Job Report

Joseph P. Breuer
Marine Biologist

Project No. M-9-D-5 Date 31 December 1960.

Project Name: A Developmental Survey of the Waters of South Bay in Cameron County, Especially That Area Which Would be Affected by the Opening and Closing of Boca Chica Pass.

Period Covered: 1 June 1959 to 31 May 1960. Job No. G-1

An Ecological Survey of the South Bay Area, Especially That Area which was Influenced by Boca Chica Pass While it Was Open.

Objective: To obtain a knowledge of ecological conditions which now exist in the area and to compare them with conditions which existed while the pass was open.

Procedure: Use standard collecting and analizing procedures to study the ecology of the area; compare this existing condition with that which existed prior to the closing of the pass; and to determine the feasability of reopening the pass from a fisheries resources standpoint if called upon to do so.

Findings: South Bay in Cameron County is Texas's southernmost bay area and is located three miles south of Port Isabel (Figure I). Originally a part of the Laguna Madre, South Bay is now a separate bay. It is bounded on the west and south by low lying mainland; on the east by Brazos Island and on the north by the Brownsville Ship Channel and its resulting spoil banks. Covering some 3,500 surface acres, South Bay ranges in depth from a few inches to three feet with an average of less than two feet. Bottom composition is chiefly sand in the south and east portions; clay and silt in the north and west portions; and mixtures of all three toward the center of the bay. Salinities range from 35 to 42 o/oo except when lower salinities result from local flooding. Runoff is confined to drainage from the adjacent low lying areas. The waters of South Bay are normally turbid although water over the shallow grassy areas can become very clear on calm days during summer months.

Currents in South Bay are influenced both by wind and tide. Due to its proximity to Brazos Santiago Pass and to the strong tidal currents of the adjacent Brownsville Ship Channel, diurnal tides are noticeable in South Bay. Winds from the north or south also affect the water level of South Bay. For the most part, currents and water levels in South Bay are affected by a combination of both wind and tide.

History of the Area, Physical, Meteorological and Biological

Since little work of a scientific nature was done in South Bay prior to 1950, it was necessary to rely on local history papers and old survey charts to obtain a picture of the area as it existed in years past. Additional information was obtained by talking to local historians as well as commercial fishermen and oyster men who have been long time residents of the area.

At one time, South Bay was the terminus of one of the mouths of the Rio Grande at a time when the river flow was far greater than it is now. The

resulting brackish nature of South Bay along with the incoming nutrients fostered a sizeable oyster population, remnants of which still remain. At that time, South Bay was a part of the Laguna Madre and the effects of this freshwater influx is apparent by the fact that recent oyster shells have been found as far north as Three Islands, some 15 miles north of Port Isabel. Oyster shell, while not extensive in volume, is wide spread in area indicating the far reaching influence of the river in years past.

The earliest clear picture of South Bay is immediately prior to 1935. At this time, Boca Chica Pass was open, the Rio Grande entered the gulf directly and decreased water flow of the river was apparent. Brazos Santiago Pass was open but not dredged or jettied and the Brownsville Ship Channel and its resulting spoil banks did not exist. (Figures I and II)..

In 1936, the existing jetties to Brazos Santiago Pass were built and a succession of channel and pass dredging were started. The Brownsville Ship Channel was completed in 1938 to a depth of 26 feet. Subsequent redredgings and sweepings have deepend the channel to its present depth of 38 feet. The spoil resulting from these dredgings was deposited in an almost continuous spoil bank to the south and parallel to the channel, effectively separating South Bay from the Laguna Madre.

Prior to the dredging of the Brownsville Ship Channel, Boca Chica Pass was effectively scoured out annually by strong north winds which brought a large volume of water into South Bay from the Laguna Madre. This water, forced through Boca Chica Pass with great force, was the main factor in maintaining this natural pass. This same water transport cleaned out the accumulated mud sediments from runoff and the sand from Brazos Island, effectively maintaining the bay as well as the pass.

The deposition of continuous spoil banks along the north end of South Bay effectively reduced this important water transport so that the flow through the pass was insufficient to maintain it.

Boca Chica gradually closed until in 1945 private interests completed the closing to allow automobile traffic on the Brazos Island beach.

