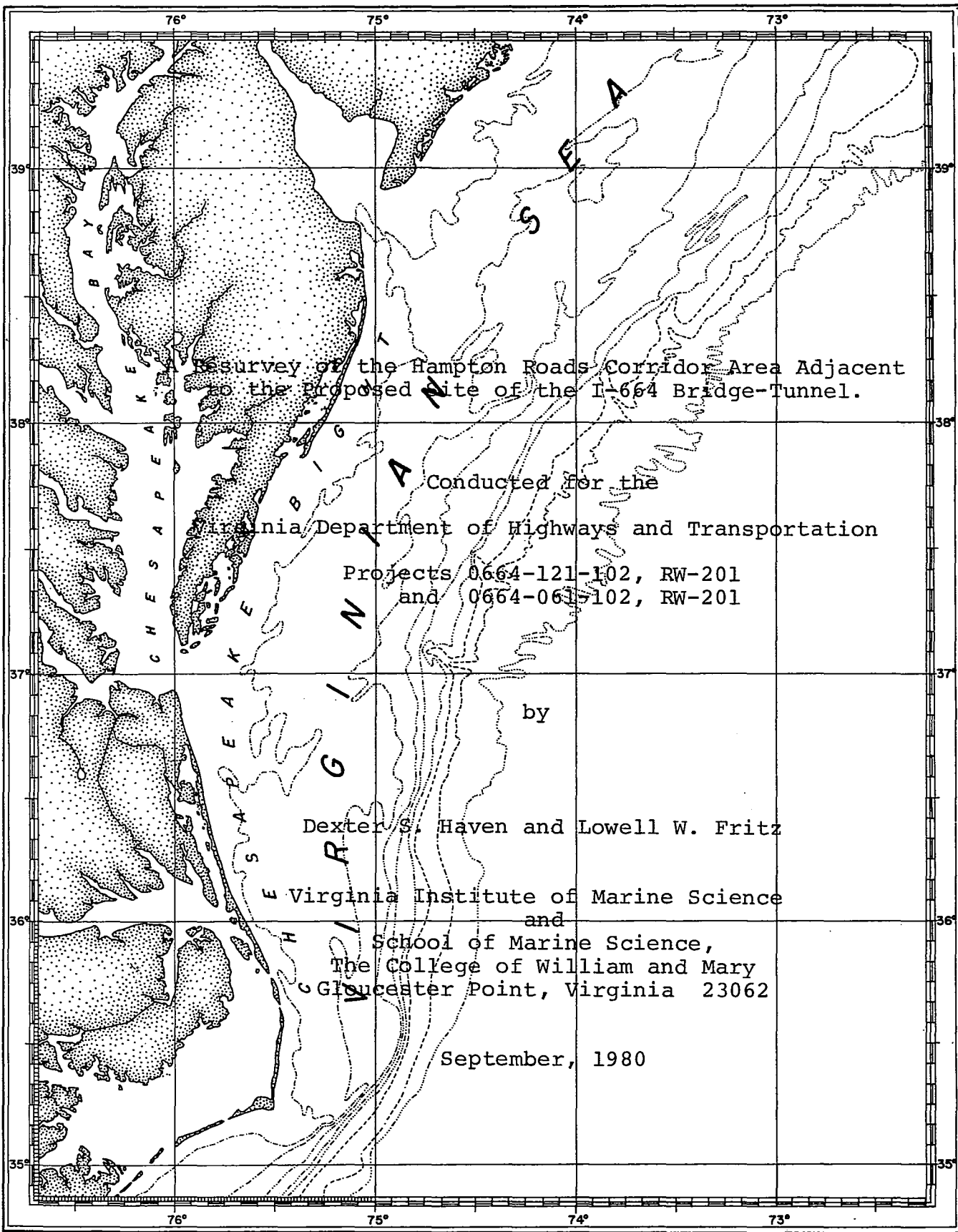


Haven



Resurvey of the Hampton Roads Corridor Area Adjacent
to the Proposed Site of the I-664 Bridge-Tunnel.

Conducted for the
Virginia Department of Highways and Transportation

Projects 0664-121-102, RW-201
and 0664-061-102, RW-201

by

Dexter S. Haven and Lowell W. Fritz

Virginia Institute of Marine Science
and

School of Marine Science,
The College of William and Mary
Gloucester Point, Virginia 23062

September, 1980

A Resurvey of the Hampton Roads Corridor Area Adjacent
to the Proposed Site of the I-664 Bridge-Tunnel.

Conducted for the
Virginia Department of Highways and Transportation
Projects 0664-121-102, RW-201
and 0664-061-102, RW-201

by

Dexter S. Haven and Lowell W. Fritz

Virginia Institute of Marine Science
and
School of Marine Science,
The College of William and Mary
Gloucester Point, Virginia 23062

September, 1980

INTRODUCTION

Background

On 5 September 1980 a survey was conducted by the Virginia Institute of Marine Science (VIMS) on Melzer's leased bottom (48.37 acres) off Newport News Point, Virginia (Figure 1). The study was done at the request of the Virginia Department of Highways and Transportation, Suffolk, Virginia in relation to the construction of I-664, Projects 0664-121-102, RW-201 and 0664-061-102, RW-201. The objective of this study was to determine the extent and value of the molluscan resource on Melzer's lease prior to construction activity. A second study would examine the area after the bridge-tunnel is completed.

