

SOUTH OYSTER BAY HARD CLAM POPULATION SURVEY



November 2009

Prepared for:

**Town of Oyster Bay
Department of Environmental Resources
150 Miller Place
Syosset, New York 11791**

and

**New York State Department of State
One Commerce Plaza
99 Washington Avenue
Albany, New York 12231
518-474-6000**

www.nyswaterfronts.com

Prepared by:

**Cashin Associates, P.C.
1200 Veterans Memorial Highway
Hauppauge, New York 11788
631-348-7600**



TOWN OF OYSTER BAY

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This report was prepared for the Town of Oyster Bay and the New York State Department of State with funds provided under Title 11 of the Environmental Protection Fund.

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SOUTH OYSTER BAY HARD CLAM POPULATION SURVEY

SECTION 1: INTRODUCTION

1.1 Study Overview

In August of 2004, the Town of Oyster Bay (the Town) sponsored an assessment of the hard clam (Mercenaria mercenaria) population in South Oyster Bay, a shallow bar-built bay located on the south shore of Long Island located about 30 miles east of New York City. South Oyster Bay (the Bay) is part of the South Shore Estuary Reserve (SSER) which has been designated as a special estuary management area by New York State because of its unparalleled biological, economic, and social values. This survey, which sought to determine the distribution, abundance, and population structure of hard clams in the Bay, was the first comprehensive assessment of the hard clam population in South Oyster Bay since 1978. This information is important because it:

- provides an assessment of the status and health of the Bay's hard clam resource;
- is integral to development of a hard clam management program, particularly as it relates to controlling harvest;
- provides background information needed for the design of projects that will enhance the abundance of hard clams;

- provides baseline data so that future changes in the hard clam resource can be identified and so that the effectiveness of management and enhancement actions can be evaluated; and
- contributes to a better understanding of the hard clam resource throughout the SSER.

The hard clam population survey also implements or supports several of the recommendations of the Long Island SSER Comprehensive Management Plan (CMP) (South Shore Estuary Reserve, 2001):

- "Document the current status of living resources in the Reserve..." (Protect and Restore Living Resources in the Reserve, recommendation 2; Implementation Action 3-1);
- "Increase molluscan shellfish populations for commercial harvest through enhancement of shellfish stocks and improvements of water quality." (Protect and Restore Living Resources in the Reserve, recommendation 7; Implementation Action 3-3);
- "Support efforts to manage harvest of shellfish and other living estuarine resources on a basis consistent with the natural capacity of the estuary." (Protect and Restore Living Resources in the Reserve, recommendation 8; Implementation action 3-1);

- "Support productivity of commercially and ecologically important estuarine species by sustaining existing habitats of high functional quality and restoring degraded habitats..." (Protect and Restore Living Resources in the Reserve, recommendation 9; and Implementation Action 3-4); and
- "Address critical information needs regarding productivity of hard clam and other shellfish with research that focuses on growth and nutrition, recruitment, settlement, predation, and Brown Tide effects." (Protect and Restore Living Resources in the Reserve, recommendation 10).

This report presents the results of the field survey and analysis of the data. It also assesses the condition of the hard clam resource and provides recommendations for future actions for consideration by the Town.

This project was specifically conducted for the Town of Oyster Bay, funded in part through a grant provided by the New York State Department of State Environmental Protection Fund for South Shore Estuary Reserve Workplan Implementation, as outlined in the South Shore Estuary Reserve's Comprehensive Management Plan. This report was prepared for the Town of Oyster Bay and the New York State Department of State with funds provided under Title 11 of the Environmental Protection Fund. This project was

performed in accordance with the requirements of the New York State Department of Environmental Conservation (NYSDEC) under Shellfish Population Survey Permit No. 04-SP-2 (Appendix A).

1.2 Regional Setting

South Oyster Bay is located at the western end of the SSER, a chain of interconnected bays that extends nearly 70 miles along the south shore of Long Island from East Rockaway Inlet to Shinnecock Bay; to its west is Hempstead Bay and to its east is the Great South Bay (Map 1). South Oyster Bay is transitional between Hempstead Bay to the west, which has only limited areas of open water and many marsh islands, and the Great South Bay to the east, which is mainly open water.

South Oyster Bay is a relatively small bay with an area of approximately 7,000 acres (it should be noted that various published reports give different acreages which may be related to South Oyster Bay's fairly extensive system of marsh islands and tidal flats). The entire Bay lies within the Town of Oyster Bay which owns the bay bottom and manages the Bay's shellfish resource.

The average water depth at low tide is four feet. The central and northeastern areas of South Oyster Bay are open water while

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the western end and the southeastern corner of the Bay contain extensive systems of marsh islands; there are approximately 820

acres of marsh islands according to the *South Oyster Bay Habitat Management Plan* (Town of Oyster Bay, 2004). The western part of the Bay also contains extensive intertidal flats surrounding the marsh islands and has extensive eelgrass (*Zostera marina*) beds. The northern portion of the bay borders the mainland shoreline which is characterized by residential development, marina, and public parkland.

Tidal exchange between South Oyster Bay and the Atlantic Ocean occurs through Jones Inlet, located approximately five miles to the west of South Oyster Bay, and Fire Island Inlet, located more than ten miles to the east. Of the two inlets, Jones Inlet has the greatest impact on the Bay's circulation and hydrography. The tidal range in South Oyster Bay ranges from 1.7 to 2.0 feet and the salinity is between 25 to 30 parts per thousand.

1.3 Shellfish Harvesting Practices

Shellfish harvesting is only permitted in certain areas of South Oyster Bay in accordance with the water quality standards established by the National Shellfish Sanitation Program (NSSP). The NYSDEC regularly monitors the water quality throughout South Oyster Bay, and based on the criteria classifies harvest status areas as follows:

- areas that meet the NSSP criteria for the harvest of shellfish are classified as "certified" and are said to be "open" to shellfish harvesting;
- areas that do not meet the criteria are classified as "uncertified" and are "closed" to shellfish harvesting;
- areas that only meet the certified criteria when certain rainfall conditions are met are classified as "conditionally certified"; and,
- areas that only meet the certified criteria during certain times of the year are classified as "seasonally certified".

According to the NYSDEC, the acreage of shellfish lands in South Oyster Bay is 6,190 acres (New York State Department of Environmental Conservation, 2004). Of that area, 4,130 acres, located in the northern half of South Oyster Bay, were uncertified as of January 1, 2004. Of the 4,130 acres that were uncertified, 1,510 acres located in the southern half of the uncertified area were classified as seasonally certified with shellfish harvesting allowed from April 1 to November 30. Within the western end of uncertified area, approximately 50 acres were designated as conditionally certified from November 10 to November 30, and from April 1 to May 14; the area was open to shellfish harvesting provided that no more than 0.10 inches of rain was recorded in a 24 hour period in each of seven

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successive days (shellfishing is allowed on the eighth day). The Tobay Marina Boat Basin and Tobay Heading, which together encompass approximately 70 acres, are seasonally uncertified from May 15 to September 30 because of high levels of boating activity and the potential for release of sanitary waste. The extent of certified, uncertified, and seasonally certified areas from 1970 to 2004 is given in Table 1-1.

Historically, South Oyster Bay has not had a very productive hard clam resource or hard clam industry. Between 1993 and 2003, according to statistics compiled by the NYSDEC, the hard clam harvest ranged from a low of 321 bushels worth \$29,345 in 1995 to a high of 1,997 bushels worth \$186,461 in 1998 (Table 1-2). The annual average harvest during this period was 1,122 bushels worth \$97,146.

South Oyster Bay in some years produces a commercial harvest of soft clams (*Mya arenaria*). According to the NYSDEC, in 2003, 208 bushels of soft clams worth \$19,500 were harvested. The recent maximum harvest was in 1999 when 1,487 bushels worth \$103,950 were taken.

The level of commercial shellfish harvesting in South Oyster Bay has not been well documented so it is not possible to estimate shellfish harvest effort (i.e., fishing pressure). While the NYSDEC reports the number of shellfish digger permits issued to shellfishermen who claim the Town of Oyster Bay as

their residence (Table 1-3), it is not known how many work in South Oyster Bay as compared to Oyster Bay Harbor on the north shore of the Town of Oyster Bay. One estimate is that about 15 baymen work in South Oyster Bay, either part-time or full-time (Town of Oyster Bay, 2005).

In addition to the commercial harvest of hard clams, hard clams are also harvested recreationally. Residents of the Town of Oyster Bay can harvest up to one-quarter bushel of hard clams per day for recreational purposes. The harvesting is done by feet or recreational "scratch rakes" which resemble a typical garden rake with a wire basket across the rake's frame to hold hard clams that are raked out of the bottom by the teeth. The number of recreational harvesters has not been documented. Recreational harvesting tends to occur most frequently on the tidal flats and adjacent shallows, particularly those on the south side of Squaw Island (Town of Oyster Bay, 2005). Qualitative observations indicate that recreational fishing is popular in this area during the summer months.

The Town of Oyster Bay plants seed hard clams in South Oyster Bay. The number of seed clams planted by the Town was as follows: 300,000 in 1994; 780,000 in 1995; 580,000 in 1996; and 500,000 each year from 1997 to 2001 (Town of Oyster Bay, 2002).

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TABLE 1-1. Acreage of Certified, Uncertified, and Seasonal areas, South Oyster Bay.

Year	Certified	Uncertified	Seasonally Certified ¹
1970	5,490	700	
1975	2,170	4,020	
1980	2,980	3,210	
1986	3,185	3,005	
1990	3,160	3,030	
1995	3,140	3,050	
1999	2,060	4,130	1,510
2000	2,060	4,130	1,510
2004	2,060	4,130	1,510

¹ Seasonal acreage closed is a subset of the total acreage closed.

Source: NYSDEC, 2004

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TABLE 1-2. Hard clam harvest from South Oyster Bay and its value from 1993 to 2003.

YEAR	HARVEST (bushels)	VALUE
2003	356	\$34,757
2002	1,241	\$124,275
2001	1,352	\$120,201
2000	1,296	\$118,099
1999	1,666	\$135,447
1998	1,997	\$186,461
1997	1,546	\$123,247
1996	1,476	\$113,648
1995	321	\$29,345
1994	549	\$40,491
1993	<u>545</u>	<u>\$42,632</u>
Annual Average:	1,122	\$97,146

Source: NYSDEC

TABLE 1-3. Numbers of diggers permits, Town of Oyster Bay

Year	Number	Year	Number
2002	101	1996	166
2001	99	1995	167
2000	93	1994	174
1999	133	1993	147
1998	144	1992	167
1997	178		

Note: New York State shellfish diggers permits issued to individuals who gave the Town of Oyster Bay as their place of residence.

