

Figure 1. Delaware Bay locations where *Haplosporidium nelsoni* spores were found in oyster spat during 1991 and 1992 sampling. Location are identified in Tables 1 and 2.

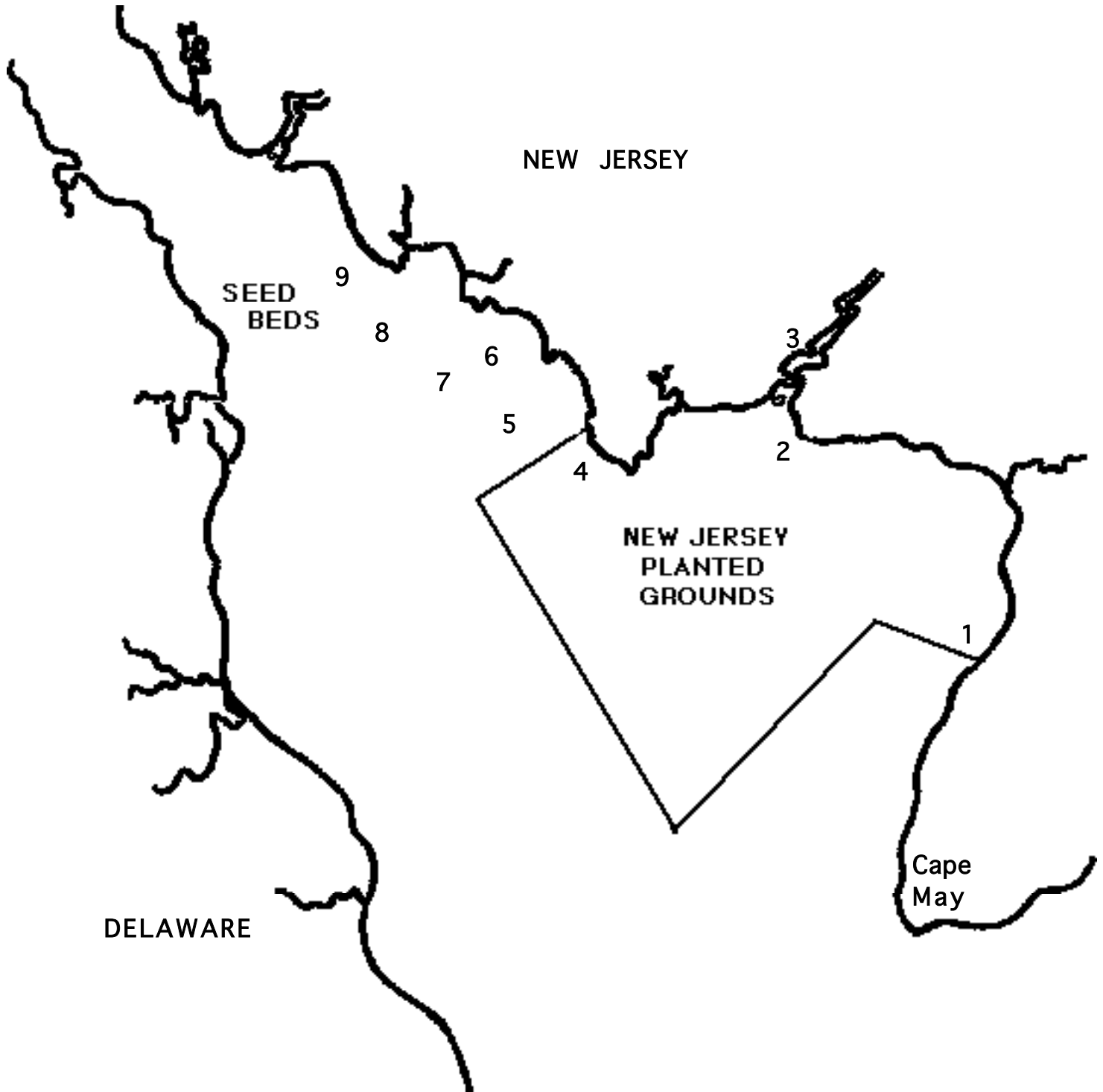
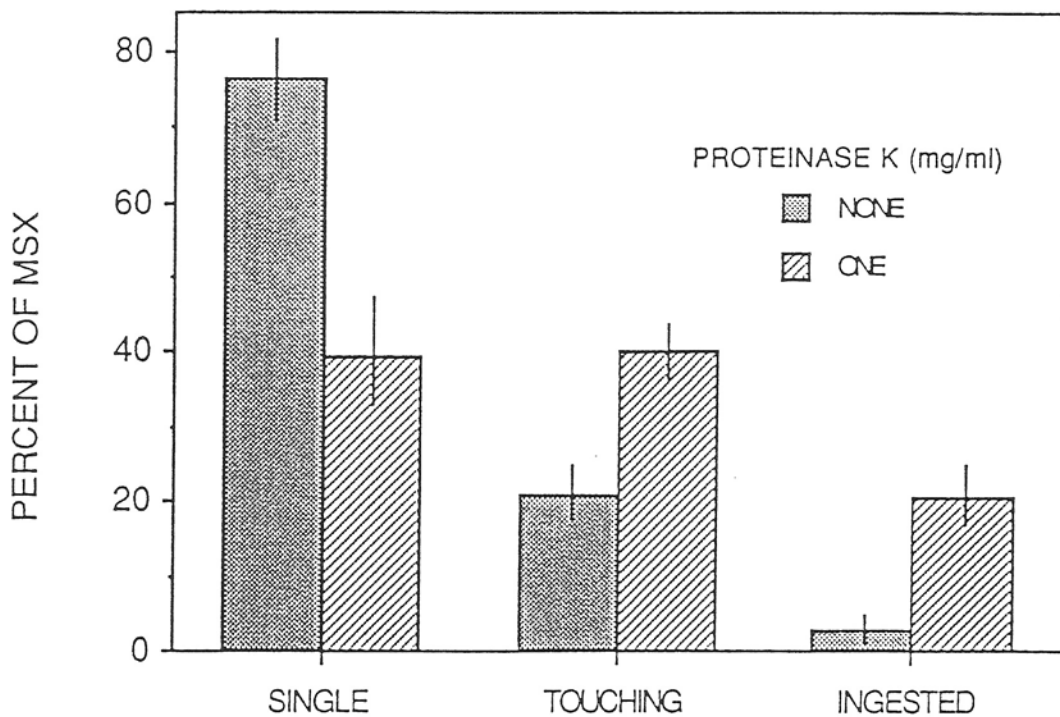
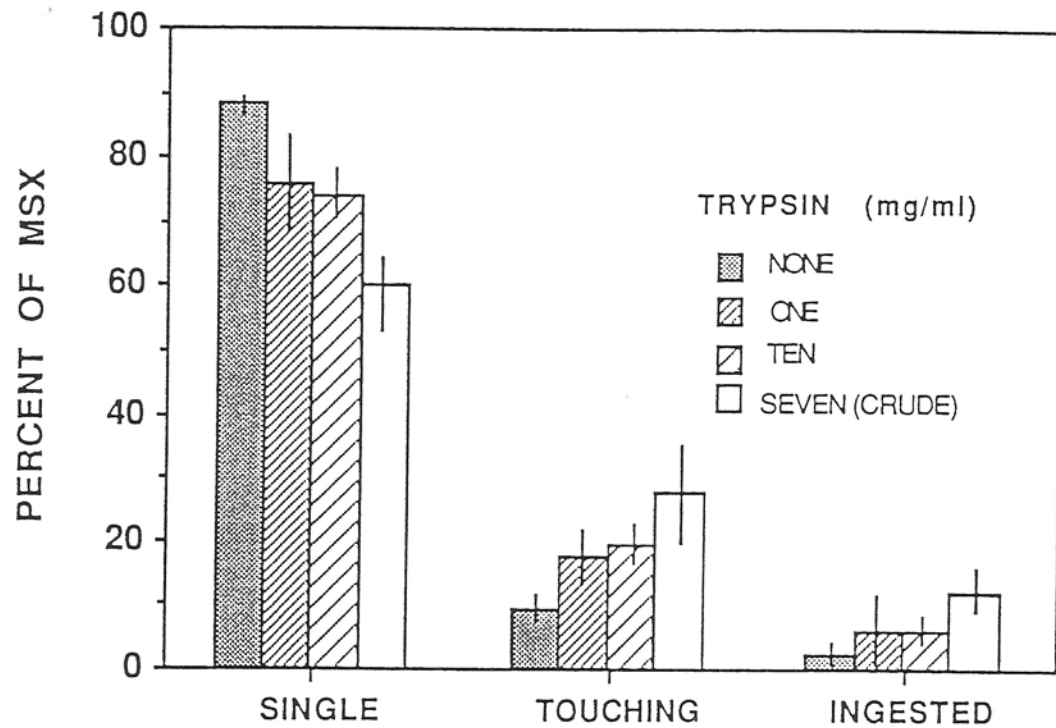