Description of the Area

Melzer's 48.37 acre lease is located off Newport News Point where depths range between 4 and 18 feet at mean low water (MLW). Prior to 1960 the area to the northeast of this lease was leased to growers by the VMRC for oyster culture. Since the onset of the oyster pathogen MSX late in 1959, no oysters have been grown commercially in this region (Hampton Roads).

Hard clams are harvested commercially in this area by clammers using patent tongs. The usual daily catch per boat in the vicinity of this lease may be 5 to 6 thousand clams. The area is restricted for shellfish harvest

by the Virginia Department of Shellfish Sanitation. Clams may not be sold for direct consumption, but must first be relaid under the supervision of the Virginia Marine Resources Commission for 15 days in approved waters prior to reharvest and resale. This is a costly process. Consequently, the wholesale price of Hampton Roads clams is lower than for clams which do not come from restricted areas. The latest wholesale price for these clams is:

1. Over 2-3/4 inches long, 2¢ each;
2. Smaller than 2-3/4 inches long, 5¢ each.

METHODS

For sampling purposes the Melzer lease was surveyed and marked with stakes by the Virginia Marine Resources Commission (VMRC) prior to our study. A plot of the lease provided by the VMRC was subdivided into sampling areas 300 feet on each side¹ (Figure 1). Later, 14 of these squares were randomly selected for sampling. These squares were: 3, 4, 5, 13, 14, 15, 16, 18, 21, 22, 26, 27, 30-33, and 32-35 (Figure 1). In addition, squares 1 and 9 were sampled. These two samples are not used to calculate mean areas or dollar values. They were taken since they were nearest the construction site. The

¹Some areas on the margins of the 300 X 300 ft plots were smaller in two instances these were included into adjacent plots.

data will be used at some future date to evaluate possible changes.

All samples were taken by a chartered research vessel the JUDITH ANN captained by Mr. DeAlteris. All sampling, analysis of the data and preparation of this report was by VIMS personnel. This boat was equipped with patent tongs which covered a bottom area of 36" X 46" (11.5 ft²). The "bar width" on the tongs was about one inch. Therefore, clams larger than 25 mm in width would be captured by the gear.

The actual location of the squares to be sampled on the lease was determined by reference to the poles set at the corners of the plot by the VMRC. Using these as reference points a floating buoyed rope of known length was towed astern of the research vessel so squares might be located. When necessary, areas to be sampled were marked with buoys.

The samples were collected as follows. The boat was positioned near the upriver or downriver edge of a single square and a heavy chain-anchor drag lowered to the bottom. This type of anchor allowed the boat to be moved slowly across the square by the current (or by the boat's motor, if needed) as 10 patent tong samples were collected.

The catch of each grab was examined and the following data recorded:

1. Numbers of clams collected in each grab;
2. Bottom type - mud, sand, shell or clay;

3. The presence or absence of live oysters;
4. The presence or absence of clam or oyster shells.

Later, all clams from a single station were combined and transported to the laboratory where length, height and width (see Appendix) were recorded to the nearest mm.

Loran readings were taken at the start and end of each sampling sequence.

RESULTS

Bottom Type

The predominant bottom type at each station is shown in Table 1. It varied from fine sand, mud or clay without shells to a bottom containing mostly oyster shell. Single clam shells and fragments of clam shells were common. Numbers were estimated to range from about 0 to 6 per grab. Oyster shell ranged from none to about 50% of the volume of each grab.

Most of the oyster shell was buried; squares 5 and 13, however, contained much surface shell.

No live oysters were taken.

An unusual condition was noted in square 16 where the patent tongs raised blackened fine sand which indicated anaerobic conditions.

Density Per Acre

Hard clams occurred in moderate abundance at every station sampled; the range was from 0.096/ft² to 0.322/ft²; the average density was 0.2/ft² (Table 1). Calculations based on these data indicate an average density of 8,712 clams per acre (43,560 sq ft/acre X 0.2 clams/ft²).

Lengths of Clams

The length, height and width of all clams captured by the patent tongs is shown in the Appendix of this report; lengths are shown in 5 mm class intervals, along with percentage of totals in Table 2. An analysis of Table 2 shows that 40.8% of all clams captured were less than 2-3/4 inch (70 mm) in length. That is, this percentage was classed as littleneck or cherrystone.

