UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Exploratory Fishing and Gear Research Base
Woods Hole, Massachusetts 02543

CRUISE REPORT

Delaware II Cruise 71-1
June 1 - July 23, 1971

OCEAN QUAHOG SURVEY

August 16, 1971

Figure 1. -- Crew members sorting ocean quahogs during the recently completed cruise of the Delaware II. On occasion catches of up to 10.5 bushels were taken during 4 minute "standard" sampling tows. Two bushels in four minutes is considered to represent comparatively high density.

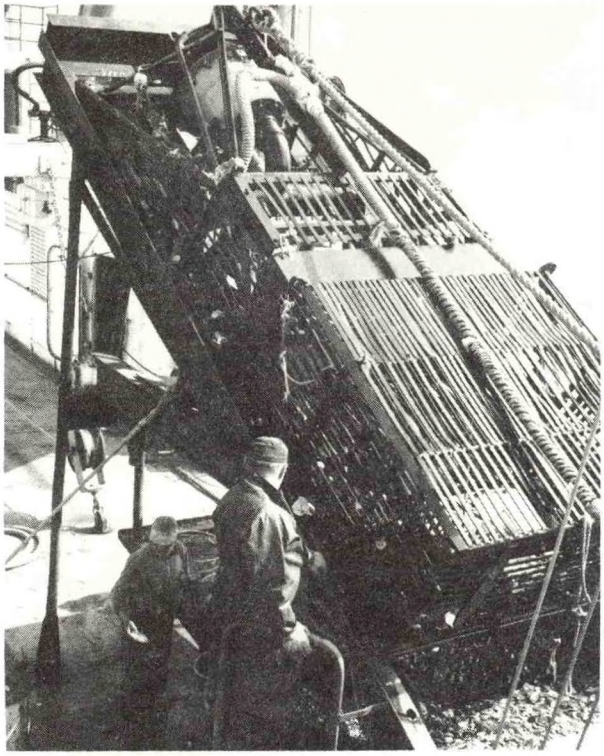

Figure 2. -- Hydraulic clam dredge on board Delaware II. This dredge is equipped with a submersible electric pump which supplies water to jets at the forward end of the dredge. The dredge is shown here on a launching platform located near the stern of the Delaware II.

Investigations to determine the distribution and abundance of ocean quahogs (Arctica islandica)* were extended geographically to include areas between Cape Cod and Isles of Shoals (New Hampshire). To supplement earlier (1970) surveys for ocean quahogs south of New England, additional coverage was accomplished between Nantucket Shoals and New Jersey.

With some modification, survey procedures followed those adopted during earlier explorations for surf clams and ocean quahogs. This approach consists of sampling depths ranging from 10 to 35 fathoms along grid lines formed by Loran coordinates. Spacing of individual stations varies from approximately 1 to 2 nautical miles apart depending on suitability of bottom and other factors. Normally the 48-inch wide dredge, equipped with a hydraulic jet system (see Figure 2) was towed for four minutes at each location. Counts were made of total catch by species and the size range was recorded.

Throughout the survey primary emphasis was given to coverage in ocean quahog depth range. On some occasions surf clams, Spisula solidissima and a related species S. polynyma, were captured. The survey completed during 1971 was conducted in 9 more or less discreet units (see Figures 3 and 5; Table I). Seven of these "units" accounted for new geographical coverage from New Jersey to the Isles of Shoals (N.H.). The remaining two were concerned with production fishing (E) and population estimates (in blocks B & C). Each of the survey units is discussed briefly below.

Ipswich Bay (F)

Some coverage was accomplished in Ipswich Bay from Halibut Point (Cape Ann) to south of the Isles of Shoals (New Hampshire). Seventy-eight stations at depths ranging from 7 to 30 fathoms produced ocean quahogs from 81 percent of the stations sampled. Average catch rates equaled only .05 bushels per minute of fishing; individual catches were uniformly low never reaching 2 bushels or more from one station. The results of the Delaware II Cruise 71-1 are in conflict with an earlier survey by the National Marine Fisheries Service using