Figure 2. Percent of *Haplosporidium nelsoni* (MSX) plasmodia found in categories of interaction with oyster hemocytes after treatment with proteinases and incubation with the oyster cells for one hour. Single - plasmodia are alone; Touching - hemocytes are in contact with plasmodia; Ingested - hemocytes have ingested plasmodia. Vertical bars are the standard error of the mean of 2-4 replicates. In each replicate, 300-600 plasmodia were counted and classified.



INTERACTION WITH HEMOCYTES

Table 1. Prevalence of all *Haplosporidium nelsoni* infections and infections with spores in oyster spat collected in 1991.

CHT LOC	GRD	COLL. DATE	TOT COLL.	TOTAL SHUCK	TOT SICK	LT. PLAS.	ADV PLAS.	TOTAL PLAS.	TOTAL PRE-SP	TOT SP	TOT INF.	PREVALENCE					
												TOT	SP	LT INF	ADV INF	SP/INF	SP/ADV
<u>1990 SET</u>																	
1	CAPESTORE	4/23	78	78	13	5	3	8	0	0	8	10%	0%	63%	38%	0%	0%
1	CAPESTORE	5/10	61	61	12	0	0	0	0	0	0	0%	0%	0%	0%		
1	CAPESTORE	6/3	61	61	4	0	4	4	0	3	4	7%	5%	0%	100%	75%	75%
1	CAPESTORE	6/6	247	117	19	2	10	12	1	7	12	10%	6%	17%	83%	58%	70%
1	CAPESTORE	6/8	55	55	5	0	3	3	0	3	3	5%	5%	0%	100%	100%	100%
1	CAPESTORE	6/9	134	134	15	5	2	7	0	0	7	5%	0%	71%	29%	0%	0%
1	CAPESTORE	6/12	152	152	11	1	10	11	1	6	11	7%	4%	9%	91%	55%	60%
1	CAPESTORE	6/17	243	243	11	3	6	9	1	6	9	4%	2%	33%	67%	67%	100%
1	CAPESTORE	6/20	27	27	5	0	2	2	0	2	2	7%	7%	0%	100%	100%	100%
1	CAPESTORE	6/30	73	73	3	0	2	2	0	1	2	3%	1%	0%	100%	50%	50%
1	CAPESTORE	7/8	67	67	3	0	3	3	0	2	3	4%	3%	0%	100%	67%	67%
1	CAPESTORE	7/15	196	196	6	1	3	4	0	3	4	2%	2%	25%	75%	75%	100%
1	CAPESTORE	7/22	224	224	14	4	3	7	1	3	7	3%	1%	25%	75%	43%	100%
1	CAPESTORE	7/29	228	228	12	3	1	4	0	0	4	2%	0%	25%	75%	0%	0%
1	CAPESTORE	8/5	204	204	10	1	2	3	0	0	3	1%	0%	25%	75%	0%	0%
1	CAPESTORE	8/13	215	215	5	1	0	1	0	0	1	0%	0%	25%	75%	0%	
1	CAPESTORE	8/27	264	264	4	1	2	3	0	0	3	1%	0%	25%	75%	0%	0%
1	CAPESTORE	9/4	129	129	12	2	5	7	0	0	7	5%	0%	25%	75%	0%	0%
1	CAPESTORE	9/11	117	117	7	0	3	3	0	1	3	3%	1%	25%	75%	33%	33%
1	CAPESTORE	9/19	120	120	6	1	0	1	0	0	1	1%	0%	25%	75%	0%	
1	CAPESTORE	10/1	54	54	1	0	0	0	0	0	0	0%	0%	25%	75%		
TOT			2949	2819	178	30	64	94	4	37	94	3%	1%	32%	68%	39%	58%
<u>1991 SET</u>																	
1	CAPESTORE	10/1	138	138	1	1	0	1	0	0	1	1%	0%	100%	0%	0%	
1	CAPESTORE	10/24	233	233	12	5	0	5	0	0	5	2%	0%	100%	0%	0%	
1	CAPESTORE	11/12	185	185	20	3	1	4	0	0	4	2%	0%	75%	25%	0%	0%
1	CAPESTORE	11/19	166	166	9	2	0	2	0	0	2	1%	0%	100%	0%	0%	
1	CAPESTORE	11/25	134	134	8	1	1	2	0	0	2	1%	0%	50%	50%	0%	0%
1	CAPESTORE	12/5	120	120	18	2	1	3	0	0	3	3%	0%	67%	33%	0%	0%
1	CAPESTORE	12/13	67	67	ALL	0	0	0	0	0	0	0%	0%	0%	0%		
TOT			1043	1043	68	14	3	17	0	0	17	2%	0%	82%	18%	0%	0%

