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Delaware Bay 1995 Random Sampling of Oyster Seed Beds

by

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Summary of the 1995 Random Sampling of the Delaware Bay Seed Beds

Attached is a summary of the 1995 seed bed sampling data with similar data for 1994 and 1993. All data were collected between November 27, 1995 and December 3, 1995 using a boat and captain donated by Bivalve Packing. This information is provided based on a stratified random sampling of grids from the seed beds. The strata (groups) from which the samples were selected are: Test area, general bed, marginal areas. One sample was taken from one of the 4 test area grids, and no more than two samples were taken from the marginal areas of the beds. The remainder of the samples were from the general bed. All data were adjusted to a 37 quart bushel.

The data format is the same as in the past years. Data are displayed from the farthest up bay beds to those down bay. For each bed the percentage of oysters for each sample is presented, with rankings from highest to lowest. Percentage of oyster is based on volume of oyster (exclusive of spatted shell) in the sample divided by the total volume of the shell, oyster and debris in the sample. Those samples that have over 40% oyster are underlined. The test area is a small area of 4-6 grids that has been sampled consistently as representative of the better areas of the bed. The test area sample is indicated by an *. Oysters per bushel, yearlings per bushel and spat per bushel are based on actual counts adjusted to 37 quarts.

Due to the influence of Dermo on the industry we have continued the new set of columns for Percentage Mortality and added data on Weighted Prevalence and Percent Prevalence of Dermo. The Percentage Mortality figure is based on the number of boxes that were counted in the samples. Prevalence is the percentage of oysters with detectable infections. Weighted Prevalence is the average infection intensity (scored from 0 to 5) of all infected and uninfected oysters.

The major points of interest this year are:

- The sampling period was five to six weeks later than the past years. This may affect the sampling efficiency and the number of dead oysters. The late sampling **will** affect the interpretation of the Dermo data (see below).
- There was a seed bed harvest last year. This may have affected the numbers of oyster on some seed beds more than others.
- The number of oysters per bushel has generally remained about the same as last year. There is an indication of some increase in numbers of oysters on the inshore beds of the Lower Bay (Nantuxent Point, Hog Shoal, Beadons).

- The number of oysters in market size categories on most beds has decreased. The largest decreases were on Middle, Cohansey, Ship John and Shell Rock.
- Mortalities based on box counts were higher on all beds than last year. This may be due to the late sampling. The highest mortalities were on New Beds, Vexton and Egg Island. Low numbers of oysters collected make data from these beds (particularly Egg Island) subject to potentially large errors.
- Spat setting was about the same as last year, and was widespread. Average sets approaching 200 per bushel occurred on Ship John, Shell Rock, and Vexton. Beadons had spat set of over 200 for the second year in a row.
- Prevalence of Dermo remains about the same as last year. Weighted Prevalence (a measure that indicates infection intensity) indices have declined slightly from last year, but this **may** have been affected by the late sampling. Please refer to the discussion belwo for information on Dermo that should be carefully evaluated in any decision to move oysters.

The size distribution data (Table 3) have been used to estimate the numbers of oysters in each size group for a 37 quart bushel dredge sample for all sampled beds. These size/frequency data can provide an estimate of the numbers of oysters in each size class. We have highlighted (bold) and summed the number of 3 inch long oysters per average bushel of material expected from each of the beds. We have also included information on 2.5" oysters. A summary of 1994 and 1995 data for selected beds is provided in Table 2 below.

Although numbers of oysters remained about the same as in 1994, the numbers of market sized oysters per bushel, and the proportion of those oysters that are market size declined on the middle seed beds (Middle, Cohansey, Ship John and Shell Rock). Numbers of market size oysters per bushel remained the same on Bennies, but declined somewhat on New Beds. The decline in marketable oysters is due almost entirely to decline in the number of oysters per bushel. The percent of marketable oysters in the bushel relative to the total number of oysters in the bushel, remained in approximately the same as last year.