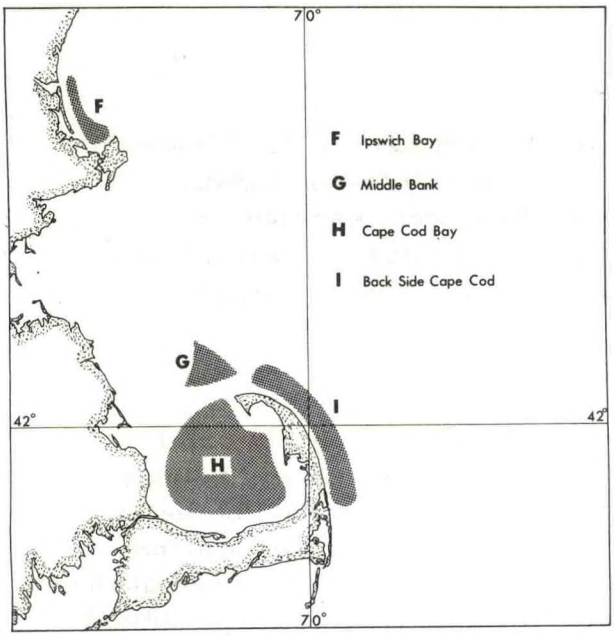

Figure 3. -- Areas sampled during 1971. At these locations catch rates for ocean quahogs were uniformly low with standard tows averaging .04 to .4 bushels per 4 minutes dredging. Much of the bottom in this area is erratic with hard rocky patches and considerable stone and small boulders. These factors make dredging hazardous.

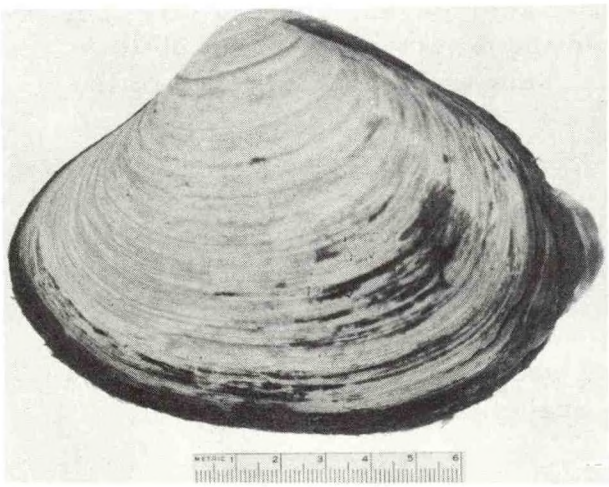

Figure 4. -- The clam Spisula polynyma taken in quantity from 21 fathoms on Middle Bank in Massachusetts Bay. This species is found in the Northeast Pacific as well as the Northwest Atlantic.

the chartered vessel Jo-Ann. In this work a smaller dredge and lower powered vessel than the Delaware II produced significantly higher catch rates. Additional studies are scheduled during 1971 to attempt to better understand the variations experienced.

Cape Cod Bay (H)

Good coverage was accomplished in the deeper (8 to 34 fathoms) waters of Cape Cod Bay. Over-all catch rates were low at .09 bushels per minute of fishing and with only two of 168 locations fished yielding catch rates of 2 bushels or more per standard 4-minute tow. In the areas surveyed, soft mud was the primary component of the bottom sediments. In waters of less than 10 fathoms occasional patches of rocky bottom jeopardized fishing effort.

Middle Bank (G)

On Middle Bank (Stellwagen Bank), 51 fishing stations produced catches of ocean quahogs at rates equal to Cape Cod Bay (.09 bu./min. fishing). Although catch rates were not high, with only two stations producing catch rates of 2 bushels per standard 4 minute tow. Some locations (in 21 to 23 fms.) yielded interesting catches of the clam Spisula polynyma (see Figure 4) a variety related to the surf clam. At one station a four minute tow produced four bushels of this large bivalve. On the northern portions of this bank heavy concentrations of gravel and small rock made dredging hazardous.

Cape Cod (I)

Due to heavy concentrations of gravel, detailed coverage of the "backside" of Cape Cod was not undertaken. From the 11 locations fished (all within 9 to 21 fms.), average catches of ocean quahogs were the lowest experienced. However, at several shallow stations (11 to 12 fms.) off Nauset catches of surf clams of up to 1.5 bushels in 4 minutes fishing time were accomplished.

Nantucket - Cox Ledge (E)

In response to requests for ocean quahogs to be used in experimental processing, a limited amount of "production" fishing was engaged in between Nantucket Shoals and Cox Ledge. Using information developed during the 1970 surveys several locations were test fished for high yields. At one location, south of Cox Ledge, 12 hours fishing produced about 150 bushels of ocean quahogs. This rate could be increased with improved sorting techniques. During actual fishing time the average catch rate equaled 1.5 bushels per minute of dredging; the highest average rate experienced for any unit area on the current cruise.