Value of the Hard Clam Resource Per Acre

Information obtained from dealers indicate that clams 2-3/4 inches or less are considered "nicks" or "cherry-stones" by the trade. These sell (from restricted waters) at five cents each. Clams over 2-3/4 inches are considered chowders and there is little demand at present. For the purpose of this report, they are slightly overvalued at two cents each. Often they sell, however, for one cent and sometimes there is no market. Values for the clams on the lease are calculated as follows:

Table 2 shows the lengths and average size of all clams collected in the study. These data indicate that 40.8% of the clams captured by the patent tongs on the leased area were under 2-3/4 inches (70 mm) and 59.2% were larger (chowders). Therefore, the average value based on densities given above are:

$$8,712 \times 40.8\% \times 5\text{¢} = \$177.72$$

$$8,712 \times 59.2\% \times 2\text{¢} = \underline{103.15}$$

$$\text{TOTAL} \quad \$280.87$$

That is, the total value of hard clams if all were harvested per acre is approximately \$280.87.

The VMRC lists 48.37 acres in this lease. Therefore, the overall value of the clams in the bottom is \$280.87 X 48.37 acres = \$13,586. Naturally, it would be impossible to harvest all these clams and the values given are clearly maximal. Moreover, our estimate does not include costs of harvest.

It is concluded that the entire area surveyed now supports hard clam populations which range from about 0.096 to 0.322/ft². Most of the clams (59.2%) are over 2-3/4 inches (70 mm) are in the "chowder" size class. These have a low value on today's market.

Table 1

Results of sampling for hard clams on Melzer's lease on 5 September 1980. Data shows for each station Loran readings, bottom type, number of clams/grab, average number/grab and total clams taken for each grab.

No. 1 - Depth 11 ft (Not one of the random selections)

Loran 41250.9
27274.9

Bottom type: hard sand and shells

No. of clams in each grab: 2, 3, 3, 2, 2, 3, 0, 0, 1, 0, 1
Total = 17

Average/grab = 1.7

Average/ft² = 0.148

No. 3 - Depth 12 ft

Loran 41250.8
27274.6

Bottom type: hard sand, gravel and shells

No. of clams in each grab: 2, 2, 1, 1, 1, 4, 1, 2, 1, 4
Total = 19

Average/grab = 1.9

Average/ft² = 0.165

No. 4 - Depth 11 ft

Loran 41251.4
27274.6

Bottom type: gravel, shells and sand

No. of clams in each grab: 4, 2, 2, 1, 2, 2, 4, 3, 4, 7
Total = 31

Average/grab = 3.1

Average/ft² = 0.269

Table 1 (Contd.)

No. 5 - Depth

Loran 41251.8
27274.6

Bottom type: shelly sand

No. of clams in each grab: 0, 3, 4, 3, 2, 3, 1, 4, 1, 2
Total = 23

Average/grab = 2.3

Average/ft² = 0.200

No. 9 - Depth 10-12 ft (Not one of the random selections)

Loran 41250.9
27275.0

Bottom type: fine sand, no shell; sand anaerobic!

No. of clams in each grab: 3, 2, 1, 1, 1,
Total = 8

Average/grab = 1.6

Average/ft² = 0.139

No. 13 - Depth 11-14 ft

Loran 41252.9
27274.3

Bottom type: old oyster ground, exposed surface shell in almost
all grabs, substrate sandy

No. of clams in each grab: 1, 1, 2, 1, 6, 4, 0, 1, 3, 5
Total = 24

Average/grab = 2.4

Average/ft² = 0.209

Table 1 (Contd.)

No. 14 - Depth 13 ft

Loran 41253.3
27274.3

Bottom type: hard clay-sand; clay is sticky

No. of clams in each grab: 3, 9, 0, 3, 3, 1, 1, 0, 5, 1
Total = 26

Average/grab = 2.6

Average/ft² = 0.226

No. 15 - Depth 10 ft

Loran 41253.7
27274.0

Bottom type: few shells in a sand-mud bottom

No. of clams in each grab = 1, 2, 4, 11, 3, 7, 4, 3, 0, 2
Total = 37

Average/grab = 3.7

Average/ft² = 0.322

No. 16 - Depth 10-12 ft

Loran 41251.8
27275.1

Bottom type: soft fine sand - anaerobic condition in sand!
(3 missing from lot); no oyster shell or clam
shell.

No. of clams in each grab: 0, 1, 2, 0, 1, 2, 1, 2, 0, 2
Total = 11

Average/grab = 1.1

Average/ft² = 0.096

Table 1 (Contd.)

No. 18 - Depth 7-15 ft

Loran 41251.8
27275.1

Bottom type: fine sand, no shell

No. of clams in each grab = 0, 1, 1, 1, 2, 0, 2, 0, 2, 2
Total = 11

Average/grab = 1.1

Average/ft² = 0.956

No. 21 - Depth 15-17 ft

Loran 41253.7
27274.5

Bottom type: find sand with a few scattered oyster shell

No. of clams in each grab: 0, 4, 1, 6, 8, 0, 2, 3, 0, 5
(2 less on L.F.) Total = 29

Average/grab = 2.9

Average/ft² = 0.252

No. 22 - Depth 19 ft

Loran 41253.8
27274.4

Bottom type: find sand with some mud; no shell

No. of clams in each grab: 3, 0, 1, 0, 2, 1, 0, 4, 2, 1
Total = 14

Average/grab = 1.4

Average/ft² = 0.122

Table 1 (Contd.)

