Report on Efforts with the NJ DEP and Oystermen to Rehabilitate the Delaware Bay Oyster Industry in 1986

by

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Introduction

The New Jersey DEP requested my services to work out of Bivalve, New Jersey, the main port of the New Jersey oyster fleet in Delaware Bay, on a one-day-a-week basis. The objective was to examine the problems of the oyster industry and advise the DEP about whether it was possible to reverse the decline in oyster production. Oyster production has declined to about 35,000 bushels in 1985 from 850,000 bushels in 1955.

This report summarizes my observations in 1986. A total of 15 days were spent in the Bivalve area. When the weather permitted, which was about half the time, I examined the condition of the oyster beds with SCUBA gear. My buddy diver was Joseph Dobarro, the NJ DEP oyster biologist stationed in Bivalve. The days when adverse weather prevented field trips were spent interviewing various oystermen.

Historical Operations of the Oyster Industry

During the 1800s, New Jersey's oyster industry in Delaware Bay functioned by gathering oysters off the oyster beds which extended from Egg Island, the southernmost area, to Arnold's Point, the northernmost area, bringing these into ports, principally Bivalve on the Maurice River, and shipping these to market, mainly Philadelphia. Most oysters were shucked before being shipped. The majority of the oysters were gathered from the southernmost or about the lower 60% of the beds where they were larger. Oysters on the upper 40% of the beds were not gathered to any extent. The oyster fleet consisted of about 400 schooners and sloops. Salinities over the beds usually ranged from about 15 ppt at Egg Island to about 7 ppt at Arnold's Point. The oyster beds comprised 6,000 to 7,000 acres. Figure 1 is a chart of the seed beds from New Beds to Arnolds.

Around the turn of the century, the Philadelphia market wanted larger, fatter oysters from the oyster producers. Thus, a new management plan was implemented in which the oysters were transplanted from the lower oyster beds, henceforth called seed beds, to beds which were leassed from the state in the southern part of the bay. Salinities there were 25-27 ppt. The oysters were transplanted from the seed beds in a state regulated bay season which usually lasted about three to four weeks. Most oysters were marketed from September through December after two growing seasons. When the oystermen transplanted oysters from the seed beds, they had to leave blank shells on the beds by state law. The loads could contain no more than 15% blank shells by volume. This system was somewhat wasteful becuase oyster drills (mostly Urosalpinx cinerea) are abundant in the leased beds. In the late 1960s, I determined that the density of oyster drills in a typical bed was 25/yd^2. These oyster drills destroyed all the small oysters attached to adult oysters and shells.

In 1957 a disease termed MSX infected the oysters; it caused heavy mortalities of oysters on beds in salinities higher than 15 ppt. During the first few years of the disease, mortalities of adult oysters were at least 90% a year. Since then, oyster mortalities have usually ranged between 50 to 70% a year. During recent years, the oyster fleet has usually consisted of 50 to 60 dredge boats.

By 1986 the New Jersey oyster industry had fallen to an extremely depressed condition. Few oysters were available to be harvested in the beds in part because the disease had killed many oysters in the lower seed beds (Bennies Ground and New Beds) because salinities there had risen above 15 ppt. In 1985 most of the oysters which the companies were selling came from southern states, Maryland, Virginia, and even Louisiana. The companies repacked or shucked the oysters and sold them under their own label.

Research in 1986

The work in 1986 had three objectives.

