1987

Oyster Shoal Survey - Spring 1987

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by

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July 15, 1987

Virginia Marine Resource

Report No. 87-9

Oyster Shoal Survey

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The objective of the annual oyster survey in the spring is to determine the bushel counts prior to fall harvest for seed and to assess the condition of market and seed oysters on selected shoals. The selection of the shoal is based upon the importance of the shoal as a source of seed and/or market oysters, whether it is representative of a region of the subestuary, and whether the shoal had been sampled in the past.

The sample unit was three samples on each station with a twenty-four inch (opening) dredge with three inch teeth, running either downcurrent or upcurrent on parallel tracks, and retention of a one-half bushel measured sample representative of each haul. An additional sample was taken if the relationship between the variances and the mean bushel counts fell outside an acceptable range. The acceptable range in variance was based upon experiential knowledge and principle. The principle has been described in a memo dated April 2, 1986 (see Appendix).

The data collection included: the count of market oysters (over 3" in length), the count of small oysters (less than 3" in length but larger than the previous year's set), the count of spat, the count of new boxes (attached shell clear of meat), count of old boxes, count of gapers (dying oysters still containing meat), list of predators, a description of fouling, bottom temperature, bottom salinity and observations of the condition of the oysters and the bottom. The data summary of each shoal included; the average count of oysters per bushel, the percent mortality based upon numbers of gapers and recent boxes, the percent mortality based upon numbers

of gapers and all boxes (old and recent), a list of predators retained in the dredge, a description of fouling; and a characterization of the reef as a seed oyster or market oyster reef. Seed oysters are small oysters including spat.

In the past fifty years approximately 75% of the seed oyster planted on private leases in Virginia came from the James River (Haven et al. 1981). All of the shoals in the James River are characterized as seed oyster areas. The value of a bushel of seed to the industry is correlated to the potential for converting it into one or more bushels of market oysters at harvest time. If the count per bushel of small oysters in the seed equals the count of market oysters per bushel or harvest time, approximately 220-300 oysters, the bushel of seed would be described as good. In addition, if the count of spat in the bushel of seed exceeded the high counts of small oysters, for example 300-400 spat, then there is an additional potential to convert the bushel of seed into more than one bushel of market oysters or harvest time.

Usually bushels of seed oyster from the James River with counts of oysters exceeding seven hundred (700) are termed "a good count". None of the samples in the spring of 1987 averaged as high as 700. None of the samples contained enough spat to have potential for providing an additional bushel at harvest time of market oysters from the spat. The average spat count for all of the shoals in the James River is 47 spat per bushel. The highest spat count per bushel occurred at Point of Shoals and was 86 spat per bushel. The Horsehead seed is excellent because of high bushel count which averaged 579 oysters/bushel. The Point of Shoals seed is satisfactory because the average count of small oysters in a bushel of seed is 240.

Mortalities in the James River based upon gapers and recent boxes did not exceed 8%. Mortalities based upon gapers, old boxes and recent boxes,

which may have extended back to the previous fall, reached a high of 48% on Thomas Rock. The temperatures were between 16 and 18°C. and the mortalities will increase as the temperature rises.

In spite of mortalities due to disease and high levels of exploitation the count of market oysters per bushel sample upriver from Brown Shoal was 55. This is down from 64 markets per bushel in the same area in spring of 1986. At Thomas Rock where mortalities have reached at least 48 percent, the markets constitute as much as 32 percent of the bushel.

In the York River only Aberdeen Rock was sampled. It would be correct to describe this shoal as depleted because of the extremely low level of oysters and spatfall.

The recent mortalities on the shoals in the Piankatank River were between 4 and 12 percent. Mortalities since last fall on Burton's Point are at least 28 percent. The bushel count continued the downward trend from the fall of 1985 high levels. Palace Bar remains excellent for seed oysters with good small oyster counts and good spat counts. Ginney Point rock continues to produce satisfactory seed and each bushel averages 60 market oysters.

The impact of the mortalities caused by disease are clear in the Rappahannock River but the number of market oysters per bushel still averages 58 at Hog House Bar and upriver. Below Hog House Bar the number of markets averages 11 per bushel. Recent mortalities were no higher than 18 percent except on Broad Creek, where the recent mortalities reached 27 percent. This reflects the spring flow of fresh water and its tendency to act favorably on the mortality rates. The salinity was only 12.2 °/oo on ebb tide at Smokey Point at the time of the survey. The mortality over a

longer period calculated from total of all boxes is at least 48 percent at Drumming Ground and 48 percent at Broad Creek.

Only Middle Ground was sampled in the Corrotoman River. The mortality rate is at least 17 percent from the fall of 1986 thru the first quarter of 1987. The samples here averaged 8 percent (percentage of bushel count) markets and were below average for markets and below average for seed oysters.

The set in the Great Wicomico River was the highest in state waters. All of the shoals sampled could be used as sources of seed. Fleet Point and Haynie Point are excellence sources of seed. The bushel counts ranged from 1330 oysters/bushel to 2224 oysters/bushel in the samples from all of the shoals. Growths of Gracilaria are dense upriver at Haynie Point but do not appear to interfere with the growth or survival of the oysters. The mortality rates are 6 percent or less when based upon the total bushel including the 1986 spat. When the spat count was subtracted from the total, the mortality, since last fall, is as high as 50 percent (at Fleet Point).

In Pocomoke Sound, Bird Rock is described as barren. Island Rock and Robin Hood might also be termed as very close to depleted. At these low levels of population mortality rates are affected by just a few additional boxes. However, one third of the oysters were markets on P. G. #9 while the remaining areas are either below average or depleted. The best spat count was on Marshall's Rock where the spat numbered 53 per bushel. The recent mortality on Marshall Rock was 34 percent and the 1986 set was severely affected.

Since the temperatures at the time of the survey were below 20^{o}C, except at three stations in Pocomoke Sound, it is assumed that mortalities were just beginning at the time of the survey. The very low salinities in

the James river in early May would suggest additional mortalities due to the spring freshets will appear. However, in the James River and the Rappahannock River the fresh water should have a beneficial effect upon the incidence of diseases.

The data collected is shown in Table 1; and, Table 2 presents the average bushel counts, percent mortality, evidence of predation, description of fouling and characterization of the shoal. The appendix shows the location of station in each river sampled.

