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A study of oyster ground leases adjacent to the James River bridge, Newport News, Virginia

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A STUDY OF OYSTER GROUND LEASES ADJACENT TO THE JAMES RIVER BRIDGE, NEWPORT NEWS, VIRGINIA

Conducted for the

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Isle of Wight County

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ABSTRACT

Two leases of oyster planting ground adjacent to the James River Bridge at the Newport News end were studied in December, 1978. Sampling revealed that one area contained large quantities of oysters while, on the other area, oysters were scarce. Comparison with sample results and fathometer-traced bottom profiles taken in a 1976 study of the same areas indicates a close similarity.

INTRODUCTION

A survey of the shellfish resource on two oyster planting ground leases adjacent to the James River Bridge was conducted in December 1978 by personnel of the Virginia Institute of Marine Science. The survey was done at the request of the Virginia Department of Highways and Transportation in conjunction with Project Number 0017-046-102, B-605.

In this report of the 1978 study reference will be made to a previous study of the same area. The report of the previous study was entitled, "A Study of Leased Oyster Grounds Adjacent to the New and Old James River Bridges, Newport News, Virginia" and was dated September, 1976.

The James River - A Brief Review of Some Ecological Aspects

The James River, where the study area is located, is the largest seed oyster producing region on the East Coast. Oysters set naturally here on areas of shell bottom. In the last five seasons, seed production from public grounds in the river has averaged 381,296 bushels annually.

The James River has undergone major changes in production over the years and there has been a drastic decline since 1960. This decline was part of a Bay-wide decline in nearly all high salinity regions (15 parts per thousand and over). The basic cause of this phenomenon was the oyster pathogen MSX which first appeared in the Bay in 1960 and

killed millions of bushels of oysters in high salinity waters. Heavy mortalities were experienced in Hampton Roads and to a lesser extent in the area immediately below the James River Bridge. The disease did not cause mortalities in mid to low salinities. Accompanying the decline in stock in the lower James River was a river-wide decline in spatfall. The area covered in the present study was subject to mortalities as high as 60% per year due to MSX in the early 1960's.

Today MSX is still a major cause of mortality of seed oysters (originating from the James River seed area) if they are relaid in high salinity areas. Since about 1970, however, there has been a gradual increase in the survival rates of oysters setting in the lower James. The reason for this increased survival is not fully understood. It may be related to a decrease in the severity of MSX due to a succession of years of below-average salinity, or an increase in the resistance to MSX of oysters setting in the area; possibly a combination of both factors is involved.

Another factor which has favored a build up of oyster populations in the study area is a decrease in numbers of oyster drills. Prior to 1972 the oyster drill killed many small oysters in the area below the bridge; however, in 1972 flood waters accompanying tropical storm Agnes killed drill populations in the study area.

Regardless of the cause, there has been a major increase in numbers of oysters on public bottoms in the lower James which began about 1970-71, and by 1975 several of the public rocks adjacent to the study area had developed large populations of seed and market-sized oysters. Also, as shown by the 1976 study and an earlier 1972 study ("Survey of Leased Oyster Grounds Adjacent to the James River Bridge at Newport News, Virginia", Dec. 1972), populations had increased to high levels on several of the private leases adjacent to the bridge.

METHODS

Locating Stations

The corners of the leased tracts were marked by personnel of the Virginia Marine Resources Commission (VMRC) before sampling was conducted. Stations where samples were collected were first located on charts of the area on west to east lines across each tract at regular intervals. Stations were designated by a system of letters and numbers (Figure 1). In the river, the stations were located with reference to the corner stakes established by VMRC and by using appropriate landmarks; a plastic line marked at 100 foot intervals was then used to measure distances. In general, stations were located so that one station represented, on the average, about 3 acres. Table 1 identifies the leases studied, acreages, stations and samples.

Table 1

Tracts of Leased Ground Surveyed and Number of Samples Taken (1978).

Lessee	VMRC Plat No.	Acreage of Lease*	Number of Station	Number of Samples
Miles, J. H. & Co.	7988	42	14	28
Michaux, L. S., EST.	8113	8	3	6

*All of this acreage is outside the right-of-way.