No. 26 - Depth 11 ft

Loran 41254.0
27274.7

Bottom type: fine sand

No. of clams in each grab: 1, 1, 2, 2, 1, 2, 3, 1, 0, 4
Total = 17

Average/grab = 1.7

Average/ft² = 0.148

No. 27 - Depth 9 ft

Loran 41254.8
27274.5

Bottom type - fine sand, no shell

No. of clams in each grab: 3, 2, 1, 1, 2, 2, 2, 4, 3, 1
Total = 21

Average/grab = 2.1

Average/ft² = 0.183

No. 30 and 33 - Depth 10 ft

Loran 41256.9
27274.4

Bottom type: fine sand, no shell; about 33 clam shells in 10 grabs

No. of clams in each grab: 0, 2, 5, 2, 2, 3, 1, 2, 5, 1
Total = 23

Average/grab = 2.3

Average/ft² = 0.200

Table 1 (Contd.)

No. 32 and 35 - Depth 7 ft

Loran 41257.3
27274.3

Bottom type: fine sand; no shell

No. of clams in each grab: 1, 2, 4, 2, 1, 6, 5, 2, 0, 0
Total = 23

Average/grab = 2.3

Average/ft² = 0.200

Average for all stations except No. 1 and 9 = 2.20 clams/grab

Average/ft² for all stations except No. 1 and 9 = 0.193 clams/grab

Table 2

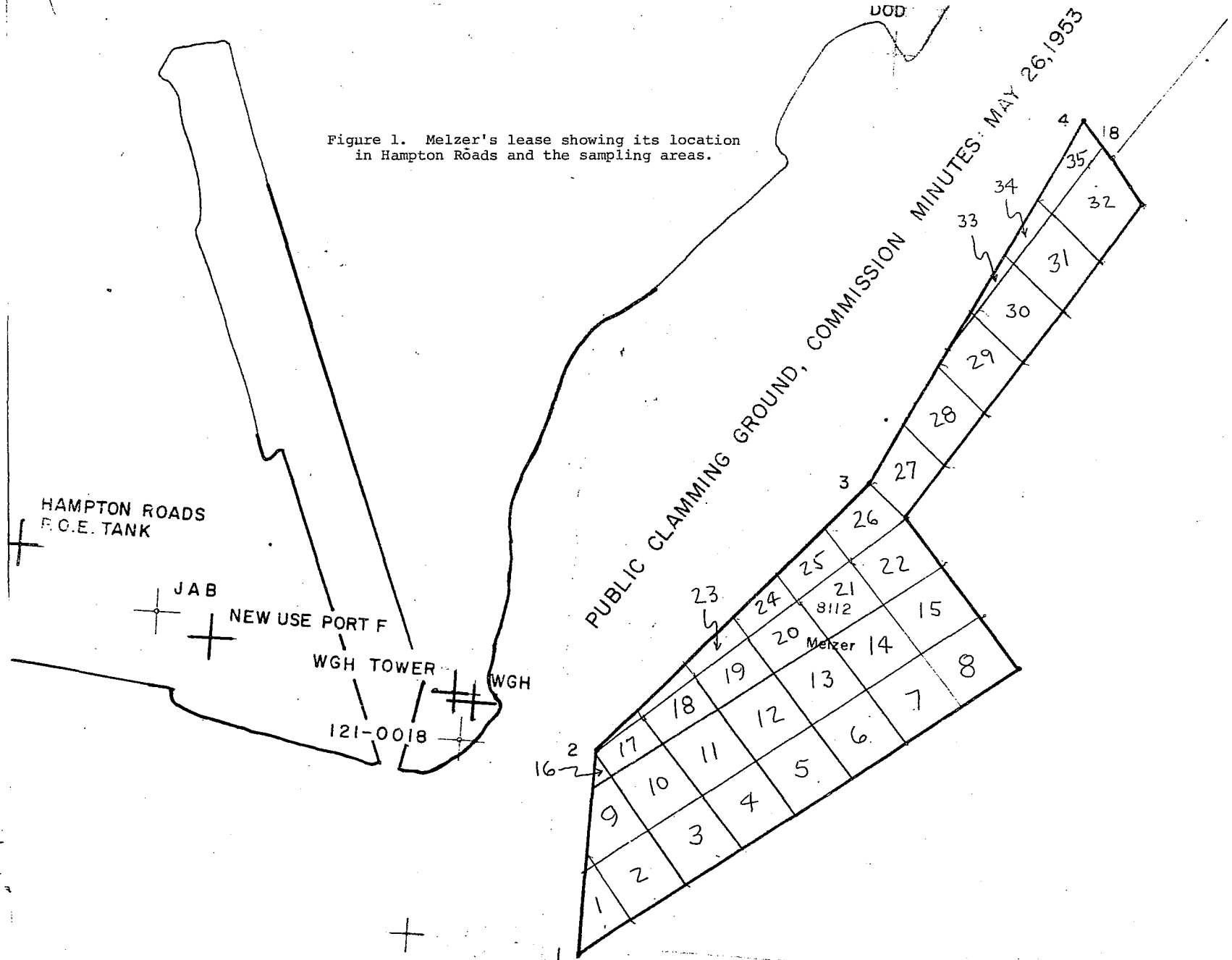
Length Frequencies,¹ Average Size and Percent Total in Various Size Classes of Hard Clams Harvested By Patent Tongs at Stations in Melzer's Lease Off Newport News Point.