Please remember that these data do not provide an estimate of the numbers of oysters on the seed beds, but provide a relative assessment of what could be expected from a dredge haul on a particular bed. Disease continues to be a dominant factor in the survival of oysters, and all decisions must be interpreted in conjunction with the analysis of the diseases on the seed beds.

Summary of the 1995 Random Sampling of the Seed Beds

Bed		Percent Oyster			Oysters/Bushel			Spat/ Bushel			Yearlings/Bushel			Percent Mortality			Dermo Percent Prevalence			Dermo Weighted Prevalence		
		1995	1994	1993	1995	1994	1993	1995	1994	1993	1995	1994	1993	1995	1994	1993	1995	1994	1993	1995	1994	1993
Round Is.		**78.9**	69.3	64.8																		
Round Is.		**63.4**	40.4	60.2																		
Round Is.		**61.5**	34.8	41.6	**372**	253	449	**62**	57	19	**41**	18	6	**12**	8	12	--	60	25	--	0.5	0.1
Round Is.		**60.8**	28.3	41.5																		
Round Is.	*	**51.8**	19.1	8.3																		
Round Is.		4.7	11.3	0																		
Up. Arnolds		**72.3**	--	62.5																		
Up. Arnolds		**65.1**	--	3.1	**422**	--	282	**109**	--	26	**40**	--	4	**15**	--	14	**60**	--	30	**1.2**	--	0.2
Up. Arnolds	*	**63.6**	--																			
Arnolds		**57.1**	81.7	72.6																		
Arnolds		**50**	58.3	72.6																		
Arnolds	*	**44.8**	58	71.3	**203**	301	395	**55**	78	26	**42**	32	9	**18**	7	10	**90**	100	63	**1.7**	1.9	0.6
Arnolds		0	47.6	58.2																		
Arnolds		0	22.6	57.1																		
Arnolds		0	0	0																		
Up. Middle		--	25	--																		
Up. Middle		--	0.6	--	--	47	--	--	47	--	--	2	--	--	4	--	--	--	--	--	--	--
Middle		**44.8**	51.2	58.7																		
Middle		**43.4**	43.2	51.1																		
Middle		**41.4**	40.5	45.1																		
Middle		39.7	37.1	40.5																		
Middle	*	39.5	35.6	38.4	**132**	138	163	**162**	142	40	**36**	26	5	**38**	30	23	--	80	97	--	2.3	3.4
Middle		0.9	33.3	30.1																		
Middle		0	26.7	0																		
Middle		0	13.2	0																		
Middle		0	6	0																		
Cohansey	*	**50.9**	43.1	46.9																		
Cohansey		**47.4**	42.5	39.4																		
Cohansey		35.7	40	37.7	**154**	152	177	**160**	302	31	**40**	44	7	**32**	22	29	**70**	95	100	**2.1**	2.7	3.5
Cohansey		22.4	39.9	30.8																		
Cohansey		14.8	37.5	28.4																		
Ship John	*	**49**	58.5	48.3																		
Ship John		39.9	45.9	46.6																		
Ship John		37.3	37.8	45.2	**151**	149	267	**198**	123	68	**53**	41	11	**36**	24	27	--	100	100	--	3.4	4
Ship John		34.1	30.3	44.3																		
Ship John		33	20.6	42.9																		
Ship John		25.1	--	20.5																		