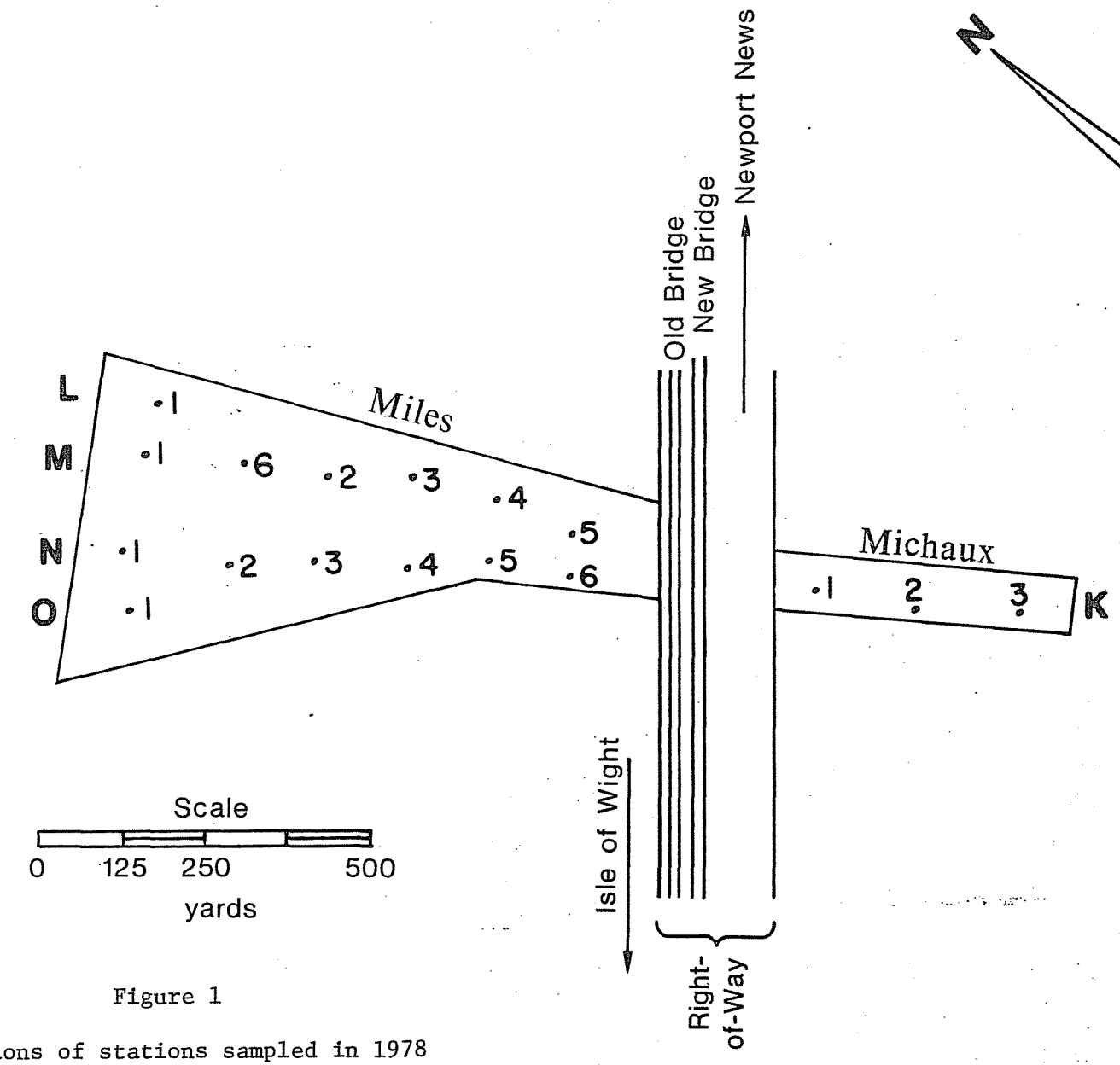


Figure 1

Locations of stations sampled in 1978 James River Bridge study.

Sampling Bottom Substrate With Patent Tongs

The bottom samples were obtained with a pair of heavy "patent tongs" which were raised and lowered by a power winch. These "tongs" equipped with teeth penetrated soft mud and hard shelly bottom to a depth of about 4 to 5 inches and brought to the surface everything over 1 inch diameter in a section of bottom 1.3 square yards in area. At each station, 2.6 square yards were sampled by taking two grabs; after each grab the boat was moved slightly so that the tongs did not fall twice in the same place.

At each station, the following data were obtained: date, vegetation (if any), bottom type, quantity and volume of shell, number and volume of living oysters, number of hard clams, and number of boxes (hinged but empty shells). This last parameter was useful in estimating mortality. Live oysters were measured.

Using the area sampled by the tongs (1.3 square yards) and other data, we calculated mean numbers (and, later, bushels) of oysters and shells per acre. Table 2 shows how these calculations were made.

Data on oyster and shell density at all stations in terms of bushels per acre are shown in Figure 2.

Use of Fathometer to Determine Bottom Topography

A portable recording fathometer was used to make a tracing of the profile of the bottom. The locations of

Table 2

Methods of Calculating Average Density of Live Oysters and Shells.