TABLE 1. SUMMARY, SPRING 1987 OYSTER-BAR SURVEY

BAR	OYSTERS MKT.	SM.	SPAT	Bu. COUNT	$\bar{x}$ COUNT	GAPER	BOXES REC	OLD	PRED.	FOULING	BOTTOM °C	°/oo	TIME	TIDE	$\bar{x}$ DEPTH	LORAN COORD.	OBSERVATIONS SAMPLE PREC., Etc.
JAMES RIVER																	
HORSEHEAD	70	566	40	676		0	8	20	Mud crabs	Barnacles-light	16.0	1.6	1010	Max Ebb	11'	273460	Seas Light
	72	348	70	490		0	4	28	ditto	Mussels-light						41333.2	Wind N>5K
	42	468	28	538		0	8	18	ditto	ditto							
	76	510	24	610	579	0	6	38	ditto	ditto							
PT. OF SHLS.	48	242	84	374		0	14	24	Mud crab	Barnacles-light	17.0	0.7	1345	Max Ebb	7.5'	27344.0	Seas Light
	66	234	44	344		0	12	16	None	ditto						41310.6	Wind N>5K
	36	246	86	368	362	0	4	20	None	ditto							Lrge. amt. cinder
WRECK SHLS.	48	106	22	176		0	10	62	Mud crabs	Barnacles	18.0	3.4	1330	Late Ebb	9'	27326.0	Seas calm
	38	90	30	158		0	8	88	ditto	ditto						41301.8	Wind calm
	58	94	26	178	171	4	12	56	ditto	ditto							
THOMAS ROCK	42	118	52	212		0	12	214	Mud crabs	Barnacles	17.5	3.4	1245	Late Ebb	7.8'	27302.7	Seas calm
	50	170	36	256		2	24	194	ditto	ditto						41288.4	Wind calm
	70	106	42	218	229	0	20	180	ditto	ditto							
RIDGE	30	60	32	122		0	10	72	Mud crab	Microciona-light	16.0	4.8	1030	Late Ebb	7.3'	27280.6	Seas light
	44	60	28	132		0	14	54	Turbellarian	Barnacles-light						41218.8	Wind SW Light
	32	60	58	150	135	0	10	64	Urosalpinx	Colonial Bryozoan-light							
YORK RIVER																	
ABERDEEN RK.	2	0	2	4		0	0	8	Mud crab	Microciona	17.0	9.2	1030	Late Ebb	8.2'	27368.3	Seas Light
	0	0	0	0	2	0	0	6	Turbellarian	Anomia						41501.2	Wind NE 15-20
MOBJACK BAY																	
PULITZ BAR	28	34	34	96		0	14	98	Mud crab	Hydroides, mod.	17.5	17.8	1430	Late Flood	18'	27310.6	Seas moderate
	14	16	6	36		4	12	56	Urosalpinx	Cliona, Anomia						41534.6	Wind NE 15-20
	22	12	10	44	59	0	6	68	Odostomia	Crepidula, Molgula, Barnacles Blood clam							Hydroides dominant
PIANKATANK R																	
GINNEY PT.	94	560	126	780		0	6	58	Stylochus	Mussels	16.0	13.4	1000	Max. Ebb	8.5'	27347.4	
	48	254	180	482		0	32	54	Mud crab	Molgula						41659.7	
	44	198	138	380		2	20	48	None	Anemone							Mussels dominant
	56	368	134	558	550	4	26	52	None	Algae							

SUMMARY, SPRING 1987 OYSTER BAY SURVEY

BAR	OYSTERS MKT.	SM.	SPAT	Bu. COUNT	$\bar{x}$ COUNT	BOXES GAPER	REC	OLD	PRED.	FOULING	BOTTOM °C	°/oo	TIME	TIDE	$\bar{x}$ DEPTH	LORAN COORD.	OBSERVATIONS SAMPLE PREC., Etc.
PALACE BAR	22	370	390	782		0	90	72	Mud crabs	Mulgula	19.0	13.3	1135	Late Ebb	10'	27338.1	
	30	316	202	548		0	68	76		Hydroides						41658.3	
	22	334	312	668		0	70	100		Microciona							
	30	308	310	648	662	2	64	42									
BURTON PT.	4	188	140	332		4	58	110	None	Molgula, moderate	18.0	13.4	1300	Late Ebb	8'	27326.0	
	10	228	200	438		0	40	86	None	Barnacles, moderate						41652.9	
	20	182	142	344	371	0	50	84	None	Hydroides, moderate Crepidula Microciona, abun.							Microciona dominant
RAPPA. RIVER																	
BOWLER'S RK.	50	24	6	80		0	0	0	Mud crab	Barnacle, light	19.0	7.2	1000	Early	8.6'	27472.4	Seas calm
	36	28	2	66		0	0	0	Turbellarian	Anemones, light				Flood		41847.3	Wind calm
	72	68	2	142		0	0	2		Mussels, light to moderate							Mussels dominant, Lg. amts. of cinder
MORATTICO	56	44	0	100		0	2	14	Mud crab	Mussels, med.	19.8	10.5	1345	Max	13'	27440.4	Seas calm
	54	24	0	78		0	4	6	Turbellarian	Barnacles, light				Flood		41779.0	Wind calm
	58	12	0	70	83	0	0	10		Molgula, light							Mussels dominant
SMOKEY PT.	72	20	30	122		0	6	22	None	Mussels, light	15.4	12.2	1400	Late Ebb	11.5'	27417.8	Seas calm
	52	26	20	98		0	0	14	Mud crab	Barnacles, light						41779.0	Wind NE light
	70	30	20	120	113	0	4	16	None	Molgula, light							
HOG HOUSE	66	20	28	114		0	0	36	Mud crab	Mussels, mod.	18.8	11.5	1415	High Slack	15.5'	27398.3	Seas 1-2'
	72	14	36	122		0	2	52	ditto	Barnacles, Molgula,						41725.8	Wind NE 15
	50	20	40	110	115	0	0	40	ditto	Anemones; light							Mussels dominant
DRUMMING GD.	4	26	72	112		0	44	92	None	Molgula, Sabelli-	18.2	13.3	1345	Max. Ebb	12'	27378.9	Seas light
	6	26	86	118		0	16	82	Mud crab	dae; mod. Barnacles						41738.0	Wind S 5-10 K
	0	56	98	154	128	2	20	94	None	Mussels; light							
PARROTS	12	34	124	170		0	0	26	Mud crabs	Molgula, Barnacles	18.2	12.6	1245	Max. Ebb	8.5'	27361.9	Seas calm
	22	50	112	184		10	10	48	None	Mussels, Micro-						41710.4	Wind light
	18	48	192	258		14	14	26	Mud crabs	ciona; light							Barnacles dominant
	20	104	118	242	214	8	8	60	None								