Summary of the 1995 Random Sampling of the Seed Beds

Bed		Percent Oyster			Oysters/Bushel			Spat/ Bushel			Yearlings/Bushel			Percent Mortality			Dermo Percent Prevalence			Dermo Weighted Prevalence		
		1995	1994	1993	1995	1994	1993	1995	1994	1993	1995	1994	1993	1995	1994	1993	1995	1994	1993	1995	1994	1993
Shell Rock		**45.4**	47.5	40.4																		
Shell Rock		**40.3**	46.7	38.9																		
Shell Rock	*	35.7	43.6	36.8																		
Shell Rock		34.8	40.6	35.5	**114**	134	151	**197**	88	102	**32**	30	12	**36**	22	36	**100**	90	100	**2.3**	2.9	3
Shell Rock		20.3	36.3	28.1																		
Shell Rock		12.9	3.1	20.8																		
Shell Rock		2.8	0.4	4.3																		
Ben Sand	*	38.2	9.4	46.8																		
Ben Sand		15.1	3.3	14.2																		
Ben Sand		9	1.2	3.5	**47**	14	72	**117**	55	40	**25**	4	4	**39**	28	46	–	100	100	–	2.7	4.1
Ben Sand		2.1	0.3	0.7																		
Bennies		**75.2**	42.3	46.1																		
Bennies	*	39.5	40.5	35.8																		
Bennies		28.9	40	26.2																		
Bennies		20.8	39	24.1																		
Bennies		12.8	34.4	10.7																		
Bennies		3.2	17.1	9.2																		
Bennies		0.8	5.9	6.6	**79**	75	66	**110**	68	32	**20**	20	4	**31**	30	45	**100**	90	100	**1.7**	2.9	3.2
Bennies		0.8	3.7	3																		
Bennies		0.8	2.6	3																		
Bennies		0.6	0.3	0.4																		
Bennies		0	0.3	0.3																		
Bennies		0	0.3	0																		
Nantxt Pt		34.6	--	21																		
Nantxt Pt		25	--	12.9																		
Nantxt Pt	*	24.8	--	3.1	**120**	--	30	**113**	--	31	**30**	--	1	**39**	--	52	**50**	--	100	**1**	--	4.5
Nantxt Pt		17.4	--	0.5																		
Nantxt Pt		6.3	--	0																		
Nantxt Pt		3.7	--	0																		
Hog Shl	*	**61.1**	--	29.9																		
Hog Shl		37.6	--	26.8																		
Hog Shl		29.7	--	21.1	**124**	--	48	**117**	--	48	**20**	--	1	**28**	--	52	--	--	100	--	--	3.6
Hog Shl		9.3	--	0.3																		
Hog Shl		6.3	--	0.3																		
Hog Shl		0	--	0																		
New Beds		**45.3**	66.7	44																		
New Beds	*	**43.5**	55.3	38.3																		
New Beds		**41**	45	36.3																		
New Beds		24.2	44.7	5.6																		
New Beds		21.8	32.9	5.2	**92**	124	67	**81**	248	78	**7**	39	4	**49**	24	47	**100**	100	100	**1.4**	3.3	3.2
New Beds		16.1	18.8	3.3																		
New Beds		15	0.3	2.1																		
New Beds		9.7	0.3	0.3																		
New Beds		7.1	0	0																		
New Beds		1.4	–	–																		