1. Each grab of the patent tongs covered 1.3 square yards on the bottom; two grabs were made at each station.

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

3. The following size distribution was seen in samples from Miles' ground (oysters and shell recovered from Michaux's ground was too small to indicate the distribution):

1978

No. Lg/bu.	=	328
Overall No./bu	=	536
Market	=	32%
Small	=	61%
Yearling	=	7%
Box Counts	=	6%
No. Sm/bu.	=	769

(10 1978 spat were seen)

4. Calculations of estimated densities and quantities were done in the following manner:

Density:

Using data from station L1 on Miles' ground (Table 3) as an example: 51 oysters and 18.0 quarts of shell were taken in two grabs, each covering 1.3 square yards of bottom.

$$\frac{\text{51 oysters recovered at Sta. L1}}{\text{2.6 yd}^2 \text{ covered at sta.}} \times \frac{\text{4,840 yd}^2}{\text{acre}} \div$$

$$\frac{\text{536 oysters}}{\text{bushel}} = \text{177 bushels oysters/acre}$$

$$\frac{\text{18.0 quarts shell from Sta. L1}}{\text{2.6 yd}^2 \text{ covered at sta.}} \times \frac{\text{4,840 yd}^2}{\text{acre}} \div$$

$$\frac{\text{50 quarts}}{\text{bushel}} = \text{670 bushels shell/acre}$$

Table 2 (Contd.)

Quantity:

Using "Totals" data from Miles' ground (Table 3) as an example: 502 large oysters, 1,053 small oysters, and 184.0 quarts shell were taken in 28 samples, each covering 1.3 square yards of bottom. The 28 samples represent the entire plot of 42 acres.

$$\frac{502 \text{ large oysters}}{36.4 \text{ yd}^2} \times \frac{4{,}840 \text{ yd}^2}{\text{acre}} \div \frac{328 \text{ large oysters}}{\text{bushel}} \times$$

42 acres = 8,547 bushels large oysters

$$\frac{1{,}053 \text{ small oysters}}{36.4 \text{ yd}^2} \times \frac{4{,}840 \text{ yd}^2}{\text{acre}} \div \frac{769 \text{ small oysters}}{\text{bushel}} \times$$

42 acres = 7,647 bushels small oysters

$$\frac{184 \text{ quarts shell}}{36.4 \text{ yd}^2} \times \frac{4{,}840 \text{ yd}^2}{\text{acre}} \div \frac{50 \text{ quarts}}{\text{bushel}} \times$$

42 acres = 20,551 bushels shell

$$\frac{105 \text{ boxes}}{36.4 \text{ yd}^2} \times \frac{4{,}840 \text{ yd}^2}{\text{acre}} \div \frac{536 \text{ boxes}}{\text{bushel}} \times 42 \text{ acres}$$

= 1,094 bushels of boxes (shell only)

