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FILE

Oyster Shoal Survey, Spring 1988

by

James P. Whitcomb

Virginia Institute of Marine Science

and

The College of William and Mary
Gloucester Point, Virginia 23062

July 1, 1988

Virginia Marine Resource
Report No. 88-6

Oyster Shoal Survey

Spring 1988

James P. Whitcomb

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 number 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.

The mortalities of oysters in Virginia, caused by disease, have resulted in a shortage of "market" oysters and "seed" oysters. The only James River bar which produced seed counts was Horsehead. Although the bushel count there was below what is considered a good "seed count" (700 oysters per bushel) there are 237 small oysters per bushel at Horsehead. This is a marginal count for seed but the best available in the James River.

Since 1985 the James River has become the center of the "market" oyster landings in Virginia. For more effective monitoring a station has been added at Long Rock and a station has been added at Dry Shoal. In the spring of 1986 there was an average of 64 oysters $\bar{>}3$" on the combined bars above Brown Shoal. In the spring of 1987 this count dropped to 55 oysters $\bar{>}3$" in length. In this survey (spring 1988) the bars above the line of high mortalities (Wreck Shoal-Dry Shoal) averaged 24 oysters $\bar{>}3$". In the same three year period the average count of set of oysters counted during the spring survey has remained low (40-55 spat per bushel).

The mortalities from, primarily, disease on James River bars has increased from a high of 7% in the spring of 1986 to 48-60 percent in 1987 and 1988. Mortalities remain high downriver of Wreck Shoal and Dry Shoal and low upriver of these bars. Surviving recruitment has remained low on all bars in this same three year period but the recruitment in the spring of 1988 at Ridge, the furthest station down river, was (76 spat per bushel) exceeded only by the set at Point of Shoals.

The bushel counts are below 100 oysters per bushel downriver from Wreck Shoal and Dry Shoal. Upriver of these same bars the bushel count has dropped from an average of 504 oyster per bushel (spring 1986) to 274 oysters per bushel (spring 1988). This drop in count is attributed to disease mortality plus exploitation by harvesting "market" oysters. The James River oysters bars are now marginal as a source of "seed" oysters and would be characterized as "spotty" if not marginal as a source of "market" oysters. The low number of surviving spat in the spring surveys since the spring of the 1986 has, in addition, characterized the James River as failing to match the losses in number of oysters with an equal recruitment of spat.

The York River station at Aberdeen Rock had an average bushel count of 24 oysters per bushel of cultch and 10 spat per bushel but no $\bar{>}3$" oysters. Pultz Bar the single station for Mobjack Bay had an average count of 9 oysters per bushel of cultch and no spat but two $\bar{>}3$" oysters per bushel. Both bars are classified as depleted.

The bars in the Piankatank River have continued to have substantial mortalities with low recruitment except at Palace Bar where surviving spat was 297 spat per bushel. But the count of small oysters at Palace Bar (108 per bushel) limits the use of the oysters for "seed". None of the bars will support the harvesting of $\bar{>}3$" "market" oysters.

With the exception of Broad Creek the counts of oysters per bushel of cultch for all the bars in the Rappahannock River ranged from 7 (Hog House Bar) to 63 (Bowlers Rock). All of the bars were either marginal or of no value for harvesting of "market" oysters ($\bar{>}3$" in length). Recruitment was low at all bars. The disease caused mortalities have been in recent years unexpectedly high above Towles Point except at Bowlers Rock.

Middle Ground was the only station in the Corrotoman River a tributary of the Rappahannock River. In the past two years bushel counts fell from 338 oysters per bushel (spring 1987) to 57 oysters per bushel (spring 1988). Mortalities, measured by all boxes, increased from 14 to 64 percent in the same period while spat numbered 21 per bushel (spring 1988). The disease, Perkinsus mar., appears to be epidemic now in the Corrotoman River.

The heavy set on sampled oyster bars in the Great Wicomico River, ranging from 336-1932 spat per bushel, masks the concurrent mortalities. The mortality of "market" (≥3" in length) and small oysters at Fleet Point was 68 percent. Just 10 "market" (≥3" in length) were collected in 10 samples from all of the bars. Although the spat per bushel averages 887 spat on all bars the number of small oysters decreased 56 percent in one year. Haynie Bar was classified as very good as a source of "seed" but the remaining sampled bars were below average.

Four bars in Pocomoke Sound were not sampled because they were classified as depleted in the previous fall survey. The two remaining stations P.G. #9 and P.G. #10 had, respectively; 76 and 87 percent mortalities. Bushel counts fell in one year at these stations, respectively; 147 to 35 and 230 to 7. Neither bar has enough oysters for harvesting of "markets".

TABLE 1. SUMMARY, SPRING 1988 OYSTER BAR SURVEY

BAR	OYSTERS MKT	OYSTERS SM	OYSTERS SPAT	BU. COUNT	$\bar{X}$ COUNT	BOXES GAPER	BOXES REC	BOXES OLD	PRED.	FOULING	°C	°/oo	TIME	TIDE	$\bar{X}$ DEPTH	LORAN COORD.	OBSERVATIONS SAMPLE PREC., ETC.
JAMES RIVER																	
Horsehead	16	228	20	264		0	0	10	mud crabs; few	barnacles; mod	15.2	8.8	1015			27346.0	Wind light.
	14	246	6	266		0	0	2	mud crabs; few	barnacles; mod						41333.2	
	36	238	16	290	273	0	0	4	mud crabs; few	barnacles; mod							barnacles dominant
Pt. of Shls.	18	202	138	358		0	24	12	Stylochus; few	barnacles; mod	15.0	9.2	1115			27344.0	Wind light
	34	238	212	484		0	26	16	mud crabs; few	mussels; few						41310.6	
	20	108	120	248		0	10	12	Odostomia								
	28	110	74	212	326	0	8	0									barnacles dominant
Long Rock	24	140	10	174		0	2	14	mud crabs	very light fouling	15.2	11.6				27338.4	Wind light
	36	198	14	248		0	14	16								41312.9	
	32	158	10	200		0	0	14									
	40	206	26	272	224	0	6	12									
Dry Shoal	14	56	26	96		0	2	72	mud crabs	barnacles; mod mussels; few	15.3	14.1	1300		7'	27332.5	
	10	44	16	70		0	0	76								41302.3	
	28	64	30	122	96	0	2	116									
Wreck Shl.	12	50	40	102		0	2	64	mud crabs; few	very light	15.2	13.7	1315			27326.0	Wind light
	8	62	30	100		0	0	76	mud crabs; few	fouling						41301.8	
	12	30	34	76	93	0	2	86	mud crabs; mod.								