5 September 1980

Length Interval mm	Station No.																Total No.	Percent Total
	<u>1</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>9</u>	<u>13</u>	<u>14</u>	<u>15</u>	<u>16</u>	<u>18</u>	<u>21</u>	<u>22</u>	<u>26</u>	<u>27</u>	<u>30- 33</u>	<u>32- 35</u>		
20-24.9												1					1	0.4
25-29.9																		
30-34.9		1												1			2	0.7
35-39.9			1									2					3	1.1
40-44.9		2	2			1					1	1	1				9	3.3
45-49.9		1	1	1		1	1	1			1						7	2.6
50-54.9	1	1			2		1	1		1	2	1			1		4	1.5
55-59.9			2	3	1		1	1		1	5	1					14	5.2
60-64.9	1	2	4	7	1	5		2			2			2	2	2	30	11.1
65-69.9	4	1	4	4	4	4	5	8			6	1		3	5	3	40	14.9
70-74.9	3	5	8	3	2	1	6	8	2	1	6	4	3	3	3	5	46	17.1
75-79.9	6	4	2	4	1	6	7	5		2			2	2	2	2	37	13.8
80-84.9	1	1	3	1	1	2	3	5	5	4	4	1	5	4	6	5	44	16.4
85-89.9	1	1	2			3	1	4	1	2		1	3	2	3		20	7.4
90-94.9						1	1	2					1	2	1	2	10	3.7
95-99.9																2	2	0.7
Total	17	19	29	23	8	24	25	37	8	11	27	13	15	21	23	21	269	
Average Length	73.3	66.2	71.6	66.7	66.4	72.5	73.2	68.8	81.2	77.2	66.0	59.8	79.8	73.5	75.7	77.4		

¹Squares 1 and 9 excluded; 2-3/4 inch (70 mm) is the maximum size of cherrystones.

Figure 1. Melzer's lease showing its location in Hampton Roads and the sampling areas.



Appendix

Length, Height and Width of Hard Clams Captured on Melzer's Ground on 5 September 1980 with Patent Tongs. Area Collected Off Newport News Point, James River, Virginia.

<u>Location</u>	<u>Clams No.</u>	<u>Length mm</u>	<u>Height mm</u>	<u>Width mm</u>	<u>Remarks</u>
9	8	71.2	62.8	38.8	Not one of the random samples
9	2	54.9	52.2	32.8	
9	3	50.3	45.7	26.2	
9	4	57.4	53.2	32.7	
9	6	71.8	65.4	40.5	
9	1	60.5	55.2	32.6	
9	7	79.4	72.8	41.4	
9	5	85.4	80.6	49.7	
Average		66.4			
3	1	61.8	56.1	34.0	
3	2	72.3	65.7	41.0	
3	3	73.7	66.0	39.2	
3	4	83.9	78.5	47.9	
3	5	87.0	81.9	50.4	
3	6	33.3	30.2	17.6	
3	7	76.2	68.9	43.8	
3	8	74.0	69.1	46.5	
3	9	54.3	48.8	28.5	
3	10	44.8	39.7	26.6	
3	11	43.6	39.2	21.2	
3	12	72.1	66.3	39.3	
3	13	67.0	62.3	38.9	
3	14	45.7	40.8	24.1	
3	15	76.6	69.9	43.9	
3	16	78.1	72.5	45.6	
3	17	63.6	59.3	34.6	
3	18	77.4	71.8	42.4	
3	19	71.5	65.1	39.7	
Average		66.2			
16	1	82.7	79.8	49.3	3 clams missing from collection
16	2	86.4	78.7	48.4	
16	3	83.0	79.8	49.0	
16	4	74.6	69.5	45.2	
16	5	83.6	77.7	49.3	
16	6	82.2	77.9	45.6	
16	7	84.8	78.5	44.8	
16	8	72.5	68.9	43.8	
Average		81.2			

Appendix (Contd.)

