DREDGE MATERIAL MANAGEMENT PLAN
QUAHOG RESOURCES SURVEY FOR
NEW BEDFORD AND FALL RIVER

Prepared for

MASSACHUSETTS OFFICE OF
COASTAL ZONE MANAGEMENT
100 Cambridge Street Boston, Massachusetts 02202

Prepared by

NORMANDEAU ASSOCIATES INC.
25 Nashua Road
Bedford, NH 03110-5500

R-17769.000

February 1999

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1.0 INTRODUCTION

Quahog sampling was conducted in New Bedford Harbor and the Taunton River in October 1998 in support of the development of Dredged Material Management Plans for New Bedford and Fall River. The purpose of these surveys was to provide data on standing crops of quahogs in these areas that can be used to evaluate the effects of dredging and aquatic disposal on quahog resources.

2.0 METHODS AND MATERIALS

2.1 SAMPLING LOCATIONS

One area in New Bedford Harbor, located in the northwest corner of the outer harbor near the hurricane barrier, was assessed for quahog resources. Shallow waters, generally less than 8 feet mean low water (MLW) were sampled by a commercial fisherman using tongs (Figure 2-1). Three transects were located parallel to the western shore in depths of less than 8 feet MLW. Two additional transects were located parallel to the hurricane barrier at depths of 9 and 11 feet along a relatively steep slope. Thirty-nine (39) tong samples were collected. Each sample consisted of two individual grabs adjacent to each other to a depth of nine inches. Density of quahogs for the sample was estimated as the mean of the two adjacent grabs. A hydraulic dredge was used to sample waters deeper farther offshore from the tong samples. Six 100-m tows were made at depths between 8 and 10 feet.

In the Taunton River four locations were sampled by hydraulic dredge (Figure 2-2). FR1ATC was located furthest upstream, above the Brightman Street Bridge to the northwest of the navigation channel. FR3ATC was located just downstream of the Route 195 Bridge, and to the northwest of the navigation channel. FR4ATC and FR5ATC were located furthest downstream, to the northwest and southeast of the navigation channel. The number of dredge samples in each location ranged from six to eight and was proportional to the area of the location. Each tow was 100-m long.

2.2 FIELD METHODS

The processing of the samples was the same for both tong and dredge samples. Generally, all quahogs were counted and measured to the nearest mm along their long axis. The contents of the tong or dredge samples were placed on a culling table and quahogs were sorted from the debris and other material. Generally, all quahogs were counted and measured to the nearest mm along their long axis. If catches from the dredge were greater than one bushel, the quahogs were placed in any one of several bushel baskets as they were sorted from the debris. One basket was then randomly selected and all the quahogs in that basket were measured. There was no subsampling of tong samples. All quahogs were returned to the water after processing.