During part of this cruise, a limited amount of gear testing was performed. This was to determine if the towing hawser length/water depth ratio exerted any effect upon the fishing effectiveness of the dredge -- and if so, to find the optimal hawser/depth ratio. A previously surveyed area of clam producing bottom south of Martha's Vineyard was selected for this work. Successive tows of equal duration were made from the same starting point with all variables kept as nearly the same as possible. Starting with a 3:1 ratio, the hawser length was shortened for each succeeding tow. The catches increased as the length was returned to just less than a 2:1 ratio and then they began dropping off. The best towing angle of the hawser (as evidenced in these tests) was about 30 to 40 degrees (as measured from the horizontal). This was a length/depth ratio of approximately from 1.8:1 to 2.0:1.

Block Island (D)

One hundred forty fishing stations were completed south of Block Island, 31 percent of these produced catch rates ranging from two to eight bushels per standard four minute tow. The over-all catch average of .5 bushels per minute was relatively high. Fishing conditions were generally good in the areas worked with only occasional concentrations of gravel and hard bottom.

Long Island Central (B)

This area produced average catch rates of .42 bushels per minute. Comparatively high catch rates were experienced both at inshore (shallow) locations as well as in offshore (deeper) positions, indicating a comparatively uniform distribution of the ocean quahog in this sub-division. Forty-eight percent of all tows caught ocean quahogs at a rate of 2 to 10.5 bushels per 4 minute tow. (For more details see fishing log.)