Table 1 (con't). Prevalence of all *Haplosporidium nelsoni* infections and infections with spores in oyster spat collected in 1991.

CHT LOC	GRD	COLL. DATE	TOT COLL.	TOTAL SHUCK	TOT SICK	LT. PLAS.	ADV PLAS.	TOTAL PLAS.	TOTAL PRE-SP	TOT SP	TOT INF.	PREVALENCE					
												TOT	SP	LT INF	ADV INF	SP/INF	SP/ADV
1990 SET																	
LOWER BAY																	
3	MAURICE R.	6/16	235	87	13	0	2	2	0	0	2	2%	0%	0%	100%	0%	0%
4	381D	5/3	28	28	0	1	0	1	0	0	1	4%	0%	100%	0%	0%	
2	EAST POINT	5/10	40	40	6	0	0	0	0	0	0	0%	0%				
2	EAST POINT	6/6	137	117	12	2	2	4	0	2	4	3%	2%	50%	50%	50%	100%
4	455D	4/24	32	32	4	1	0	1	0	0	1	3%	0%	100%	0%	0%	
4	455D	6/10	32	32	3	0	0	0	0	0	0	0%	0%				
4	455D	6/21	51	51	2	0	1	1	0	1	1	2%	2%	0%	100%	100%	100%
		TOT	555	387	40	4	5	9	0	3	9	2%	1%	44%	56%	33%	60%
UPPER BAY																	
5	EGG ISL	6/21	49	49	2	1	1	2	0	1	2	4%	2%	50%	50%	50%	100%
6	STRAWBERRY	6/7	84	84	7	1	4	5	1	2	5	6%	2%	20%	80%	40%	50%
6	STRAWBERRY	6/10	111	111	5	1	0	1	0	0	1	1%	0%	100%	0%	0%	
6	STRAWBERRY	6/21	87	87	3	0	0	0	0	0	0	0%	0%				
7	NEW BEDS	6/7	138	138	8	3	4	7	0	1	7	5%	1%	43%	57%	14%	25%
7	NEW BEDS	6/21	77	77	0	0	0	0	0	0	0	0%	0%				
8	BENNIES	6/7	104	104	4	0	1	1	0	0	1	1%	0%	0%	100%	0%	0%
8	BENNIES	6/21	90	90	3	2	0	2	0	0	2	2%	0%	100%	0%	0%	
9	SHELL ROCK	6/7	68	68	2	0	0	0	0	0	0	0%	0%				
9	SHELL ROCK	6/21	101	101	5	0	0	0	0	0	0	0%	0%				
		TOT	909	909	39	8	10	18	1	4	18	2%	0%	44%	56%	22%	40%
1991 SET																	
3	MAURICE R.	11/6	160	160	7	3	1	4	0	0	4	3%	0%	75%	25%	0%	0%
4	455D	11/6	50	50	1	0	0	0	0	0	0	0%	0%				
			210	210	8	3	1	4	0	0	4	2%	0%	75%	25%	0%	0%

Table 2. Prevalence of all *Haplosporidium nelsoni* infections and infections with spores in oyster spat collected in 1992.