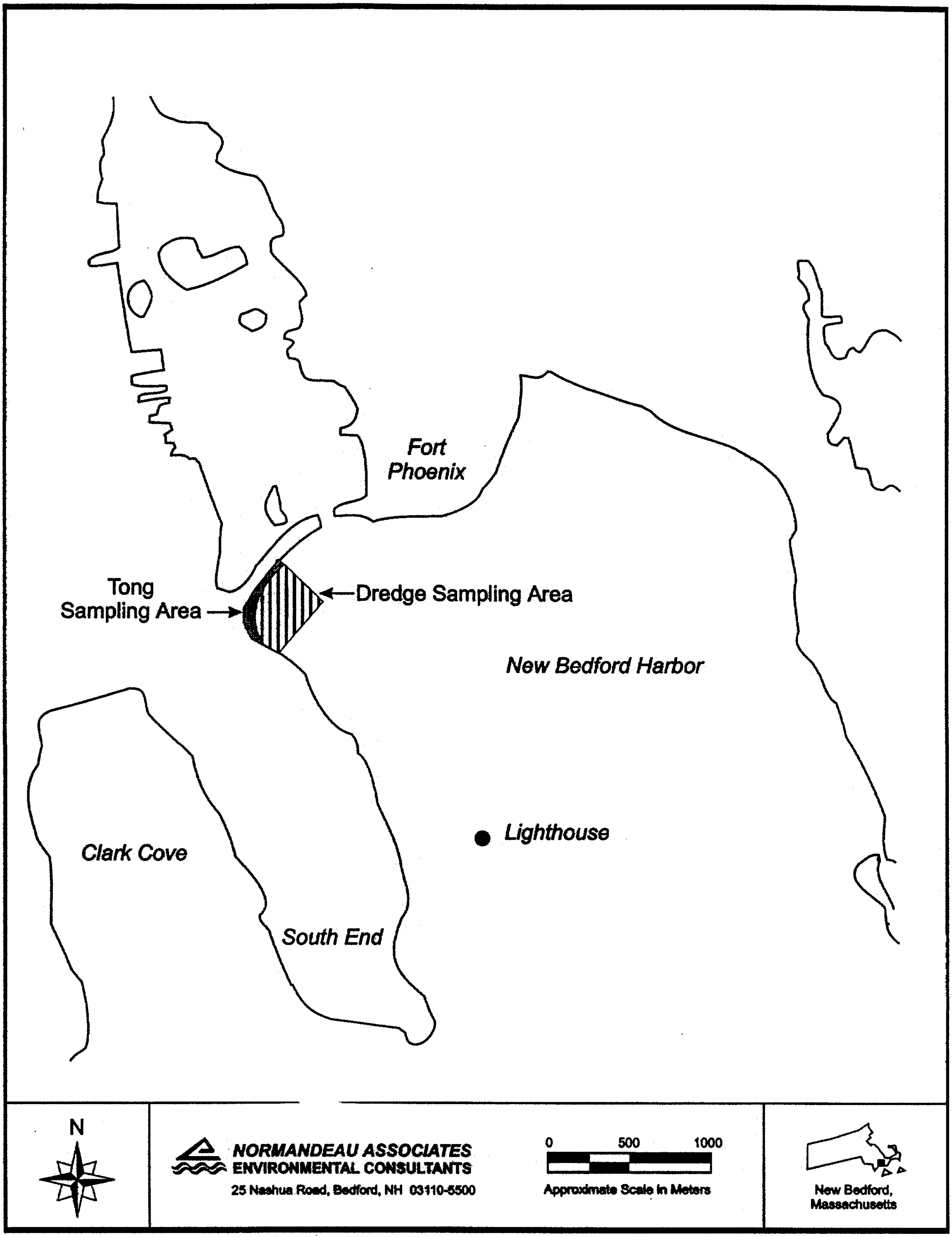

Figure 2-1. Location of sampling stations in New Bedford Harbor.