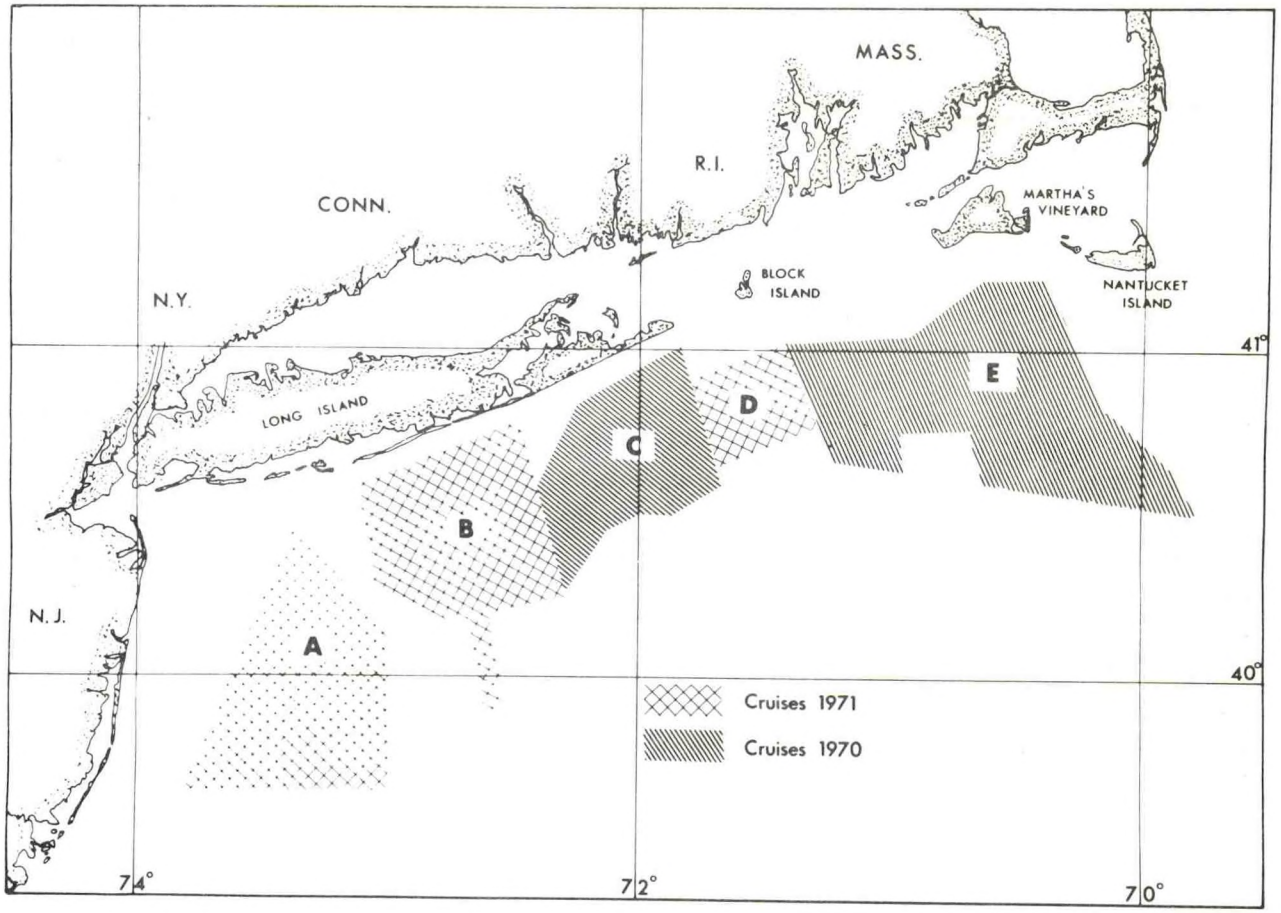

Figure 5. -- Area south of Cape Cod fished during 1970 and 1971. Best average catch rates were experienced in blocks "B - C - D" where standard 4 minute sampling tows averaged about 2 bushels.

Population Estimate

During the latter part of the cruise, a specialized survey was conducted to estimate the clam population in an approximately 900 square mile area. This study was conducted off the central part of Long Island -- south of Islip to Bridgehampton -- and was generally centered offshore of Moriches Inlet. The position of the survey area chosen was between and bounded on the east by the points 40° 21' and 40° 54' north latitude at 71° 14' west longitude and extended westward to 40° 23' to 40° 36' north latitude at 73° 14' west longitude.

The over-all area was divided into two depth strata. One stratum was between 10 and 19 fathoms deep; the other was between 20 and 30 fathoms of depth. The more shallow stratum was sub-divided into possible sampling areas with 3,736, 740 possible sampling stations resulting. Of this number, 51 stations were randomly selected but only 36 could be fished because of the frequent presence of lobster potfishing gear in inshore areas. A similar procedure was used for the 20 to 30 fathom stratum. From a possible 7,692, 216 stations in this stratum, 77 were randomly selected and fished. Data recorded from the combined total

of 110 of the 113 stations were used in making this preliminary estimate of the clam population in the area.

An additional 69 randomly selected stations (in depths from 10 to 30 fathoms) were fished to provide supplementary data for more detailed analysis to be made and reported at a later date.

The population estimate for the 10 to 19 fathom stratum was 2,885,585 bushels, plus or minus 850,146 bushels. The estimate for the 20 to 30 fathom stratum was 10,925,023 bushels, plus or minus 1,075, 525 bushels. For the entire 900 square mile area, the clam population was estimated to range from 11.9 to 13.8 million bushels.

The clam population estimates were made on the basis of taking the mean catch (in bushels) of clams from randomly selected stations in a stratum and multiplying this average by the number of possible sampling stations in the stratum. This average was 0.77222 bushels for the 10 to 19 stratum and 1.42027 bushels for the 20 to 30 fathom stratum. The precision[1/] of the mean number of bushels taken in the 10 to 19 fathom stratum was 0.22751 or 29.46 percent of the mean. For the 20 to 30 fathom stratum, the precision of the mean was 0.13982 or 9.8 percent of the mean. Precision for the mean catch (in bushels) for the combined strata is 0.18028 or 13.8 percent of the mean. Precision of this sampling was good in comparison to some other survey results.

Barnegat (A)

One hundred twenty-nine sampling tows were made in the area east of New Jersey and adjacent to the Hudson Canyon. No catches of 2 or more bushels per 4 minutes were experienced. Over-all catch rates were very low when compared to other locations south of Cape Cod surveyed to date. The survey catch rate of .1 bushels per minute is less than 20 percent of the average rate experienced from off southern Long Island and Block Island.

During the work completed in 1971, 1081 fishing locations were sampled, in the area from New Hampshire to New Jersey. In general much higher catches of ocean quahogs were taken from south of Cape Cod.

1/ In the statistical sense, "precision" can be loosely defined as "a measure of repeatability."