CHT LOC.	GRD	COLL. DATE	TOT COLL.	TOTAL SHUCK	TOT SICK	LT. PLAS.	ADV PLAS.	TOTAL PLAS.	TOTAL PRE-SP	TOT SP	TOT INF.	PREVALENCE				
												TOT	SP	LT INF	ADV INF	SP/ADV
1991 SET																
1	CAPESTORE	5/21	103	103	8	1	7	8	3	3	8	8%	3%	13%	88%	43%
1	CAPESTORE	5/27	116	116	7	3	4	7	2	2	7	6%	2%	43%	57%	50%
1	CAPESTORE	6/4	102	102	7	2	4	6	2	2	6	6%	2%	33%	67%	50%
1	CAPESTORE	6/11	171	171	15	1	9	10	1	4	10	6%	2%	10%	90%	44%
1	CAPESTORE	6/18	191	191	4	1	2	3	0	1	3	2%	1%	33%	67%	50%
1	CAPESTORE	6/25	226	226	14	1	6	7	0	3	7	3%	1%	14%	86%	50%
1	CAPESTORE	7/1	178	178	7	0	0	0	0	0	0	0%	0%			
1	CAPESTORE	7/8	187	187	9	3	6	9	1	5	9	5%	3%	33%	67%	83%
1	CAPESTORE	7/14	211	211	15	2	2	4	0	2	4	2%	1%	50%	50%	100%
1	CAPESTORE	7/21	263	263	11	0	4	4	0	3	4	2%	1%	0%	100%	75%
1	CAPESTORE	7/27	168	168	5	1	0	1	0	0	1	1%	0%	100%	0%	
1	CAPESTORE	8/4	181	181	14	0	2	2	0	0	2	1%	0%	0%	100%	0%
1	CAPESTORE	8/10	183	183	4	0	0	0	0	0	0	0%	0%			
1	CAPESTORE	8/19	159	159	6	0	1	1	0	0	1	1%	0%	0%	100%	0%
1	CAPESTORE	8/25	149	149	3	0	0	0	0	0	0	0%	0%			
1	CAPESTORE	8/31	161	161	6	2	1	3	0	0	3	2%	0%	67%	33%	0%
1	CAPESTORE	9/10	119	119	2	0	0	0	0	0	0	0%	0%			
1	CAPESTORE	9/17	125	125	4	0	0	0	0	0	0	0%	0%			
1	CAPESTORE	9/28	109	109	4	0	0	0	0	0	0	0%	0%			
		TOT	3102	3102	145	17	48	65	9	25	65	2%	1%	26%	74%	52%
1992 SET																
1	CAPESTORE	10/6	99	99	4	0	0	0	0	0	0	0%	0%			
1	CAPESTORE	10/28	99	99	2	0	0	0	0	0	0	0%	0%			
		TOT	198	198	6	0	0	0	0	0	0	0%	0%			
1991 SET UP BAY																
8	NEW BEDS	6/25	55	55	3	0	3	3	2	2	3	5%	4%	0%	100%	67%
9	SHELL ROCK	6/18	65	65	8	1	7	8	1	1	8	12%	2%	13%	88%	14%
		TOT	120	120	11	1	10	11	3	3	11	9%	3%	9%	91%	30%

Table 3. Comparison of prevalence data from preliminary (fresh) and final (combined fresh/tissue section) examination of 1990 set collected in 1991.