Location	Clams No.	Length mm	Height mm	Width mm	Remarks
1	1	63.3	58.3	33.4	Sand
1	2	79.1	74.5	44.0	
1	3	80.3	74.3	43.7	
1	4	74.3	70.6	42.7	
1	5	79.7	74.2	45.6	
1	6	69.2	67.0	42.3	
1	7	70.4	64.0	39.3	
1	8	69.3	65.4	41.0	
1	9	89.2	83.5	51.7	
1	10	54.2	50.6	32.9	
1	11	77.7	71.0	41.1	
1	12	77.7	70.4	44.4	
1	13	78.6	70.8	41.2	
1	14	73.6	67.8	41.4	
1	15	68.4	63.8	38.1	
1	16	65.6	61.0	33.8	
1	17	76.3	77.1	46.9	
Average		73.3			
5	1	61.7	57.5	32.9	<u>Bottom Trash</u> 1) 32 clam shells (3 qts) 2) oyster shell, coal, small rocks (3.5 qts)
5	2	80.3	74.6	47.3	
5	3	49.7	43.0	27.6	
5	4	71.7	67.0	42.6	
5	5	62.1	58.7	35.9	
5	6	79.2	73.8	42.5	
5	7	57.6	53.8	32.9	
5	8	64.8	57.9	34.8	
5	9	64.1	60.5	35.9	
5	10	66.9	63.3	39.4	
5	11	57.1	53.4	30.4	
5	12	76.1	69.2	40.5	
5	13	68.0	64.4	40.1	
5	14	65.9	60.1	35.5	
5	15	76.6	71.5	42.3	
5	16	76.4	73.8	47.1	
5	17	57.8	50.3	30.0	
5	18	62.3	57.6	35.2	
5	19	71.6	64.5	38.4	
5	20	64.4	56.3	33.6	
5	21	70.7	63.1	36.3	
5	22	69.1	64.5	38.6	
5	23	61.4	55.7	--*	
Average		66.7			*one valve broken

Appendix (Contd.)

Location	Clams No.	Length mm	Height mm	Width mm	Remarks
18	1	54.4	50.2	30.8	Fine sand; no shell
18	2	84.5	80.0	49.3	
18	3	59.3	55.1	34.8	
18	4	86.6	82.2	50.9	
18	5	79.0	76.4	51.6	
18	6	71.3	68.5	45.9	
18	7	82.1	77.7	50.6	
18	8	83.5	78.3	46.2	
18	9	78.2	78.5	47.6	
18	10	82.0	77.1	49.8	
18	11	88.4	85.5	51.8	
Average		77.2			
22	1	69.5	64.4	40.5	1 clam missing
22	2	58.8	56.0	33.5	<u>Bottom Trash</u> 59 clam shells (5 qts) oyster shells, conchs, coal fragments, rocks: 3-4" diameter (10 qts)
22	3	88.4	79.6	48.4	
22	4	24.7	21.0	13.0	
22	5	80.3	78.1	50.3	
22	6	35.0	31.3	18.7	
22	7	74.6	68.3	40.0	
22	8	70.0	65.7	38.5	
22	9	70.4	63.5	39.2	
22	10	42.1	39.8	25.2	
22	11	39.0	34.9	23.1	
22	12	53.7	47.2	29.9	
22	13	71.4	66.0	40.8	
Average	59.	59.8			
30-33	1	72.7	68.8	45.5	<u>Bottom Trash</u>
30-33	2	76.3	70.3	41.1	33 clam shells (3 qts) shells (1 qt) One clam missing from collection *broken shell
30-33	3	62.2	58.4	34.7	
30-33	4	93.7	92.6	55.3	
30-33	5	83.0	81.4	48.3	
30-33	6	52.8	48.1	28.9	
30-33	7	88.0	81.4	49.3	
30-33	8	89.7	82.1	49.9	
30-33	9	81.0	78.8	52.4	
30-33	10	73.5	69.8	41.5	
30-33	11	68.6	62.9	39.6	
30-33	12	83.4	83.6	52.7	
30-33	13	75.8	68.1	--*	
30-33	14	69.1	62.7	37.8	
30-33	15	80.0	73.1	44.2	

Appendix (Contd.)

<u>Location</u>	<u>Clams No.</u>	<u>Length mm</u>	<u>Height mm</u>	<u>Width mm</u>	<u>Remarks</u>
30-33	16	86.8	79.9	45.3	Fine sand; no shell
30-33	17	66.0	59.7	35.9	
30-33	18	69.2	64.8	--*	*Broken
30-33	19	69.0	65.7	40.6	
30-33	20	60.8	55.4	34.4	
30-33	21	73.2	68.7	43.7	
30-33	22	82.4	75.2	--*	*Broken
30-33	23	83.6	77.9	46.8	
Average		75.7			
14	1	76.6	74.2	44.2	<u>Bottom Trash</u>
14	2	76.4	69.2	40.9	
14	3	91.3	84.0	50.4	42 clam shells (4 qts)
14	4	80.0	78.5	49.1	
14	5	81.7	77.6	50.4	shells, rocks, conch shells
14	6	79.0	72.4	41.6	(2 qts)
14	7	56.1	50.4	30.2	
14	8	49.0	44.3	27.3	one clam missing from collection
14	9	70.2	63.1	39.2	
14	10	68.0	61.7	36.2	
14	11	77.2	76.6	46.7	
14	12	66.3	62.5	39.3	
14	13	73.3	68.0	41.7	
14	14	68.2	63.4	37.8	
14	15	65.8	60.6	36.1	
14	16	73.6	68.4	42.2	
14	17	82.4	77.7	42.7	
14	18	71.2	67.0	42.0	
14	19	70.1	62.9	35.0	
14	20	66.7	63.5	40.9	
14	21	75.9	70.8	41.9	
14	22	76.1	73.9	45.0	
14	23	77.0	71.4	43.2	
14	24	85.7	80.2	50.0	
14	25	73.1	65.2	40.4	
Average		73.2			
26	1	83.0	78.3	48.7	<u>Bottom Trash</u>
26	2	79.0	74.2	47.9	
26	3	80.9	76.1	51.1	22 shells (clam) = 2 qts
26	4	80.5	76.6	48.3	
26	5	87.7	82.1	51.9	1.25 qts shells, etc.; one more clam on talley sheet