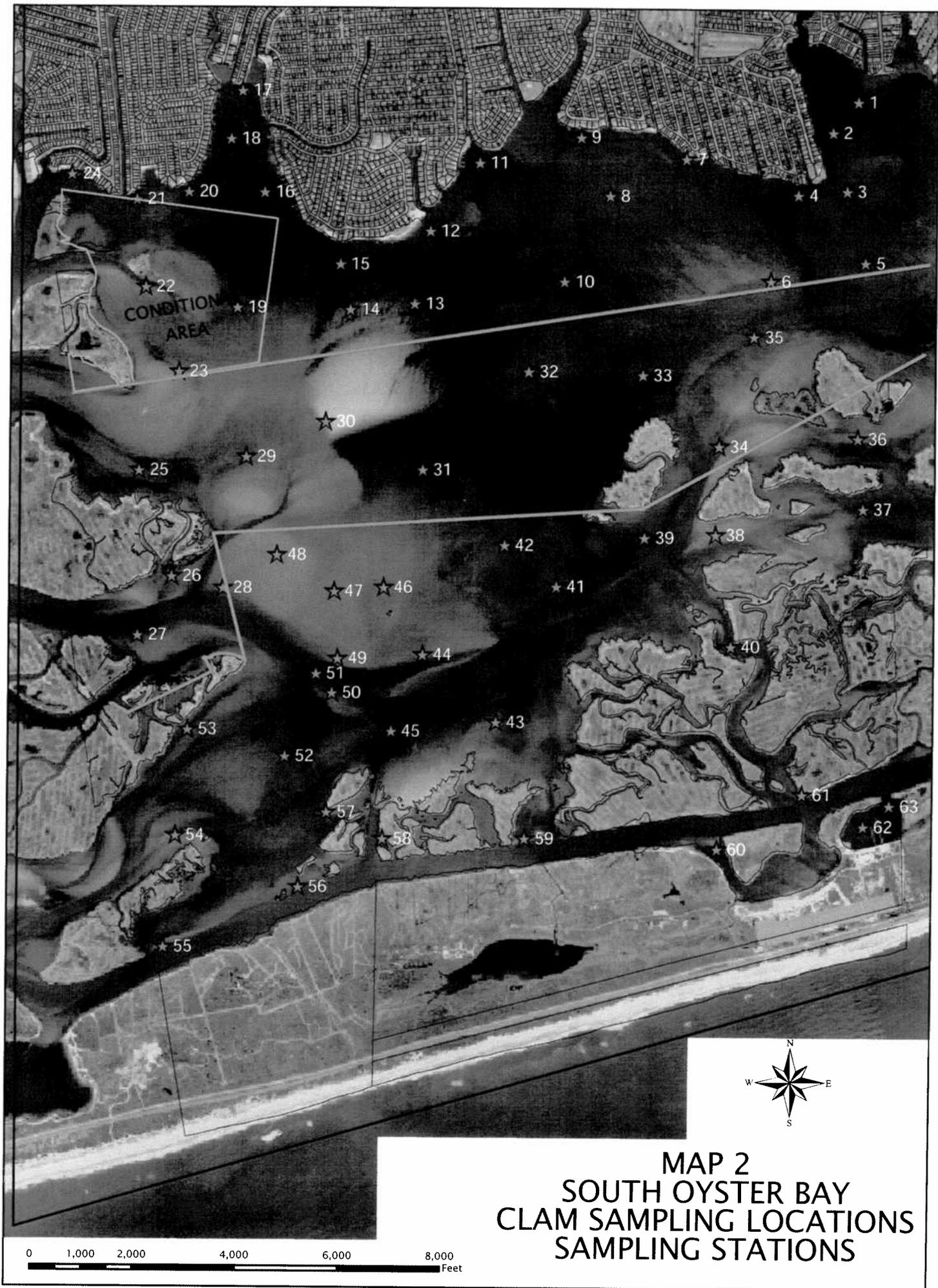
Source: NYSDEC

SECTION 2: METHODODOLOGY

A total of 63 stations were sampled for this study (Map 2). The sample stations were distributed throughout South Oyster Bay so as to obtain a baywide assessment of the hard clam population and to sample the different sediment types, intertidal and subtidal areas, and the different harvest designations. The field survey was performed during August/September 2004.

Representative samples were taken from each certification classification in the Bay. The station numbers comprising the uncertified area of South Oyster Bay were: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 20, 21, and 24. The seasonal area of South Oyster Bay consisted of station numbers: 19, 22, 23, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 60, 62, and 63. Station numbers encompassing the certified area of the Bay included: 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, and 61.

The primary method of sample collection was by mechanical clamshell bucket. The clamshell bucket was operated by a crane mounted on a barge that required a minimum water depth of three feet. The barge would travel to the station to be sampled and once on the station, it would be anchored. The latitude and longitude of the station would then be determined using a Global Positioning System (GPS) (Appendix B). Air and water temperature, water depth, salinity, sediment type, and amount of



MAP 2
SOUTH OYSTER BAY
CLAM SAMPLING LOCATIONS
SAMPLING STATIONS

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eelgrass coverage were also recorded. This method of sampling has been used by other Towns on Long Island, and it has become the standard survey methodology for surveys conducted in the South Shore Estuary over the past 30 years.

The clamshell bucket retrieved a bottom sample that had an area of approximately one square meter. The sample was deposited into a "cull box" that consisted of two sieves: a top sieve comprised of metal bars with a spacing of approximately one inch to break up the sediment sample, reduce the sediments impact on the sieve beneath it, and retrieve the larger clams, and a bottom sieve comprised of a one-quarter inch galvanized mesh screen which retained the smaller hard clams, as well as other species. After the sample was deposited in the upper sieve, it was washed through the sieves with a pressured water jet to remove as much sediment as possible. After the sample was washed, the material retained on the sieve was sorted and all hard clams were removed for measuring.

A variation in sampling methods was utilized in the intertidal areas because the barge mounted crane could not reach such areas even at high tide. The same equipment and procedure were used, except that the bottom samples were excavated by hand with shovels and the material placed onto the one-quarter inch mesh cull box. After the sample was washed with water, the material

retained on the sieve was sorted and all hard clams were removed for measuring.

At each station, two, and in some instances three, bottom samples were collected. The length of all hard clams that were retained on the sieves was measured. Any other species that were retained on the mesh were noted. The bottom type was qualitatively determined based on the sediment sample retrieved in the bucket.

SECTION 3: FINDINGS

3.1 Overview of Findings

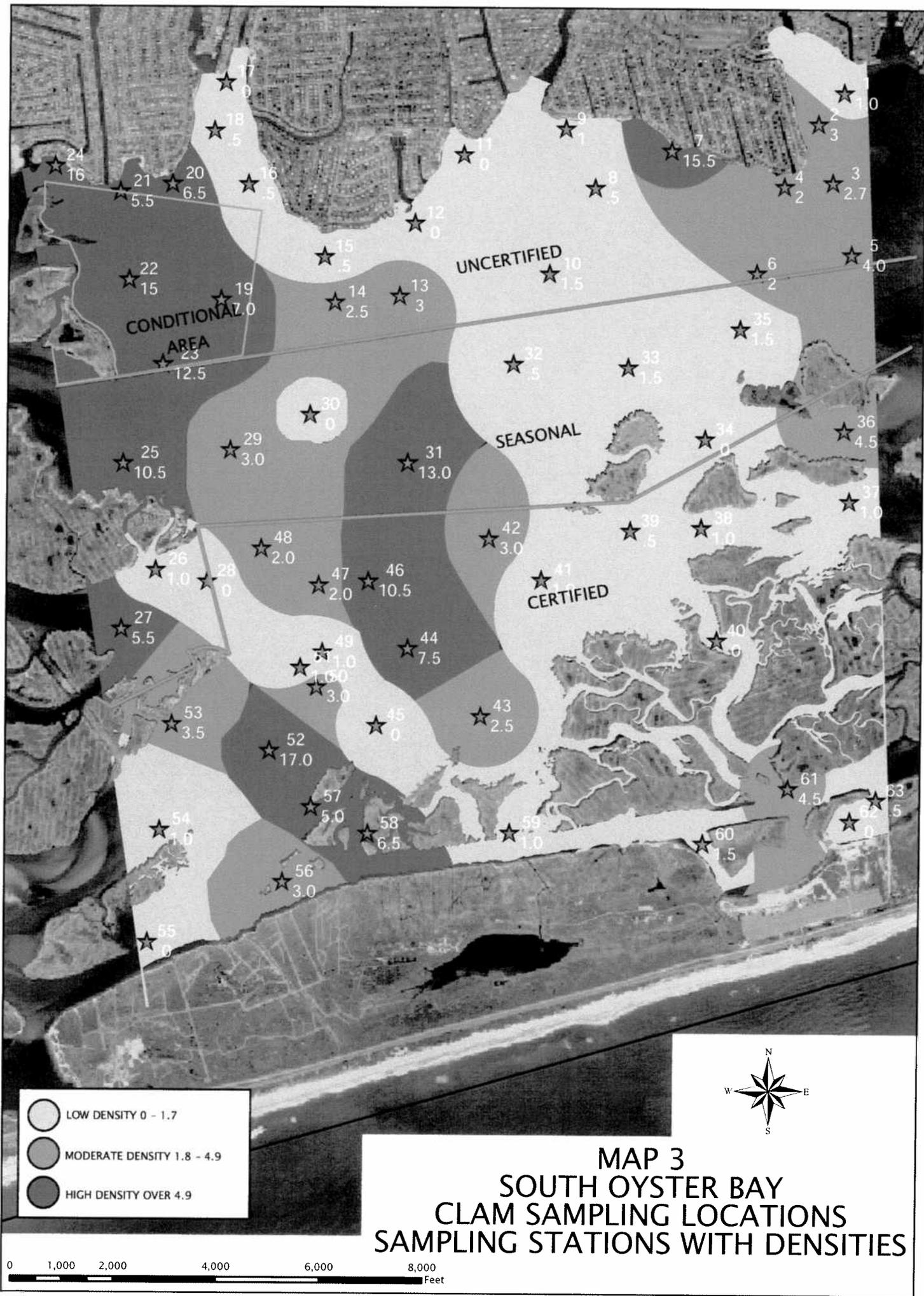
The number of clams collected at each station, together with a listing of sizes, mean density, and mean size, is given in Appendix C. A summary of the density, mean size, and sediment type is given in Table 3-1.

Table 3-2 provides a summary of clam density by commercial size category (seed, littleneck, cherrystone, and chowder) and by certification status. Table 3-3 provides a summary of average density and size of clams collected in uncertified, seasonal, certified, and total area sampled.

Hard clams were found at 53 of the 63 sample locations. The average hard clam abundance in South Oyster Bay was 3.5 hard clams per square meter (clams/m²) and ranged from zero clams/m² (stations 11, 12, 17, 28, 30, 34, 40, 45, 55, and 62) to a high of 17 clams/m² (station 52). The average size (shell length) of the hard clams sampled was 81.8 mm (3.2 in.) and ranged from 17 mm (0.7 in.) at station 61 to 119 mm (4.7 in.) at station 7.