SUMMARY, SPRING 1987 OYSTER BAY SURVEY

BAR	OYSTERS MKT.	OYSTERS SM.	SPAT	Bu. COUNT	$\bar{x}$ COUNT	GAPER	BOXES REC	BOXES OLD	PRED.	FOULING	BOTTOM °C	BOTTOM °/oo	TIME	TIDE	$\bar{x}$ DEPTH	LORAN COORD.	OBSERVATIONS SAMPLE PREC., Etc.
BROAD CK.	8	50	90	148		0	58	98	Mud crabs	Molgula, Mussels	19.0	13.8	1100	Max. Ebb	15'	27329.5	Seas light
	8	62	52	122		2	52	94	Stylochus	Barnacles;						41696.3	Wind SN 10-15
	12	92	106	210	160	2	62	142		moderate							Barnacles dominant
CORROTOMAN R.																	
MIDDLE GD.	26	86	198	310		0	8	62	None	Microciona	20.0	12.2	1515	Max. Ebb	10'	27386.2	Seas calm
	34	96	190	320		0	20	62	None	Barnacles,						41763.0	Wind calm
	28	62	294	384	338	0	8	50	None	Gracilaria; light							
GR. WICOMICO																	
HAYNIE PT.	18	370	1368	1768		0	94	72	Stylochus	Barnacles, light	19.8	11.5	1500	Max. Ebb	5'	27366.9	Seas light
	18	456	1036	1510		2	46	54	Mud crabs	Mussels, light						41881.6	Wind E 5-10 K
	18	474	1408	1900		4	56	56	Stylochus	Gracilaria, mod.							Gracilaria
	22	542	1000	1564	1686	8	94	74	Numerous	to abundant							dominant
WHALEY'S E.	22	100	1668	1790		0	80	82	Mud crabs	Barnacles, mussel	18.5	10.9	1330	Max. Ebb	9'	27361.6	Seas calm
	24	138	1620	1782		0	80	68	Turbellarian	Hydroides, Molgula;						41867.3	Wind calm
	28	206	1990	2224	1932	2	46	94	ditto	light							
FLEET PT.	12	258	1648	1918		0	164	106	Mud crabs	Barnacles; mod-	18.2	11.9	1100	Max. Ebb	14'	27358.3	Seas calm
	20	146	1376	1542		0	80	132	Turbellarian;	erate, Molgula,						41868.9	Wind calm
	22	206	1102	1330		0	70	90	numerous	Mussels, light							Barnacles dominant
	24	166	1142	1332	1531	0	72	74									
POCOMOKE SND.																	
P.G. #9	56	30	28	114		0	2	68	Mud crab	Microciona,	22.0	15.2	1430	Early Ebb	5.5'	27222.6	Seas 1-2'
	38	36	32	106		0	16	52	Stylochus;	Barnacles, Molgula;						42011.3	Wind SW 10-20 K
	48	72	50	170		0	8	62	numerous	light							
	50	80	66	196	147	0	12	80									
P.G. #10	22	188	98	308		0	16	22	None	Sabellidae; nume-	22.0	15.9	1530	Max. Ebb	6'	27230.8	Seas 1-2'
	22	96	52	170		0	16	32	None	rous. Microciona,						41999.3	Wind SW 10-20 K
	32	94	60	186		0	36	30	None	Molgula, Barnacles;							Sabellidae
	32	168	56	256	230	0	20	28	None	light. Lyonsia,							dominant
										Pectinaria, Mya;							
										few							

SUMMARY, SPRING 1987 OYSTER BAY SURVEY

BAR	OYSTERS MKT.	SM.	SPAT	Bu. COUNT	$\bar{x}$ COUNT	GAPER	BOXES REC	OLD	PRED.	FOULING	BOTTOM °C	°/oo	TIME	TIDE	$\bar{x}$ DEPTH	LORAN COORD.	OBSERVATIONS SAMPLE PREC., E.
MARSHALL'S	18	54	100	172		2	94	12	Mud crabs	Hydroides, Mol-	20.2	17.4	1400	Max. Ebb	10'	27246.8	Seas 0.5'
RK.	14	60	10	84		0	30	12	Eupleura	gula, Crepidula,						41957.2	Wind light
	20	74	36	130		2	66	8	egg cases	Anomia, Barnacles,							
	2	52	68	122	127	2	64	2		light to mod.							
										Mussels, Blood							
										clams; few							
BIRD PK	0	2	2	4		0	4	0	Mud crabs	Molgula, Hydroides	19.0	18.8	1300	Max. Ebb	20'	27237.8	Seas light
	4	4	0	8	6	0	2	2	Eupleura	Crepidula, Anomia,						41939.1	Wind NW light
										Barnacles, Blood							lrge. amts. cin-
										clams; light							der, lrge. amt.
																	blackshell
ISLAND RK	4	12	0	16		0	0	18	Mud crabs	Hydroides, Crepi-	19.0	18.5	1200	Late Ebb	16'	27226.1	Seas calm
	12	10	0	22	19	0	6	20	Eupleura	dula, Sabellaria,						41933.1	Wind calm
									egg cases	Molgula, Cliona,							
									Alcyonidium;	Alcyonidium; light							
									light								
ROBIN HOOD	12	4	0	16		0	2	14	Mud crabs	Hydroides; light	19.0	18.7	1055	Late Ebb	17.5'	27234.0	Seas calm
	10	12	0	22	19	0	0	4	Eupleura	to mod. Molgula,						41921.9	Winds calm
										Cliona, Sabellaria,							
										Blood clams,							Hydroides
										Hydroids; light							dominant

Table 2. Bushel count and condition of oysters on each bar.

Bar	Average Bu. Count	Percent Mortality Based Upon Recent Boxes and Gapers	Percent Mortality Based Upon All Boxes and Gapers	Evidence of Predation	Fouling	Classification
James River						
Horseshead	579	1	5	Mud crabs	Barnacles, Mussels; light	seed; excellent
Point O Shoals	362	3	7	Mud crabs	Barnacles; light	seed; satisfactory
Wreck Shoals	171	6	32	Mud crabs	Barnacles; light	seed; below average
Thomas Rock	229	8	48	Mud crabs	Barnacles; light	seed; below average
Ridge	135	8	35	Mud crabs Turbellarian Urosalpinx	Microciona, Barnacles, Colonial Bryozoan; light	seed, below average
York River						
Aberdeen Rock	2	NA	NA	Mud crab, Turbellarian, Eupleura, Urosalpinx	Microciona, Ammonia, Molgula Crepidula, Blood clams; light	Barren
Mobjack Bay						
Pultz Bar	59	17	59	Mud crab, Odastomia, Urosalpinx	Hydroides; mod. Cliona, Anomia, Crepidula, Molgula, Barnacles, Blood clam; light	Market, below average
Piankatank River						
Ginney Point	550	4	12	Mud crab, Stylochus	Mussel; abundant Anemones; many Molgula, Algae; light	Market; 11% markets seed; satisfactory

Table 2. Bushel count and condition of oysters on each bar.

Bar	Average Bu. Count	Percent Mortality Based Upon Recent Boxes and Gapers	Percent Mortality Based Upon All Boxes and Gapers	Evidence of Predation	Fouling	Classification
Palace Bar	662	10	18	Mud crabs	Molgula, Hydroides, Microciona; light	Market; 4% markets seed; excellent
Burton Point	371	12	28	None	Molgula, Barnacles, Hydroides; Moderate, Crepidula, Microciona; abundant	Market; 3% market
Rappa. River						
Bowlers Rock	91	0	2	Mud crab Turbellarian	Mussels; light to moderate Barnacle, Anemone; light	Market; 58% markets
Morattico Bar	83	2	13	Mud crab Turbellarian	Mussels; mod. Barnacles, Molgula, light	Market, 40% markets
Smokey Pt.	113	3	15	Mud crab	Mussels Barnacles, Molgula, light	Market; 37% markets

Table 2. Bushel count and condition of oysters on each bar.