SUMMARY, SPRING 1988 OYSTER BAR SURVEY

BAR	OYSTERS MKT	SM	SPAT	BU. COUNT	$\bar{X}$ COUNT	BOXES GAPER	REC	OLD	PRED.	FOULING	°C	°/oo	TIME	TIDE	$\bar{X}$ DEPTH	LORAN COORD.	OBSERVATIONS SAMPLE PREC., ETC
Thomas Rk.	8	22	38	68		0	10	132	mud crabs	Alcyonidium;	15.0	16.3	1050	Max flood	10'	27302.7	Seas calm
	12	28	76	116		0	6	84		heavy. hydroids, Molgula							41218.8
	4	18	62	84		0	6	146		barnacles, mussels							
	8	16	64	88	89	0	10	132									
Ridge	4	28	130	162		0	6	72	mud crabs	hydriods, barnacles,	15.0	17.7	1000	Max flood	7'	27280.6	Wind light
	6	20	110	136		0	0	66		Molgula, Anomia,						41218.8	Seas calm
	2	14	38	54		0	4	34		sponge; light							
	6	12	26	44	99	0	6	34									
York River																	
Aberdeen	0	10	6	16		0	0	4	mud crabs	Cliona, Anomia	14.8	17.3	1000	Late flood	7'	27368.3	Wind E 7Kt
Rock	0	20	16	36		0	0	12	mud crabs	Hydrozoans,						41501.2	Seas calm
	0	12	8	20	24	0	0	6	mud crabs	Crepidula							
Mobjack Bay																	
Pultz Bar	0	4	0	4		0	0	26	mud crabs	serpulids;	15.2	19.9	1300	Early ebb	12'	27310.6	Calm
	2	8	0	10		0	2	46	mud crabs	Molgula; light bryozoan, Anomia						41534.6	serpulids dominant
	4	10	0	14	9	0	0	36	mud crabs	sponge							
Piankatank R.																	
Ginney Pt.	10	82	84	176		0	26	160	mud crabs	mussels,	15.6	15.2	1230	Early flood	7'	27347.2	
	16	102	68	186		0	12	98		barnacles and						41659.6	
	10	94	92	196	186	0	34	110		Microciona							
Palace Bar	0	156	470	626		0	60	24	mud crabs	Microciona,	16.0	15.2	1030	Slack before flood	9'	27338.0	Calm
	0	98	206	304		0	36	30	mud crabs	hydriods; heavy						41658.0	Microciona dominant
	2	44	140	186		0	14	30	mud crabs	worms, Odostonia							
	4	134	372	510	407	0	50	28	mud crabs								

SUMMARY, SPRING 1988 OYSTER BAR SURVEY

BAR	OYSTERS MKT	OYSTERS SM	OYSTERS SPAT	BU. COUNT	$\bar{X}$ COUNT	BOXES GAPER	BOXES REC	OLD	PRED.	FOULING	°C	°/oo	TIME	TIDE	$\bar{X}$ DEPTH	LORAN COORD.	OBSERVATIONS SAMPLE PREC., ETC
Burton's Pt.	0	2	2	4		0	0	56	mud crabs	Microciona,	16.0	15.7	1000	Late ebb	9'	27326.4	Calm
	0	0	6	6		0	0	32	oyster drills	serpulids, bryozoan, Crepidula						41652.3	
	0	0	10	10	7	0	0	10		yellow sponge							
Rappa. R.																	
Bowler's Rk.	6	6	14	26		0	2	10		barnacles,	17.0	8.1	1325	Max ebb	9	27472.4	Seas 1 1/2 to 2'
	44	30	40	114		0	2	6		mussels						41847.3	
	30	14	20	64		0	2	6									
	16	20	12	48	63	0	4	2									
Morattico	12	30	0	42		1	2	20	mud crabs	Molgula; heavy	16.2	12.1	1220	Early ebb	13'	27446.8	Windy SW
	14	6	0	20		0	2	18		mussels, barnacles						41818.6	
	8	8	0	16	26	0	2	24		anemones; light							Molgula dominant
Smokey Pt.	22	34	2	58		0	0	76	mud crabs	Molgula, mussels; mod	15.8	13.6	1115	Early ebb	12'	27418.1	Wind SW mod.
	18	30	0	48		0	2	102		hydriods, barnacles,						41779.9	Seas 1 1/2-2'
	30	32	0	62	56	0	2	86		anemones; light							
Hog House	0	2	0	2		0	0	40	mud crabs	Molgula; heavy	18.0	14.1				27398.3	Molgula dominant
	0	10	0	10		0	0	66								41725.8	Black shell abund
	0	8	0	8	7	0	0	34									
Drumming Gnd.	0	42	10	52		0	0	50	mud crabs	mussels, sponges	17.5	14.6				27377.8	
	2	24	18	44		0	0	38		tunicates, barnacles						41738.1	
	0	20	28	48	48	0	0	62		hydroids							
Parrot Rk.	0	26	14	40		0	0	28	mud crabs	Microciona, tunicates, bryozoan,	17.0	15.3				27361.9	
	0	22	26	48		0	0	36		mussels and						41710.4	
	0	44	26	70	53	0	0	40		barnacles							
Broad Ck.	0	56	48	104		0	0	108	mud crabs	barnacles; heavy	16.5	16.0				27329.5	barnacles
	2	76	84	162		0	0	96	Stylochus	Molgula, mussels,						41696.3	dominant
	2	124	94	220		0	0	96		anemone							
	2	98	88	188	169	0	2	100									