3.2 Abundance and Distribution

A generalized mapping of clam density found in the study is given in Map 3. Areas of high abundance were found along the



western portions of the Bay, especially in the uncertified and conditional areas. Several major abundance areas were found in the seasonal area along the western boundary of the Bay and around Squaw Island. Areas of low abundance were found in central portions of the bay extending from the mainland to the barrier islands.

The stations with the highest abundance of clams (over 10 clams/m²) were nos. 7, 22, 23, 24, 25, 31, 41, and 52. Nos. 7 and 24 were located along the mainland shoreline in uncertified waters. Nos. 22 and 23 were located in the conditional areas at the western portion of the uncertified area. Nos. 25 and 31 were located in the seasonal area. Nos. 41 and 52 were located in the certified area.

In comparing the abundance in the uncertified and open waters, the overall abundance of clams in the uncertified waters was essentially the same as that of the certified waters. Usually it is expected that uncertified waters have higher quantities than certified waters because of the lack of fishing presence in the uncertified areas. Although there were several areas of high abundance in the uncertified waters, most stations in that area actually had low clam density. This probably indicates that conditions along the mainland shoreline are not conducive to good clam growth and survival. The seasonal area (including the conditional area) had a clam density significantly higher

than both the uncertified and certified areas. The abundance in the seasonal area probably reflects reduced fishing presence combined with favorable clam growth and survival conditions.

3.3 Size Distribution

The mean size of clams obtained at all stations was 81.8 mm (3.2 in). A general size distribution of clams at all stations is shown in Tables 3-4a to 3-4c. A size distribution broken down by commercial category (i.e., seed, littleneck, cherrystone, chowder) for the entire clam stock is provided in Tables 3-5a to 3-5c.

Overall, the average size and site frequency distribution indicates that the population of clams is aged, with a high percentage of old clams. Approximately 85 percent of the clams are in the chowder and cherrystone categories, representing the oldest clams in the population. Seed and littleneck clams are relatively unabundant, totaling about 15 percent of the population. The general lack of seed clams at most locations was noted during the field survey. This was consistent with informal reports provided to the sampling staff by baymen, who said that seed clams have been scarce in the bay for the past several years.

The overall low density of young clams in the bay, and the aged population of the resource, indicate that the resource has low productivity.

The minimum harvestable size for hard clams as set by New York State Conservation law is one inch in thickness which corresponds to a shell length of approximately 48 mm (1.9 in.). Hard clams smaller than the legal size are considered "seed".

Hard clams are typically marketed according to size with littleneck or "neck" being the smallest, chowder the largest, and cherrystone or "cherries" intermediate between littlenecks and chowders. The sizes of these different categories are not established in law, and market conditions can often shift the classification such that a small cherrystone will be classified as a littleneck or a "top" neck. The generally accepted sizes are as follows:

Littlenecks	48mm to < 70mm (approx. 1.9 in. to < 2.8 in.)
Cherrystone	70mm to < 80mm (approx. 2.8 in. to < 3.1 in.)
Chowder	greater than 80mm (> 3.1 in.)

3.4 Standing Stock of Clams

The total standing stock of clams in the study area was calculated based on the mean clam densities and area. The mean clam density for each size class of clams was used to calculate standing stock for each sub-area of the bay. Standing stocks of

each sub-area were totaled to calculate the bay-wide standing stock. The standing stock estimates are given for uncertified, seasonal, certified, and total areas and for each size category of clam in Table 3-6. The total standing stock of 60.8 million clams consists mainly of clams in the chowder category. Approximately 83 percent of the stock lies in certified and seasonal clamming areas.

3.5 Comparison to Other Areas

The findings of a hard clam survey performed by the Town of Oyster Bay for the Oyster Bay Harbor/Cold Spring Harbor Complex in 1999 found an average density of clams of 4.3 clams/m², with a maximum of 54 clams/m². Overall, the Oyster Bay Harbor/Cold Spring Harbor Complex had a higher density and higher percentage of small size clams compared to South Oyster Bay. Although there were many areas with low clam densities, many areas were identified with high clam densities with a significant proportion of littlenecks. This is consistent with the general knowledge that the north shore embayment has been a more productive clamming area in recent years compared to South Oyster Bay.

In terms of other areas, a 1998 study of Huntington Harbor, which is also regarded as a productive clamming area, indicated a density of 7.74 clams/m², with a high proportion of seeds and

littlenecks. Discussions with Town of Brookhaven representatives have indicated that clam densities in the Brookhaven portion of Great South Bay have undergone a general, consistent decline since the productive years of the 1970s and 1980s, and that the average clam densities are now comparable to those found in South Oyster Bay. Clam densities in the Town of Islip and Babylon portions of Great South Bay have also experienced major declines, and the clam fishery is presently at minimal levels.

3.6 Historical Abundance

In 1978, a shellfish survey was undertaken in South Oyster Bay using modified commercial clam tongs and sediment suction dredges (Greene, 1980, WAPORA, 1982). Approximately 30 stations distributed relatively uniformly across the Bay were sampled. South Oyster Bay was found to be an unproductive clamming area with low densities and poor recruitment, compared to other areas of the Great South Bay where there was extensive fishery. Chowder clams made up 65 percent of the population, cherrystones 19 percent, littlenecks 14 percent, and seed 2 percent. No seed clams were found in the thick eelgrass beds of South Oyster Bay and clam abundance in the closed shellfishing areas, which would be expected to be high, were equal to or lower than those

found in open shellfish areas. Standing stocks are found in the 1983 study, given in Table 3-7.

It is interesting to note that South Oyster Bay did not undergo the extreme decline in clam abundance experienced by the eastern portion of Great South Bay since the 1980's. The clam density found in 1980 was 4.6 clams/m², whereas the present study found a 3.5 clams/m² density. Total estimated standing stock fell from 78 million clams in 1980 to 61 million clams in this study, a decline of 22 percent. This decline is relatively small compared to the major declines reported for the eastern portion of Great South Bay.

The size distribution of clams did not change dramatically from 1980 to 2004. The percentage of the total population consisting of chowder clams was approximately 65 percent in both the 1980 and 2004 studies. The percentage of seeds and littlenecks combined was approximately 16 percent, and the percentage of cherrystones was approximately 18 percent, for both the 1980 and 2004 studies. The size clams distribution has essentially remained unchanged over the past 24 years. This appears to indicate that there have not been any substantial changes in the factors affecting the hard clam population in South Oyster Bay.

3.7 Other Species

A listing of other species recovered during the hard clam survey is given in Table 3-8, with an indication of their relative abundance. Although the hard clam was the most widely distributed, several other mollusk species were also fairly common including the razor clam and awning clam. Razor clams are consumed as food but commercial fishing of the species is minor on Long Island. The awning clam is a small clam, generally less than an inch in length, with no commercial or food value.

Known shellfish predators found in the study included the mud crab, whelk, moon snail, oyster drill, and calico crab. Whelks and moon snails are very active clam predators that can feed on both seed and adult clams. Mud crabs were common throughout the bay and found in high concentrations. Mud crabs are suspected of being major predators of juvenile clams and they are potentially a factor affecting the survival of clams in the bay.

Although not captured during this study, blue claw crabs were observed in the waters during the field sampling. This species has experienced a significant increase in abundance in the Great South Bay over the past 20 years and is subject to a directed fishery. The blue claw crab is known to be an important

predator of juvenile clams. The calico crab, which was collected during this study, is similarly regarded as an active predator of small clams. Another well-known shellfish predator, the common starfish, was found at five sampling locations.

Predation may be a major factor affecting the abundance of hard clams in the study area, especially in the areas with higher salinity where certain predators (starfish, whelk, moon snail, and calico crab) are more abundant.

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TABLE 3-1. Hard clam abundance at each station and sediment type.

Station Number	Density (clams/m²)	Mean Size (mm)	Sediment Type
1	1	85	mud
2	3	70	mud/clay
3	2.7	98	muddy sand
4	2	74	muddy sand
5	4	89	sand
6	2	106	muddy sand
7	15.5	87	muddy sand
8	0.5	94	mud
9	1	91	sand
10	1.5	95	muddy sand
11	0	-	mud/bog
12	0	-	sand
13	3	86	muddy sand
14	2.5	86	muddy sand
15	0.5	105	mud/peat
16	0.5	88	mud
17	0	-	black muck
18	0.5	38	sand/gravel
19	7	84	muddy sand
20	6.5	73	coarse sand/gravel
21	5.5	75	sand/gravel
22	15	85	mud
23	12.5	88	mud
24	16	77	coarse sand
25	10.5	93	muddy sand
26	1	93	sand
27	5.5	59	muddy sand
28	0	-	sand
29	3	77	muddy sand
30	0	-	muddy sand
31	13	87	muddy sand
32	0.5	80	muddy sand
33	1.5	75	muddy sand
34	0	-	sand/mud
35	1.5	44	muddy sand
36	4.5	92	muddy sand
37	1	92	sand
38	1	89	sand
39	0.5	90	sand
40	0	-	mud
41	1	76	muddy sand
42	3	76	muddy sand

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43	2.5	94	sand
44	7.5	85	sand
45	0	-	sandy mud
46	10.5	87	mud/sand
47	2	56	mud/sand
48	2	49	mud
49	1	64	sand
50	3	67	sand
51	1	95	sand
52	17	87	mud/sand
53	3.5	81	sand
54	1	118	sand
55	0	-	sand
56	3	81	sand
57	5	97	muddy sand
58	6.5	70	muddy sand
59	1	85	muddy sand
60	1.5	56	sandy mud
61	4.5	76	sand
62	0	-	soft mud
63	0.5	93	black mud
MEAN	3.5	81.8	