Summary of the 1995 Random Sampling of the Seed Beds

Bed		Percent Oyster			Oysters/Bushel			Spat/ Bushel			Yearlings/Bushel			Percent Mortality			Dermo Percent Prevalence			Dermo Weighted Prevalence		
		1995	1994	1993	1995	1994	1993	1995	1994	1993	1995	1994	1993	1995	1994	1993	1995	1994	1993	1995	1994	1993
		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Strawbrry		--	30.8	--																		
Strawbrry		--	5.3	--																		
Strawbrry		--	0.3	--	--	19	--	--	164	--	--	18	--	--	24	--	--	80	--	--	2.7	--
Strawbrry		--	0.3	--																		
Strawbrry		--	0	--																		
Strawbrry		--	0	--																		
Hawks Nest		--	28.6	--																		
Hawks Nest		--	22.5	--																		
Hawks Nest		--	12.8	--																		
Hawks Nest		--	8.1	--	--	50	--	--	193	--	--	26	--	--	24	--	--	80	--	--	3.3	--
Hawks Nest		--	5.5	--																		
Hawks Nest		--	0	--																		
Beadons		**48.9**	26.5	20.7																		
Beadons		**46.5**	12.1	10.2																		
Beadons		**44.1**	9.7	9.8																		
Beadons		**41.2**	8.8	5.5																		
Beadons	*	18.8	6	3.9	**135**	28	23	**241**	270	56	**40**	29	5	**30**	17	72	**90**	30	100	**2.1**	1.1	4.6
Beadons		18.6	3.2	2.9																		
Beadons		3.1	3.1	2.7																		
Beadons		1.7	0.4	2.5																		
Beadons		0.7	0.4	0.4																		
Beadons		0	0.3	0																		
Vexton	*	**43.3**	--	25																		
Vexton		34.8	--	17.5																		
Vexton		32.7	--	15.6																		
Vexton		24.8	--	13.1																		
Vexton		4.7	--	8.1	**71**	--	81	**183**	--	37	**28**	--	5	**46**	--	47	--	--	--	--	--	--
Vexton		3.3	--	1.6																		
Vexton		3	--	0																		
Egg Is.		9.1	30.6	19.2																		
Egg Is.		4.9	16	13.5																		
Egg Is.		3.2	3.6	4																		
Egg Is.	*	1.6	2.9	2.7																		
Egg Is.		1.3	2.8	0.7	**8**	16	17	**3**	26	29	**1**	4	6	**80**	51	58	**100**	100	100	**3.1**	3.9	3.8
Egg Is.		1.1	0.3	0.3																		
Egg Is.		0	0.3	0.3																		
Egg Is.		0	0	0																		
Egg Is.		0	0	0																		
Egg Is.		0	0	0																		
Ledge		--	43.1	--																		
Ledge		--	0.4	--																		
Ledge		--	0.3	--																		
Ledge		--	0.3	--	--	18	--	--	5	--	--	2	--	--	35	--	--	100	--	--	3.8	--
Ledge		--	0	--																		
Ledge		--	0	--																		
Ledge		--	0	--																		
Ledge		--	0	--																		

Table 2. Average number of oysters per bushel based on samples from selected seed beds in 1994 and 1995. The values indicate the numbers of oysters greater than 2.5 and 3 inches in length that could be expected if a bushel of oyster and shell was removed directly from the dredge (no pre-sorting).

	1994			1995		
Bed	greater than 2.5 inches (63.5mm)	greater than 3 inches (76.2mm)	Number/Bu.	greater than 2.5 inches (63.5mm)	greater than 3 inches (76.2mm)	Number/Bu.
Arnolds	91	23	301	139	51	203
Middle	67	29	138	45	15	132
Cohansey	76	34	152	29	14	154
Ship John	71	27	149	42	17	151
Shell Rock	55	27	134	11	24	114
Bennies	34	19	75	36	18	79
New Beds	50	30	124	36	20	92

Dermo Prevalence and Weighted Prevalence

The weighted prevalence of Dermo disease was lower, on nearly all beds, during the 1995 sampling compared to 1994 and 1993. As discussed below, however, these samples may not reflect a true decrease in Dermo levels this past year. In Delaware Bay, the highest intensities of Dermo disease typically occur in September or October, which is one reason that we try to schedule the seed bed sampling for October. From this peak, intensities decrease steadily throughout the winter and early spring. The decline is a combination of two processes: the deaths of the most heavily infected oysters and the overwinter death of parasites within surviving oysters. Both result in a decreasing infection intensity in the population.