Bar	Average Bu. Count	Percent Mortality Based Upon Recent Boxes and Gapers	Percent Mortality Based Upon All Boxes and Gapers	Evidence of Predation	Fouling	Classification
Hog House Bar	115	1	28	Mud crab	Musesls, Barnacles, Molgula; light	Market; 35% markets
Drumming Ground	128	18	48	Mud crab	Molgula, Sabellidae; mod. Barnacles, Mussels; light	Market; 3% markets
Parrots	214	7	21	Mud crab	Microciona, Barnacles, Molgula Mussels; light	Market; 8% markets
Broad Cr.	160	27	48	Mud crab Stylochus	Barnacles; moderate	Market; 5% markets
Corrotoman Rk. Middle Gd.	338	3	17	None	Microciona, Barnacles, Gracilaria, light	Market; 8% markets
Great Wicomico R. Haynie Pt.	1686	4	8	Mud crabs Turbellarians; numerous	Barnacles, Mussels; light Gracilaria; light to mod.	Seed; excellent

Table 2. Bushel count and condition of oysters on each bar.

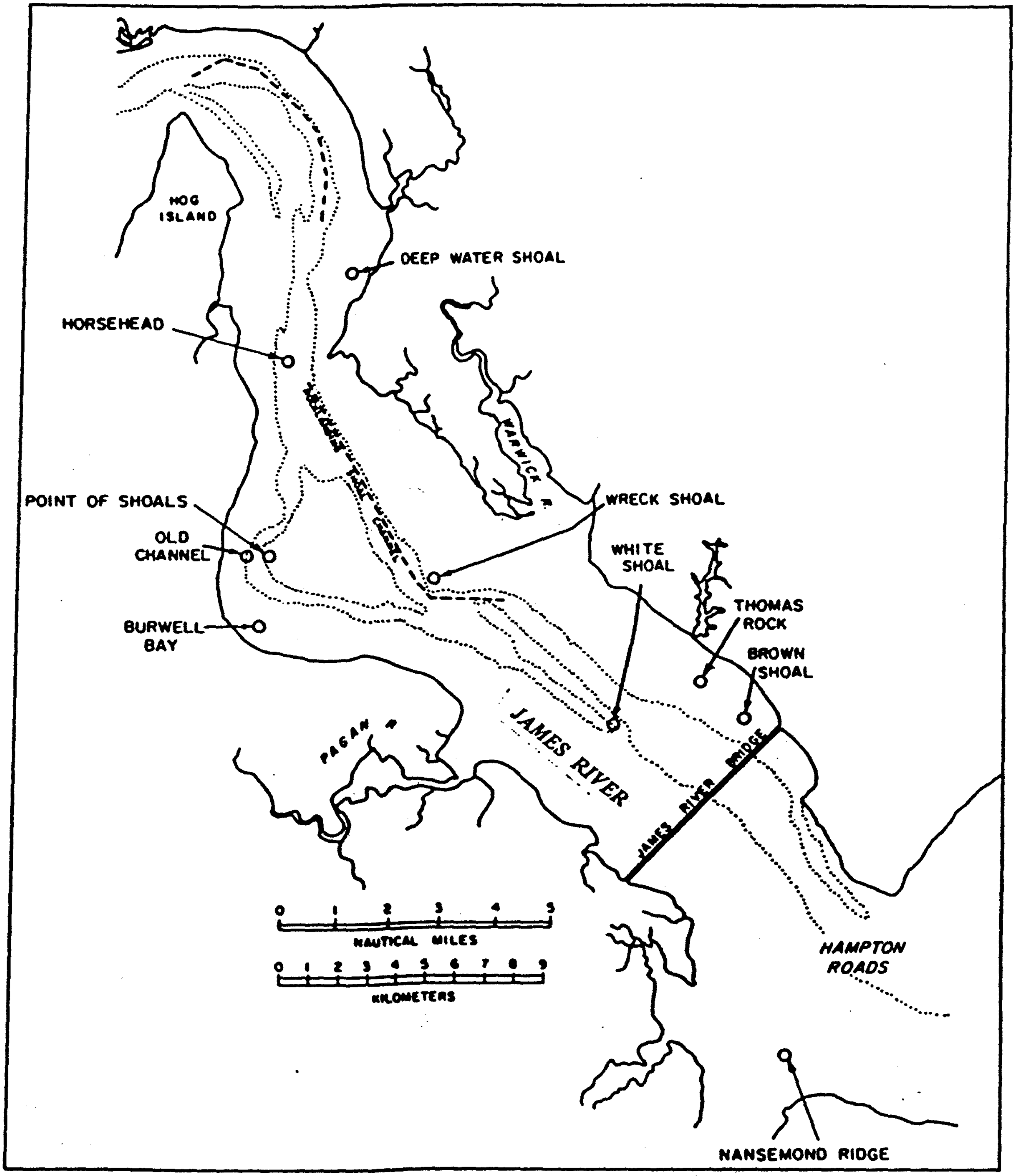
Bar	Average Bu. Count	Percent Mortality Based Upon Recent Boxes and Gapers	Percent Mortality Based Upon All Boxes and Gapers	Evidence of Predation	Fouling	Classification
Whaley's E.	1932	3	7	Mud crab Turbellarians;	Barnacles, Mussels, Molgula, Hydroides; light	Seed; satisfactory
Fleet Pt.	1531	6	11	Mud crabs Turbellarians; numerous	Barnacles; moderate Molgula, Mussels; light	Seed; excellent
Pocomoke Sound						
P.G. #9	147	6	34	Mud crabs Turbellarians; numerous	Microciona, Barnacles, Molgula; light	Market; 33% markets
P.G. #10	230	10	18	None	Sabellidae; numerous; Microciona, Molgula, Barnacles; light Pectinaria, Mya, Lyonsia; few	Market; 11% markets
Marshall's Rk.	127	34	37	Mud crabs Eupleura egg cases	Hydroides, Molgula, Crepidula, Anomia, Barnacles; light to moderate. Mussels, Blood clams; few	Market; 10% markets