At present, South Bay, with only one small shallow opening at the north end, is almost a dead bay. The frequent redredging of the Brownsville Ship Channel and subsequent spoil deposition periodically pumps tons of silt into the bay.. There is no water circulation to transport this silt as well as the silt entering with runoff water and the sand which enters from the encroaching sand dunes of the island. Fully two-thirds of the water volume of South Bay has been replaced by sediment in the past 25 years.

Present Flora and Fauna of South Bay

Vegetation in South Bay is confined chiefly to those areas shown on Figure II. Turtle grass, Thalassia testudinum Konig, is the principle spermatophyte present, although some manatee grass, Cymodocea manatorum Aschers, and shoal grass, Diplanthera wrightii Aschers, is also present. Various species of brown algae are found attached to oyster shells.

South Bay, while adjacent to Brazos Santiago Pass, does not support the large number of faunal species that are found immediately north of the Brownsville Ship Channel. Water turbidity and bottom sediments are believed to be the factors which influence the number of species present in this case. Most of the invertebrate forms live among the oyster clumps found chiefly in the

heavy vegetated areas of South Bay. The anthozoan, Calliactis tricolor (Le Sueur), is common on oysters and crabs. Many species of marine annelids are present in mud among the oyster clumps including Branchiomma nigromaculata (Baird) and Nereis pelagica occidentalis Hartman. Copepods and amphipods are very abundant, the copepods principally in the spring months when vast numbers enter the bays from the gulf. Barnacles, while present, are apparently crowded out, for the most part, by the commercial oyster.

Both the white shrimp, Penaeus setiferus, (Linnaeus) and the brown shrimp, Penaeus aztecus Ives, are present periodically just inside the north entrance with both species using South Bay as a nursery grounds as well as a resting place prior to migrating to the gulf. The pistol shrimp, Crangon heterochaelis (Say) and Tozeuma carolinensis Kingsley are also present. Many species of crabs are found here, including hermit crabs, Pagurus sp.; Callinectes sapidus Rathbun, the commercial blue crab; and the Gulf crab, C. danae Smith. Among the oyster clumps are the mud crab, Neopanope texana texana (Stimpson), and the oyster crab, Pinnotheres ostreum Say. Among the molluscs, the commercial oyster, Crassostrea virginica (Gmelin), is the most abundant and the most important. Other abundant molluscs include Brachiodontes exustus Linne, Anomia simplex d'Orbigny, Mercenaria campechiensis Gmelin and Cyrepidula plana Say. The squid, Loligo brevis Blainsville, is abundant during winter months. Holothurians, bryozoans, and ophiuroids are also common. The principal fish of South Bay includes the stingaree, Dasyatis sabina (Le Sueur); the sea catfish, Galeichthys felis (Linnaeus); the anchovy, Anchoviella sp.; pipe fish, Syngnathus sp.; mullet, Mugil sp.; the 8-fingered threadfin, Polydactylus octonemus Girard; and mojarra, Eucinostomus sp. Commercial species include the sheepshead, Archosargus probatocephalus (Walbaum); the sea trout, Cynoscion nebulosus (Cuvier and Valenciennes); the redfish, Sciaenops ocellatus (Linnaeus); the black drum, Pogonias cromis (Linnaeus); and the southern fluke, Paralichthys lethostigma Jordan and Gilbert.

Sports and Commercial Fishing -- Past and Present

In years past, prior to 1945, South Bay was heavily fished commercially. Trout, redfish, and drum were harvested annually in large numbers. Commercial fishermen tell of almost unbelievable fish landings coming from South Bay in years past, mostly by methods now illegal. Sports fishing was almost unknown at that time. At present, both sports and commercial fishing is almost non-existant in South Bay. The perpetual turbid condition of the water discourages most sport fisherman, and the presence of shallow bars and oyster clumps effectively deters the average boat enthusiast. Commercial fishing, while once important, now supports only a few persons and this is sporadic. Trout, redfish and drum are present at times during the spring and summer months. Commercial landings from South Bay cannot improve as long as the bay continues in its present physical condition.