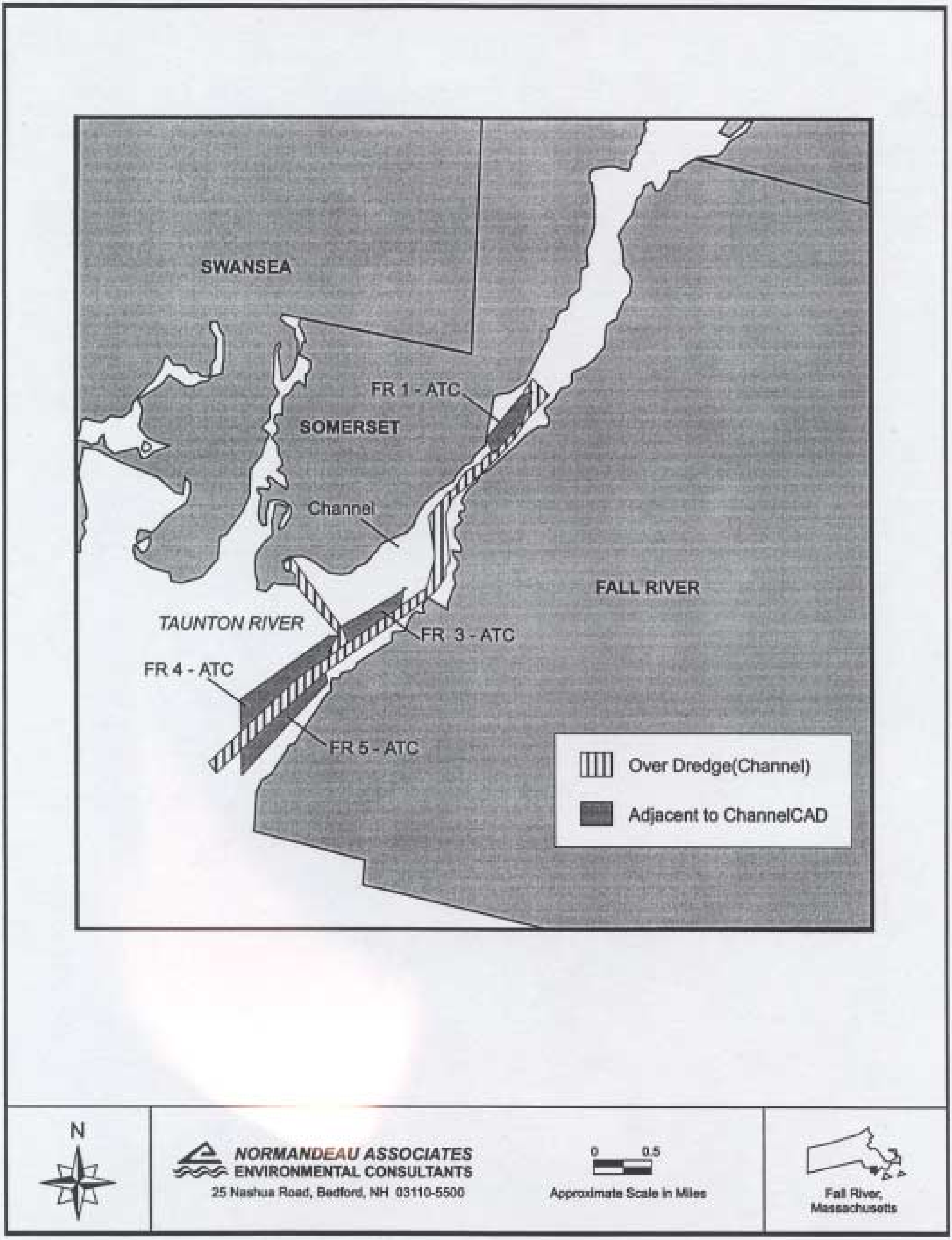

Figure 2-2. Locations of sampling areas in the Taunton River.

The location of all tong samples, and the location of the beginning and end of each dredge track were recorded with differential global positioning system (GPS).

Hydraulic dredges are not 100% efficient, as some shellfish are either left behind in the dredge track or cast outside the dredge track by the dredge (Meyer et al. 1981). To assess the efficiency of the dredge, divers observed the number of clams remaining in the dredge track and cast outside the dredge track at 10-m intervals using methods specified by DMF. Every 10 m along the dredge track, divers counted the number of quahogs remaining in the track in either a 0.14 m^2 quadrat in New Bedford or a 0.19 m^2 quadrat in the Taunton River. The quadrat was 0.25 m x the width of the dredge track which was 0.56 m in New Bedford and 0.76 m in Fall River. Any quahogs that were cast outside the dredge track and remained on the surface were counted every 10 m next to a 0.25-m-long segment of the dredge track.

2.3 ANALYTIC METHODS

For each area assessed, the mean density of quahogs in the tong or dredge samples was estimated. The mean density was multiplied by the acreage of the area to estimate the standing crop.

The efficiency (E) of the dredge was estimated as:

$$E = H/[H + (A)(q/a)]$$

where:

- E = efficiency of the dredge,
- H = number of quahogs captured in the hydraulic dredge,
- A = area of dredge track (56 m^2 in New Bedford and 76.2 m^2 in Fall River)
- q = total number of quahogs counted by divers in quadrats, plus quahogs found cast aside adjacent to the quadrat.
- a = total area sampled by divers (1.4 m^2 in New Bedford and 1.9 m^2 in Fall River)