1. Examine the condition of the seed beds using SCUBA to determine whether seed abundance on them could be increased.

We examined the lower and middle seed beds from Mid-July to Mid-September and found that: 1) about 30% of the bottom had too few shells to support commercial oystering. 2) Much of the shell material consisted of chaff; the relative quantities of chaff and large shells was not determined. The chaff shells averaged about an eighth of the size of a whole 3.5-inch oyster shell. After several dives on Bennies Ground, we observed that silt covered the chaff to such an extent that few oyster larvae could set on them. Later, this was confirmed by finding few spat on them. 3) Silt also covered the whole oyster shells and the live oysters, and appeared to reduce the density of oyster spat. 4) Because the salinity has risen in Delaware Bay, oyster drills are now numerous on Bennies Ground and New Beds. Along with mud crabs, the oyster drills killed most of the 1986 generation of oyster spat. We determined that 58% of the spat which had set on new beds had been killed by these two predators by August 22, 1986, and that 52% of the spat which had set on Bennies Ground had been killed by these two predators by September 5, 1986. (These spat were only 18 days old.) We estimated that about 97% of the spat on both beds were killed by late autumn.

Recommended Remedy

We believe that setting densities of oyster spat might be increased if the silt were washed off the chaff and shells with 'cut boards' (Figure 2) immediately before and during the setting season of oyster larvae.

The large shells on Bennies Ground collected an average of 1.5

spat/shell. The test shells placed on this bed every week by Mr. Donald Kunkle of the Rutgers Research Laboratory collected an average of 4.3 spat each, or 2.9 times more spat for the season.

The large shells on New Beds collected an average of 3.1 spat. The test shells placed on this bed every week by Mr. Kunkle collected 29 spat each, or 9.5 times more spat.

We believe that the principal reason for the difference in the spat densities is the silt on the shells. We anticipate as much as a two-fold increase in setting densities of oyster spat if the silt was washed off the beds.

It would be too expensive to remove oyster drills from these beds. They could be removed by suction dredge boats, but each boat can clean the drills off only one or two acres a day, and the boats are expensive to operate. At some later date, the oyster drills will be killed when salinities in the beds fall below 15 ppt as normal rainfall conditions return.

2. Look for Shell Deposits in Delaware Bay

It is essential that oyster seed beds be covered with oyster shells as cultch for oyster larvae. Spaces on the bottom without shells are devoid of spat. On several occasions, the State of New Jersey has purchased quantities of oyster shells from the Langenfelder Company in Maryland. The New Jersey DEP would like to supplement this shell supply with shells from Delaware Bay if they do occur.

On January 16, 1987 we surveyed an area about four by four miles immediately southwest of Egg Island Point for the presence of shell deposits. We probed about 10 shoal areas which looked as though they might have been shell deposits (Figure 3). The probing was done with a hollow aluminum pole. Each shoal which we examined, however, consisted entirely of

sand. The possibility remains that shell deposits occur in other parts of the bay.

3. Interview Oystermen to Obtain Their Views About Current Management Practices of the Beds

Before the disease MSX infected and killed most of Delaware Bay's oysters in high salinity waters, the oyster companies transplanted oysters from the seed beds each spring to their leased beds in high salinity waters and left them there for two growing seasons, harvesting them two autumns later, as already noted. Since MSX has been killing oysters, however, the companies have reduced the time which the oysters have remained on the growing beds to one growing season, spring to the following autumn, to reduce the oyster mortalities.

In 1985 and 1986 salinities were above normal, however, and mortalities were exceptionially high, above 90% in most cases. Thus, some of the oystermen believe that the most prudent management of the bay's oysters would be to change from the relaying of oysters to the high salinity leases to marketing oysters directly from the lower seed beds as the industry did in the 1800s. The advantage of the plan would be that MSX mortalities of adult oysters would not occur and predation of oyster spat by oyster drills would be avoided in years of normal salinity. Thus, total production of oysters would be substantially higher. The disadvantage would be that when the oysters were marketed they would be smaller and have thinner meats.

The oystermen were unable to devise a plan for direct marketing amongst themselves. An outsider such as myself was needed to devise a workable plan. To do this, I visited each of the leading oystermen two or three times to get their ideas about how a plan might work. The tentative plan that was formulated involves limiting the daily and seasonal catch per boat, depending

on the size of the boat. Details of the plan are attached. The oystermen did not adopt this plan in 1987. Nevertheless, it is available if they wish to adopt if in the future.