Effects of Physical Changes on Oyster Populations

The principal value of South Bay at the present time is commercial oystering. While South Bay oyster production is insignificant when compared to Galveston Bay it is of importance to the local area. The importance of these oysters lie not in the volume of production, but in other factors.

Through the passage of many years the oysters in South Bay have developed a tolerance to a set of conditions which would not appear to be conducive to proper oyster growth. Once living in a more normal oyster habitat, they are now subjected to heavy siltation and turbid water, vast and rapid changes in water temperatures, high salinities ranging from 35 to 42 o/oo. In spite of seemingly adverse conditions, these oysters continue to produce amazingly well.

Accurate spat collection and oyster growth tray data have not been obtained in South Bay to date. Both spat collectors and trays have had a habit of disappearing within 30 days ofplacement. Examination of cultch shell, however, has shown the presence of all sizes of oysters from 2 mm up during all twelve months of the year. This fact, along with the fact that all stages of sex development has been noted in the mature oysters during all seasons of the year indicates that a part of the oyster population is engaged in spawning throughout most of the year. It would appear to follow, then, that a portion of the total oyster population of South Bay would be of harvestable quality throughout the year, which is the case. Commercial oystermen have found that by harvesting from shallow waters of less than 18 inches during the winter months and from deeper waters of three or more feet in depth during the summer months, at least 80% of the oyster brought to the oyster house are marketable. Since most of the commercial oyster population is found in the deeper waters, this gives the highest production during the summer months. Since South Bay is not affected by closed seasons, this gives the Port Isabel area a virtual monopoly on fresh Texas oysters of good quality during the period when the remainder of the coast is closed to commercial oystering.

Exact growth rates of the South Bay oyster arenot known but it appears that a commercial oyster can be obtained from the egg in one year. The shells are often very fragile and the inner surfaces contain numerous mud worm blisters. The meat of the oyster often varies in color but the taste is reported to be excellent.

Several tests made on South Bay oysters for the presence of the fungus Dermocystidium marinum have shown negative. Oyster pests do not appear to be a problem, except for the mud worm. An analysis of shell factor, 5 solids and condition factors appears in Figure IV. It should be remembered that the high and low extremes in values that one would expect in a normal oyster population where the entire population passes through the spawning cycle at the same time would not be evident where all stages are present at any one time and in any given sample.

Production appears to be holding its own at present although only 20% of the area is now producing oysters in a bay which was once one continuous oyster reef. In spite of the ability of these oysters to acclimate themselves to adverse conditions, South Bay oyster production should cease in a few years. Unless changes are made in spoil deposition in the very near future, South Bay will have become completely filled in and land locked within 10 years. I doubt if ever these oysters could continue to produce in a stagnant pond or on dry land.

Two additional reasons can be given here to supplement the case for aid to the South Bay oyster population. Experimental work has been done for the past three years in an effort to encourage the growth of South Bay oysters in Port Isabel Bay by transplanting these oysters onto beds of mud shell. While work on this project has not been completed, results have been discouraging to date and there is no reason to anticipate success at this time. In addition, the South Bay oyster appears to have developed into a new physiological race, capable of reproduction, development and rapid growth in an environment not acceptable to other oyster populations in other Texas bays. With the trend toward increased agricultural, industrial and municipal water use in Texas, fresh water drainage into the bays could decline to a point where the normal brackish salinity required for other oyster populations cannot be maintained. In this event, the present South Bay oyster population and its progeny may well become the basic stock of all future Texas oyster production.

Effects of Physical Changes on Invertebrate and Fish Populations

Aside from the production of oysters in South Bay, the erection of the jetties at Brazos Santiago Pass and the closing of the natural pass at Boca Chica is believed to have its adverse effects on the invertebrate and fish populations of the lower Laguna Madre area.

In some ways, the dredged and jettied Brazos Santiago Pass functions more adequately than Boca Chica Pass ever did. Brazos Santiago Pass provides for the adequate entrance of gulf water and helps to assure proper water circulation in the lower Laguna Madre. Moreover, the incoming currents appear to be satisfactory in bringing in planktonic forms, such as, diatoms, copepods and larval fish and invertebrate forms including shrimp, crabs, redfish, croaker, flounder, and others.