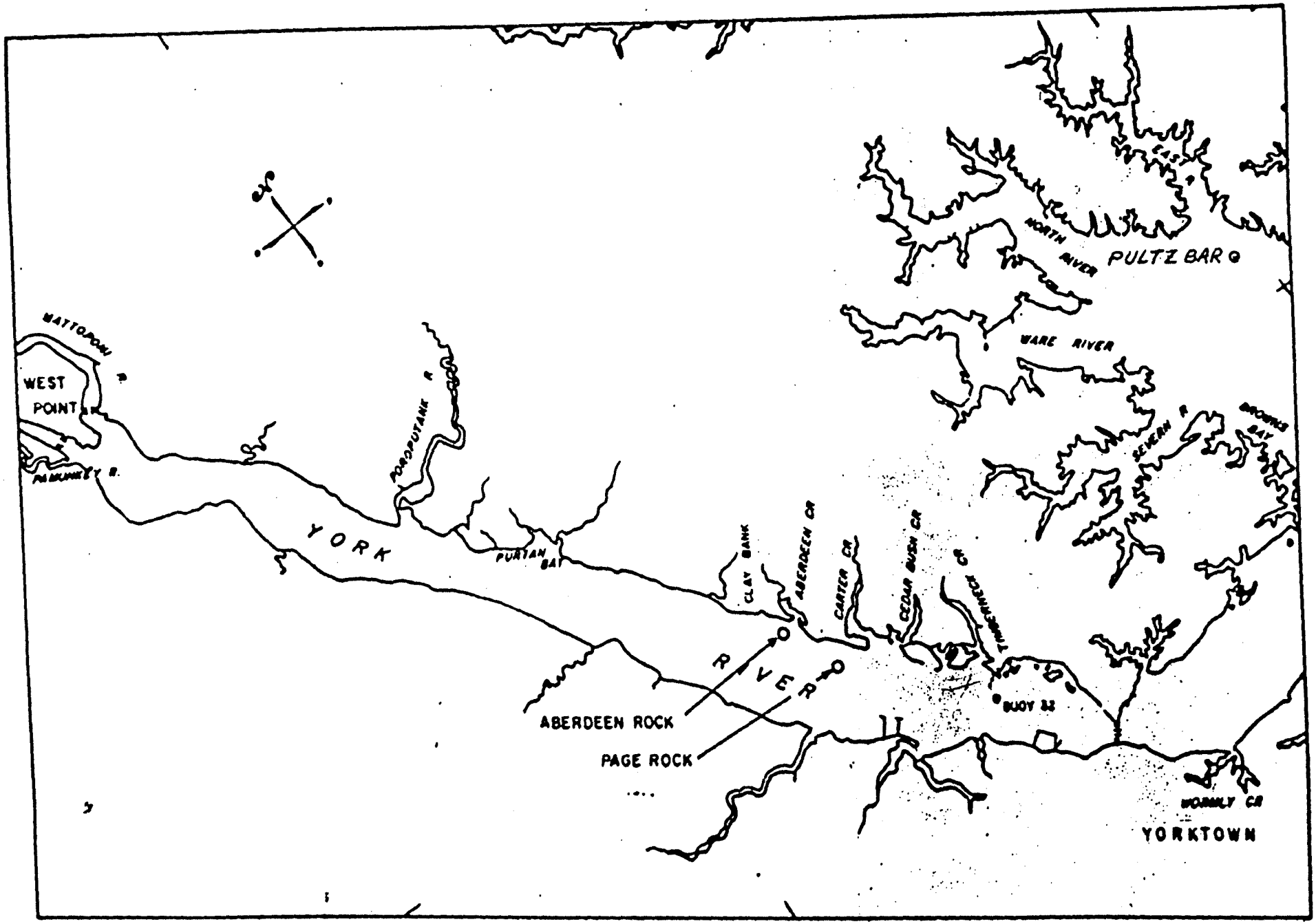
Table 2. Bushel count and condition of oysters on each bar.

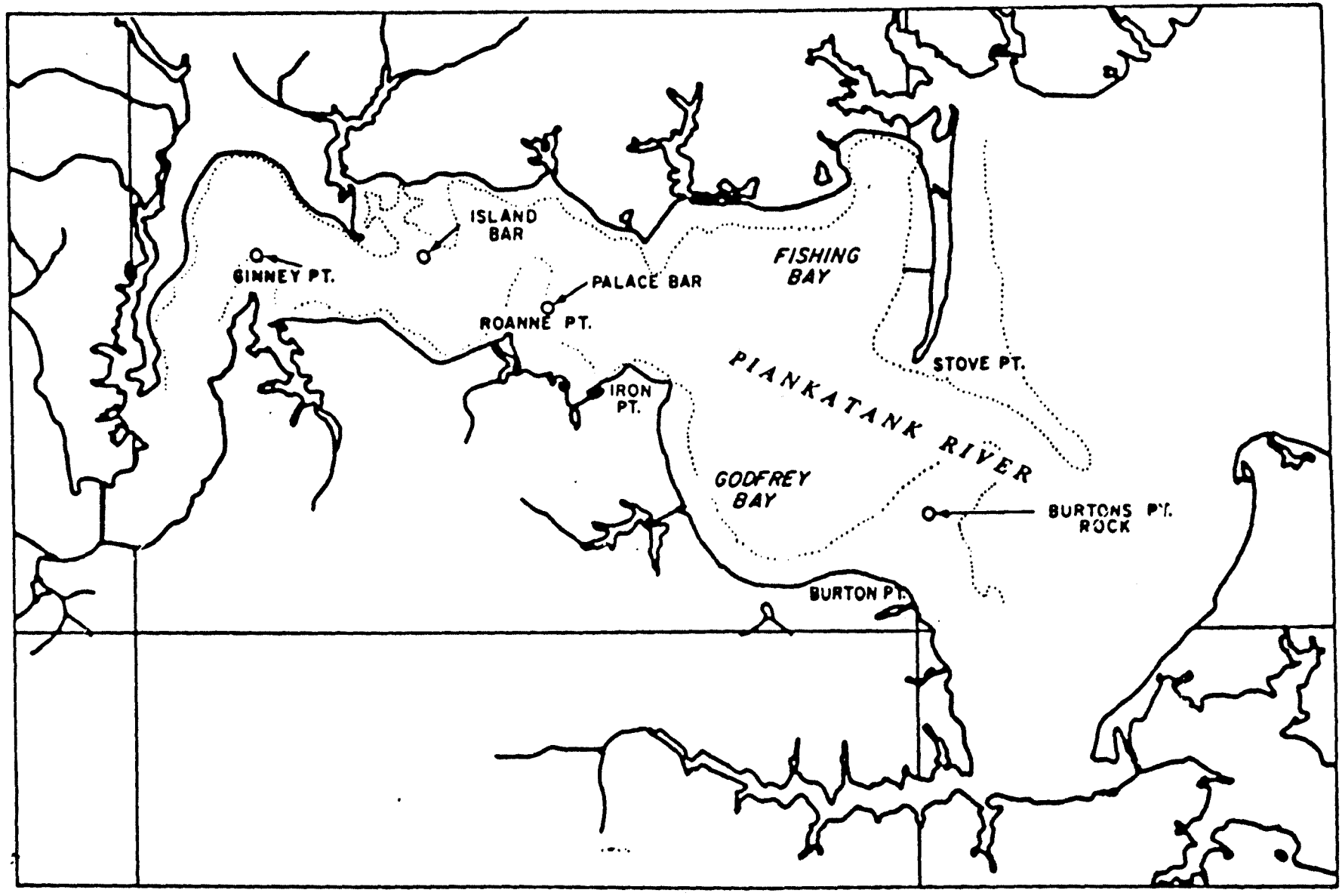
Bar	Average Bu. Count	Percent Mortality Based Upon Recent Boxes and Gapers	Percent Mortality Based Upon All Boxes and Gapers	Evidence of Predation	Fouling	Classification
Pocomoke Snd. (con't)						
Bird Rock	6	NA	NA	Mud crabs Eupleura	Molgula, hydroides, Crepidula, Anomia, Barnacles, Blood clams; Light	Barren
Island Rock	19	14	54	Mud crabs Eupleura egg cases	Hydroides, Crepidula Sabellaria Molgula, Cliona, Alcyonidium; light	Market; below average
Robin Hood	19	5	34	Mud crabs Eupleura	Hydroides; light to moderate, Molgula, Crepidula, Cliona, Sabellaria, Blood clams, Hydroids; Light	Market; below average