Research Plans for 1987

1. I had found that in Long Island Sound that silt accumulates on oyster beds during the winter and suffocates oysters when temperatures rise to 6°-7°C in the spring. At those and higher temperatures, oysters are forced to open and begin pumping water. If they are covered by silt and do not have access to water, they suffocate. In Connecticut, mortalities of oysters from suffocation ranged from about 10 to 50%. We plan to determine whether similar suffocation mortalities of oysters also occur in Delaware Bay. The beds to be checked will be: (a) Bennies Ground or New Beds, (b) Shell Rock and (c) Arnolds, Middle Ground or Ship John.

2. We had planned to transplant at least 500 bushels of oysters from Arnolds, Middle Ground and Ship John to Bennies Ground and New Beds in the spring to determine how they will survive. Obviously, these oysters will have to be spread in areas where the oyster drills are relatively scarce. If no such area can be found, this project will have to be postponed. An effective management plan in the future might involve transplanting seed oysters from these upper beds to areas in Bennies Ground and New Beds where oysters are relatively scarce and spread shells on the upper beds to collect oyster sets.

3. We will construct at least two 12-foot wide 'cut' boards for washing silt off shells. Then, we plan to wash the silt off at least one 25-acre section of Bennies Ground, New Beds, Shell Rock and Arnolds immediately before and during the setting period of oyster larvae, to determine how much this procedure increases setting densities of oyster spat. If effective, the State could desilt the seed beds to increase oyster production in the future.

Figure 1. Chart of the New Jersey seed oyster beds in Delaware Bay.

