.)



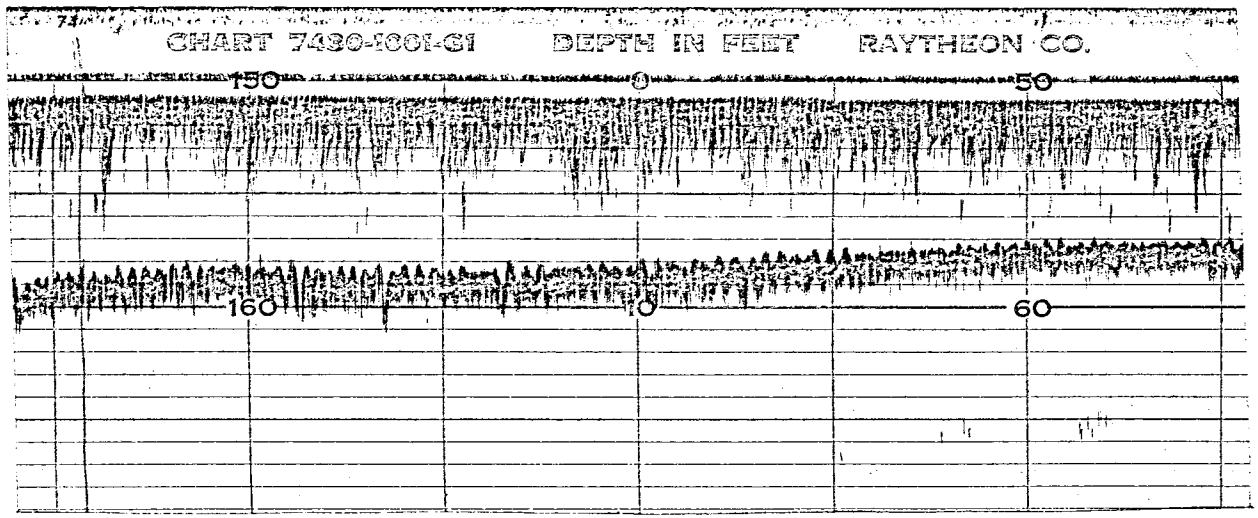
Fathometer tracing of the bottom along Transect 1, which is 400 feet beyond the upriver Right-of-Way line and is leased by Ballard Fish and Oyster Company, made 10/23/80.



Fathometer tracing of the bottom along Transect 2, which is 75 feet beyond the upriver Right-of-Way line and is leased by Ballard Fish and Oyster Company; made 10/23/80.

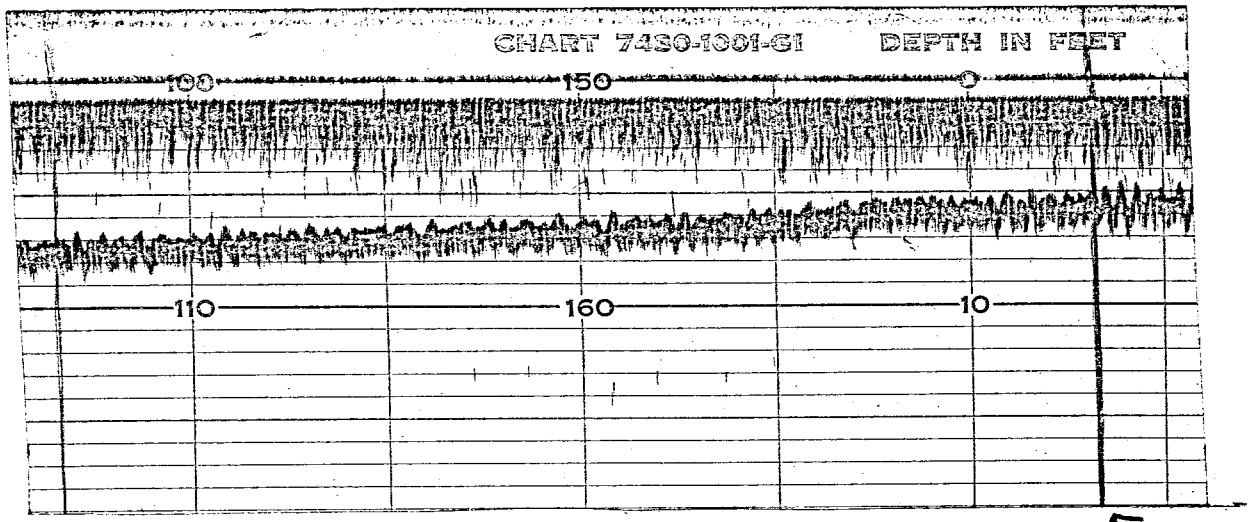


Fathometer tracing of the bottom along Transect 3 which is along the Right-of-Way line upriver of the bridge; made 10/23/80.