SUMMARY, SPRING 1988 OYSTER BAR SURVEY

AR	MKT	OYSTERS SM	SPAT	BU. COUNT	$\bar{X}$ COUNT	BOXES GAPER	REC	OLD	PRED.	FOULING	°C	°/oo	TIME	TIDE	$\bar{X}$ DEPTH	LORAN COORD.	OBSERVATIONS SAMPLE PREC., ETC.
orrotoman R.																	
iddle Gnd.	0	46	24	70		0	10	96	mud crabs	Molgula.	18.8	14.5	1200	Ebb	11'	27386.2	Wind. light
	2	32	26	60		0	2	74		Hydroides; light						41763.0	Seas calm
	0	26	14	40	57	0	16	102	blood clams and mussels								
r. Wicomico																	
aynie Pt.	2	252	458	712		0	104	148	mud crabs	barnacles. mussels; mod.	18.8	14.5	1415	Early flood	5'	27366.4	Calm
	2	238	626	866		0	136	102	Stylochus	Molgula. Gracilaria;						41871.4	30-40% shells were black
	0	208	368	576	718	0	164	124		light. algae							
haleys' E.	0	74	792	866		2	74	54	Stylochs	barnacles.	18.0	14.7	1300	Early flood	10'	27361.0	Wind SE light
	2	124	540	666		1	104	58		hydoids; light						41866.7	Calm
	0	48	450	498		0	26	38		mussels. Gracilaria							30-40% shells were black
	4	88	336	428	615	0	40	66									
leet Pt.	0	62	1932	1994		0	120	50	mud crabs	bryozoans. Molgula	16.8	15.6	1145	Low slack	10'	27358.2	Wind light
	0	42	1566	1608		0	62	38	Stylochus	barnacles, mussels						41868.1	Calm
	0	76	1804	1880	1827	0	30	74									
ocomoke Snd																	
.G. #9	10	22	12	44		0	12	106	mud crabs	Molgula; heavy Sabellidae; mod	20.5	14.3	1350	Max ebb	7'	27222.6	Wind light
	10	14	2	26		0	12	90	numerous Stylochus	barnacles, bryozoans						42011.3	Seas light
	14	20	0	34	35	0	0	114	numerous	anemones, blood clams, Lyonsia; few							Molgula dominant
.G. #10	0	2	4	6		0	2	48	mud crabs	Molgula. Hydroides,	19.0	15.4	1410	Max ebb	6 1/2'	27230.8	Wind S. light
	2	4	2	8	7	0	0	40	numerous	bryozoan, Sabellidae; mod Lyonsia; few						41999.3	Seas light

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						
Horsehead	273	0	>1	mud crabs	barnacles; mod	seed; below average
Pt. of Shls.	326	5	8	mud crabs, Stylochus, Odostomia	barnacles; mod mussels; few	seed; below average
Long Rock	224	2	8	mud crabs	very light fouling	seed; below average
Dry Shoal	96	3	49	mud crabs	barnacles; mod mussels; few	seed; below average
Wreck Shoal	93	1	45	mud crabs	very light fouling	seed; below average
Thomas Rk.	89	8	60	mud crabs	Alcyodiduim; heavy hydroids, barnacles Molgula and mussels	seed; below average
Ridge	99	4	36	mud crabs	hydroids, barnacles, Molgula, Anomia, sponge; light	seed; below average
York River						
Aberdeen Rk.	24	0	23	mud crabs	Cliona, Anomia hydroids, and Crepidula	depleted
Mobjack Bay						
Pultz Bar	9	7	80	mud crabs	serpulids; heavy Molgula; light bryozoan, Anomia, sponge	depleted

Bushel count and condition of oysters on each bar.