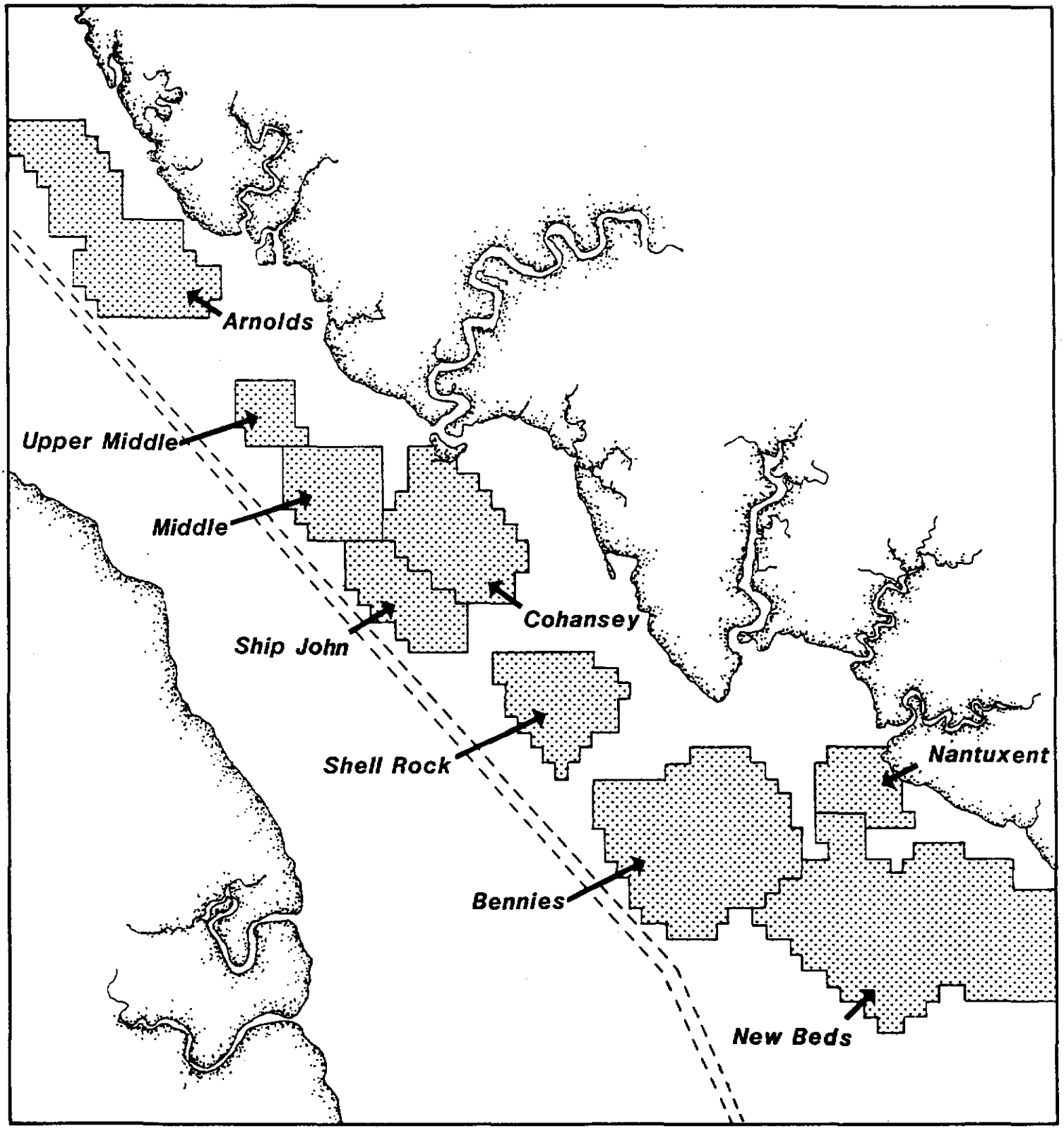

Arnolds
Upper Middle
Middle
Cohansey
Ship John
Shell Rock
Nantuxent
Bennies
New Beds

Figure 2. Diagram of cut board for washing silt off oyster beds.