Table I. -- Results of Ocean Quahog Surveys 1970 - 1971

AREA	No./Tows	Minutes	Depth Min.	Depth Max.	Percent with Quahogs	Average Bushels per 1 Minute Fishing
Ipswich (F)	78	583	7	30	81%	.05
Cape Cod Bay (H)	168	986	8	34	60%	.09
Middle Bank (G)	51	204	10	32	55%	.09
Cape Cod (I)	17	78	9	21	22%	.01
Nantucket - Cox's '71 (E)	48	302	12	29	99%	1.50 1/
" * (E)	470	1880	20	35	71%	.25
Block Island (D)	140	550	17	36	90%	.50
Long Island East * (C)	316	1264	10	35	99%	.50
Long Island Central (B)	268	1077	12	35	97%	.42
Barnegat (A)	129	517	15	37	87%	.10
Random Survey (B & C)	182	728	12	30	95%	.27
1970	786	3144	10	35	85%	.37
1971	1081	5025	7	37	76%	.33
Both Years	1867	8169	7	37	81%	.34

* 1970

1/ Production fishing.

( ) Letter in parenthesis designates geographic location (see map).

PERSONNEL

	Part - I	II	III
Alan J. Blott - NMFS, Woods Hole		X	
Laird Bruster - NMFS, Woods Hole	X		
Arnold Carr -- Mass. Dept. of Natural Resources	X		
Michael G. Corbett - NMFS, Woods Hole	0		
James M. Craven - NMFS, Woods Hole		X	
Joseph Devenney - NMFS, Woods Hole		X	X
John Everett - NMFS, Washington, D. C.			0
Warren D. Handwork - NMFS, Woods Hole	X	X	
Christopher Mantzaris - NMFS, Woods Hole			X
Ernest D. McRae, Jr. - NMFS, Woods Hole			X
Vernon E. Nulk - NMFS, Woods Hole			X
Warren F. Rathjen - NMFS, Woods Hole	X	X	
Keith A. Smith - NMFS, Woods Hole		0	
George Toneatti - NMFS, Woods Hole	X	X	X
Patrick J. Twohig		0	0

0 - Portion of Part indicated.
X - All of Part indicated.

Part I: June 1 - June 11
Part II: June 16 - July 2*
Part III: July 12 - July 23

* June 17 & July 2 were demonstration cruises.

APPENDIX .... Ocean Quahog Catches of 2 or More Bushels per 4 Minute Tow. 1/

Station No.	Catch Ocean Quahogs	Loran Reading 3H4	Loran Reading 3H5	Water Depth (fathoms)
IPSWICH BAY:				
None				
MIDDLE BANK:				
160	2.0	3530	1330	23
171	2.0	3510	1290	18
BK. CAPE COD:				
None				
CAPE COD BAY:				
23	3.5	3740	1250	9
132	2.0	3560	1300	34
NANTUCKET (Cox's Ledge):				
331	2.0	6235	1325	17
335	2.0	5900	1675	27
338	8.0	5885	1675	27.5
339	5.2	5885	1675	28
340	2.8	5886	1675	28
341	10.0	5885	1674	28
342	6.4	5887	1673	28
344	12.4	5885	1675	28
345	4.8	5884	1677	28
346	8.0	5890	1676	27
347	8.0	5885	1678	27
348	2.0	5890	1677	27
349	5.2	5890	1677	27
350	3.6	5885	1681	27
351	4.0	5890	1680	27
352	4.8	5892	1670	27
353	2.8	5888	1674	27
354	3.6	5886	1676	26
355	2.8	5885	1675	26
357	7.0	5886	1672	28
358	2.8	5885	1675	28
359	2.1	5882	1675	28
360	6.8	5883	1674	28
362	3.7	5887	1675	29
BLOCK ISLAND:				
369	2.25	5790	1800	30
371	2.5	5780	1800	31
377	2.5	5730	1825	32
382	2.0	5755	1825	31
383	3.0	5760	1825	30
384	3.7	5765	1825	30
385	3.5	5770	1825	31
386	7.0	5775	1825	30
397	2.75	5750	1850	31
407	7.0	5750	1875	28
408	3.7	5745	1875	28
409	6.5	5740	1875	29
410	6.0	5735	1875	29
411	6.5	5730	1875	31
412	6.0	5725	1875	31
415	5.5	5710	1875	31
422	2.25	5675	1875	33
428	2.75	5670	1900	34
429	6.75	5675	1900	32
434	6.5	5705	1900	30
435	6.2	5710	1900	29
436	4.0	5715	1900	29
437	5.5	5720	1900	29
438	6.2	5725	1900	29
439	4.4	5730	1900	26
440	7.0	5700	1925	26
441	2.8	5695	1925	27
443	4.5	5685	1925	30
449	5.5	5650	1925	33
467	3.25	5675	1950	28
468	4.5	5680	1950	26
476	8.0	5650	1975	28
477	3.0	5645	1975	30
478	4.0	5640	1975	30
479	6.0	5635	1975	30
480	2.3	5630	1975	31
482	6.75	5620	1975	31
483	5.25	5625	2000	30
484	5.0	5630	2000	30
485	4.75	5635	2000	35
486	5.0	5640	2000	31
487	4.0	5640	2000	29
499	2.5	5570	2050	29