However, while factual data gained by scientific investigation is lacking, it is believed that the numbers of these incoming larval forms could be substantially increased by the opening of an unjettied pass, such as formerly existed at Boca Chica. Most plankton forms are carried by gulf currents along the beach, parallel to shore and swept into the bays by the currents through passes. Tests made by dropping dyes into the gulf waters off the beach at Brazos Island during the prevailing north current indicate that while some of the water enters the pass between the jetties, much of the water is carried around the ends of both jetties and continues on north along the beach of Padre Island, while the water is pocketed at the base of the south jetty. While the percentage of larval forms entering Brazos Santiago Pass may appear to be sufficient to supply the lower Laguna Madre, current patterns of the entire Laguna Madre and perhaps even Corpus Christi Bay and any increase in volume or percentage of larval forms entering the bay system at this end could not be detrimental to the system.

While factual data are somewhat lacking here, perhaps the greatest benefit of an open unjettied pass in this area would be to the adult fish and shellfish migrating from bay to gulf or from gulf to bay. Most of the summer bay population of croaker, pin perch, pig fish and mullet migrate to the gulf during the fall months either to spawn or to inhabit deeper water which are less susceptible to winter temperature changes. The entire juvenile brown shrimp population migrates to the gulf at the same time. Large portions of the bay trout and redfish population follow these fish and shrimp, which constitute their food supply, into the gulf. Maturing redfish migrate to the gulf to spawn as do the flounder and the blue crab.

While Boca Chica Pass was open, these important bay fish were able to travel their preferred route along the beach in the guts between the bars of the surf and enter the bay system through the natural, unjettied Boca Chica and Brazos Santiago passes. The entire route was in protected shallow water.

With the closing of Boca Chica Pass, these fish were forced to use Brazos Santiago Pass and with the construction of the jetties were forced to leave the protection of the shallow water of the surf and enter the 50 foot deep water around the ends of the jetties to circumvent the jetties, then traveled at least one mile between the jetties in 40 feet of water to reach the shallow water of the bay. These deep water areas between and at the ends of the jetties are frequented by large sharks and porposes which are particularly abundant during periods of fish migrations. While no factual data is known on the number of sharks and porpoises that frequent the area or to what extent food and game fish are utilized by them as food, I suspect that if the facts were known, we would find that the poundage of commercial and sports fish eaten by these sharks and porpoise would exceed the commercial landings in the lower Laguna Madre bay area.

Summary and Recommendations

This report has dealt with the findings of a study to determine the ecological conditions existing during the period of the study in South Bay, Cameron County, Texas, and to compare these conditions with those which are reported to have existed prior to 1935. The effects of the dredging of the Brownsville Ship Channel and the resulting deposition of spoil was shown to have retarded the annual flushing of South Bay and the natural maintenance of Boca Chica Pass resulting in the closing of this pass and filling in of South Bay and the subsequent decline in oyster production. This report also dealt with the effects of the jettying of Brazos Santiago Pass and the closing of Boca Chica Pass; the reduction in numbers of larval invertebrate and fish forms entering the bay from the gulf and the subjection of important bay sports and commercial fish to depredation by predators.

In an effort to prevent the further filling in of South Bay; to restore South Bay and its oyster production capabilities to some semblance of its former self; to increase the numbers of larval invertebrate and fish forms such as, brown and white shrimp, pin perch, croaker, blue crabs, flounder and redfish entering the bay system and to decrease the depredation of our adult trout, redfish, flounder and other important sports and commercial fish, it is recommended that the following proposals be given serious consideration in the order named:

1. It is recommended that efforts be made to prevent any further deposition of spoil in the area which would cause silt to enter any portion of South Bay. If this is successfully accomplished, it is then recommended that;

2. A study of the tides, currents, wind and resulting water transport of the Port Isabel-South Bay area be made to determine if the presence of the Brownsville Ship Channel would prevent a possible return of conditions prior to 1935. If this study reveals that a return of conditions is possible, it is then recommended that;

3. Part of all of the spoil separating South Bay from the Laguna Madre be removed to allow substantially increased water transport from the Laguna Madre to South Bay during periods of strong and prolonged north winds. If this spoil removal is effected, it is then finally recommended that Boca Chica Pass be reopened.