COLL. DATE		PREVALENCE*					
		ALL INFECTIONS	LIGHT INF.	ADV INF.	SPOR. INF.	ADV. W/ SPORES	ALL SPOR. INFECTIONS
6/3	PRELIMINARY	7%	0%	100%	75%	75%	5%
6/3	FINAL	11%	36%	64%	36%	56%	4%
6/9	PRELIMINARY	5%	71%	29%	0%	0%	0%
6/9	FINAL	16%	46%	54%	7%	14%	1%
6/17	PRELIMINARY	4%	33%	67%	67%	100%	2%
6/17	FINAL	9%	72%	28%	28%	100%	2%
6/30	PRELIMINARY	3%	0%	100%	50%	50%	1%
6/30	FINAL	12%	59%	41%	11%	26%	1%
7/8	PRELIMINARY	4%	0%	100%	67%	67%	3%
7/8	FINAL	50%	86%	14%	6%	43%	3%
7/15	PRELIMINARY	2%	25%	75%	75%	100%	2%
7/15	FINAL	24%	94%	6%	6%	100%	2%
7/22	PRELIMINARY	3%	57%	43%	43%	100%	1%
7/22	FINAL	35%	96%	4%	4%	100%	1%
7/29	PRELIMINARY	2%	75%	25%	0%	0%	0%
7/29	FINAL	21%	98%	2%	0%	0%	0%
8/5	PRELIMINARY	1%	33%	67%	0%	0%	0%
8/5	FINAL	9%	89%	11%	0%	0%	0%
8/13	PRELIMINARY	0%	100%	0%	0%	0%	0%
8/13	FINAL	17%	100%	0%	0%	0%	0%
8/27	PRELIMINARY	1%	33%	67%	0%	0%	0%
8/27	FINAL	20%	73%	27%	0%	0%	0%
9/4	PRELIMINARY	5%	29%	71%	0%	0%	0%
9/4	FINAL	25%	75%	25%	0%	0%	0%
9/11	PRELIMINARY	3%	0%	100%	33%	33%	1%
9/11	FINAL	12%	79%	21%	7%	33%	1%
9/19	PRELIMINARY	1%	100%	0%	0%	0%	0%
9/19	FINAL	21%	100%	0%	0%	0%	0%
10/1	PRELIMINARY	0%	0%	0%	0%	0%	0%
10/1	FINAL	15%	100%	0%	0%	0%	0%

*Categories "ALL INFECTIONS" and "ALL SPORULATING INFECTIONS" are based on all oysters examined; Categories "LIGHT," "ADVANCED" and "SPORULATING" are based on infected oysters only; category "ADVANCED W/SPORES" is based on advanced infections only.

Table 4. Comparison of prevalence data from preliminary (fresh) and final (combined fresh/tissue section) examination of 1991 set collected in 1992.

		PREVALENCES*					ALL
COLL		ALL	LIGHT	ADV	SPOR.	ADV. W/	SPOR.
DATE		INF.	INF.	INF.	INF.	SPORES	INF.
5/21	PRELIMINARY	8%	13%	88%	38%	43%	3%
5/21	FINAL	17%	33%	67%	17%	26%	3%
6/4	PRELIMINARY	6%	33%	67%	33%	50%	2%
6/4	FINAL	8%	52%	48%	24%	50%	2%
6/18	PRELIMINARY	2%	33%	67%	33%	50%	1%
6/18	FINAL	9%	88%	12%	6%	50%	1%
7/1	PRELIMINARY	5%	33%	67%	56%	83%	3%
7/1	FINAL	17%	80%	20%	17%	83%	3%
7/14	PRELIMINARY	2%	50%	50%	50%	100%	1%
7/14	FINAL	12%	92%	8%	8%	100%	1%
7/27	PRELIMINARY	1%	100%	0%	0%	0%	0%
7/27	FINAL	18%	100%	0%	0%	0%	0%
8/10	PRELIMINARY	0%					
8/10	FINAL	18%	100%	0%	0%	0%	0%

*Categories "ALL INFECTIONS" and "ALL SPORULATING INFECTIONS" are based on all oysters examined; Categories "LIGHT," "ADVANCED," and "SPORULATING" are based on infections oysters only; category "ADVANCED W/SPORES" is based on advanced infections only.