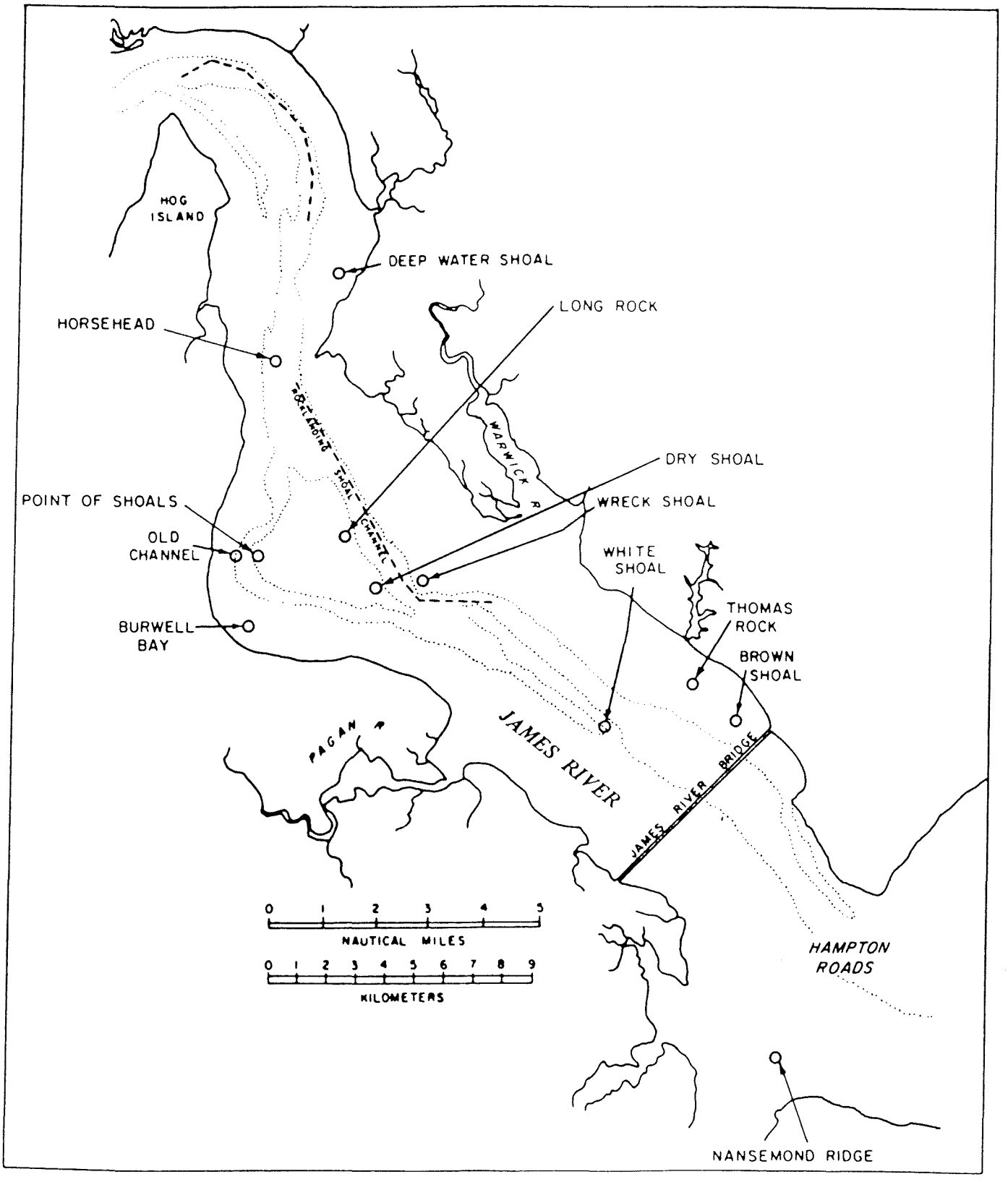
Bar	Average Bu. Count	Percent Mortality based upon Recent Boxes and Gapers	Percent Mortality based upon All Boxes and Gapers	Evidence of Predation	Fouling	Classification
Piankatank R.						
Ginney Point	186	11	44	mud crabs	mussels, barnacles and Microciona	market, 6% markets
Palace Bar	407	9	14	mud crabs	Microciona, hydroids; heavy. barnacles, tubeworms, and Odostomia	seed; below average
Burton's Pt.	7	0	82	mud crabs oyster drills	Microciona, serpulids, Bryozoan Crepidula, and yellow sponge	market; poor
Rappa. R.						
Bowler's Rk.	63	4	12		barnacles, mussels	market; 38% markets.
Morattico	26	8	47	mud crabs	Molgula; heavy mussels, barnacles anemones; light	market; 44% markets.