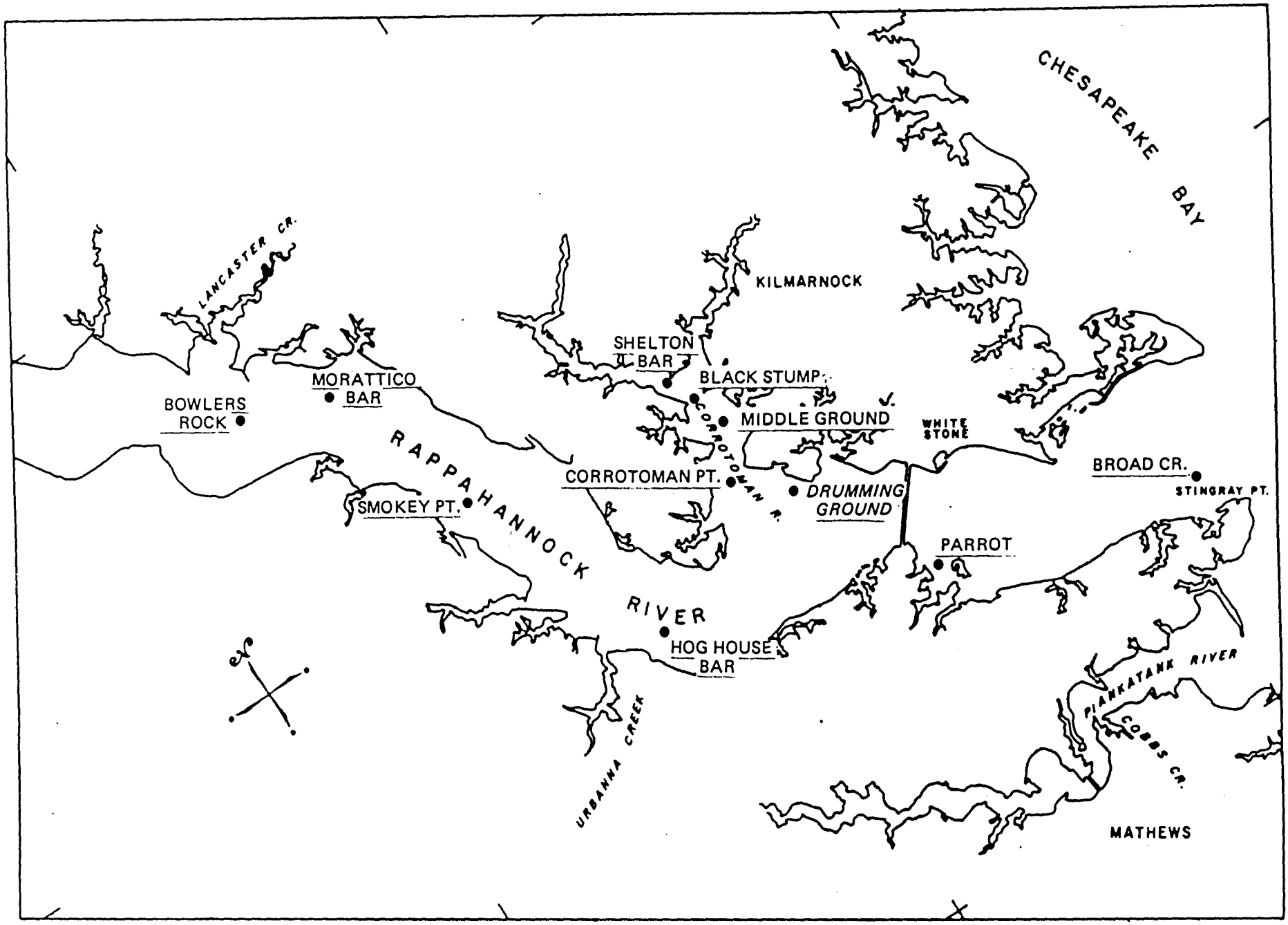
APPENDIX

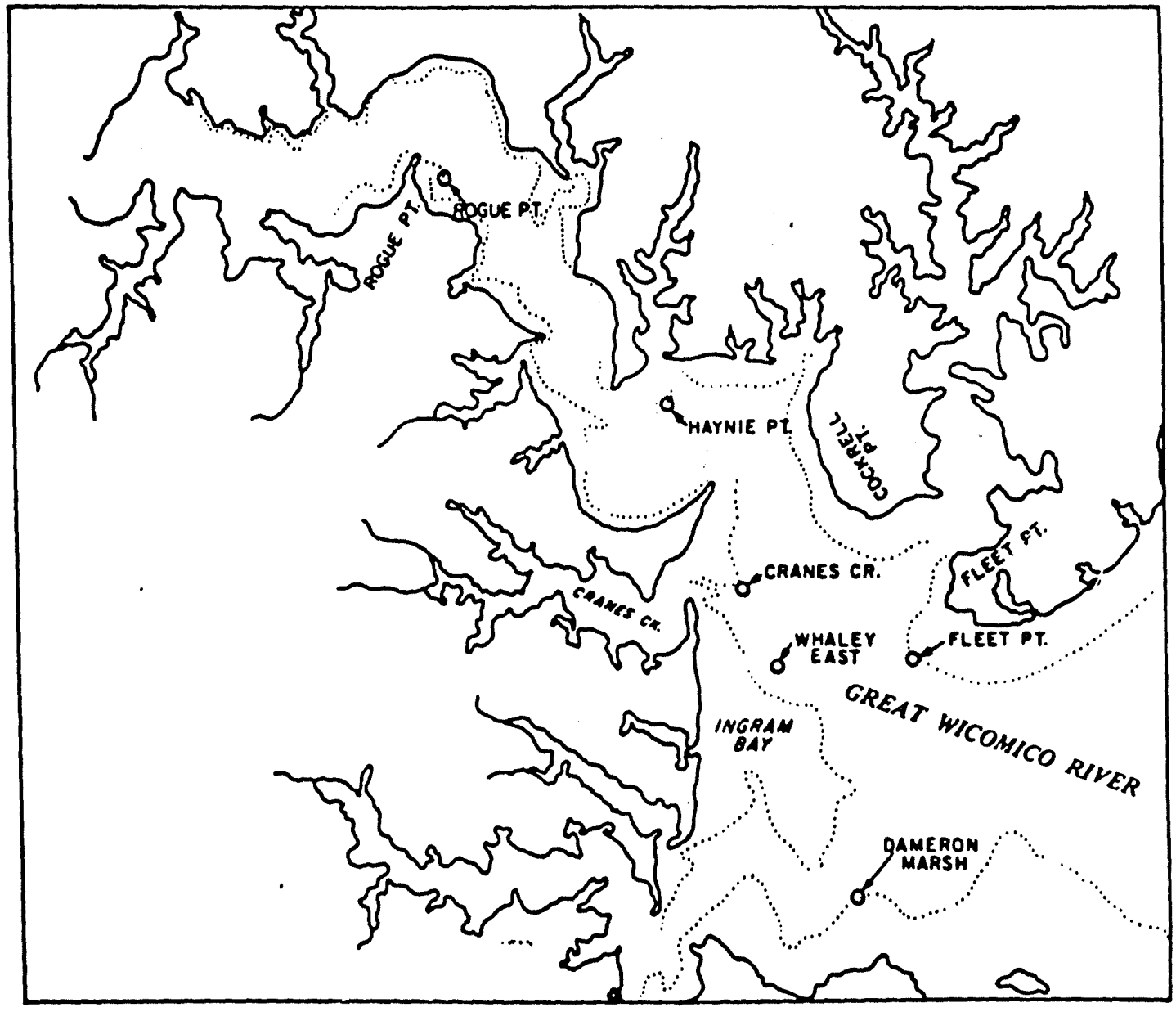
Locations of stations in the rivers in the spring 1987.