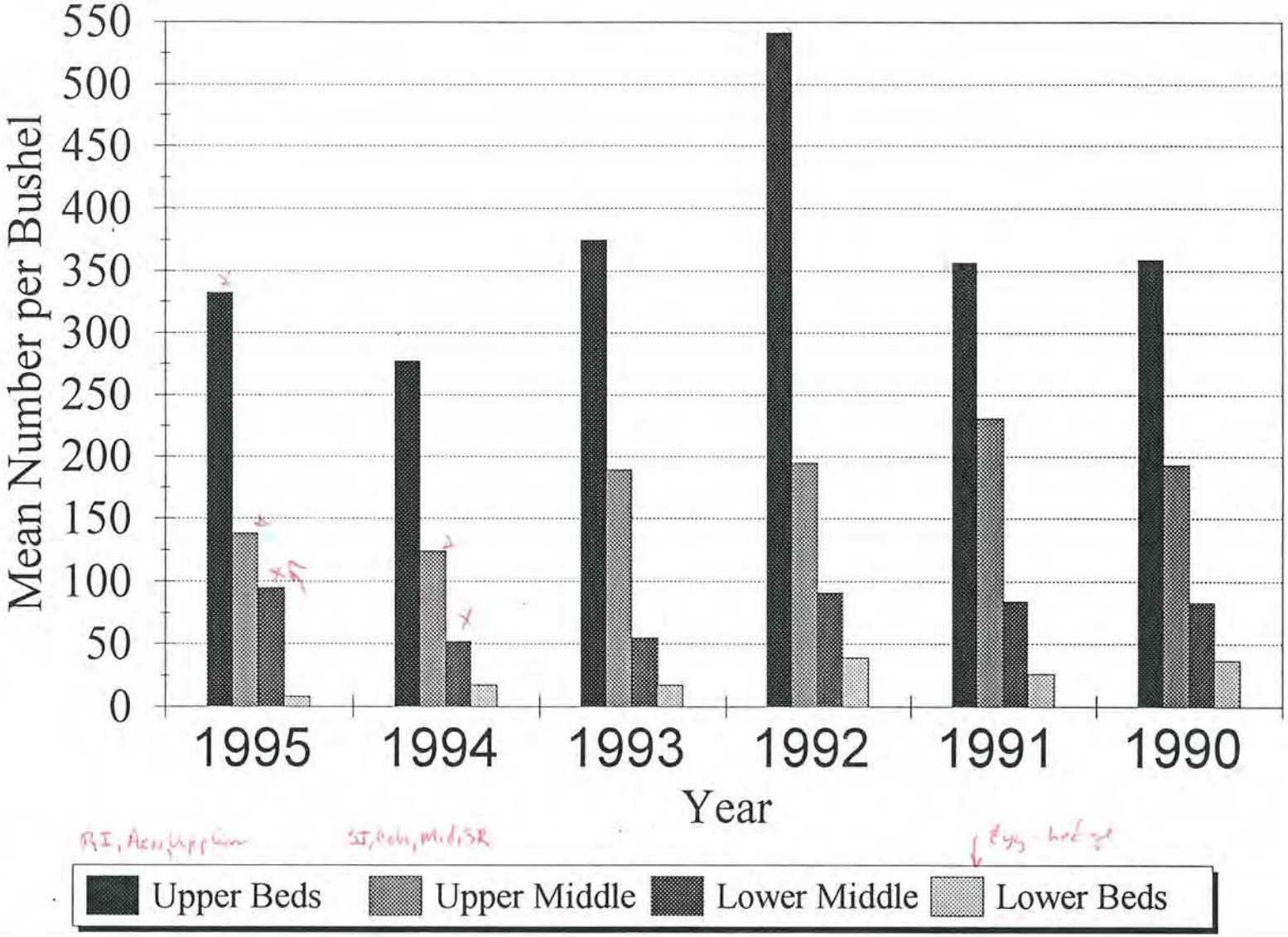
Instead of our normal mid October sampling, funding uncertainties delayed the 1995 sampling until early December, about 6 weeks late. Thus, the lower disease levels in 1995 may well be a function of the later sampling date. Total (box count) mortality in the 1995 samples was considerably higher than in 1994, which itself was probably related to the late sampling (an additional 6 weeks in which oyster could die) and which could well have reduced Dermo levels in the surviving oysters. Parasite numbers would also have begun to decline in living oysters. Summer and fall weighted prevalences in transplanted oysters on the leased grounds and lower seed beds were as high as in previous years. **Give these facts and uncertainties, it would be unwise to draw the conclusion that Dermo levels in Delaware Bay are any different than last year.**

Table 3. Size Frequency distribution of oysters from Delaware Bay seed beds, 1995.