Smokey Pt.	56	2	54	mud crabs	Molgula, mussels; mod. hydroids, barnacles, anemones; Light	market; 42% markets.
Hog House	7	0	87	mud crabs	Molgula; heavy	market; poor
Drumming Gnd.	48	0	51	mud crabs	mussels, sponges tunicates, barnacles, hydroids	market; poor
Parrot Rk.	53	0	39	mud crabs	Microciona, tunicates, bryozoans, mussels and barnacles	market; poor
Broad Ck.	169	>1	37	mud crabs, Stylochus	barnacles; heavy Molgula, mussels and anemone	market; poor
Corrotoman R.						
Middle Gnd.	57	14	64	mud crabs	Molgula, hydroides; light blood clams & mussels	market; poor

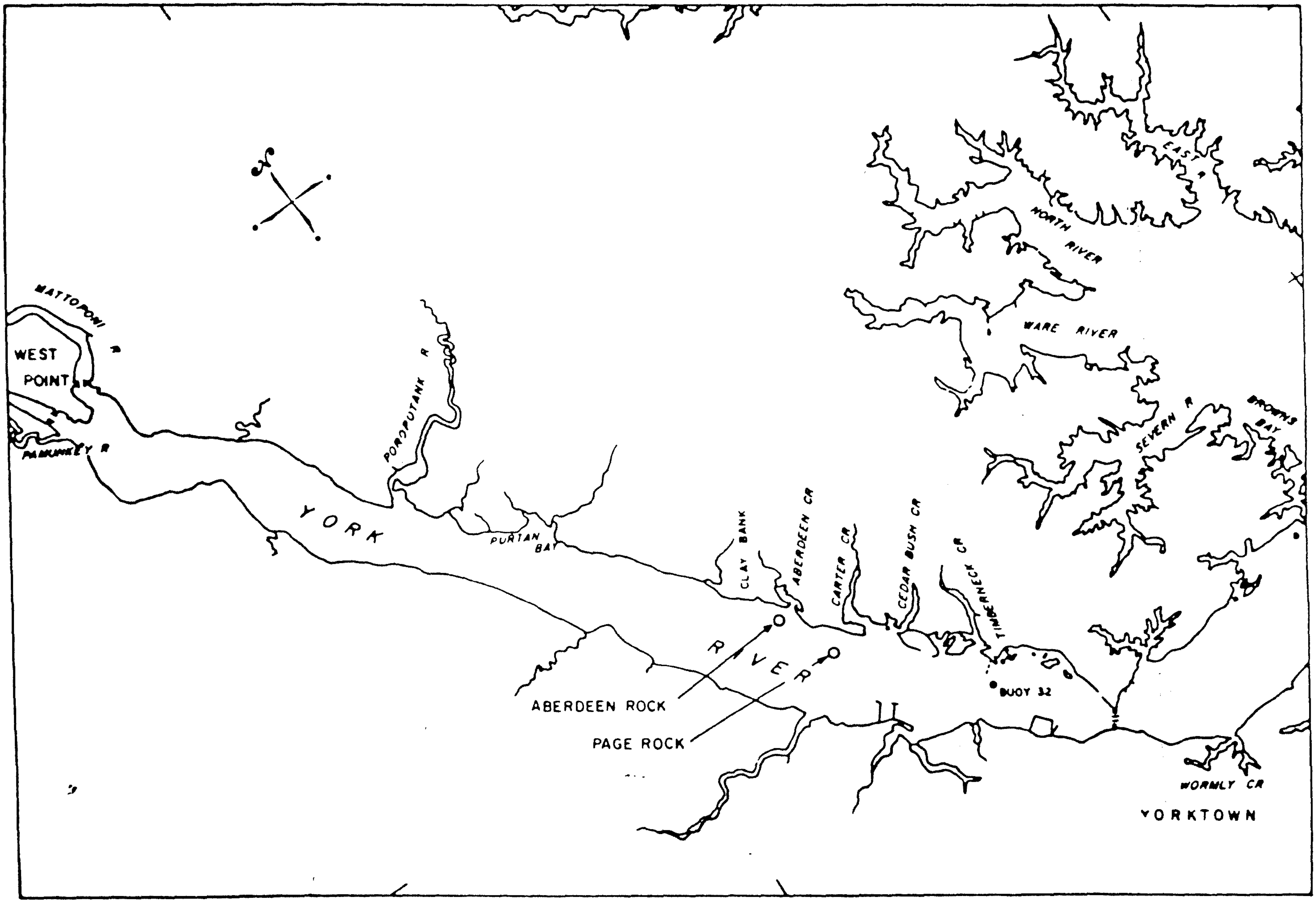
Bushel count and condition of oysters on each bar.