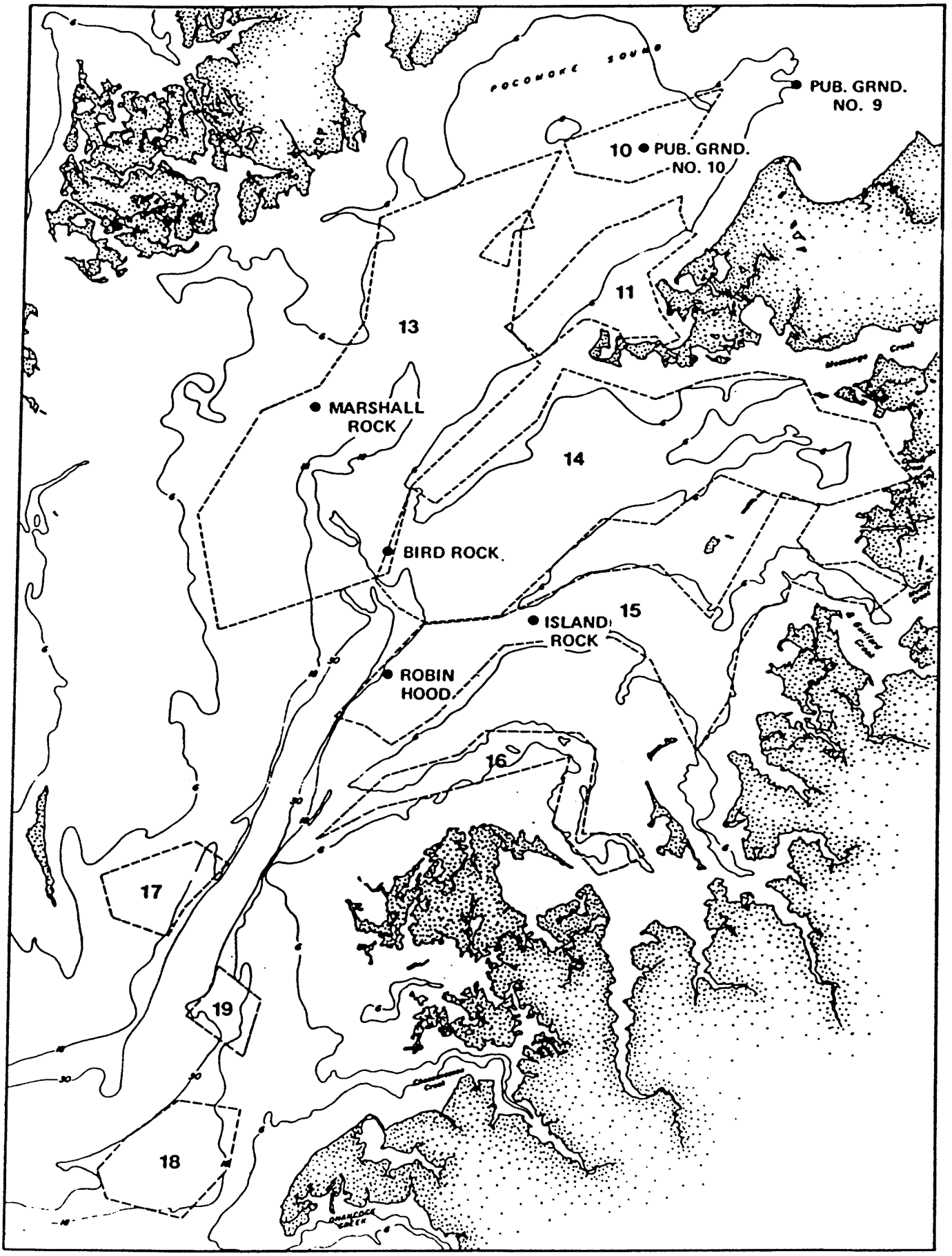

HOG ISLAND
DEEP WATER SHOAL
HORSEHEAD
WARWICK R.
POINT OF SHOALS
WRECK SHOAL
OLD CHANNEL
WHITE SHOAL
THOMAS ROCK
BURWELL BAY
BROWN SHOAL
JAMES RIVER
PAGAN R.
JAMES RIVER BRIDGE
0 1 2 3 4 5
NAUTICAL MILES
0 1 2 3 4 5 6 7 8 9
KILOMETERS
HAMPTON ROADS
NANSEMOND RIDGE


WEST POINT
MATTAPONI R.
PAMUNKEY R.
POROPOTANK R.
YORK
PURTAN BAY
CLAY BANK
ABERDEEN CR.
CARTER CR.
CEDAR BUSH CR.
TIMBERNECK CR.
RIVER
ABERDEEN ROCK
PAGE ROCK
BUOY 33
NORTH RIVER
PULTZ BAR
WARE RIVER
SEVERN R.
BROWNS BAY
WORMLY CR.
YORKTOWN


ISLAND BAR
GINNEY PT.
PALACE BAR
FISHING BAY
ROANNE PT.
STOVE PT.
IRON PT.
PIANKATANK RIVER
GODFREY BAY
BURTONS PT.
ROCK
BURTON PT.