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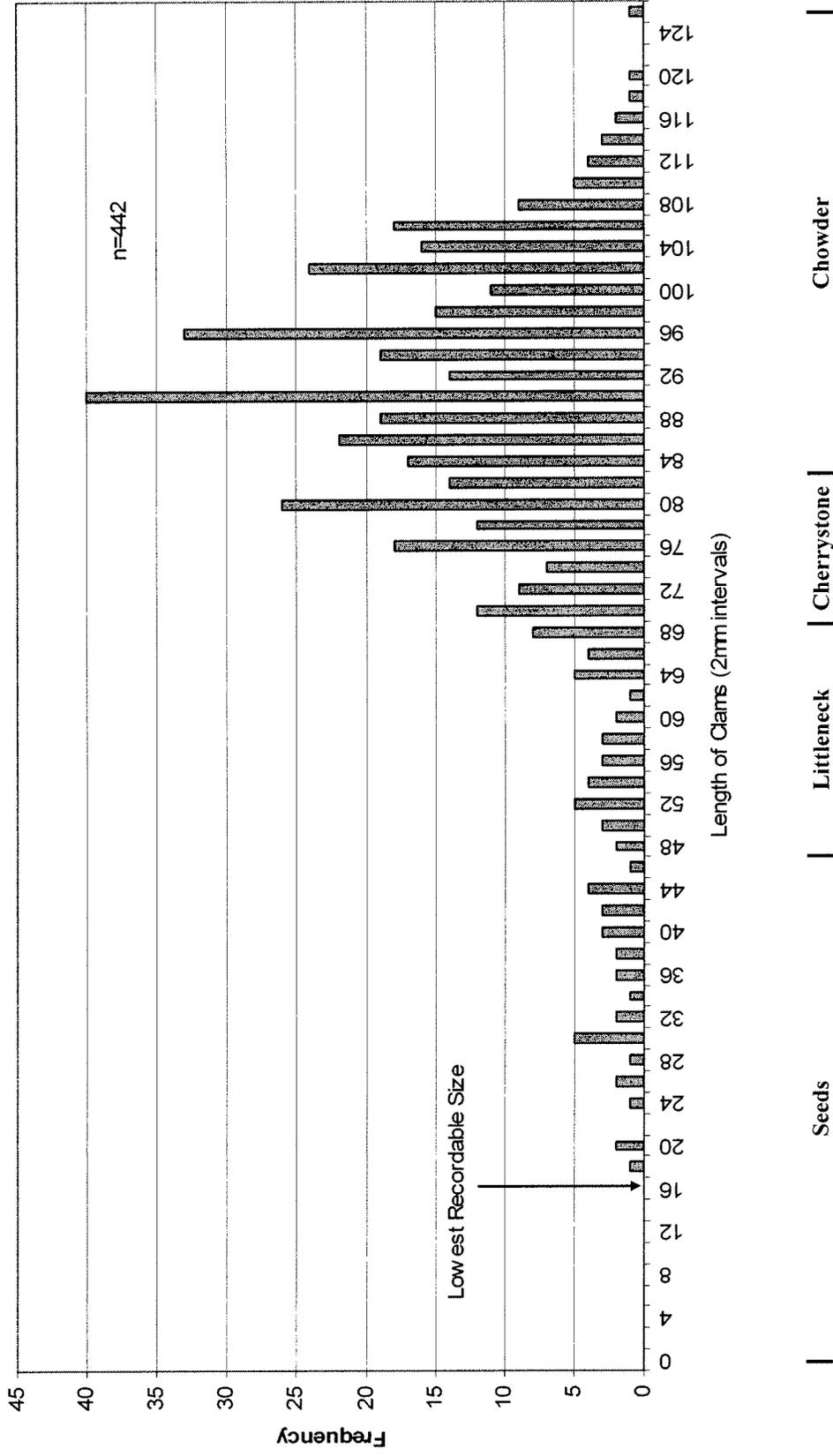
TABLE 3-2. Mean Clam Density by Sub-Area and Size Class.

Area	Seeds	Little Necks	Cherry Stones	Chowder	Total
Uncertified	0.3	0.3	0.2	2.5	3.2
Seasonal	0.4	0.4	0.7	2.9	4.3
Certified	0.2	0.3	0.8	2.0	3.3
Harbor-Wide Mean Density	0.3	0.3	0.6	2.4	3.5

TABLE 3-3. Density and Size by Sub-Area.

	Uncertified	Seasonal	Certified	All Stations
Average Size (mm)	85.7	83.3	82.8	81.8
Average Density (Clams/m ²)	3.2	4.3	3.3	3.5