The number of quahogs captured (H) was adjusted for the efficiency of the dredge (E) to estimate the number of quahogs in the dredge track (D)

$$D = (H/E)$$

Dredge efficiency was computed for two to three samples in each area in New Bedford or Fall River. The dredge efficiency estimates were then applied directly to the samples from which they were derived to estimate the total number of quahogs in the dredge track. Except for FR4ATC, the bottom type in each area was judged to be homogeneous. Therefore, an average dredge efficiency for each area was applied to the remaining samples within an area. At FR4ATC dredge efficiency was very low (0.09) for sample 4B. Diver's notes did not indicate any differences in substrate type at sample 4B, however, the water was deeper at this location than other locations within FR4ATC. This low dredge efficiency was only applied to sample 4B and the other dredge efficiency estimate (0.66) was applied to the remaining samples.

The efficiency of the tong was assumed to be 100% (E=1), meaning that each tong sample was assumed to comprise all the quahogs in the 0.1 m^2 area sampled by the tong.

The number of quahogs in an area was estimated as:

$$Q = (D/A)\,Z$$

where:

Q = standing crop of quahogs
D = number of quahogs in the dredge track or tong sample
A = area of dredge track (56 m^2 in New Bedford and 76.2 m^2 in Fall River) or tong sample (0.1 m^2)
Z = area (m^2).

Density of quahogs was presented as number/m^2, number/acre, and bushels/acre. Standing crop was presented as number of quahogs and total bushels in each location. Factors used to convert standing crop to 60 lb. bushels were 420/bushel for littlenecks (51-60 mm), 240/bushel for cherrystones (61-70 mm) and 120/bushel for chowders (greater than 70 mm).

3.0 RESULTS

3.1 NEW BEDFORD

The density and standing crop of quahogs captured by tong and dredge are presented in Tables 3-1 and 3-2. Density of all size classes was lower in the tong samples, which were located closer to shore than the dredge samples. In the dredge samples there was a progression to higher densities with increasing size class. When samples from both gears are combined an estimated 335,000 quahogs were present at this location, representing about 1,960 bushels of marketable-size quahogs (Table 3-3).

3.2 FALL RIVER

FR1ATC had the highest densities of total quahogs, seed clams, littlenecks, cherrystones, and chowders among areas sampled in the Taunton River (Table 3-4). Despite the relatively small size of this area, standing crops of seed, littlenecks, and cherrystones were the highest. Standing crop of chowders ranked fourth, and standing crop of total quahogs was first.

FR3ATC had the second highest densities of total quahogs, seed quahogs, littlenecks, and cherrystones (Table 3-4). Despite the high densities of the smaller size classes, density of

Table 3-1. Density and Standing Crop of Quahogs Sampled by Tong in New Bedford Harbor.

Area (acres)	Size Class	Density			Standing Crop	
		No./m²	No./acre	Bu/acre[a]	Number	Bushels[a]
10	Seed	<0.1	141	—	1,410	—
10	Littlenecks	0.1	312	1	3,120	7.4
10	Cherrystones	0.1	312	1	3,120	7.4
10	Chowders	0.1	384	3	3,840	32.0
10	Total	0.3	1,149	5	11,490	46.8

Table 3-2. Density and Standing Crop of Quahogs Sampled by Dredge in New Bedford Harbor.

Area (acres)	Size Class	Density			Standing Crop	
		No./m²	No./acre	Bu/acre[a]	Number	Bushels[a]
20	Seed	0.2	662	—	13,240	—
20	Littlenecks	0.5	2,072	5	41,440	98.7
20	Cherrystones	1.3	5,107	21	102,140	425.6
20	Chowders	2.1	8,335	69	166,700	1,389.2
20	Total	4.1	16,176	95	323,520	1,913.5

Table 3-3. Standing Crop of Quahogs Sampled in New Bedford Harbor.

Area (acres)	Size Class	Standing Crop	
		Number	Bushels[a]
30	Seed	14,650	—
30	Littlenecks	44,560	106.1
30	Cherrystones	105,260	433.0
30	Chowders	170,540	1,421.2
30	Total	335,010	1,960.3

[a] Conversion factor for seed clams to bushels does not exist.

Table 3-4. Density and Standing Crop of Quahogs at Four Locations in the Taunton River.