Appendix (Contd.)

Location	Clams No.	Length mm	Height mm	Width mm	Remarks
26	6	93.7	85.7	49.0	
26	7	85.9	83.0	49.8	
26	8	41.3	38.5	22.0	
26	9	83.4	77.4	44.4	
26	10	77.3	72.6	40.9	
26	11	81.3	74.4	43.6	
26	12	74.3	69.0	41.6	Broken shell
26	13	73.2	67.2	42.0	
26	14	85.4	82.8	48.8	
26	15	89.4	82.7	51.4	2 clams missing from collection
Average		79.8			
27	1	80.0	76.4	44.4	<u>Bottom Trash</u>
27	2	86.3	81.0	51.1	
27	3	90.1	82.2	51.9	
27	4	81.9	78.1	47.1	2-1/2 qts, 25 clam shells
27	5	68.6	62.9	36.6	
27	6	59.0	54.1	31.1	7 qts, oyster shells, conchs, moon snails
27	7	74.0	69.7	45.4	
27	8	86.9	80.0	48.8	
27	9	69.8	65.6	40.6	
27	10	68.1	62.7	38.2	
27	11	57.7	51.7	32.9	
27	12	71.1	65.0	38.8	
27	13	74.5	69.6	42.2	
27	14	32.1	27.9	15.7	
27	15	93.9	88.2	53.4	
27	16	77.5	71.5	43.3	
27	17	64.1	58.0	36.8	
27	18	63.2	58.8	35.8	
27	19	83.8	79.3	49.8	
27	20	79.6	72.7	44.7	
27	21	81.2	74.7	42.3	
Average		73.5			
32-35	1	65.9	62.6	37.1	<u>Bottom Trash</u>
32-35	2	62.7	58.8	36.0	
32-35	3	77.9	73.9	46.6	28 shells (clams)
32-35	4	90.5	83.3	49.7	3 qts
32-35	5	81.0	74.2	44.2	
32-35	6	70.9	66.6	37.4	
32-35	7	74.8	69.6	40.9	
32-35	8	81.4	78.1	49.5	

Appendix (Contd.)

<u>Location</u>	<u>Clams No.</u>	<u>Length mm</u>	<u>Height mm</u>	<u>Width mm</u>	<u>Remarks</u>	
32-35	9	80.8	79.0	44.9	2 missing from collection	
32-35	10	70.8	67.7	40.5		
32-35	11	98.4	92.0	53.1		
32-35	12	65.3	60.3	39.1		
32-35	13	62.5	57.6	35.4		
32-35	14	74.4	70.6	42.2		
32-35	15	71.4	67.5	37.5		
32-35	16	66.4	64.1	39.8		
32-35	17	76.6	71.3	42.3		
32-35	18	82.7	81.6	47.3		
32-35	19	95.9	87.1	50.9		
32-35	20	84.0	76.3	44.9		
32-35	21	90.5	88.0	54.3		
Average		77.4			1 broken shell	
15	1	67.4	62.4	37.6	<u>Bottom Trash</u>	
15	2	71.0	69.9	42.2		
15	3	64.9	59.7	36.0		51 shells, 5 qts
15	4	80.8	77.7	47.3		
15	5	73.7	69.6	39.9		junk shell, rocks, 5 qts
15	6	61.5	55.6	34.0		
15	7	77.4	70.3	41.4		
15	8	67.9	62.9	37.3		
15	9	81.8	73.3	43.6		
15	10	69.9	63.9	37.6		
15	11	66.1	62.7	35.6		
15	12	68.6	62.4	35.9		
15	13	68.0	63.3	39.5		
15	14	89.6	86.4	53.4		
15	15	80.9	73.4	43.4		
15	16	64.7	62.4	36.7		
15	17	81.2	77.7	46.9		
15	18	42.0	38.1	23.0		
15	19	89.1	83.4	47.2		
15	20	63.8	58.6	36.0		
15	21	71.0	66.4	37.7		
15	22	67.9	63.1	40.5		
15	23	64.1	59.3	35.7		
15	27	61.2	53.1	32.1		
15	25	63.0	60.2	37.7		
15	26	78.3	70.5	44.3		
15	27	50.7	46.4	28.4		
15	28	47.5	44.3	25.9		

Appendix (Contd.)