Table 3-4a
Size Frequency Distribution - All Stations



South Oyster Bay Hard Clam Population Survey
Town of Oyster Bay

Table 3-4b
Size Frequency Distribution - Certified and Seasonal Stations

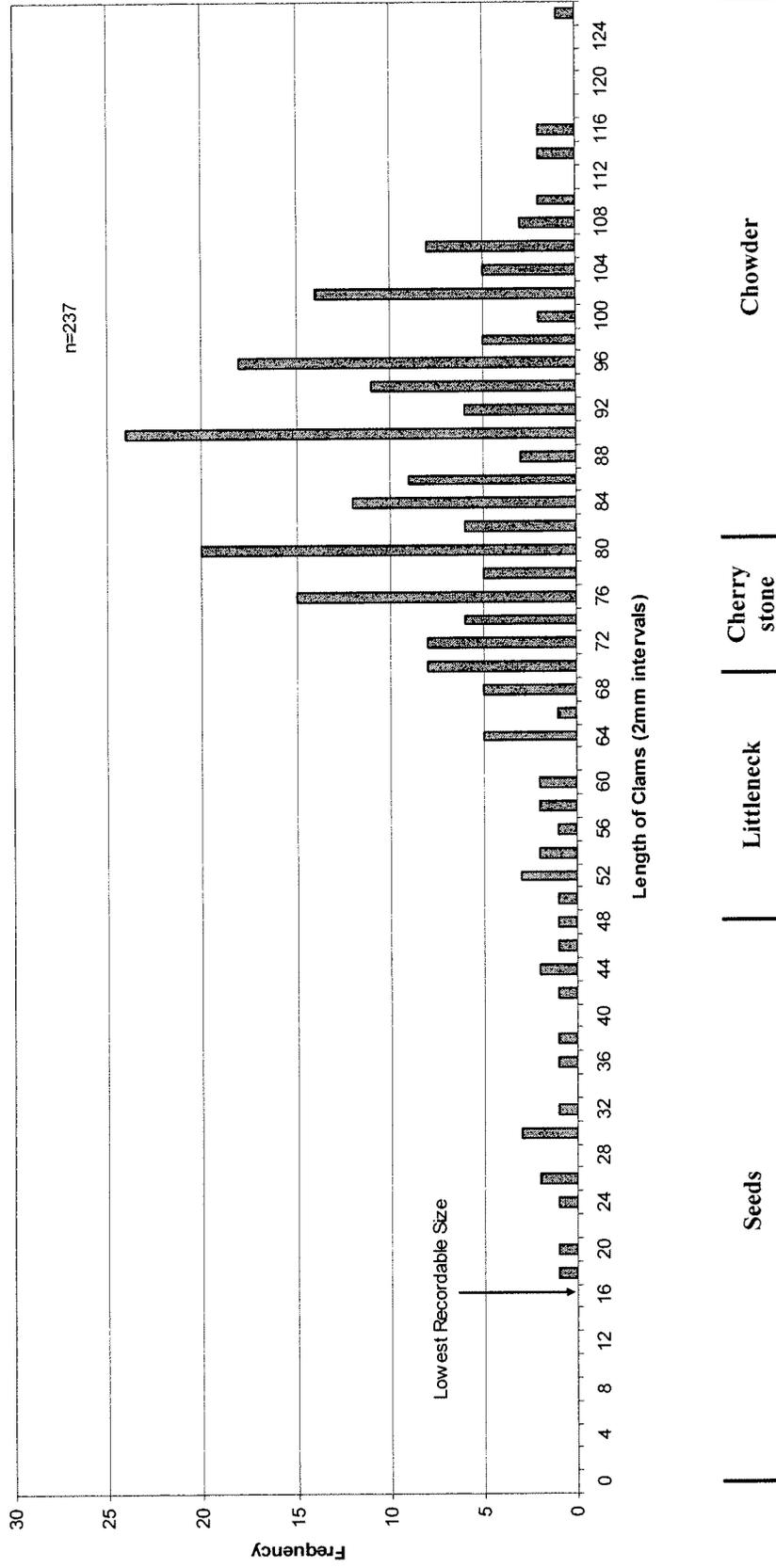


Table 3-4c
Size Frequency Distribution - Uncertified Stations

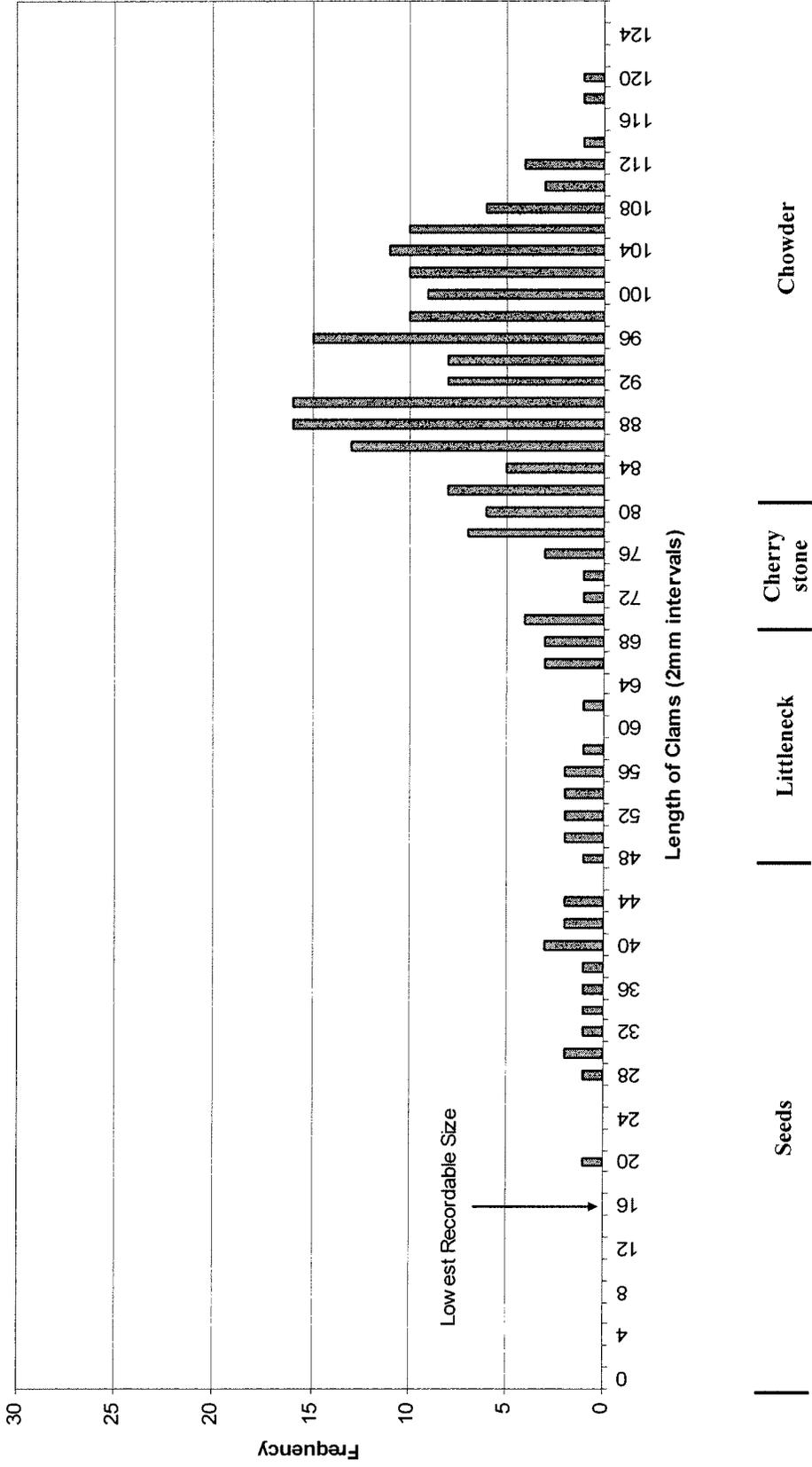


Table 3-5a
Percent Population of Standing Stock - All Sites

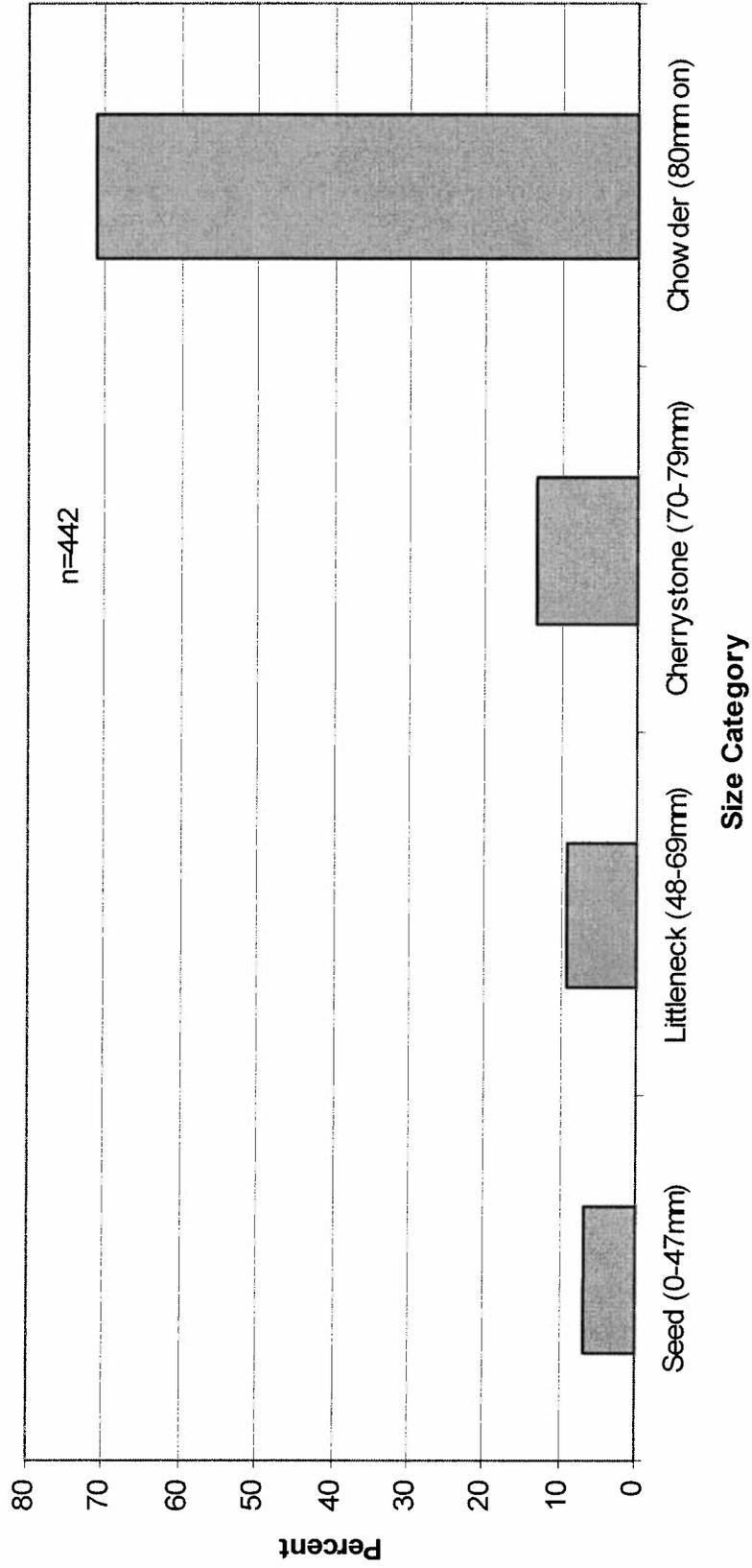


Table 3-5b
Percent Population of Standing Stock - Certified and Seasonal Sites

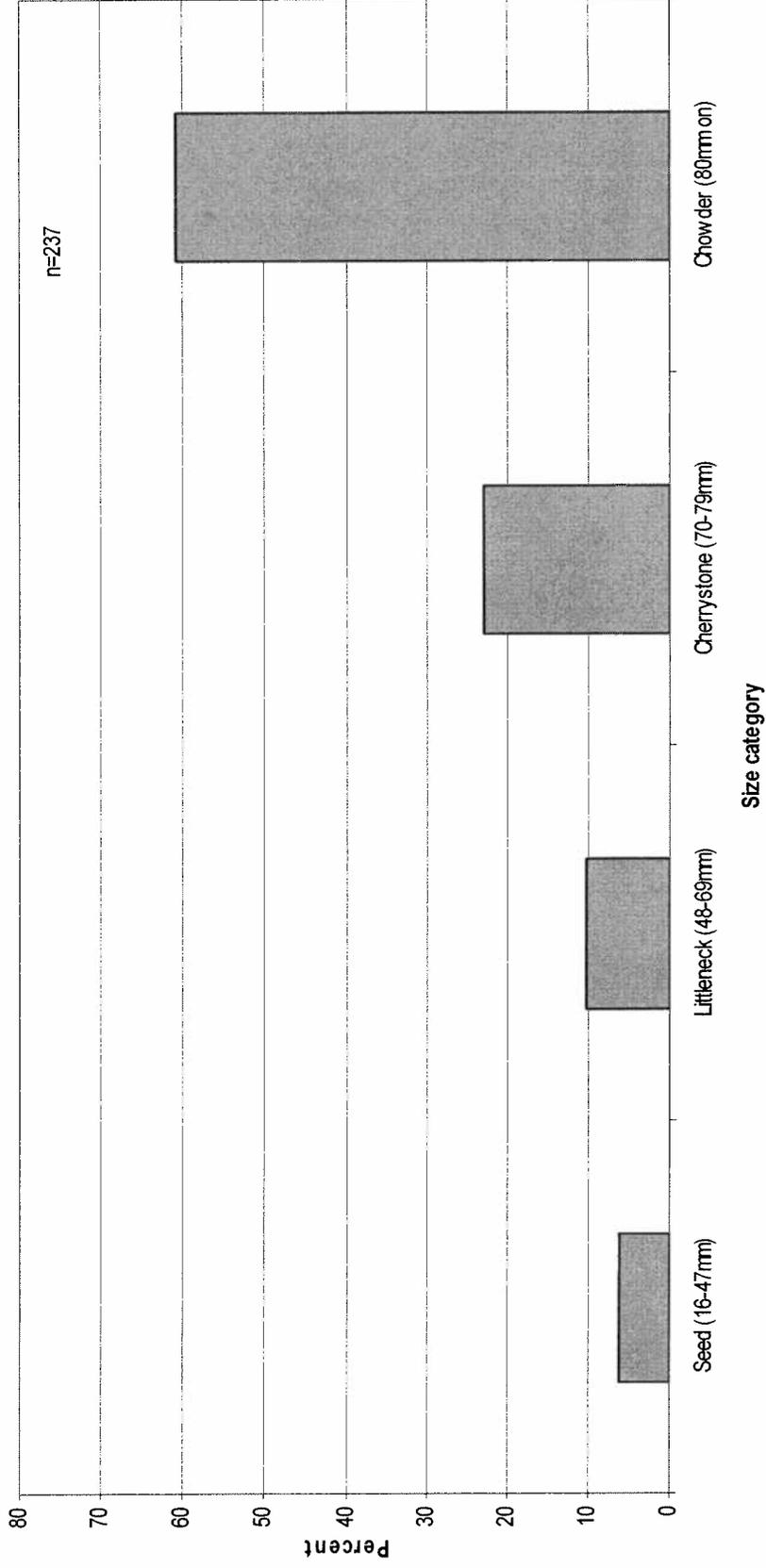
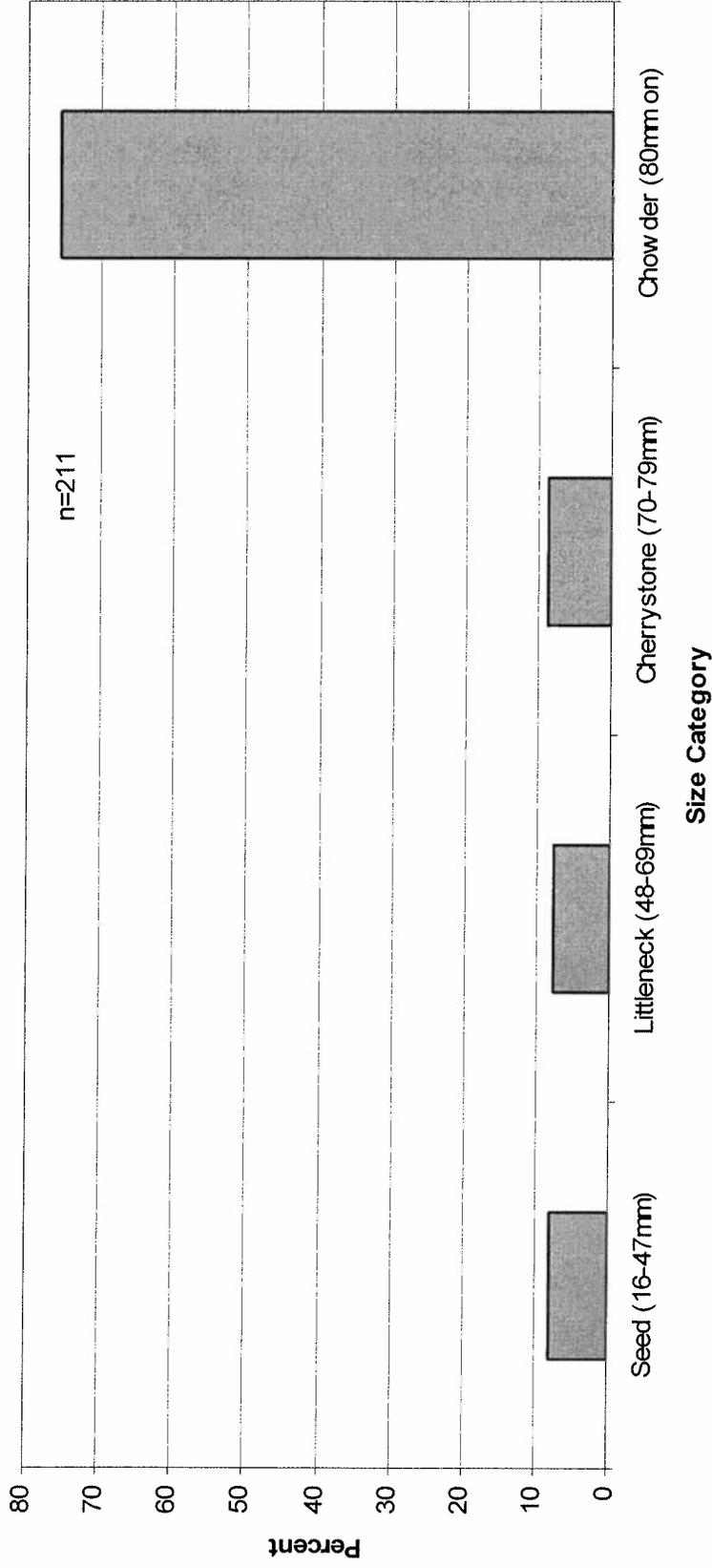


Table 3-5c
Percent Population of Standing Stock - Uncertified Stations



*South Oyster Bay Hard Clam Population Survey
Town of Oyster Bay*

TABLE 3-6. Standing Stock of Clams (in millions of clams).