Total = Average number of oysters per bushel. No. measured = Number of oysters measured from that seed bed.
Greater than 3" = Average number of oysters larger than 3 inches (75 mm) to be expected per bushel of dredged material. Sum of numbers in bold on table.
Greater than 2.5" = Average number of oysters larger than 2.5 inches (60 mm) to be expected per bushel of dredged material.
Average Size = Average size (mm) of the oysters measured from a bed. Largest = Largest oyster measured from the bed.

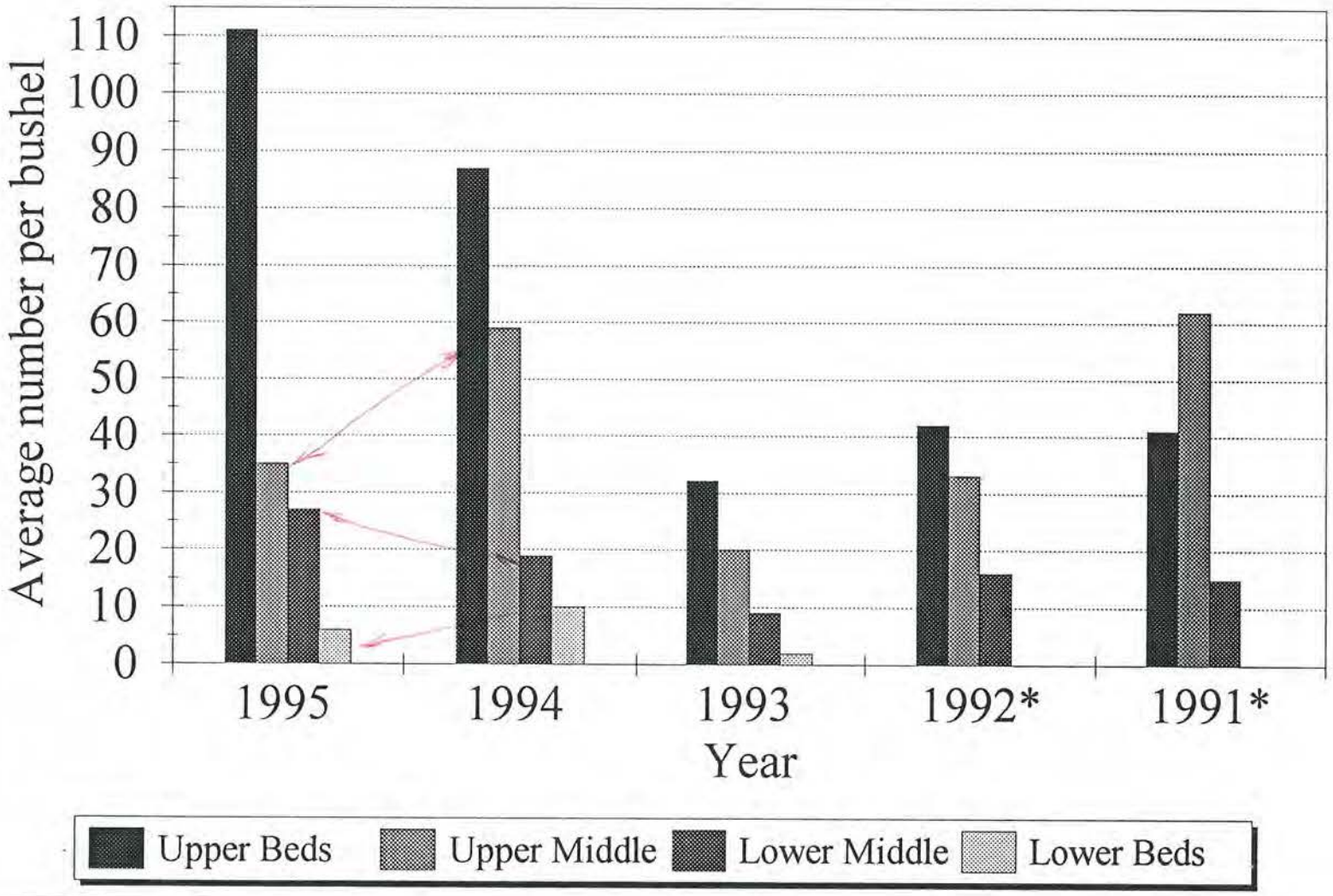
Size (mm)	Round Is	Upper Arnold	Arnolds	Middle	Cohansey	Ship John	Shell Rock	Ben Sand	Bennies	Nantxt Pt	Hog Shoal	New Bed	Beadons	Vexton	Egg Is
15	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
20	1	0	0	0	2	2	0	0	0	0	0	0	0	0	0
25	1	1	1	1	3	2	2	2	1	1	1	1	0	0	0
30	10	7	5	3	4	5	4	2	1	3	3	3	1	1	0
35	9	14	10	12	12	9	4	3	2	9	5	2	3	2	0
40	21	23	18	17	18	18	12	1	3	20	10	5	6	6	0
45	25	41	24	11	27	24	18	3	6	22	19	9	13	8	0
50	56	62	24	14	30	23	17	8	10	20	27	13	26	11	0
55	62	60	26	14	12	14	18	5	11	19	18	12	31	11	1
60	57	72	31	15	16	10	13	5	12	8	14	11	23	8	1
65	50	49	26	15	6	14	7	5	10	7	9	9	14	6	1