1/ Represents tows made during regular survey. Random survey stations not included.

Station No.	Catch Ocean Quahogs	Loran Reading 3H4	3H5	Water Depth (fathoms)
LONG ISLAND:				
514	2.0	5150	2450	26
515	2.75	5140	2450	27
516	3.25	5130	2450	29
526	3.5	5030	2450	32
527	4.0	5060	2475	30
528	2.0	5070	2475	30
529	6.5	5080	2475	30
530	5.5	5090	2475	29
536	3.25	5160	2475	25
537	4.25	5170	2475	26
550	2.0	5170	2500	23
552	3.3	5150	2500	24
554	2.0	5130	2500	25
555	3.5	5120	2500	27
556	2.0	5110	2500	27
557	6.0	5080	2500	29
558	4.5	5070	2500	28
559	3.5	5060	2500	31
560	3.75	5050	2500	30
561	3.5	5040	2500	28
562	4.25	5030	2500	31
566	3.0	5010	2525	33
567	4.0	5020	2525	27
568	5.6	5030	2525	30
569	5.0	5040	2525	28
570	5.2	5050	2525	27
571	2.5	5060	2525	27
572	2.5	5070	2525	26
573	4.0	5080	2525	26
574	2.7	5110	2525	25
581	2.3	5180	2525	19
584	3.2	5180	2550	15
585	2.2	5170	2550	17
586	2.2	5160	2550	17
587	6.5	5150	2550	17
594	2.25	5050	2550	26
595	2.75	5040	2550	27
597	2.75	5020	2550	26
599	2.0	5000	2550	31
604	4.2	4970	2575	30
605	2.1	4980	2575	30
607	2.3	5000	2575	27
608	4.5	5010	2575	27
609	3.3	5020	2575	27
610	2.4	5030	2575	26
611	2.0	5040	2575	25
612	2.3	5050	2575	25
614	3.3	5090	2575	23
617	3.3	5120	2575	20
618	4.0	5130	2575	19
619	2.5	5140	2575	17
620	3.0	5150	2575	17
635	2.0	4870	2750	25
636	4.0	4860	2750	26
671	3.0	4870	2725	27
697	2.5	4920	2700	26
699	3.5	4900	2700	28
700	2.75	4890	2700	28
704	2.0	4940	2675	27
706	2.0	4960	2675	27
707	3.0	4970	2675	25
715	6.0	5060	2675	16
716	9.0	5060	2675	16
717	2.0	5070	2675	14
718	2.1	5070	2675	14
719	10.5	5070	2655	17
720	5.5	5060	2650	19
723	4.5	5030	2650	23
725	2.0	5000	2650	25
728	3.0	4970	2650	25
729	4.0	4960	2650	27
730	5.0	4950	2650	28
731	2.0	4940	2650	28
732	5.0	4930	2650	28
733	6.0	4920	2650	30
734	6.0	4910	2650	31
735	2.8	4900	2650	30
736	2.5	4890	2650	31
737	4.5	4870	2650	30
738	5.0	4860	2650	30
739	6.0	4850	2650	30
740	3.0	4840	2650	32
741	3.5	4830	2650	32
742	2.4	4810	2650	31
744	3.2	4790	2650	31
747	2.2	4750	2650	30
748	2.0	4740	2650	33
758	2.5	4860	2600	35
759	2.5	4870	2600	35
760	2.5	4880	2600	34
761	2.0	4890	2600	32
762	2.0	4910	2600	30
763	2.0	4930	2600	31
765	3.2	4950	2600	31
766	2.4	4960	2600	31
767	4.2	4970	2600	29
768	3.8	4985	2600	29
783	2.5	5141	2575	17
784	3.75	5141	2575	17
786	4.25	5141	2575	17
NEW JERSEY - HUDSON CANYON (E. of Barnegat)				
None				