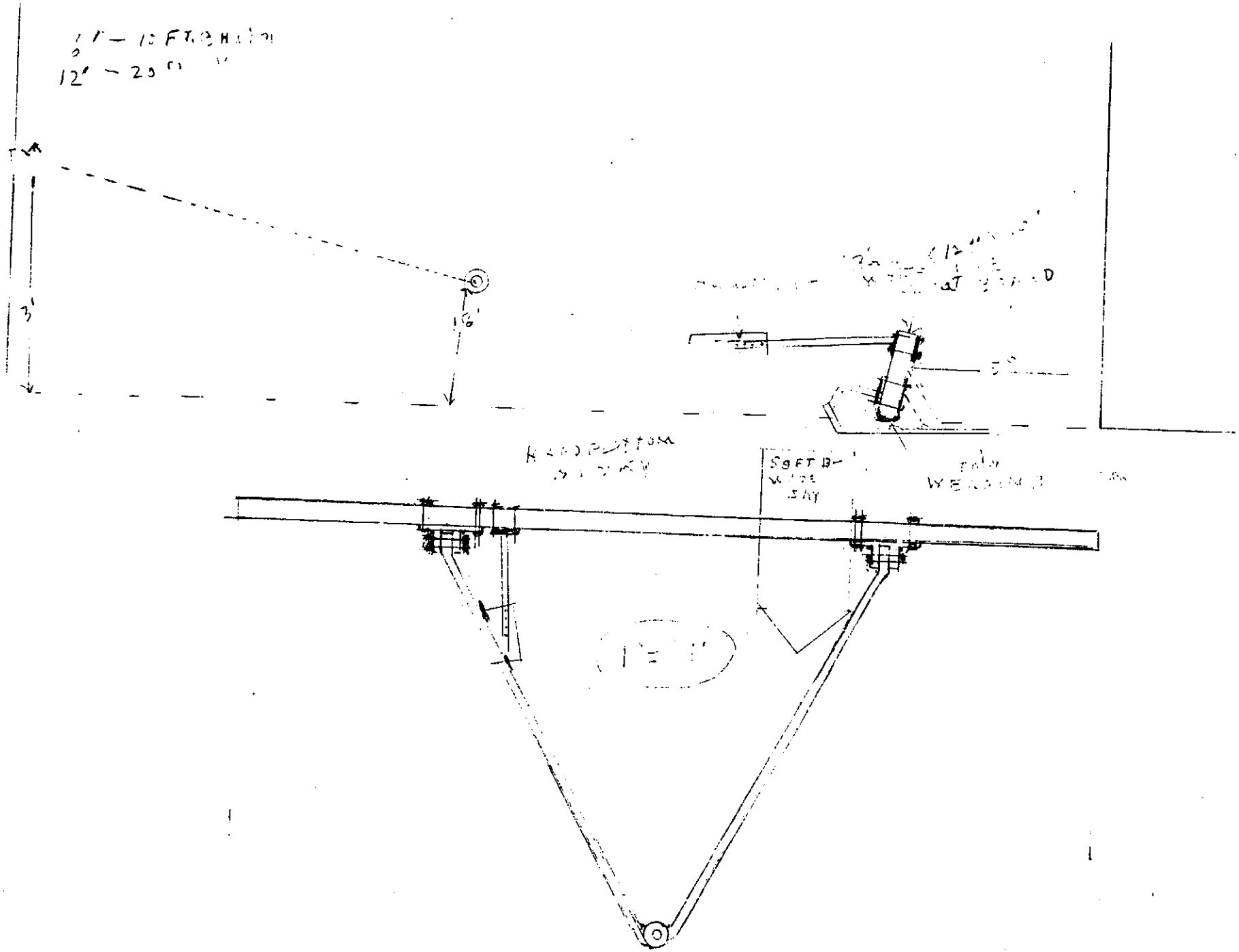
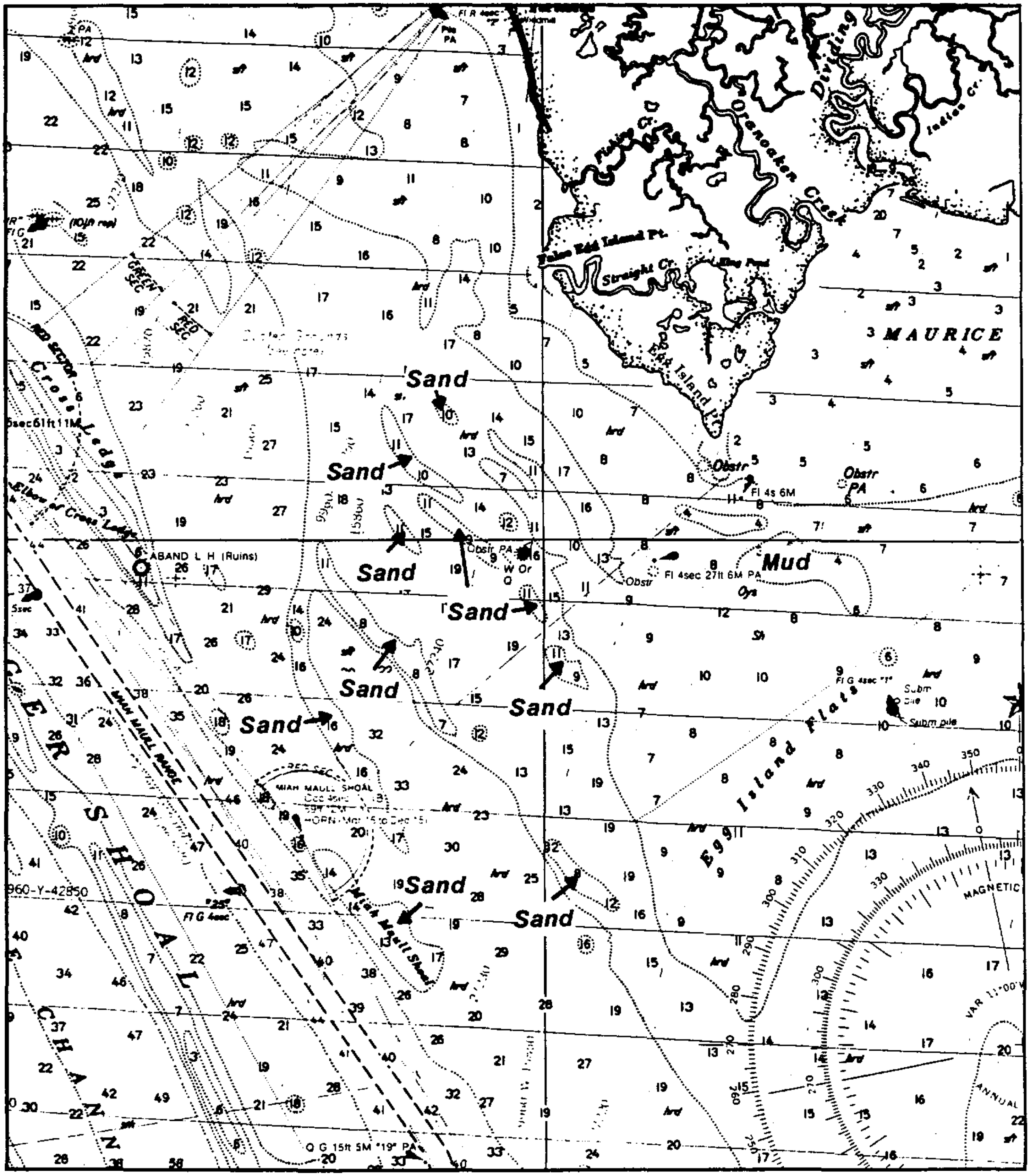