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
Gr. Wicomico R.						
Haynie Pt.	718	16	16	mud crabs, Stylochus	barnacles, mussels mod. Molgula, Gracilaria; light algae	seed; very good
Whaley's E.	615	9	16	Stylochus	barnacles, hydroids; light. mussels and Gracilaria	seed; below average
Fleet Pt.	1827	4	6	mud crabs, Stylochus	bryozoan, Molgula barnacles, and mussels	seed, below average
Pocomoke Snd.						
P.G. #9	35	19	76	mud crabs, Stylochus; numerous	Molgula; heavy Sabellidae; mod. barnacles, bryozoans anemones, blood clams, Lyonsia; few	market; poor
P.G. #10	7	13	87	mud crabs; numerous	Molgula, hydroides, bryozoan, Sabellidae; mod. Lyonsia; few	market; poor

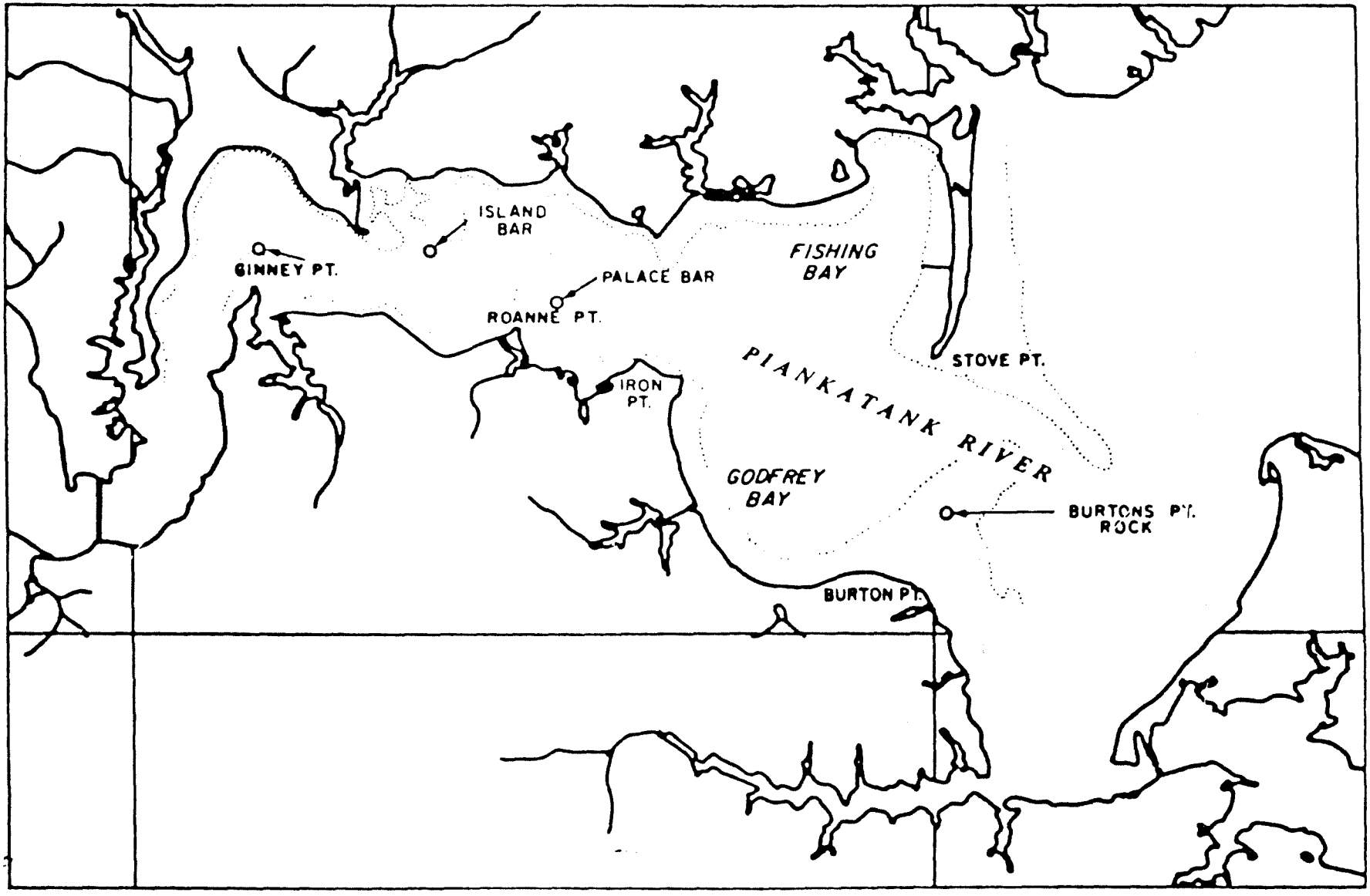
APPENDIX

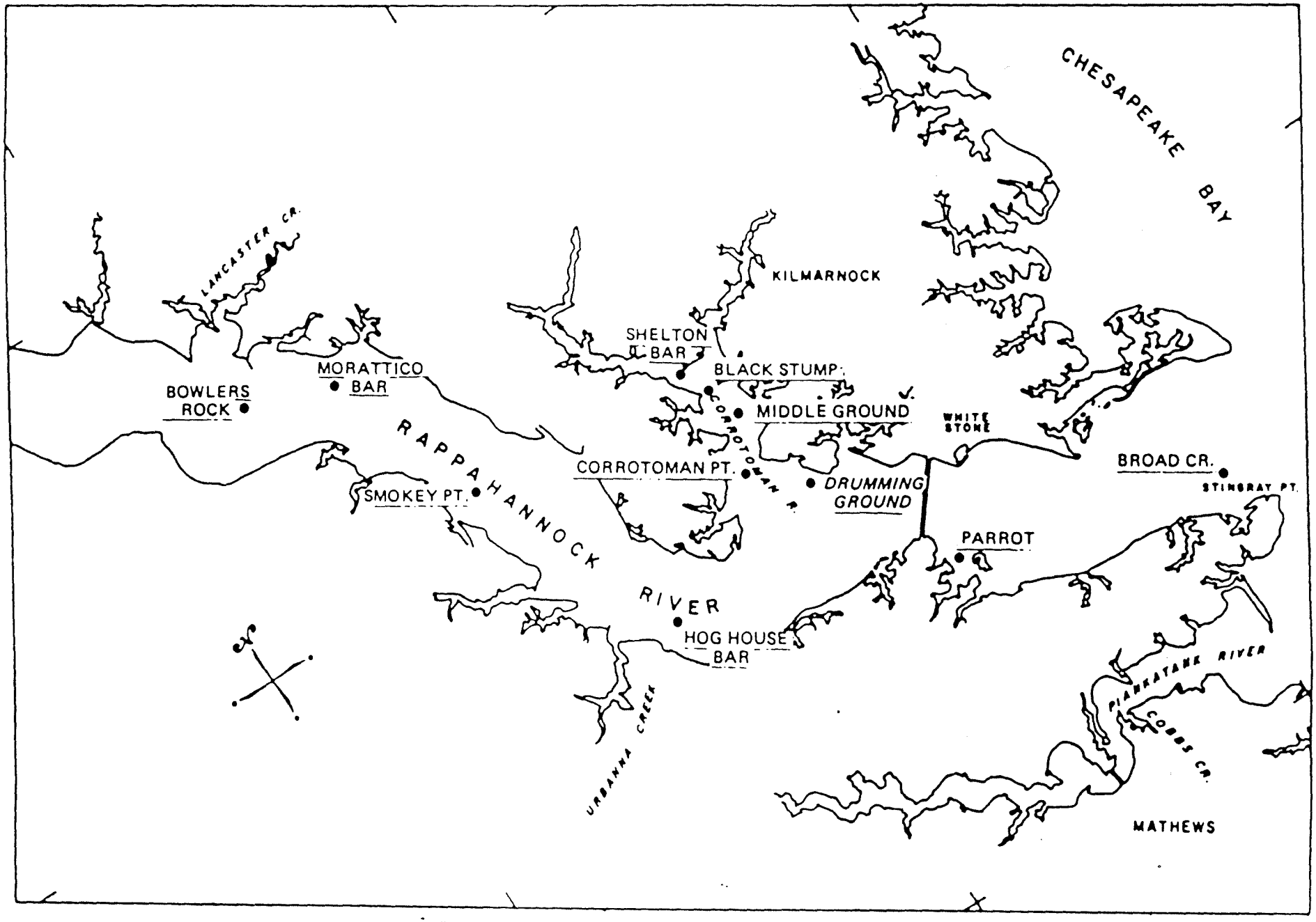
Locations of stations in the rivers in the spring 1988.