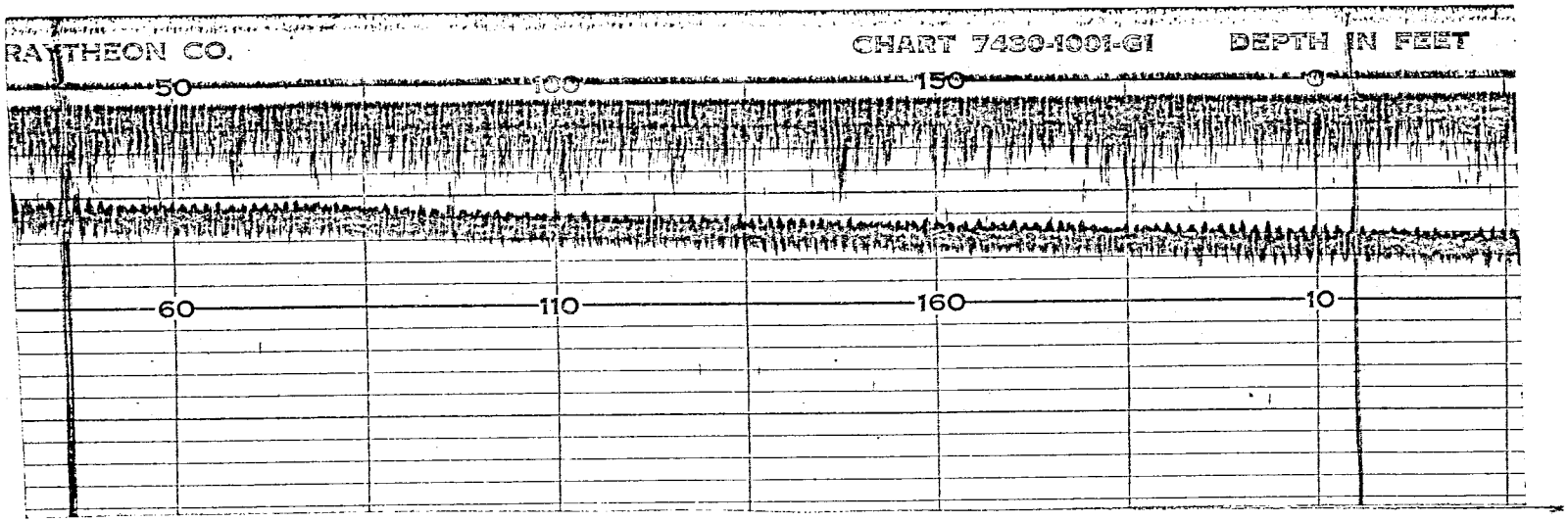


Ballard's offshore line

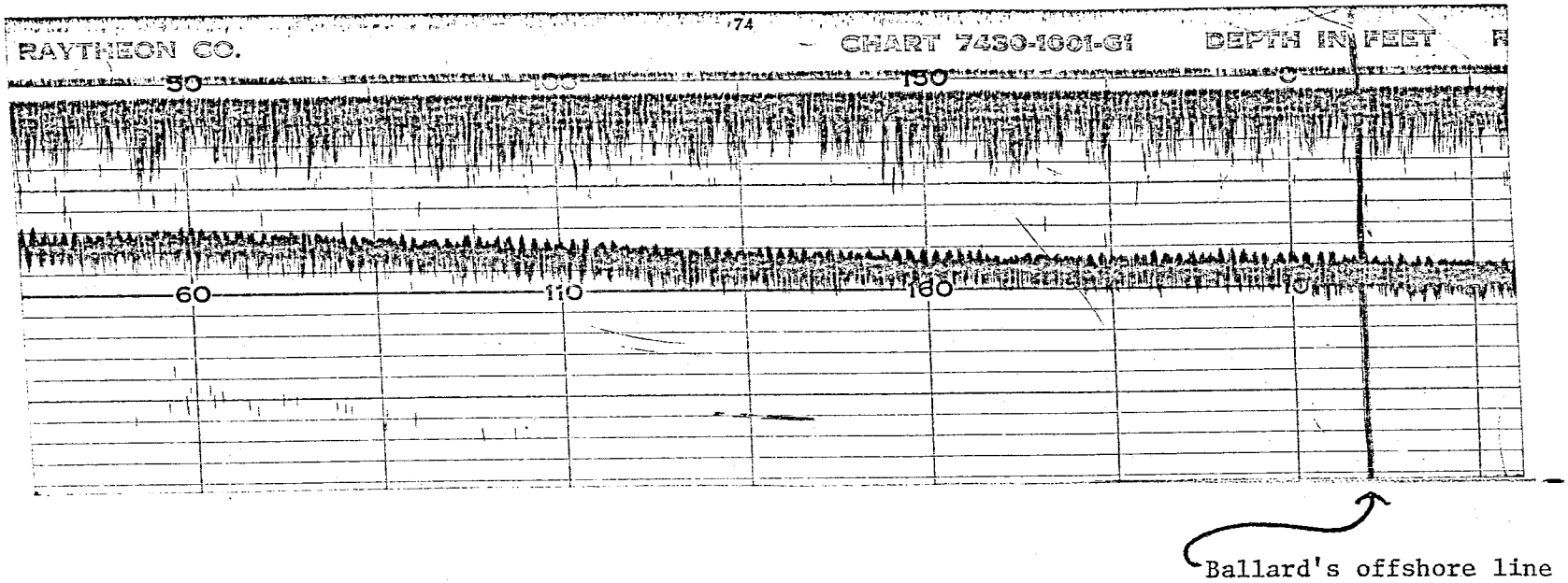
Fathometer tracing of the bottom along Transect 4a, which is along the Right-of-Way line