Area	Seeds	Little Necks	Cherry Stones	Chowder	Total
Uncertified	1.15	0.97	0.62	9.74	12.48
Seasonal	2.20	2.20	4.57	17.75	26.72
Certified	1.14	2.43	5.86	14.00	23.43
Total	4.45	5.39	9.84	41.12	60.81
Percent	7.3%	8.9%	16.2%	67.6%	100.0%

TABLE 3-7. Hard Clam Standing Stock, 1978.

Clam size	Open	Closed	Total
Seed	0.3	1.5	1.8
Littleneck	2.3	8.8	11.1
Cherrystone	5.4	9.2	14.6
Chowder	13.8	36.7	50.5
Total	21.8	56.2	78.0
Density	4.7	4.5	4.6

Note: Hard clam standing stock by size category (in millions) and hard clam density (clam per square meter) in South Oyster Bay in 1978. The open area in 1978 was 4.6 square kilometers in size, the closed area was 12.4 square kilometers, and the total area was 17.0 square kilometers.

Source: WAPORA, 1982

South Oyster Bay Hard Clam Population Survey
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TABLE 3-8. Shellfish predators and other species.

Common Name	Scientific Name	No. of Stations Found At	Highest Density Found	Known Clam Predator
MOLLUSKS				
Hard-Shelled Clam	<i>Mercenaria mercenaria</i>	49	17	
Little Surf Clam	<i>Mulinia lateralis</i>	6	17	
Common Razor Clam	<i>Ensis directus</i>	19	8	
Knobed Whelk	<i>Busycon carica</i>	2	1	X
False Quahog	<i>Pitar morrhuana</i>	3	2	
Stout Tagelus	<i>Tagelus plebeius</i>	1	1	
Blue Mussel	<i>Mytilus edulis</i>	2	10	
Channeled Whelk	<i>Busycon canaliculata</i>	3	1	X
Oyster Drill	<i>Urosalpinx cinerea</i>	2	18	X
Lobed Moon Shell	<i>Polinices duplicatus</i>	1	1	X
Gem Shell	<i>Gemma gemma</i>	1	1	
Veiled Clam	<i>Solemya velum</i>	32	55	
Jingle Shell	<i>Anomia simplex</i>	1	1	
Blood Ark	<i>Anadara ovalis</i>	3	1	
Bay Scallop	<i>Aequipecten irradians</i>	1	1	
Baltic Macoma	<i>Macoma balthica</i>	3	2	
False Angel Wing	<i>Petricola pholadiformis</i>	1	1	
Dwarf Tellin	<i>Tellina agilis</i>	1	1	
CRUSTACEANS				
Black-fingered Mud Crab	<i>Panopeus herbstii and related species</i>	37	66	X
Common Spider Crab	<i>Libinia emarginata</i>	8	3	
Hairy Hermit Crab	<i>Pagurus arcuatus</i>	1	1	
Horseshoe Crab	<i>Limulus polyphemus</i>	11	3	X
Rock Crab	<i>Cancer irroratus</i>	1	1	X
Mantis Shrimp	<i>Squilla empusa</i>	16	10	
Lady Crab	<i>Ovalipes ocellatus</i>	9	3	X
MISCELLANEOUS				
Common Sea Star	<i>Asterias forbesi</i>	5	5	x
Common Sea Squirt	<i>Molgula manhattensis</i>	18	13	

Identification Reference - Gosner, 1978

SECTION 4: SUMMARY AND CONCLUSIONS

General Findings

The general findings of the shellfish survey are described below:

1. Hard clams existing in South Oyster Bay appear to be fairly abundant, based on the wide distribution and moderate densities found during the survey. The overall density of clams is not as high as is typical for other water bodies considered to be highly productive clam waters. Although overall density appears to be moderate, however, there are two findings that indicate the resource is not healthy in terms of future harvesting viability, as described below.
2. The seed clam population is not strong in South Oyster Bay. The lack of an effective set of seeds, or the high mortality of seeds due to predation or other adverse factors, has resulted in a deficient seed population. The lack of seeds may result in poor recruitment into the harvestable size category over

the next several years and until annual sets and survival of seed clams improve. The lack of seed clams in recent years is consistent with anecdotal reports from baymen.

3. The existing stock of clams consists of a large percentage of clams in the larger, older size categories. This is a positive finding in one respect because it indicates that there is an extensive spawning stock of adult clams existing in the bay. However, in terms of overall viability of the resource, the finding indicates that the stock is based on a composition of many year classes and that annual recruitment is low. If the existing stock were depleted, it could take a relatively long term to restore itself. In addition, the large size clams are far less economically valuable on the shellfish market than the littleneck category clams, which are in highest demand and command the highest prices.

4. Uncertified waters sampled during the survey generally had lower concentrations of clams than the certified

*South Oyster Bay Hard Clam Population Survey
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and seasonal waters, although the difference in abundance was not great. This is not typical because uncertified waters usually have higher abundance because of the lack of fishing pressure. It may indicate that the uncertified waters of South Oyster Bay are not favorable for the growth and survival of clams.

Management Recommendations

Based on the above findings regarding the viability of the hard clam resources, the following management recommendations are made.

1. **Seeding Program** - The Town should consider expanding the clam seeding program for the Bay. The current seed stock throughout the harbor system appears to be low, and seeding could help to boost the weak year classes of seeds. The seeding program could be expanded based on a review of sediment type and other environmental conditions that would favor seed survival and growth.

The Town could consider utilizing larger size clams for the seeding program. The grow-out of small hard clam seeds enables them to reach a size that decreases their vulnerability to predators and improves their chances for survival. Importantly, the field survey for this investigation revealed the presence throughout the study area of large populations of mud crabs, which are predators of young seed clams. However, larger seed stock is more costly

and a smaller number of clams would be seeded for the same budget if the seed size were increased.

2. **Seed Data Collection** - It would be useful to have data as to the fate of seed clams placed into the bay. Experiments could be established to monitor the growth and survival of seed clams. Such data would be useful in assessing factors affecting the abundance of clams in the bay, and in developing improvements to the seeding program.

3. **Clam Transplants** - A traditional clam management tool on Long Island has been the transplant of clams from uncertified waters to management areas. The transplants served the purpose of reducing the potential for illegal shellfishing in closed waters, and increasing the stock available for public harvest. For South Oyster Bay, the resource may benefit more from leaving the populations in uncertified waters intact as spawning stock. The large size of clams in uncertified waters and densities that are not substantially higher than certified waters, will tend

to lessen the motivation for illegal shellfishing in these waters. Given the fact that the uncertified waters have lower abundance than open waters, clam transplants are not recommended for South Oyster Bay.

4. **Chowder Transplants** - Chowder transplant programs have traditionally been used on Long Island to provide for supplemental spawner stock. Given the aged composition of the clam resources in the bay, and the wide distribution of chowders in much of this area, it does not appear to be necessary to supplement the Bay's resources with additional chowder clams. In addition, there is evidence that chowders are relatively poor spawners compared to cherrystones and littlenecks. Funds would probably be better allocated towards purchasing seed clams to help augment the seed stock in the harbor complex.

5. **Shellfishing Pressure** - There are only about 65 licensed clambers on record for the Town of Oyster Bay at the present time. Most of the Town's clambers are thought to spend the bulk of their time clamming in

*South Oyster Bay Hard Clam Population Survey
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the Oyster Bay Harbor area rather than the South Shore. Although exact numbers are not available, it is generally known that few of the license holders are working full-time at clamming. The resource is subject to an active recreational fishery by the Town residents. Thus, the resource appears to be subject to relatively light commercial fishing pressure. Although the resource can likely sustain the level of pressure it has been subjected to in recent years, the stock probably could not sustain substantially more pressure without undergoing decline. The lack of a robust seed population and the predominance of large size clams are indicators that the population could not successfully sustain substantial increases in fishing pressure. It would be useful for the Town to collect data on the number of clammers that actually fish South Oyster Bay. The data would help to monitor changes in fishing pressure and enable better separation of north and south shore programs.

6. **Water Quality Protection** - The water quality of South Oyster Bay has been maintained at the level which has

allowed this area to retain its value as a shellfishery resource and wildlife habitat. Long-term degradation of water quality could have adverse effects in terms of the decertification of shellfish beds and impacts on the health and reproductive ability of shellfish populations. The efforts by the Town in controlling stormwater runoff and other measures included in the Town's harbor management program should be continued to help maintain water quality, and to improve water quality in isolated portions of the embayment which have been degraded.

7. **Shellfish Aquaculture** - It is becoming more and more evident that wild stocks of fish and shellfish are being over exploited and are unable to meet seafood demand. Aquaculture is being implemented in many areas of the country to provide alternative, renewable sources of seafood. Shellfish aquaculture is especially well established in many areas of the country and the world in general. Limited Town sponsored aquaculture programs could be considered to test their applicability to South Oyster Bay.

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Although there may be a general public dislike for private use of public underwater land, certain areas of the Bay that are under-utilized could be considered for aquaculture. Oyster farming is growing in popularity on Long Island because of the species' adaptability to aquaculture production and the demand for oysters on the half-shell market. Rack and cage systems that provide predator protection could be employed to raise oysters, and the practice has proven effective in the Long Island areas including the Peconic Bay. Such an aquaculture program would have an added advantage of providing a potential spawning stock which could result in a natural set of oysters in areas favorable for their growth and survival, such as the numerous wetland islands in the southern half of South Oyster Bay.

8. **Follow-Up Shellfish Survey** - The repeat of the shellfish survey would provide data on the short-term changes in the shellfish population of the Bay. This would be especially important to assess seed stock and recruitment. A study of shellfish growth rates

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performed as part of the study would help identify areas most suitable for seed transplant programs. A detailed sediment and seagrass survey could be performed in conjunction with the shellfish survey to provide baseline information on factors affecting the distribution and abundance of clams.

REFERENCES

Gosner, Kenneth L. 1978. A Field Guide to the Atlantic Seashore. Houghton Mifflin Company, Boston, Massachusetts.

Greene, G. 1980. Hard Clams, Competitors, Predators, and Physical Parameters in Great South Bay. New York Sea Grant Institute, Albany, New York.

New York State Department of Environmental Conservation. 2004. Compilation of Uncertified Acreage in the New York State Marine District, 1970 to 2004. New York State Department of Environmental Conservation, Stony Brook, New York. 1 pp.