Location	Area (acres)	Size Class	Density			Standing Crop	
			No./m²	No./acre	Bu/acre[a]	Number	Bushels[a]
FR1ATC	30	Seed	3.1	12,401	—	372,030	—
	30	Littlenecks	7.8	31,759	76.5	952,770	2,268.5
	30	Cherrystones	12.7	51,437	214.3	1,543,110	6,429.6
	30	Chowders	7.8	31,432	261.9	942,960	7,858.0
	30	Total	31.4	127,029	552.7	3,810,870	16,556.1
FR3ATC	72	Seed	0.1	443	—	31,896	—
	72	Littlenecks	0.6	2,620	6.2	188,640	449.1
	72	Cherrystones	2.4	9,631	40.1	693,432	2,889.3
	72	Chowders	5.0	20,359	169.7	1,465,848	12,215.4
	72	Total	8.1	33,053	216.0	2,379,816	15,553.8
FR4ATC	110	Seed	<0.1	27	—	2,970	—
	110	Littlenecks	0.1	212	0.5	23,320	55.5
	110	Cherrystones	0.3	1,337	5.6	147,070	612.8
	110	Chowders	7.7	31,007	258.3	3,410,770	28,423.1
	110	Total	8.1	32,583	264.4	3,584,130	29,091.4
FR5ATC	101	Seed	0.0	0	—	0	—
	101	Littlenecks	0.1	204	0.5	20,604	49.1
	101	Cherrystones	0.1	558	2.3	56,358	234.8
	101	Chowders	5.7	23,050	192.1	2,328,050	19,400.4
	101	Total	5.9	23,812	194.9	2,405,012	19,684.3

[a] Conversion factor for seed clams to bushels does not exist.

chowders was lowest. The high densities of seed, littlenecks and cherrystones resulted in standing crops of these size classes that ranked second among the areas in the Taunton River. Standing crop of chowders at FR3ATC was third, and standing crop of total quahogs was lowest.

Density of total quahogs at FR4ATC ranked third, slightly lower than FR3ATC (Table 3-4). Density of seed ranked third, but was very low at 27/acre. Similarly, densities of littlenecks and cherrystones were also low and ranked third. Density of chowders was the second highest among the areas. The standing crops of seed, littlenecks, and cherrystones followed the same pattern as density and ranked third among the areas. The relatively high density of chowders coupled with the large area of FR4ATC (110 acres) resulted in the highest standing crop of chowders and second highest of total quahogs.

Density of total quahogs at FR5ATC was the lowest among the areas (Table 3-4). Consistent with this pattern, densities of seed, littlenecks, and cherrystones were also lowest at FR5ATC. Density of chowders ranked third (Table 3-4). No seed quahogs were observed. Due to these low densities, the standing crops of seed, littlenecks, and cherrystones were lowest among the areas. Standing crop of chowders ranked second due to the relatively high density and the large area of FR5ATC.

4.0 DISCUSSION

Densities of quahogs sampled in this survey in New Bedford were within the range of those found by DeAlteris et al. (1998) in a quahog survey of New Bedford and adjacent waters. Density of total quahogs in the tong samples was $0.3/m^2$, and density in the dredge samples was $4.1/m^2$. Density of total quahogs in samples collected by divers in DeAlteris et al. (1998) ranged from $0.22/m^2$ to $6.0/m^2$.

In the Taunton River densities of quahogs ranged from $5.9/m^2$ to $31.4/m^2$, and were higher than those observed in New Bedford. There appeared to be a trend of decreasing densities of smaller size classes, especially seed, with distance down river. This may be an indication of better habitat for seed quahogs in the upriver location, especially FR1ATC.

5.0 LITERATURE CITED

DeAlteris, J., N. Thompson, and L. Skobe. 1998. Shellfish abundance estimates for eleven management areas in the Dartmouth, New Bedford, and Fairhaven region of Buzzards Bay. DeAlteris Associates Inc. Jamestown, RI.

Meyer, T.L., R.A. Cooper, and K.J. Pecci. 1981. The performance and environmental effects of a hydraulic clam dredge. Marine Fisheries Review 43(9):14-22.