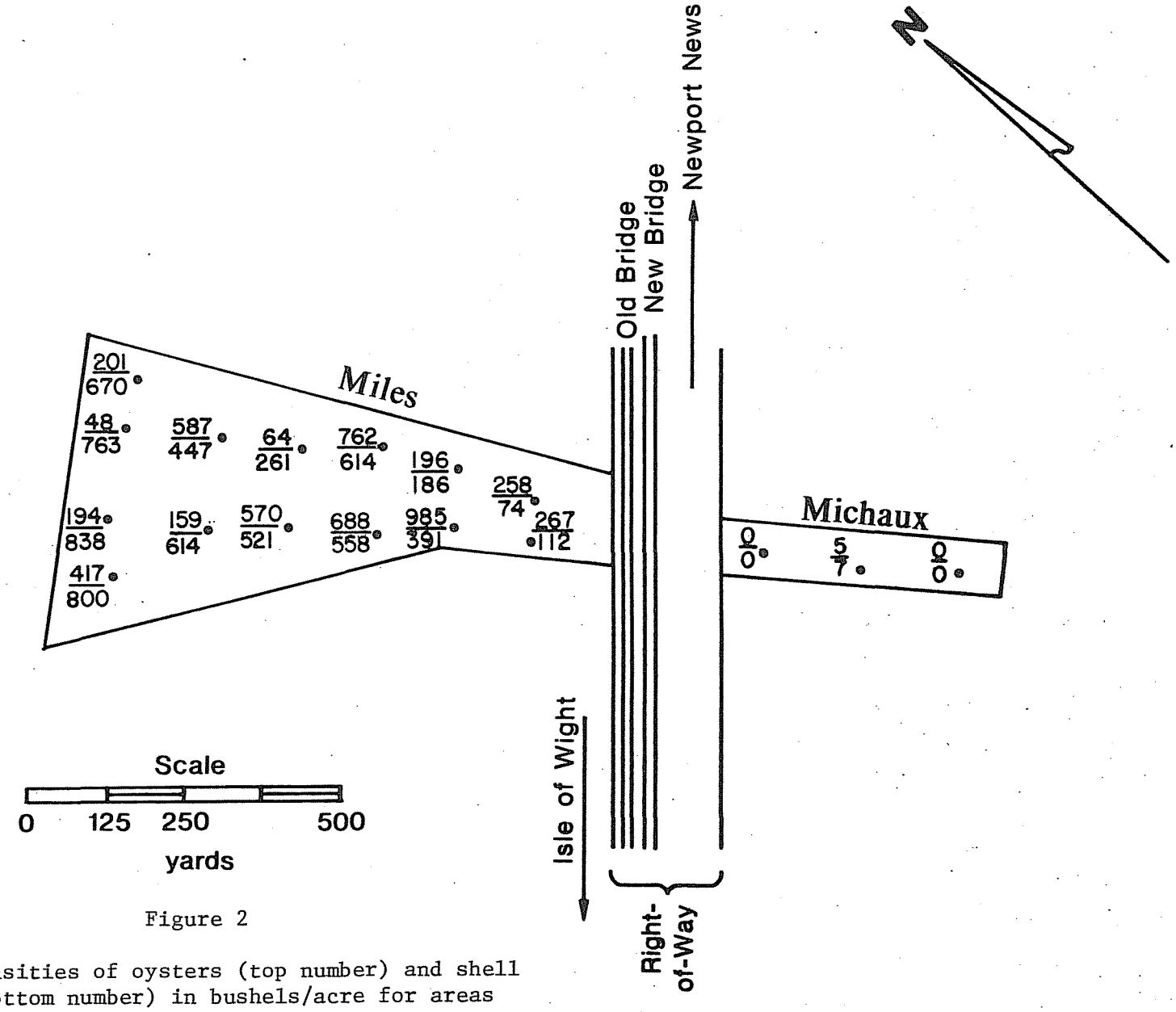


Figure 2

Densities of oysters (top number) and shell (bottom number) in bushels/acre for areas sampled in the James River - 1978.

fathometer transects are shown in Figure 3. Copies of traces produced by the fathometer are contained in the appendix.

RESULTS AND DISCUSSION

Lease of J. H. Miles and Company

On this 42 acre lease sampling was conducted at fourteen locations (Table 1, Figure 1). A total of 502 large oysters (3 inches or longer), 1,053 small oysters, 10 spat (oysters which set in summer, 1978), and 184 quarts (3.7 bushels) of shell were recovered (Tables 2 & 3). No hard clams were recovered. Densities based on the total (large and small) numbers of oysters in the patent tongs ranged from 48 bushels per acre at station M1 to 985 bushels per acre at station N5; shell ranged from 74 bushels per acre at station M5 to 838 bushels an acre at N1 (Table 4, Figure 2). The 105 boxes (shells which are still hinged but are empty of meat) comprised 6% of the catch of oysters; this indicates a mortality which is normal for the area.

The bottom over most of this tract was a mixture of mud, sand and shell, which formed a mixture firm enough to support oysters.

On the average, this tract of ground had 204 bushels of large oysters and 182 bushels of small oysters per acre; these densities are adequate for commercial harvesting.

Table 3

Numbers of Live Oysters, Shells and Boxes Found at Each Station (2 grabs) on a Plot of Oyster Planting Ground Adjacent to the James River Bridge and Leased by J. H. Miles & Co. 7 December 1978.

Station	Area Covered By Sampling (sq yds)	Live Oysters (Numbers)			Boxes (Numbers)	Shell (Quarts)
		Large	Small	Total		
L1	2.6	24	27	51	9	18.0
M1	2.6	3	13	16	3	20.5
N1	2.6	18	38	56	5	22.5
O1	2.6	38	83	121	2	21.5
M6	2.6	59	104	163	22	12.0
N2	2.6	13	35	48	2	16.5
M2	2.6	8	8	16	1	7.0
N3	2.6	44	132	176	11	14.0
M3	2.6	69	153	222	8	16.5
N4	2.6	60	144	204	15	15.0
M4	2.6	21	32	53	2	5.0
N5	2.6	84	210	294	13	10.5
M5	2.6	34	27	61	6	2.0
N6	2.6	27	47	74	6	3.0
Totals	36.4	502	1,053	1,555	105	184.0

Table 4

Estimated Densities and Quantities of Live Oysters, Boxes and Shell on a Plot of Oyster Planting Ground Adjacent to the James River Bridge and Leased by J. H. Miles & Co. 7 December 1978.

Station	Bottom Type	Density of Live Oysters (Bu/Acre)			Boxes (% of Total)	Density of Surface & Buried Shell (Bu/Acre)
		Large	Small	Total		
L1	MS	136	65	201	15	670
M1	MS	17	31	48	16	763
N1	MS	102	92	194	8	838
O1	MS	216	201	417	2	800
M6	MS	335	252	587	12	447
N2	MS	74	85	159	4	614
M2	MS	45	19	64	6	261
N3	MS	250	320	570	6	521
M3	MS	392	370	762	3	614
N4	MS	340	348	688	7	558
M4	MS	119	77	196	4	186
N5	MS	477	508	985	4	391
M5	S	193	65	258	9	74
N6	S	153	114	267	8	112
Average		204	182	386	6	489
Estimated bushels on entire plot		8,547	7,647	16,194	1,094	20,551

Notes:

MS = Muddy sand; S = Sand.