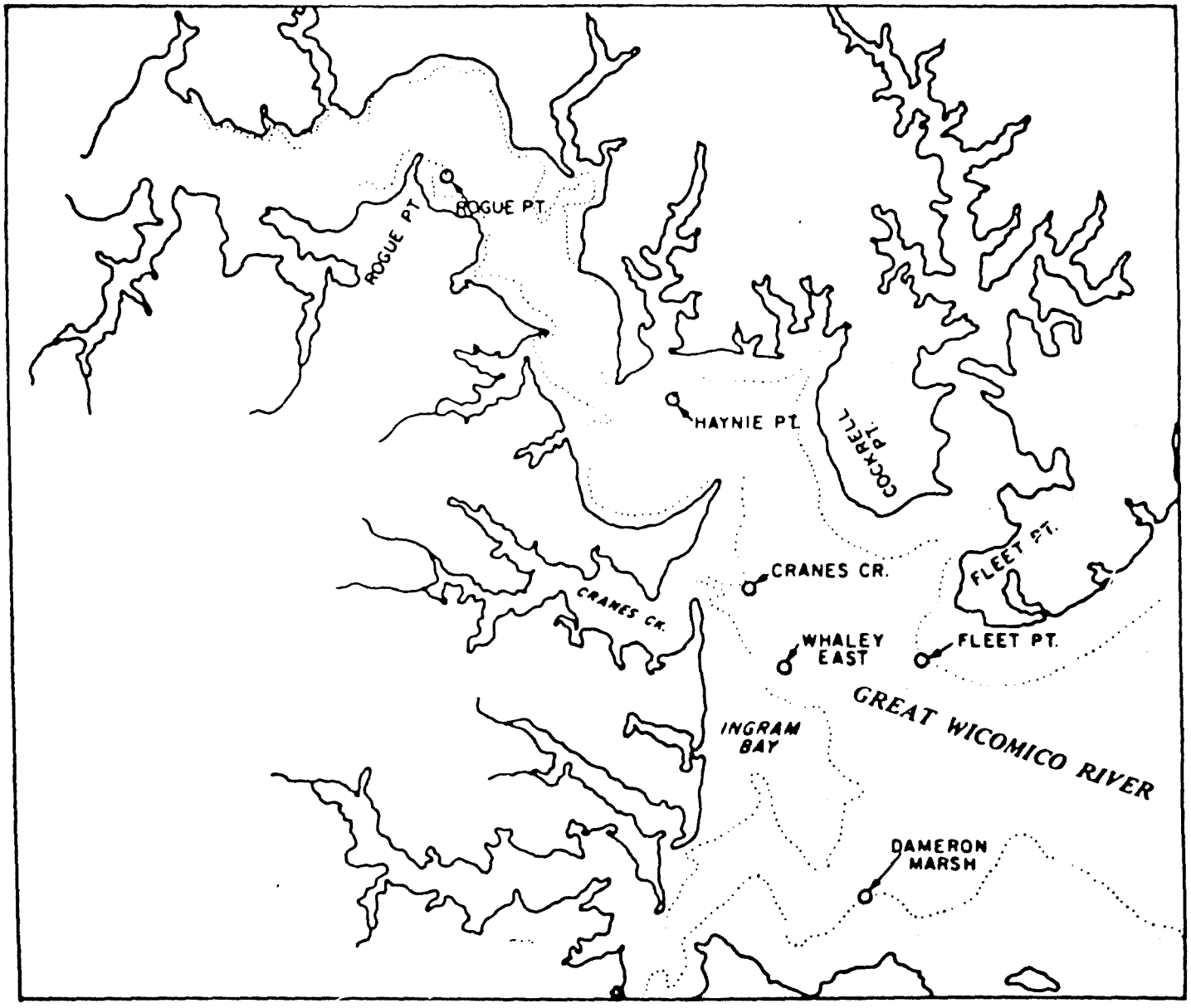

HOG ISLAND
DEEP WATER SHOAL
LONG ROCK
HORSEHEAD
WARWICK R.
DRY SHOAL
POINT OF SHOALS
WRECK SHOAL
OLD CHANNEL
WHITE SHOAL
THOMAS ROCK
BURWELL BAY
BROWN SHOAL
PAGAN R.
JAMES RIVER
JAMES RIVER BRIDGE
0 1 2 3 4 5
NAUTICAL MILES
0 1 2 3 4 5 6 7 8 9
KILOMETERS
HAMPTON ROADS
NANSEMOND RIDGE