South Shore Estuary Reserve. 2001. Comprehensive Management Plan. New York State Department of State, Albany, New York

Town of Oyster Bay. 2005. South Oyster Bay Harbor Management Plan.

Town of Oyster Bay. 2004. South Oyster Bay Habitat Management Plan.

Town of Oyster Bay. 2002. Oyster Bay/Cold Spring Harbor Complex, Harbor Management Plan.

WAPORA. 1982. Impact Assessment on Shellfish Resources of Great South Bay, South Oyster Bay, and Hempstead Bay. New York. US Environmental Protection Agency, Region II, New York, New York.

**APPENDIX A
SHELLFISH POPULATION SURVEY
PERMIT NO. 04-SP-2**

New York State Department of Environmental Conservation
Division of Fish, Wildlife & Marine Resources
Bureau of Marine Resources - Shellfisheries Section
205 North Belle Mead Road, Suite 1, East Setauket, New York 11733
Phone: (631) 444-0475 • FAX: (631) 444-0472
Website: www.dec.state.ny.us



Erin M. Crotty
Commissioner

August 5, 2004

Mr. Gregory Greene
Sr. Environmental Scientist
Cashin Associates, P.C.
1200 Veterans Memorial Highway
Hauppauge, New York 11788

RE: Shellfish Population Survey Permit No. 04-SP-2

Dear Mr. Greene:

Please find enclosed Shellfish Population Survey Permit No. 04-SP-2 which approves your request to conduct a shellfish population survey in the town controlled waters of South Oyster Bay during the period August 15 through October 15, 2004. As identified in Condition No. 5 of your Shellfish Population Survey Permit, you are required to notify NYSDEC's law enforcement at least 24 hours prior to the proposed survey.

If you have any questions or require further assistance, please contact me at (631) 444-0483.

Sincerely,


Debra A. Barnes
Biologist 2 Marine

Enclosure



SHELLFISH POPULATION SURVEY PERMIT

Permit No. 04-SP-2

Pursuant to the provisions of Sections 13-0319 and 13-0321 of the Environmental Conservation Law, permission is hereby granted to Cashin Associates, P.C., 1200 Veterans Memorial Highway, Hauppauge, New York, to undertake a Shellfish Population Survey in the certified and uncertified waters of South Oyster Bay in the Town of Oyster Bay, under the following conditions:

1. All shellfish surveying activities shall be undertaken through the use of a clamshell bucket from a barge mounted crane.
2. The surveying activities hereby permitted shall take place in the town controlled underwater lands in South Oyster Bay, Town of Oyster Bay.
3. All surveying and harvesting activities undertaken pursuant hereto shall be carried out under the direct supervision of Gregory Greene, Sr. Environmental Scientist, Cashin Associates, P.C.
4. All shellfish harvested pursuant hereto shall be immediately returned to the waters from which they are taken. Under no circumstances shall shellfish harvested in uncertified waters be returned to certified waters.
5. The Permittee shall advise the Department of Environmental Conservation's Division of Law Enforcement, (631) 444-0250, of the vessel to be used, survey location, and date(s) of the subject survey activities at least twenty-four hours prior to the involved survey.
6. A copy of the Permit must be maintained on board the involved vessel used by the Permittee to supervise the activities hereby permitted in such a way as to be immediately accessible by an Environmental Conservation Officer or other appropriate Department representative upon request.
7. This permit is issued for activities hereby approved to take place **between the dates of August 15, 2004 and October 15, 2004.**

This permit is issued subject to a reserved right of **SUMMARY SUSPENSION AND/OR REVOCATION** whenever such **SUSPENSION OR REVOCATION** is deemed prudent or necessary by the Department of Environmental Conservation in carrying out the purposes of the Environmental Conservation Law or the Rules and Regulations promulgated thereunder, whenever in the judgement of the Department the Permittee shall have violated any term or condition of the Permit or whenever the Permittee shall have violated any provision of the Environmental Conservation Law or the Rules and Regulations promulgated thereunder.

A handwritten signature in cursive script, reading "Debra A. Barnes", written over a horizontal line.

Debra A. Barnes
Biologist 2 Marine

DATED: August 5, 2004

cc: NYSDEC Law Enforcement, Region 1
Carol Hoffman, Shellfisheries
Nancy Kearney, Town of Oyster Bay
Permit File

**APPENDIX B
LATITUDE AND LONGITUDE OF
STATION LOCATIONS**

*South Oyster Bay Hard Clam Population Survey
Town of Oyster Bay*

APPENDIX B. Station number and location (latitude and longitude).

Station Number	Latitude	Longitude
1	40°39.277'	73°25.635'
2	40°39.178'	73°25.743'
3	40°38.989'	73°25.683'
4	40°38.977'	73°25.887'
5	40°38.758'	73°25.605'
6	40°38.699'	73°26.002'
7	40°39.093'	73°26.358'
8	40°38.974'	73°26.678'
9	40°39.163'	73°26.800'
10	40°38.698'	73°26.869'
11	40°39.081'	73°27.226'
12	40°38.862'	73°27.432'
13	40°38.627'	73°27.497'
14	40°38.608'	73°27.768'
15	40°38.755'	73°27.811'
16	40°38.988'	73°28.129'
17	40°39.314'	73°28.223'
18	40°39.160'	73°28.271'
19	40°38.616'	73°28.244'
20	40°38.989'	73°28.449'
21	40°38.965'	73°28.667'
22	40°38.682'	73°28.630'
23	40°38.410'	73°28.490'
24	40°39.047'	73°28.940'
25	40°38.093'	73°28.656'
26	40°37.753'	73°28.518'
27	40°37.564'	73°28.662'
28	40°37.716'	73°28.303'
29	40°38.136'	73°28.205'
30	40°38.248'	73°27.871'
31	40°38.093'	73°27.463'
32	40°38.408'	73°27.019'
33	40°38.397'	73°26.540'
34	40°38.168'	73°26.218'
35	40°38.520'	73°26.073'
36	40°38.193'	73°25.636'
37	40°37.967'	73°25.614'
38	40°37.884'	73°26.234'
39	40°37.875'	73°26.531'
40	40°37.524'	73°26.169'
41	40°37.718'	73°26.902'
42	40°37.851'	73°27.120'

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Station Number	Latitude	Longitude
43	40°37.281'	73°27.156'
44	40°37.499'	73°27.462'
45	40°37.253'	73°27.594'
46	40°37.716'	73°27.627'
47	40°37.704'	73°27.835'
48	40°37.821'	73°28.076'
49	40°37.488'	73°27.820'
50	40°37.377'	73°27.845'
51	40°37.439'	73°27.911'
52	40°37.173'	73°28.042'
53	40°37.259'	73°28.451'
54	40°36.919'	73°28.501'
55	40°36.561'	73°28.551'
56	40°36.752'	73°27.985'
57	40°36.992'	73°27.866'
58	40°36.907'	73°27.629'
59	40°36.907'	73°27.033'
60	40°36.872'	73°26.225'
61	40°37.048'	73°25.868'
62	40°36.944'	73°25.610'
63	40°37.012'	73°25.500'

**APPENDIX C
HARD CLAM ABUNDANCE AND SIZE AT EACH STATION**

Town of Oyster Bay - Hard Clam Survey - South Oyster Bay

All Stations (1 of 5)

STATION	1		2		3			4			5		6		7		8		9	
	1	2	1	2	1	2	3	1	2	3	1	2	1	2	1	2	1	2	1	2
LENGTH MEASUREMENTS (mm)	0	85	102	0	105	98	96	84	87	32	95	29	0	98	92	78	0	94	82	100
		84	68		88	102	98	112		97	70			102	104	84				
			68			103				33	98			114	119	88				
			54			94					89			111	105	86				
			49								102				82	85				
			78								118				90	95				
											108				101	35				
															102	103				
															86	104				
															95	98				
															102	107				
															90	95				
NUMBER OF CLAMS	0	2	6	0	2	4	2	2	1	3	1	7	0	4	12	19	0	1	1	1
AVERAGE SIZE (mm)	0	85	70	0	97	99	97	98	87	54	95	88	0	106	97	90	0	94	82	100
CLAM DENSITY (Clams/m ²)	1		3			2.7		2			4		2		15.5		0.5			1
PERCENT SEED																				
PERCENT LITTLE NECK																				
PERCENT CHERRY STONES																				
PERCENT CHOWDER																				
AVG. DENSITY OF CLAMS																				

South Oyster Bay Hard Clam Population Survey
Town of Oyster Bay

Town of Oyster Bay - Hard Clam Survey - South Oyster Bay
All Stations (2 of 5)

10	11		12		13		14		15		16		17		18		19		20		21		22		23		
	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	
94	104	0	0	0	89	80	87	86	105	0	88	0	0	0	38	75	70	82	110	103	77	52	90	70	52	70	
	88				90	86	87	87								67	77	88	89	99	95	78	27	90	85	85	
					81	81	81	81								92	79	103	87	95	76	20	70	88	98	98	
					89	89	88	88								87	88	92	43	77	77	85	99	71	90	90	
																94	97	97	43	65	65	56	91	105	104	104	
															108	108	40	39	61	61	41	41	90	110	94	94	
															76	76	29	29	42	42	106	106	106	95	74	74	
															87	87			34	34	93	100	101	86	86	86	
															80	80			102	102	110	103	85	65	85	85	
																			80	80	110	80	106	112	100	100	
																			100	100	100	100	95	90	103	103	
																			79	79	79	79	112	99	99	99	
1	2	0	0	0	2	4	1	4	1	0	1	0	0	0	1	9	5	7	6	3	8	13	17	13	12	12	
94	96	0	0	0	90	84	87	86	105	0	88	0	0	0	38	85	82	76	69	99	66	77	91	88	88	88	
1.5		0	0	0	3		2.5		0.5		0.5		0	0.5	7		6.5		5.5		15				12.5		

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Town of Oyster Bay - Hard Clam Survey - South Oyster Bay
All Stations (3 of 5)

	24		25		26		27		28		29		30		31		32		33		34		35		36		37	
	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
82	99	96	85	105	81	103	55	0	0	83	37	0	0	90	85	80	0	72	83	0	0	25	79	105	96	89	95	
90	50	94	104			44	93			76	92			90	80			70					102	94				
77	66	45	116			63	59			73	99			64	85									80				
106	107	79	101			58	23							101	94									106				
57	106	79	102			77								76	93									79				
53	87	79				50								81	93									86				
94	95	115				25								109	88									80				
86	95	98												90	95													
82	96	102												95	88													
83	91	70												100	81													
56	80	105												96	70													
40	95	91												84	76													
108		106													84													
89		95													84													
91		89													84													
89		105																										
107																												
104																												
99																												
81																												
20	12	16	5	1	1	7	4	0	0	0	3	3	0	12	14	1	0	1	2	0	0	1	2	2	7	1	1	
84	89	91	102	105	81	60	58	0	0	0	77	76	0	90	85	80	0	72	77	0	0	25	54	104	89	89	95	
16		10.5		1		5.5		0			3		0	13		0.5		1.5		0		1.5	4.5					