down-river of the bridge; made 10/23/80.



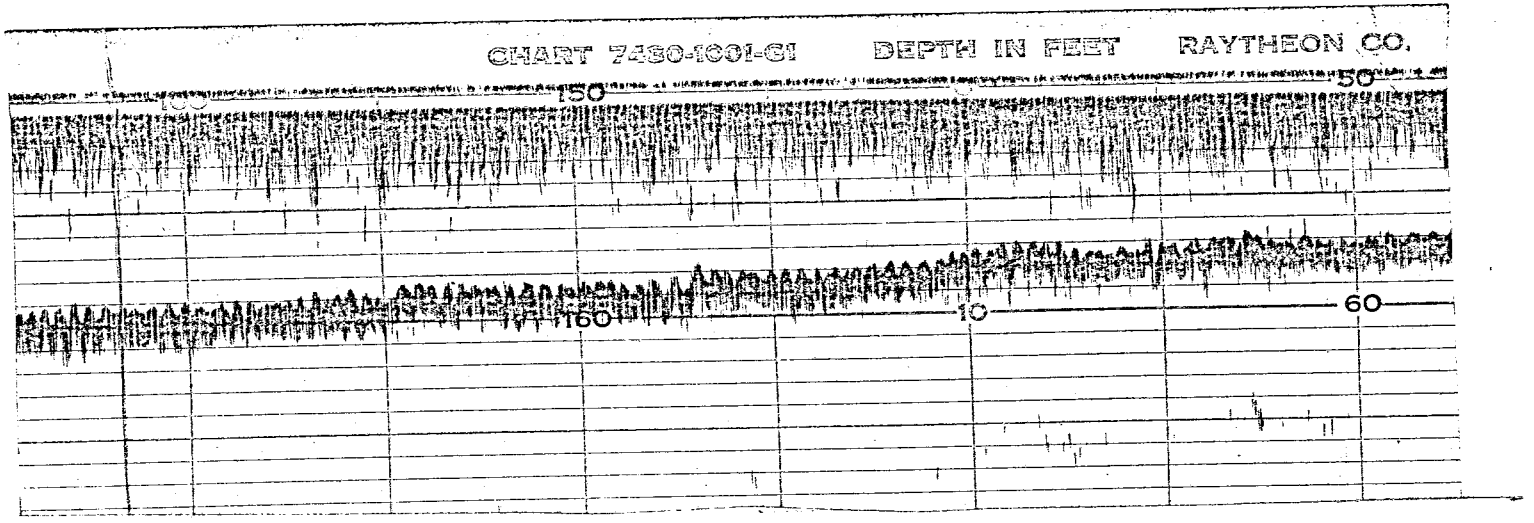
Fathometer tracing of the bottom along Transect 4b, which is along the Right-of-Way below the bridge; made 10/23/80.