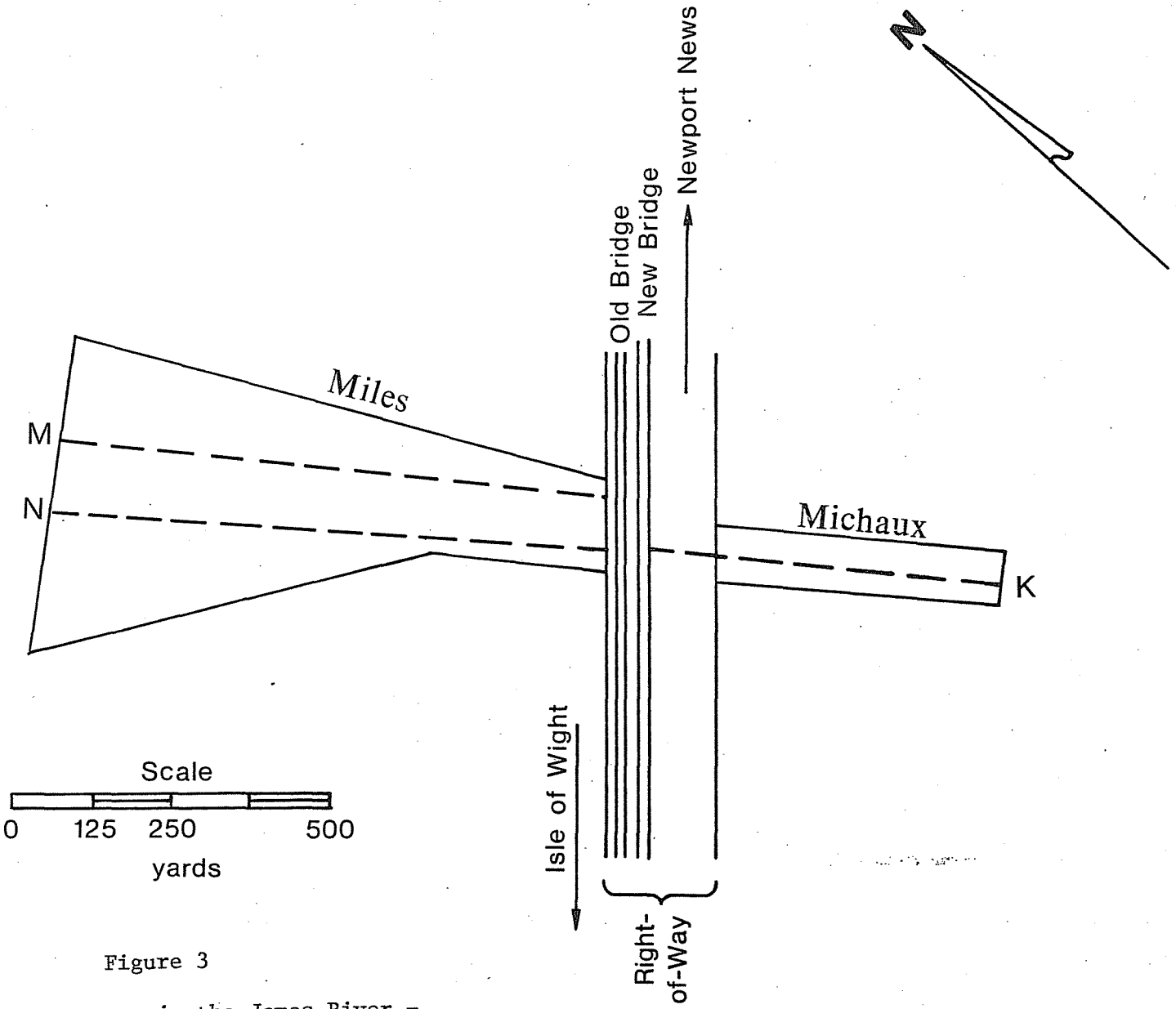


Figure 3

Fathometer traces in the James River - 1978.

Quantities of large and small oysters estimated from the above densities on December 7, 1978, were 8,547 bushels and 7,647 bushels, respectively, on the 42 acres of this lease (Table 4).

The fathometer revealed a generally flat bottom with scattered low mounds (presumably oysters and shell). The bottom near the bridge was much shallower than the majority of the lease; sampling revealed that the bottom here was very hard.

Lease of L. S. Michaux Estate

Three stations were sampled on this eight acre lease (Table 1, Figure 1). The sandy bottom yielded two small oysters and one-fifth of a quart of shell at one station and no oysters or shell at the other two (Table 5). No boxes, spat, or hard clams were recovered. We estimate that there were 13 bushels of oysters and 20 bushels of shell on this plot (Table 6).

Fathometer tracings of the bottom show a flat bottom on this lease (see appendix).

SUMMARY

Value of the Oysters and Shell on the Leases

Calculation of value was based on quantities of oysters and shell determined from our sampling and the

Table 5

Numbers of Live Oysters, Shells and Boxes Found at Each Station (2 grabs) on a Plot of Oyster Planting Ground Adjacent to the James River Bridge and Leased by L. S. Michaux Estate. 7 December 1978.