CHESAPEAKE BAY
LANCASTER CR.
KILMARNOCK
SHELTON BAR
BLACK STUMP
MORATTICO BAR
BOWLERS ROCK
MIDDLE GROUND
WHITE STONE
POTOMAC R.
CORROTOMAN PT.
DRUMMING GROUND
BROAD CR.
STINGRAY PT.
SMOKEY PT.
RAPPAHANNOCK RIVER
PARROT
HOG HOUSE BAR
PIANKATANK RIVER
COBBS CR.
URBANNA CREEK
MATHEWS


ROGUE PT.
ROGUE PT.
HAYNIE PT.
COCKRELL PT.
CRANES CR.
CRANES CR.
FLEET PT.
FLEET PT.
WHALEY EAST
INGRAM BAY
GREAT WICOMICO RIVER
DAMERON MARSH


POCOMOKE SOUND
PUB. GRND. NO. 9
10
PUB. GRND. NO. 10
11
13
MARSHALL ROCK
14
BIRD ROCK
15
ISLAND ROCK
ROBIN HOOD
16
17
19
18

MEMO

TO: Dr. H. Austin
THRU: Dr. R. Mann
FROM: J. Whitcomb
SUBJECT: Bottom survey on oyster shoals in the spring.
DATE: April 2, 1986

The purpose of the spring oyster shoal survey will be to estimate the count of oysters per bushel and the condition of the oysters on selected shoals. Selection of the shoal is based upon the importance of the shoal as a source of seed and/or market oysters, whether it is representative of a region of the subestuary, and whether the shoal has been sampled in the past.

The sample unit is three samples on each station with a twenty-four inch (opening) dredge with three inch teeth, running either with or against the current on parallel paths, retaining a one-half bushel measured sample representative of each haul. Additional samples will be taken if the relationship between the variances and the mean bushel counts falls outside an acceptable range. The acceptable range in variance is based upon experiential knowledge and principle. The principle is found in the statement that the index of precision equals the standard error devided by the average. Using an assumed precision of 20% and the equation,

$$D = 1/\bar{X} \left(\frac{S^2}{N} \right)^{1/2}$$

where D is the assumed precision, $\bar{X}$ is the arithmetic mean (or bushel count), S^2 is the sample variance, and N is the number of samples, we have an understanding of the relationship between the sample variance and the mean (bushel count).

$$0.2 = 1/\bar{X} \left(\frac{S^2}{N} \right)^{1/2}$$

$$N = S^2 / 0.2^2 \bar{X}^2 = 25 S^2/\bar{X}^2$$

using N= 1 we have,

$$\bar{X}^2 = 25 S^2$$

The line representing this relationship is shown in Fig. 1. If the ranges are plotted at each mean count value we have constructed a zone of acceptability as is shown by the dashed lines. As samples are taken the composite mean is plotted against an estimate of the variances to determine if additional samples are required.

The data collection includes: count of market oysters (over 3" in length), count of small oysters (less than 3" in length but larger than the previous year set), count of spat, new boxes, old boxes, gapers, the bottom temperature, bottom salinity and observations relative to the condition of the oysters, water column and bottom. For each station the data summary will consist of average bushel counts exclusive of spat, spat count, mortality based upon new boxes and gapers, number of predators by species, and description of fouling. The loran reference numbers will be recorded at each station.

Each shoal will be classified as either a seed or market shoal. Then it will be rated as Excellent, Satisfactory or Below Average with an explanation.

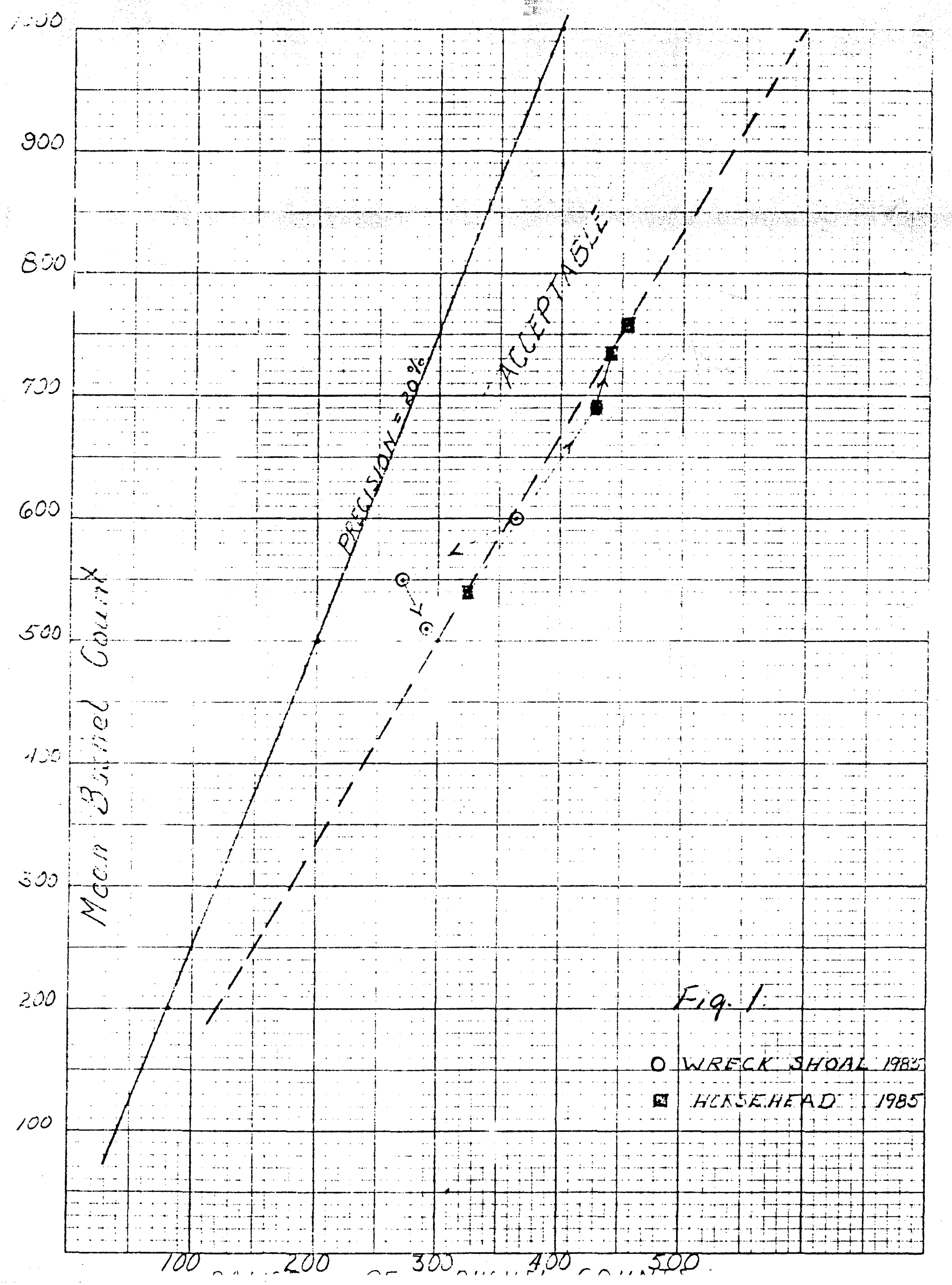

Mean Bushel Count
1000
900
800
700
600
500
400
300
200
100
100
200
300
400
500
PRECISION = 30%
ACCEPTABLE
O WRECK SHOAL 1985
HORSEHEAD 1985

Fig. 1