Table 5. Counts of *Haplosporidium nelsoni* spores from tissues of individual oyster spat collected in 1991 and 1992. Tissues remaining after sampling for original diagnosis were allowed to rot in individual tubes (with frequent centrifugation to pellet the spores followed by a change of sea water). Means and standard deviations were calculated from 4 hemocytometer counts of each sample.

<i>COLLECTED</i>	<i>SHELL SIZE(mm)</i>		<i>TOTAL SPORES</i>	
	<i>HT</i>	<i>LG</i>	<i>MEAN</i>	<i>STD DEV</i>
Jun-91	18	15	1,650	1,100
Jun-91	25	16	10,450	15,282
Jun-91	31	28	63,250	18,700
Jun-91	13	10	39,050	14,300
Jun-91	22	13	1,130,250	340,156
Sep-91	26	17	33,550	7,269
Jun-92	23	18	205,150	97,916
Jun-92	24	13	155,100	38,797
Jun-92	19	13	48,950	50,882
Jun-92	25	16	52,800	29,680
Jun-92	19	15	197,450	19,211
Jun-92	23	13	116,600	24,825
Jun-92	27	24	37,950	6,569
Jun-92	16	12	33,000	20,948
Jun-92	21	17	415,250	103,258
Jun-92	23	15	148,500	26,552
Jun-92	19	11	56,100	9,920
Jun-92	28	24	191,400	41,080
		MEAN	163,136	
		ST DEV	261,881	
		ST ERROR	61,726	

TABLE 6
 WORKSHOP ON THE LIFE CYCLE AND TRANSMISSION OF HAPLOSPORIDIUM NELSONI (MSX)
 HASKIN SHELLFISH RESEARCH LABORATORY
 RUTGERS UNIVERSITY

MARCH 18 AND 19, 1992

ATTENDEES

NAME	ORGANIZATION	EXPERTISE
DR. THEODORE ANDREADIS	CONNECTICUT AG. EXP. STATION	Life Cycles/transmission
DR. JAY ANDREWS	COLLEGE OF WILLIAM AND MARY	MSX/Epizootiology
MS. KATHRYN ASHTON-ALCOX	RUTGERS UNIVERSITY	MSX/Parasitology
MR. ROBERT BARBER	RUTGERS UNIVERSITY	MSX/Spores
DR. EUGENE BURRESON	COLLEGE OF WILLIAM AND MARY	MSX/Parasitology
MR. WALTER CANZONIER	MAURICE R. OYSTER CULT. FNDN.	MSX/Transmission
DR. JAMES CHURCHILL	WOODS HOLE OCEANOGRAPHIC INST.	Oceanography, Nearshore Currents
MR. C. AUSTIN FARLEY	NATIONAL MARINE FISHERIES SERVICE	MSX/Parasitology
DR. SUSAN FORD	RUTGERS UNIVERSITY	Convener
DR. JAMES FUXA	LOUISIANA STATE UNIVERSITY	Epizootiology/transmission
DR. HAROLD HASKIN	RUTGERS UNIVERSITY	MSX/Epizootiology
DR. ROBERT HILLMAN	BATTELLE MEMORIAL INSTITUTE	MSX/Haplosporidia
MR. FRED KERN	NATIONAL MARINE FISHERIES SERVICE	MSX/Epizootiology
DR. STEPHEN KLEINSCHUSTER	RUTGERS UNIVERSITY	Cell biology
DR. JAY LEVINE	NORTH CAROLINA STATE UNIVERSITY	Epidemiology/MSX locations
MR. JAY LEWIS	NATIONAL MARINE FISHERIES SERVICE	MSX/Oyster Diseases
DR. JAMES MILLER	RUTGERS UNIVERSITY	Climatology/Oceanography
DR. ROBERT OLSEN	OREGON STATE UNIVERSITY	Fish Parasites/Life Cycles
DR. FRANK PERKINS	COLLEGE OF WILLIAM AND MARY	MSX/Haplosporidia/Protozoans
DR. GARY TAGHON	RUTGERS UNIVERSITY	Benthic layers/organism-flow
DR. ALBERT UNDEEN	USDA/ARS	Parasite spores/sporulation