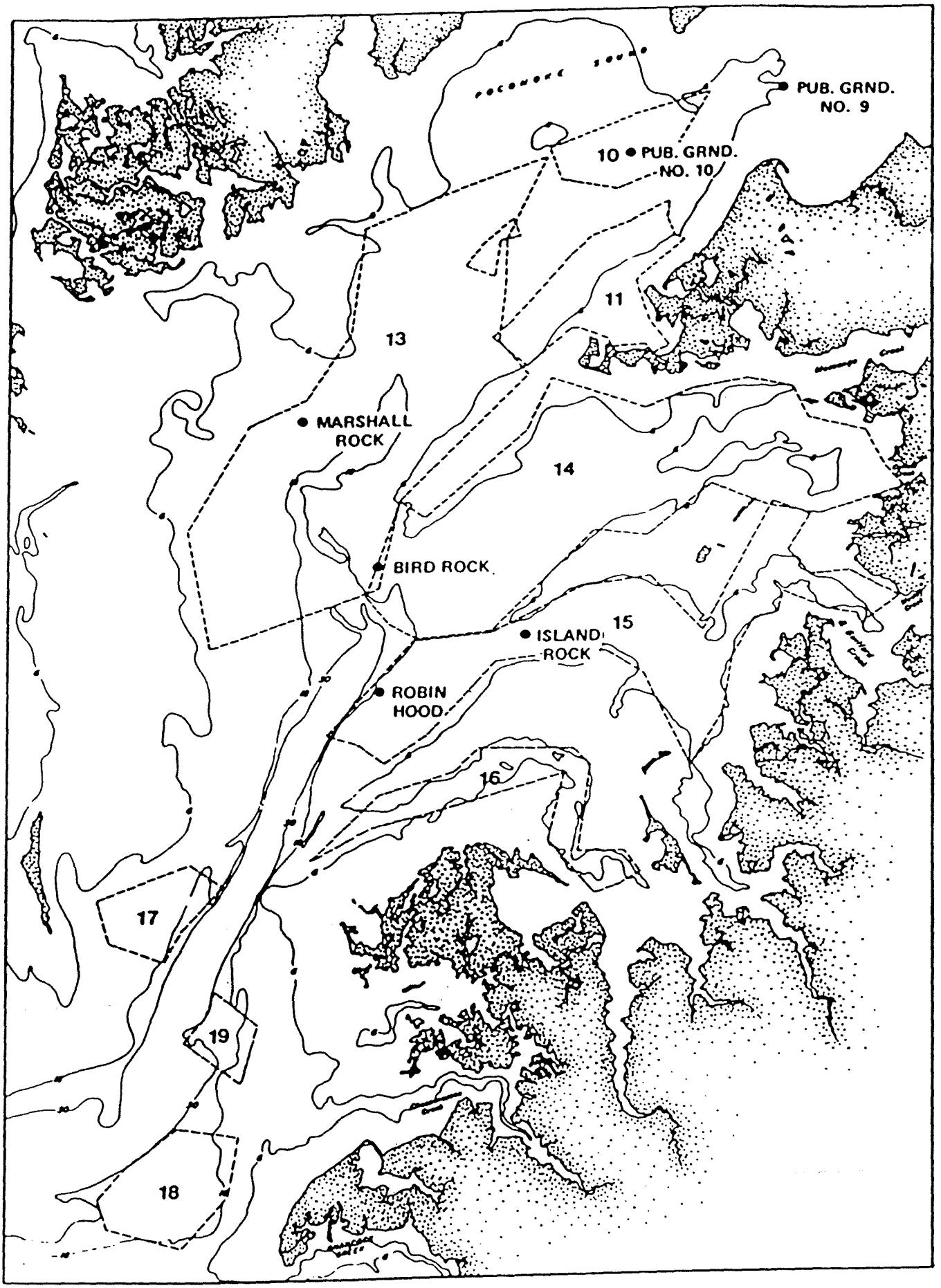


MATTOPONI R
WEST POINT
PAMUNKEY R
YORK
POROPUTANK R
PURTAN BAY
CLAY BANK
ABERDEEN CR
CARTER CR
CEDAR BUSH CR
TIMBERNECK CR
RIVER
ABERDEEN ROCK
PAGE ROCK
BUOY 32
NORTH RIVER
EAST R
WARE RIVER
SEVERN R
BROWNS BAY
WORMLY CR
YORKTOWN


ISLAND BAR
GINNEY PT.
PALACE BAR
ROANNE PT.
FISHING BAY
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
RAPPAHANNOCK RIVER
CORROTOMAN PT.
SMOKEY PT.
DRUMMING GROUND
BROAD CR.
STINGRAY PT.
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


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.

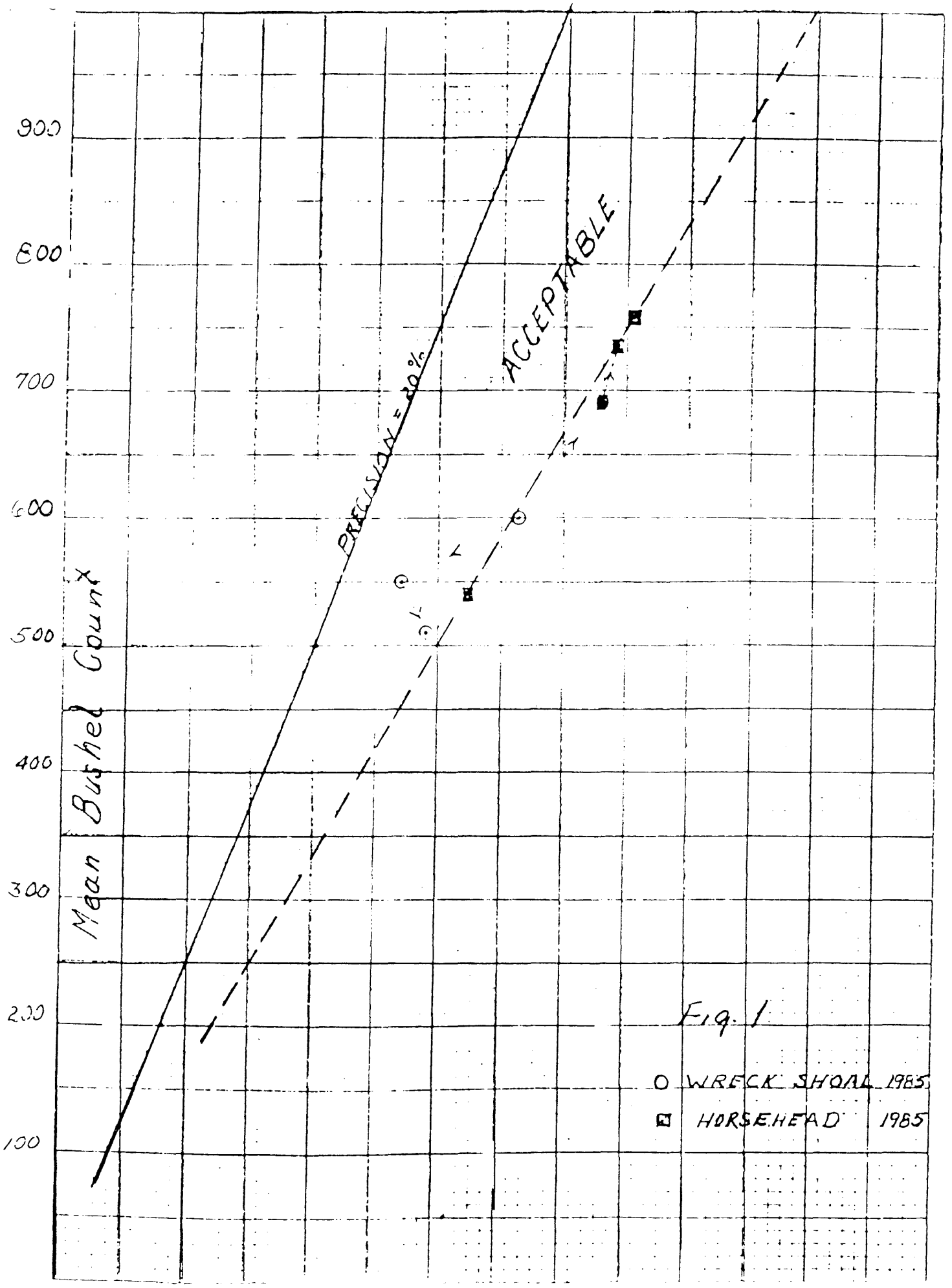

900
800
700
600
500
400
300
200
100
Mean Bushel Count
PRECISION = 20%
ACCEPTABLE
O WRECK SHOAL 1985
HORSEHEAD 1985

Fig. 1