Fathometer tracing of the bottom along Transect 5a, which is 75 feet beyond the downriver Right-of-Way line; made 10/23/80.

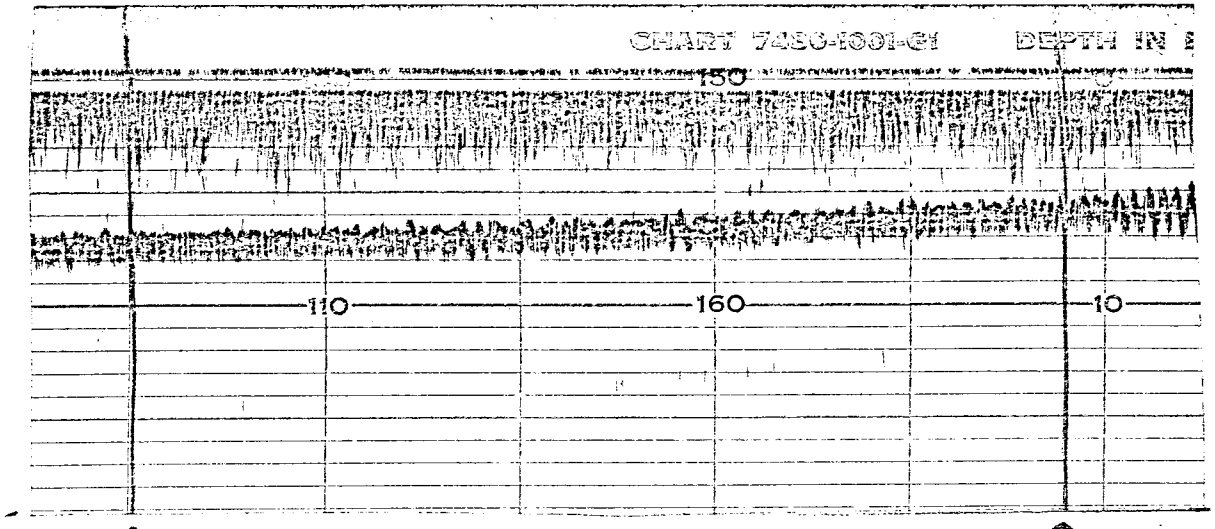


Fathometer tracing of the bottom along Transect 5b, which is 75 feet beyond the downriver Right-of-Way line; made 10/23/80.