Station	Area Covered By Sampling (sq yds)	Live Oysters (Numbers)			Boxes (Numbers)	Shell (Quarts)
		Large	Small	Total		
K1	2.6	0	0	0	0	0.0
K2	2.6	0	2	2	0	0.2
K3	2.6	0	0	0	0	0.0
Totals	7.8	0	2	2	0	0.2

Table 6

Estimated Densities and Quantities of Live Oysters, Boxes and Shell on a Plot of Oyster Planting Ground Adjacent to the James River Bridge and Leased by L. S. Michaux Estate. 7 December 1978.

Station	Bottom Type	Density of Live Oysters (bu/acre) Total	Boxes (% of Total)	Density of Surface & Buried Shell (bu/ac)
K1	S	0	0	0
K2	S	5	0	7
K3	S	0	0	0
Average		2	0	2
Estimated bushels on entire plot		13	0	20

Notes:

S = Sand.

following prices:

$10.00 per bushel for large oysters[1];

$4.00 per bushel for small oysters[1]; and

$0.26 per bushel for shell (this is what the VMRC paid in 1977 to have shells planted).

Miles

The total shellfish resource (large oysters, small oysters, and shell) on Miles' lease on the bottom was estimated to be as follows (Table 7):

Large oysters 8,547 bu @ $10	=	$ 85,470.00
Small oysters 7,647 bu @ $ 4	=	30,588.00
Shell 21,645 bu @ $0.26[2]	=	5,627.70
Total Value		$121,685.70

Of course, this estimate does not take into account harvest costs and assumes 100% harvest. It is usual to leave as many as 10-20% of the oysters on the bottom after harvest.

Data taken for this study compares very closely with 1976 data for quantity of oysters, percentage of boxes, and bottom profiles. Quantity of shell found in 1978 was almost five times that found two and a half years earlier; the increase may be due to planting, the effects of a previous dredging or erosion of surface sediments.

[1]This is a maximal value which might be obtained by selling oysters (James River) in summer.

[2]This is the shell on the surface and in the upper 4-5 inch layer.

Table 7

Estimated Value[1] of Oysters and Shells on Leased Ground Adjacent to the James River Bridge Near the Newport News End - December 1978.

Lessee	Oysters						Shell (Including Boxes)	
	Large Oysters		Small Oysters		Total			
	Quantity[2] (bu)	Value ($)	Quantity[2] (bu)	Value ($)	Quantity[2] (bu)	Value ($)	Quantity[2] (bu)	Value ($)
Miles	8,547	85,470	7,647	30,588	16,194	116,058	21,645	5,627.70
Michaux	0	0	13	52	13	52	20	5.20

Notes:

1. Calculation of value based on the following prices: for large (3 inch or longer) oysters - $10/bu is a maximal dockside price for James River oysters sold during the summer; for smaller oysters - $4/bu; and for shells = 26¢/bu, which is what the VMRC paid in 1977 to have shells planted.