70	33	39	12	15	9	11	6	6	8	4	7	7	9	5	1
75	**25**	**34**	**13**	**6**	**6**	**6**	**4**	**3**	**4**	**3**	**3**	**7**	**4**	**3**	**1**
80	**14**	**8**	**7**	**5**	**4**	**4**	**3**	**1**	**4**	**2**	**2**	**4**	**2**	**4**	**1**
85	**4**	**4**	**2**	**2**	**2**	**4**	**2**	**0**	**3**	**1**	**2**	**4**	**1**	**1**	**1**
90	**2**	**4**	**2**	**1**	**1**	**1**	**1**	**1**	**3**	**1**	**2**	**2**	**1**	**1**	**1**
95	**1**	**1**	**0**	**0**	**0**	**1**	**1**	**0**	**2**	**0**	**1**	**2**	**0**	**1**	**0**
100	**1**	**0**	**0**	**1**	**1**	**1**	**0**	**0**	**1**	**0**	**1**	**1**	**0**	**1**	**0**
105	**1**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**1**	**0**
Total/ Bushel	372	422	203	132	154	151	114	47	79	120	124	92	135	71	8
No. Measured	521	300	276	364	347	526	512	100	437	447	400	619	684	434	85
Greater than 3"	**48**	**51**	**25**	**15**	**14**	**17**	**11**	**5**	**18**	**7**	**11**	**20**	**8**	**12**	**4**
Greater than 2.5"	131	139	64	45	29	42	24	16	36	18	27	36	31	23	6
Average Size	55	55	54	53	49	51	51	53	59	48	51	57	54	56	71
Largest	104	92	101	98	100	98	99	89	112	88	102	107	97	104	122