Location	Clams No.	Length mm	Height mm	Width mm	Remarks	
15	29	70.4	65.8	41.0	Few shells; sand-mud bottom	
15	30	70.5	64.0	42.7		
15	31	76.3	71.3	43.6		
15	32	65.7	61.8	44.7		
15	33	62.4	57.5	34.3		
15	34	56.8	52.9	30.7		
15	35	79.5	72.2	44.0		
15	36	77.9	71.9	41.6		
15	37	57.5	53.6	32.9		
Average		68.8				
21	1	66.9	61.0	35.7	<u>Bottom Trash</u>	
21	2	44.6	38.7	23.9		
21	3	54.4	48.9	28.6		42 clam shells, 4 qts
21	4	58.5	54.9	32.2		
21	5	83.3	79.5	49.7		6 qts, rocks, oyster shells, etc.
21	6	49.5	44.8	27.6		
21	7	81.2	77.1	47.0		
21	8	73.5	67.1	40.2		2 more clams missing from collection
21	9	67.5	63.6	37.8		
21	10	72.3	66.0	41.2		
21	11	55.3	51.0	31.8		
21	12	68.1	62.1	37.7		
21	13	66.6	62.5	37.7		
21	14	80.8	72.4	46.1		
21	15	68.4	64.1	38.3		
21	16	58.0	53.4	34.0		
21	17	62.7	59.2	34.1		
21	18	67.0	58.8	35.2		
21	19	61.7	55.0	33.4		
21	20	53.4	50.0	28.6		
21	21	71.1	66.0	37.9		
21	22	84.9	80.0	46.6		
21	23	72.7	69.7	42.4		
21	24	57.2	51.7	31.7		
21	25	70.3	64.9	38.8		
21	26	59.0	54.2	35.2		
21	27	73.0	65.0	38.4		
Average		66.0				

Appendix (Contd.)

<u>Location</u>	<u>Clams No.</u>	<u>Length mm</u>	<u>Height mm</u>	<u>Width mm</u>	<u>Remarks</u>
13	1	81.7	77.6	49.9	<u>Bottom Trash</u>
13	2	86.0	79.9	45.5	
13	3	79.0	72.1	41.9	65 clam shells (6-1/2 qts)
13	4	88.3	80.3	46.5	
13	5	77.8	72.5	44.1	17 qts of oyster shell and rocks, etc.
13	6	69.8	61.4	37.6	
13	7	87.0	80.3	46.7	
13	8	66.2	60.3	35.2	Almost all oysters
13	9	75.6	68.4	47.5	
13	10	69.6	62.2	35.9	
13	11	62.4	57.0	36.3	
13	12	75.8	71.3	44.1	
13	13	75.2	71.1	43.7	
13	14	94.8	82.2	49.0	
13	15	62.1	56.8	34.1	
13	16	69.7	64.1	39.2	
13	17	83.3	75.5	43.5	
13	18	63.2	58.2	35.5	
13	19	77.2	70.9	42.3	
13	20	71.4	65.1	37.8	
13	21	44.4	39.7	23.6	
13	22	64.9	60.2	34.8	
13	23	66.0	59.7	35.7	
13	24	49.1	43.2	26.1	
Average		72.5			
4	1	76.4	72.0	44.4	<u>Bottom Trash</u>
4	2	65.9	60.2	35.7	
4	3	89.3	82.0	50.4	8 clam shells, 1/2 qt
4	4	77.0	69.7	45.3	
4	5	77.9	70.2	41.4	one clam missing from collection
4	6	73.2	69.6	41.0	
4	7	72.0	67.3	38.1	
4	8	84.1	80.6	52.2	
4	9	64.1	59.9	37.5	
4	10	67.2	63.0	37.4	
4	11	75.4	72.1	41.5	
4	12	66.3	62.0	38.0	
4	13	44.9	40.3	24.5	
4	14	77.9	74.3	46.4	
4	15	91.9	84.1	52.8	
4	16	40.5	35.6	20.3	
4	17	78.6	72.9	42.2	
4	18	74.3	68.7	42.6	

Appendix (Contd.)

<u>Location</u>	<u>Clams No.</u>	<u>Length mm</u>	<u>Height mm</u>	<u>Width mm</u>	<u>Remarks</u>
4	19	65.5	62.7	38.4	
4	20	76.5	72.1	46.5	
4	21	85.6	77.7	46.7	
4	22	82.4	73.7	48.3	
4	23	73.6	66.2	40.1	
4	24	75.1	72.1	44.3	
4	25	90.0	83.4	50.3	
4	26	87.9	81.6	49.8	
4	27	64.4	58.9	36.3	
4	28	42.2	39.8	21.6	
4	29	36.4	33.2	20.2	
4	30	Broken			
Average		71.6			