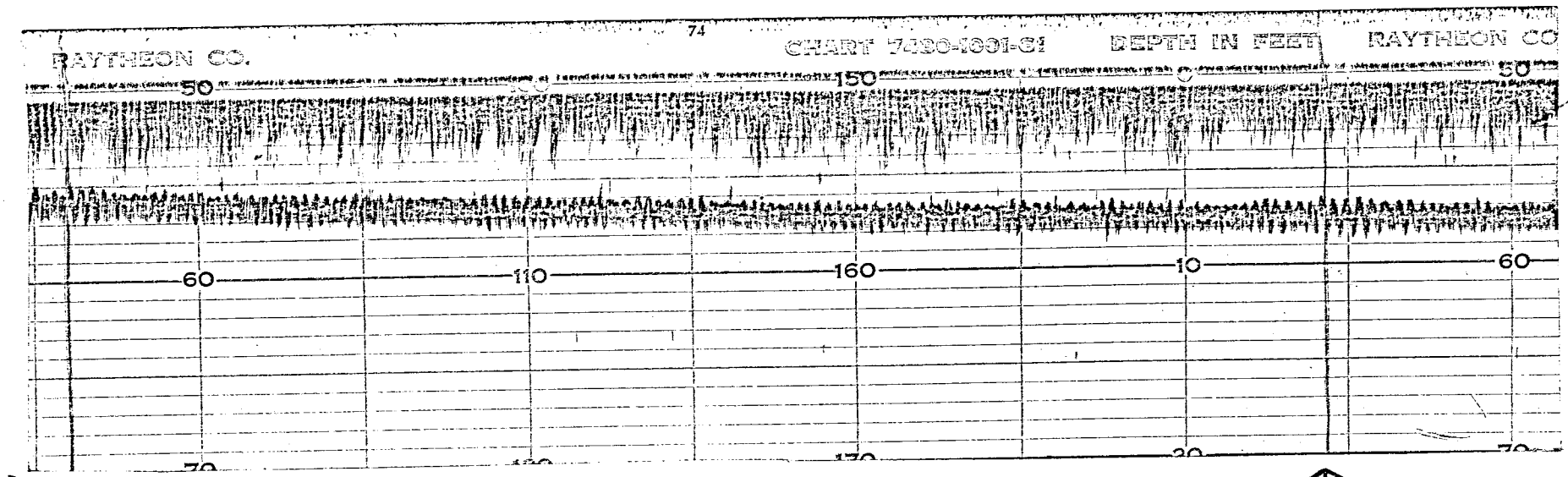


Ballard's
Offshore line

Fathometer tracing of the bottom along Transect 6a which is 500 feet beyond the downriver Right-of-Way line; made 10/23/80.



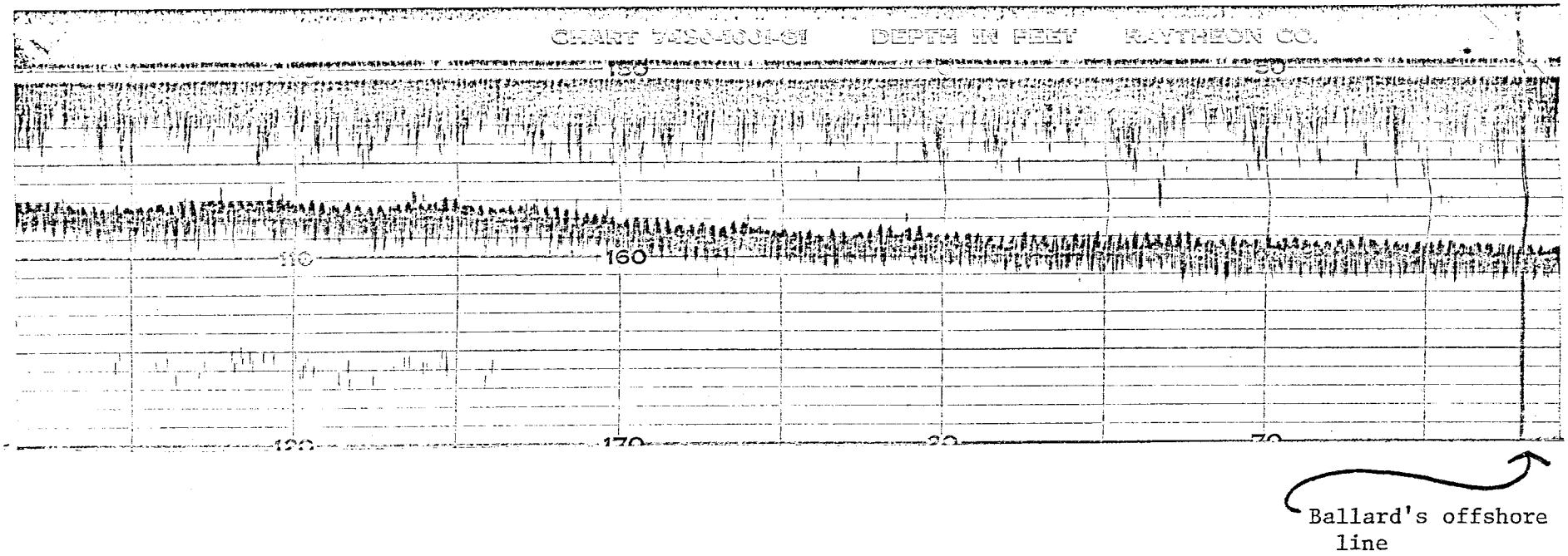
Fathometer tracing of the bottom along Transect 6b which is 500 feet beyond the downriver Right-of-Way line; made 10/23/80.



Melzer's inshore line

Line marking the offshore boundary of Melzer's lease and the inshore boundary of Ballard's lease

Fathometer tracing of the bottom along Transect 7a, which is 1000 feet beyond the downriver Right-of-Way line; made 10/23/80.



Fathometer tracing of the bottom along Transect 7b, which is 1000 feet beyond the downriver Right-of-Way line; made 10/23/80.