2. From Tables 3 thru 6.

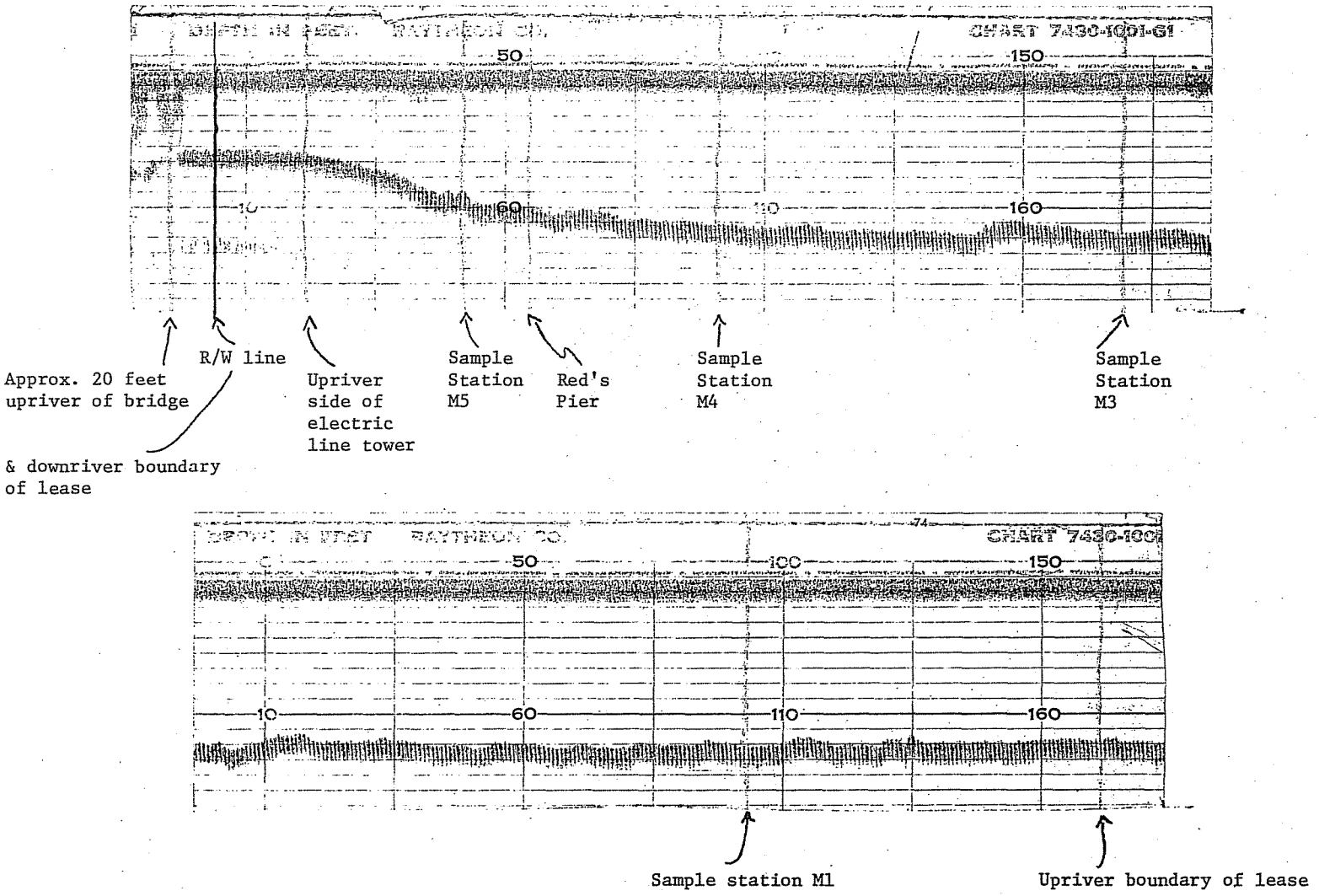
Michaux

The value of the shellfish resource on this lease was composed as follows (Table 7):

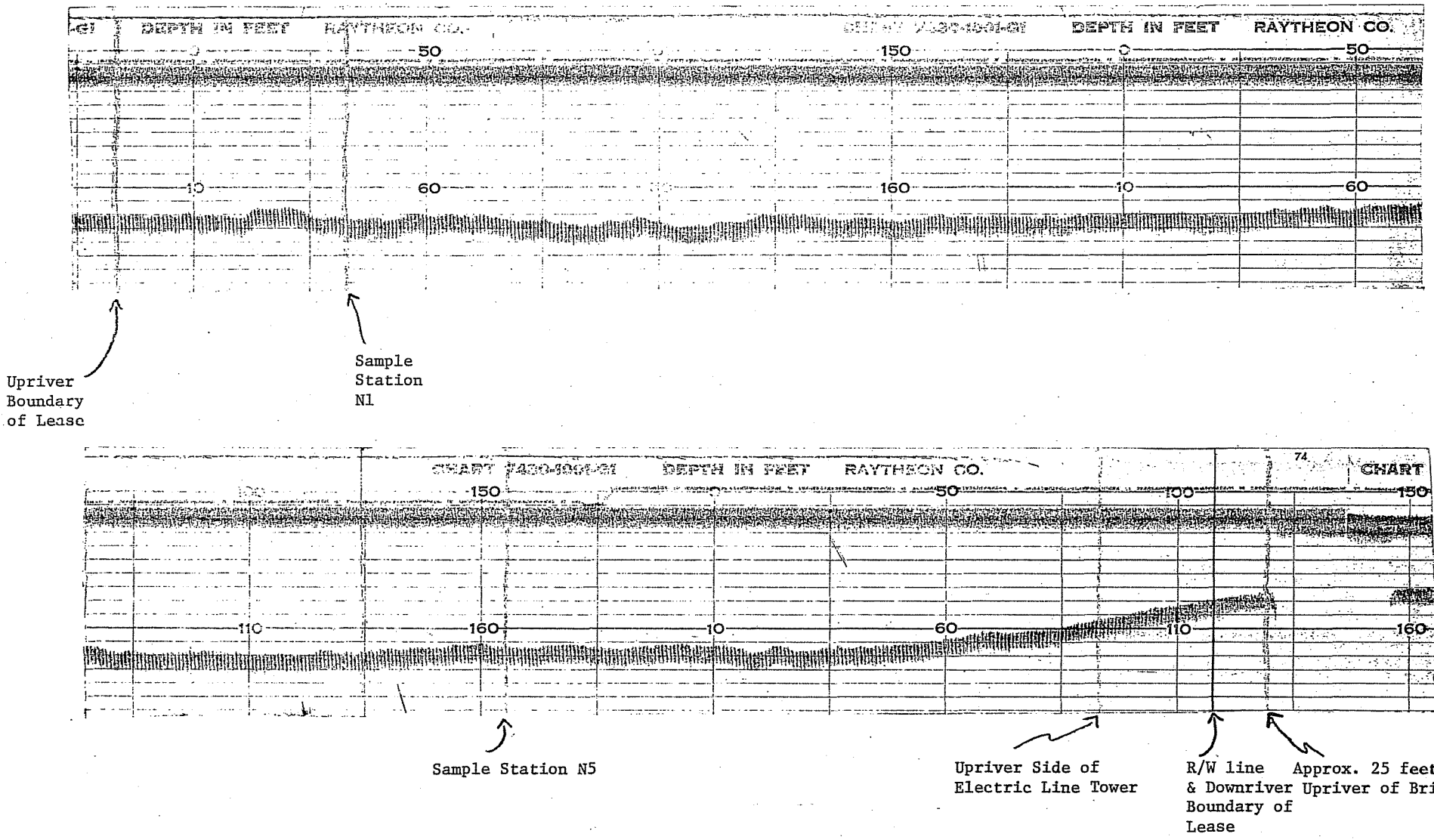
Small oysters 13 bu @ $4	=	$ 52.00
Shell 20 bu @ $0.26	=	5.20
Total Value		$ 57.20