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**Town of Oyster Bay - Hard Clam Survey - South Oyster Bay
All Stations (4 of 5)**

38	39		40		41		42		43		44		45		46		47		48		49		50		51	
	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
104	74	0	90	0	0	0	79	0	78	75	79	0	0	67	64	48	73	19	32	54	0	29	41	94	95	
										89	108	108	108	90	60	64	95	51	76	70	73	89	83			
										92	92	92	92	92	64	51	51					89	73			
										90	71	95	102	95	102	102										
										68	80	98	86	98	86											
										101	98	54	102	54	102											
										101	103	89	95	89	95											
										70				102	95											
														79	92											
														108	89											
														89												
1	1	0	1	0	0	0	2	0	3	3	3	2	2	8	7	0	0	11	10	3	1	2	2	2	0	3
104	74	0	90	0	0	0	79	0	68	83	91	99	86	85	85	88	50	73	48	51	64	0	69	66	94	95
1		0.5	0	0	0	0	1	1	3	2.5	7.5	0	0	10.5	2	2	2	1	3	1	1	3	3	1	1	

South Oyster Bay Hard Clam Population Survey
Town of Oyster Bay

Town of Oyster Bay - Hard Clam Survey - South Oyster Bay
All Stations (5 of 5)

	52		53		54		55		56		57		58		59		60		61		62		63	
	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
89	73	67	90	125	110	0	0	85	71	102	114	69	75	103	0	0	76	82	72	82	0	0	93	0
95	86	83	85					72	82	95	83	72	72	67			35	88	70	88				
95	89	80	84					76		89	83	90	78				58		94					
95	76	80						101		83	108	79	80						85					
102	79										95	94	43						82					
51	95										114	93	30						17					
102	79												30						97					
98	89																							
114	102																							
83	76																							
76	89																							
89	79																							
79	76																							
76	108																							
102	89																							
70	73																							
105	76																							
17	17	4	3	1	1	1	0	0	4	2	4	6	6	7	2	0	0	3	2	7	0	0	1	0
90	84	78	86	125	110	0	0	0	84	77	92	100	83	58	85	0	0	56	85	74	0	0	93	0
17		3.5		1		0	0	3		5		6.5		1	1.5		4.5		0				0.5	

Town of Oyster Bay - Hard Clam Survey - South Oyster Bay
Certified Stations (1 of 2)

STATION	36		37		38		39		40		41		42		43		44		45		46	
	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
SAMPLE LOCATION	102	79	89	95	104	74	0	90	0	0	78	0	66	78	76	89	68	60	0	0	54	64
LENGTH MEASUREMENTS (mm)	105	80									79		67	78	92	108	70	71			64	64
		80											72	92	106		75	79			67	86
		86															90	80			79	89
		94															90	98			89	92
		96															90	102			89	95
		106															101	103			89	95
																	101				92	95
																					95	95
																					98	102
																					102	102
																					108	
NUMBER OF CLAMS	2	7	1	1	1	1	0	1	0	0	2	0	3	3	3	2	8	7	0	0	11	10
AVERAGE SIZE (mm)	104	89	89	95	104	74	0	90	0	0	79	0	68	83	91	99	86	85	0	0	85	88
CLAM DENSITY (Clams/m ²)	4.5		1		1		0.5		0	1		3			2.5		7.5		0		10.5	
TOTAL QUANTITY	9		2		2		1		N/A	2		6			5		15		N/A		21	
TOTAL AVERAGE SIZE (mm)	92		92		89		90		N/A	76		76			94		85		N/A		87	
PERCENT SEED		4.9%																				
PERCENT LITTLE NECK		10.4%																				
PERCENT CHERRY STONES		25.0%																				
PERCENT CHOWDER		59.7%																				
AVG. DENSITY OF CLAMS		3.3																				

*South Oyster Bay Hard Clam Population Survey
Town of Oyster Bay*

**Town of Oyster Bay - Hard Clam Survey - South Oyster Bay
Certified Stations (2 of 2)**

Station	47		48		49		50		51		52		53		54		55		56		57		58		59		61	
	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
48	73	19	32	76	54	0	29	41	94	95	51	73	67	84	125	110	0	0	72	71	83	83	69	30	67	0	82	17
51		76	70		73		89	73			70	73	80	85					76	82	89	83	72	30	103		88	70
51							89	83			76	76	80	90					85		95	95	79	43			72	
											76	76	83						101		102	108	90	72			82	
											79	76									114	114	93	75			85	
											83	76									114	114	94	78			94	
											89	79															94	
											89	79															94	
											95	79															94	
											95	86															94	
											95	89															94	
											98	89															94	
											102	89															94	
											102	89															94	
											102	95															94	
											105	102															94	
											114	108															94	
3	1	2	2																									
											17	17	4	3	1	1	0	0	4	2	4	6	6	7	2	0	2	7
50	73	48	51		64	0	69	66	94	95	90	84	78	86	125	110	0	0	84	77	92	100	83	58	85	0	85	74
2		2			1		3	3	1	1	17	17	3.5	3.5	1	1	0	0	3		5	5	6.5	1	1		4.5	
4		4			2		6	6	2	2	34	34	7	7	2	2	N/A	N/A	6		10	10	13	2	2		9	
56		49			64		67	67	95	95	87	87	81	81	118	118	N/A	N/A	81		97	97	70	85	85		76	

*South Oyster Bay Hard Clam Population Survey
Town of Oyster Bay*

**Town of Oyster Bay - Hard Clam Survey - South Oyster Bay
Uncertified Stations (1 of 2)**

STATION	1		2		3			4			5		6		7		8		9		10	
	1	2	1	2	1	2	3	1	2	3	1	2	1	2	1	2	1	2	1	2	1	2
SAMPLE LOCATION	0	84	49	0	88	94	96	84	87	32	95	29	0	98	82	35	0	94	82	100	94	88
LENGTH MEASUREMENTS (mm)	85	85	54		105	98	98	112		33	70	70		102	86	78						104
			68		102	102	97				89	98		111	90	84						
		68			103						98	102		114	90	84						
		78									102	108			92	85						
		102									108	118			95	86						
															101	87						
															102	88						
															102	91						
															104	94						
															105	95						
															119	95						
NUMBER OF CLAMS	0	2	6	0	2	4	2	2	1	3	1	7	0	4	12	19	0	1	1	1	1	2
AVERAGE SIZE (mm)	0	85	70	0	97	99	97	98	87	54	95	88	0	106	97	90	0	94	82	100	94	96
CLAM DENSITY (Clams/m ³)	1		3		2.7			2			4			2	15.5		0.5	1				1.5
TOTAL QUANTITY	2		6		8			6			8			4	31		1	2				3
TOTAL AVERAGE SIZE (mm)	85		70		98			74			89			106	87		94			91		95

PERCENT SEED	9.2%
PERCENT LITTLE NECK	7.8%
PERCENT CHERRY STONES	5.0%
PERCENT CHOWDER	78.0%
AVG. DENSITY OF CLAMS	3.2

South Oyster Bay Hard Clam Population Survey
Town of Oyster Bay

Town of Oyster Bay - Hard Clam Survey - South Oyster Bay
Uncertified Stations (2 of 2)

11		12		13		14		15		16		17		18		20		21		24	
1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
0	0	0	0	89	80	87	81	105	0	88	0	0	0	0	38	29	39	95	34	40	50
				90	81	86	86									40	43	99	42	53	66
					86	87	87									82	43	103	61	56	80
					89	88	88									88	87	65	57	57	87
																92	89	76	77	77	91
																97	110	77	81	81	95
																103		77	82	82	95
																		95		82	95
																				83	96
																				86	99
																				89	106
																				89	107
																				90	107
																				91	108
																				94	
																				99	
																				104	
																				106	
																				107	
																				108	
0	0	0	0	2	4	1	4	1	0	1	0	0	0	0	1	7	6	3	8	20	12
0	0	0	0	90	84	87	86	105	0	88	0	0	0	0	38	76	69	99	66	84	89
0	0	0	0	3		2.5		0.5	0	0.5	0	0	0	0.5	6.5	5.5	5.5	5.5	16		
N/A	N/A	N/A	6			5		1	1	1	13	N/A	N/A	1	11	32					
N/A	N/A	N/A	86			86		105	88	88	73	N/A	N/A	38	75	77					

South Oyster Bay Hard Clam Population Survey
Town of Oyster Bay

Town of Oyster Bay - Hard Clam Survey - South Oyster Bay
Seasonal Stations (1 of 2)

STATION	19		22		23		25		26		27		28		29		30		31		32	
	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
SAMPLE LOCATION (mm)	67	70	20	27	47	52	45	85	105	81	25	23	0	0	73	37	0	0	64	70	80	0
	75	77	41	70	65	74	70	101			44	55			76	92			76	76		
	76	79	52	85	70	85	79	102			50	59			83	99			81	80		
	80	88	56	90	71	85	79	104			58	93							84	81		
	87	97	78	90	88	86	79	116			63								90	84		
	87		79	90	90	86	89				77								90	84		
	92		80	91	90	90	91				103								90	85		
	94		85	91	95	94	94												95	85		
	108		93	95	99	98	95												96	88		
			100	95	101	100	96												100	88		
		102	99	105	103	98												101	93			
		106	100	110	104	102												109	93			
		110	102	112		105												94	94			
						105												95	95			
						106																
						106																
						115																
NUMBER OF CLAMS	9	5	13	17	13	12	16	5	1	1	7	4	0	0	3	3	0	0	12	14	1	0
AVERAGE SIZE (mm)	85	82	77	91	88	88	91	102	105	81	60	58	0	0	77	76	0	0	90	85	80	0
CLAM DENSITY (Clams/m ²)	7		15		12.5		10.5		1		5.5		0		3		0		13		0.5	
TOTAL QUANTITY	14		30		25		21		2		11		N/A		6		N/A		26		1	
TOTAL AVERAGE SIZE (mm)	84		85		88		93		93		59		N/A		77		N/A		87		80	
PERCENT SEED																						
PERCENT LITTLE NECK																						
PERCENT CHERRY STONES																						
PERCENT CHOWDER																						
AVG. DENSITY OF CLAMS																						

*South Oyster Bay Hard Clam Population Survey
Town of Oyster Bay*

**Town of Oyster Bay - Hard Clam Survey - South Oyster Bay
Seasonal Stations (2 of 2)**

33		34		35		60		62		63	
1	2										
72	70	0	0	25	29	0	76	0	0	93	0
83				79			35				
							58				
1	2	0	0	1	2	0	3	0	0	1	0
72	77	0	0	25	54	0	56	0	0	93	0
1.5	0			1.5		1.5	0			0.5	
3	N/A	N/A		3		3	N/A	N/A		1	
75	N/A	N/A		44		56	N/A	N/A		93	