3'
16'

Figure 3. Chart of area off Egg Island Point in Delaware Bay showing shoal areas which consisted of sand.


MAURICE
Oranoaken Creek
Dividing Cr.
Fishing Cr.
Straight Cr.
False Egg Island Pt.
Egg Island Pt.
Egg Island Flats
Cross Ledge
Elbow of Cross Ledge
ABAND L H (Ruins)
MIAH MAULL SHOAL
Miah Maull Shoal
MIAH MAULL RANGE
SHOAL
CHANNEL
Sand
Sand
Sand
Sand
Sand
Sand
Sand
Sand
Sand
Sand
Mud
Obstr
Fl 4s 6M
Fl 4sec 27ft 6M PA
Subm pile
MAGNETIC
960-Y-42850
Q G 15ft 5M "19" PA

PLAN FOR DIRECT MARKETING OF OYSTERS IN DELAWARE BAY

Tentative Policy to Discuss (Suggested improvements are welcome)

-200,000 to 250,000 bushel production off Lower Seed Beds (Egg Island to Shell Rock).

-Beds open from October 15 to July 1.

-Boats could catch oysters any time they wanted during the open season.

-Catches limited to 3-inch oysters.

-The oysters would be put in uniform-size containers.

-Shucked shells would be returned to beds the following day if possible.

-Allotments by licensed boats:

	limit/day	limit/season
over 20 tons (50 boats)	125 bushels	3,500 bushels
10 to 19.9 tons (20 boats)	85 bushels	2,500 bushels
20' to 28' (25 boats)	35 bushels	1,200 bushels

If a boat fished 5 of 5 previous years, it could catch 100% of seasonal allotment. If 4 of 5 previous years, 80%. If 3 of 5 years, 60%. If 2 of 5 years, 40%. If 1 of 5 years, 20%. If 0 of 5 years, it would be excluded.

- Each bushel could be taxed about $1.50. The money would be used to hire boats to transplant seed oyssters from the Upper Seed Beds (Cohansey to Arnolds) to the Lower Seed Beds during June of the following year. The only beds to receive shells would be the Upper Seed Beds.

- Perhaps, one of the Upper Seed Beds, such as Cohansey or Ship John, would remain open for relaying onto planted grounds.

The allotments are designed to maintain the present structure of the industry. It is anticipated that oyster abundance on the Lower Seed Beds would increase as time goes on and the allotments can be proportionally raised.