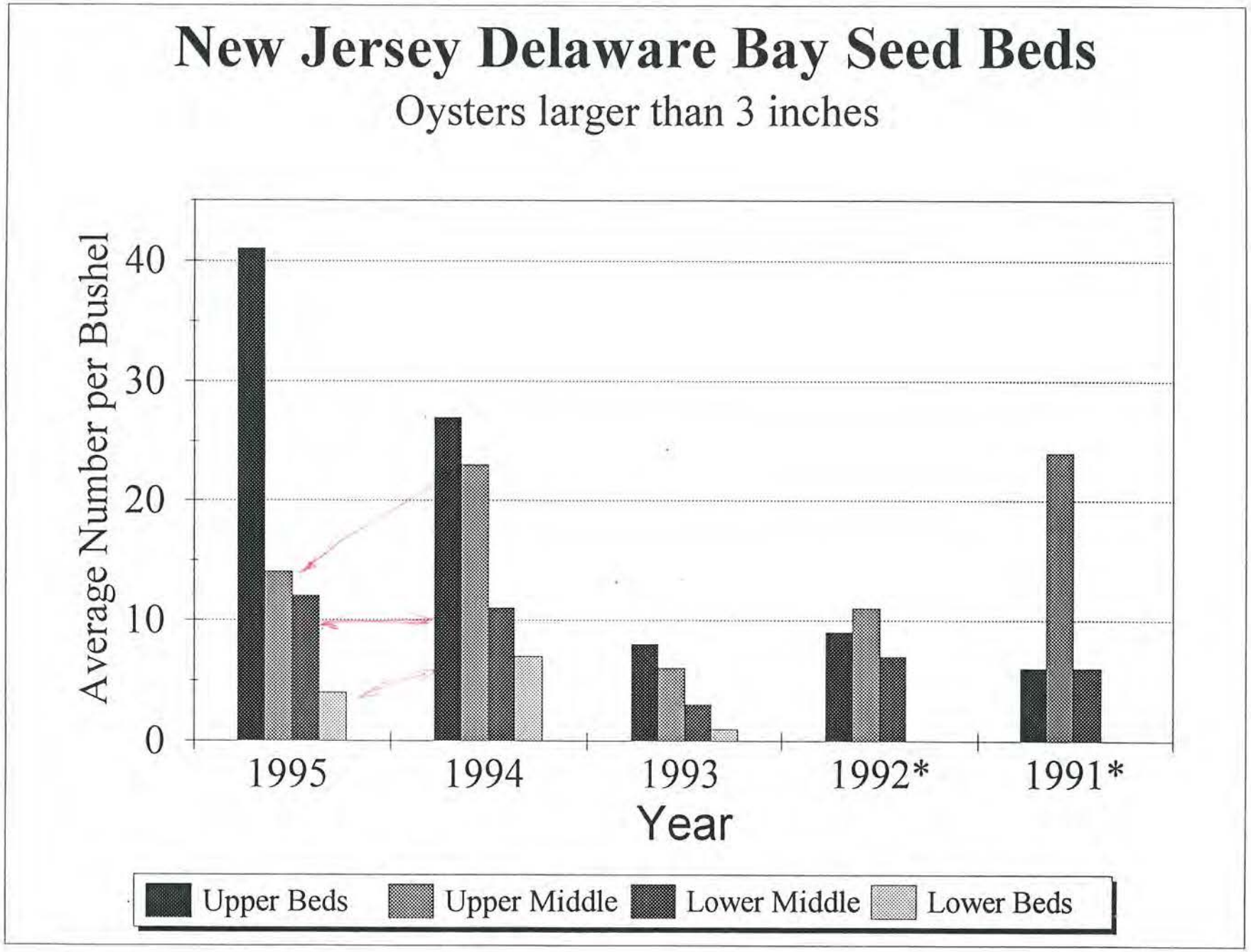
New Jersey Delaware Bay Seed Beds



New Jersey Delaware Bay Seed Beds

Oysters larger than 2.5 inches




New Jersey Delaware Bay Seed Beds
Oysters larger than 3 inches
Average Number per Bushel
0
10
20
30
40
1995
1994
1993
1992*
1991*
Year
Upper Beds
Upper Middle
Lower Middle
Lower Beds