Comparison of 1978 with 1976 data shows very close similarity.

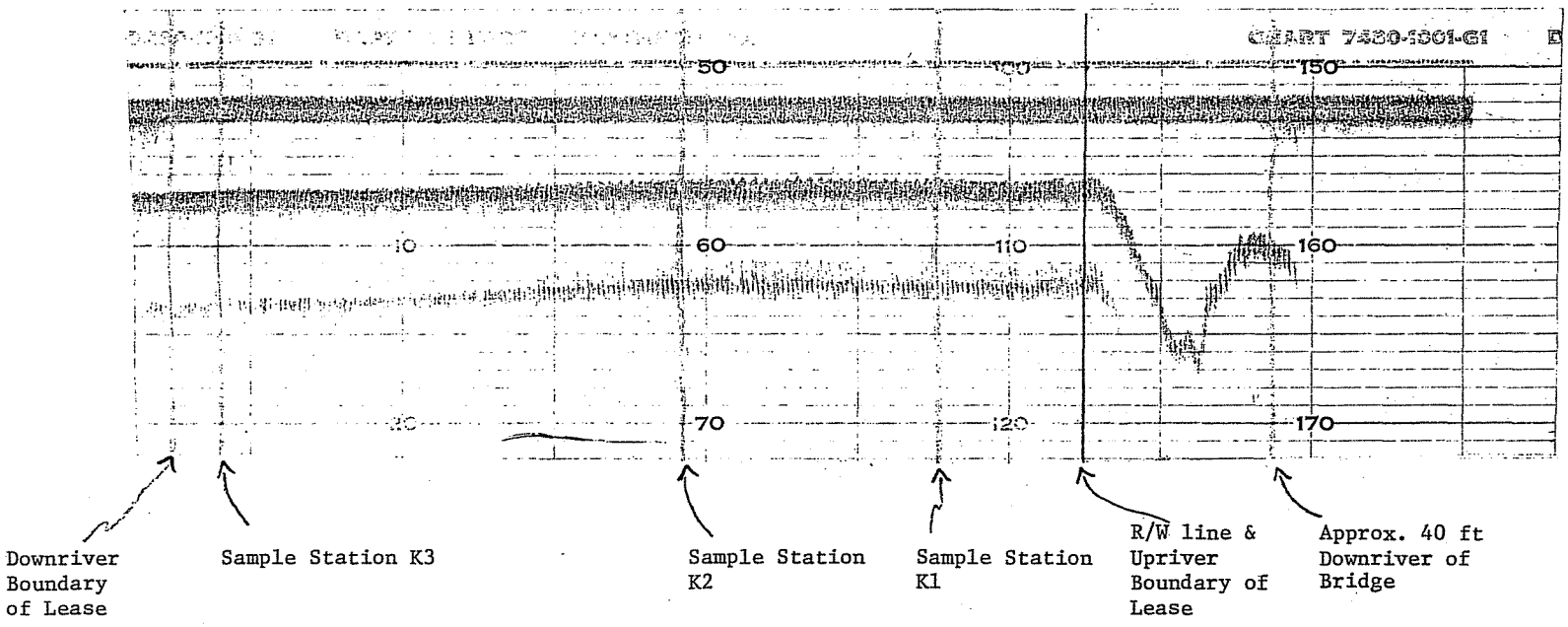
APPENDIX



Fathometer Tracing of the Bottom Along Transect M - Miles' Lease, Inshore (see Figure 3); made 7 December 1978.



Fathometer Tracing of the Bottom Along Transect N - Miles' Lease, Offshore (see Figure 3); made 7 December 1978



Fathometer Tracing of the Bottom along Transect K - Michaux' Lease (see Figure 3); made 7 December 1978.