Prepared by Joseph P. Breuer

Marine Biologist.

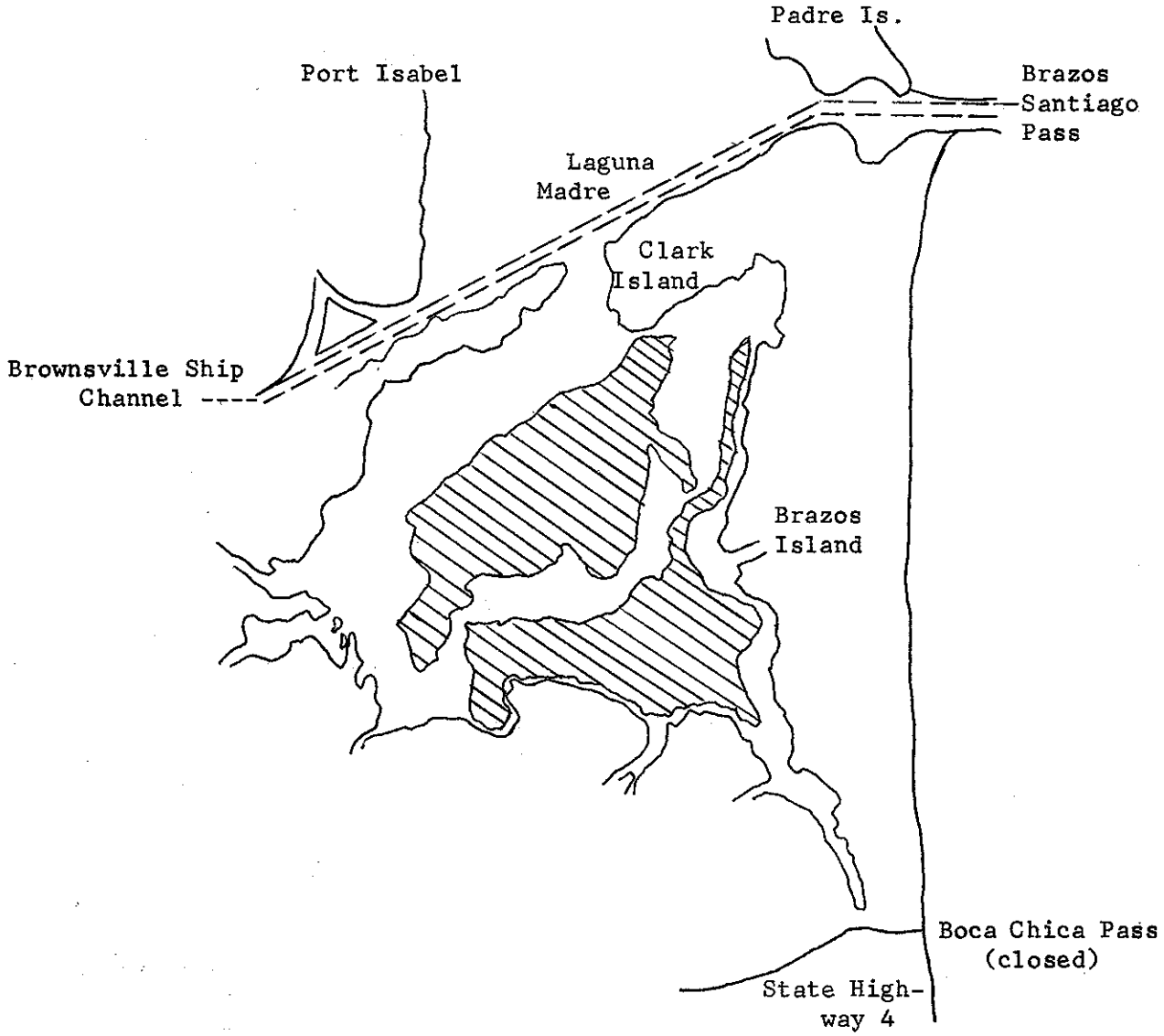
Accepted by Howard T. Lee

Howard T. Lee

Date 12 January 1961

Figure I

South Bay With General Features at Present



-- Predominant Areas of Submerged Vegetation.

Figure II

South Bay Prior to 1935

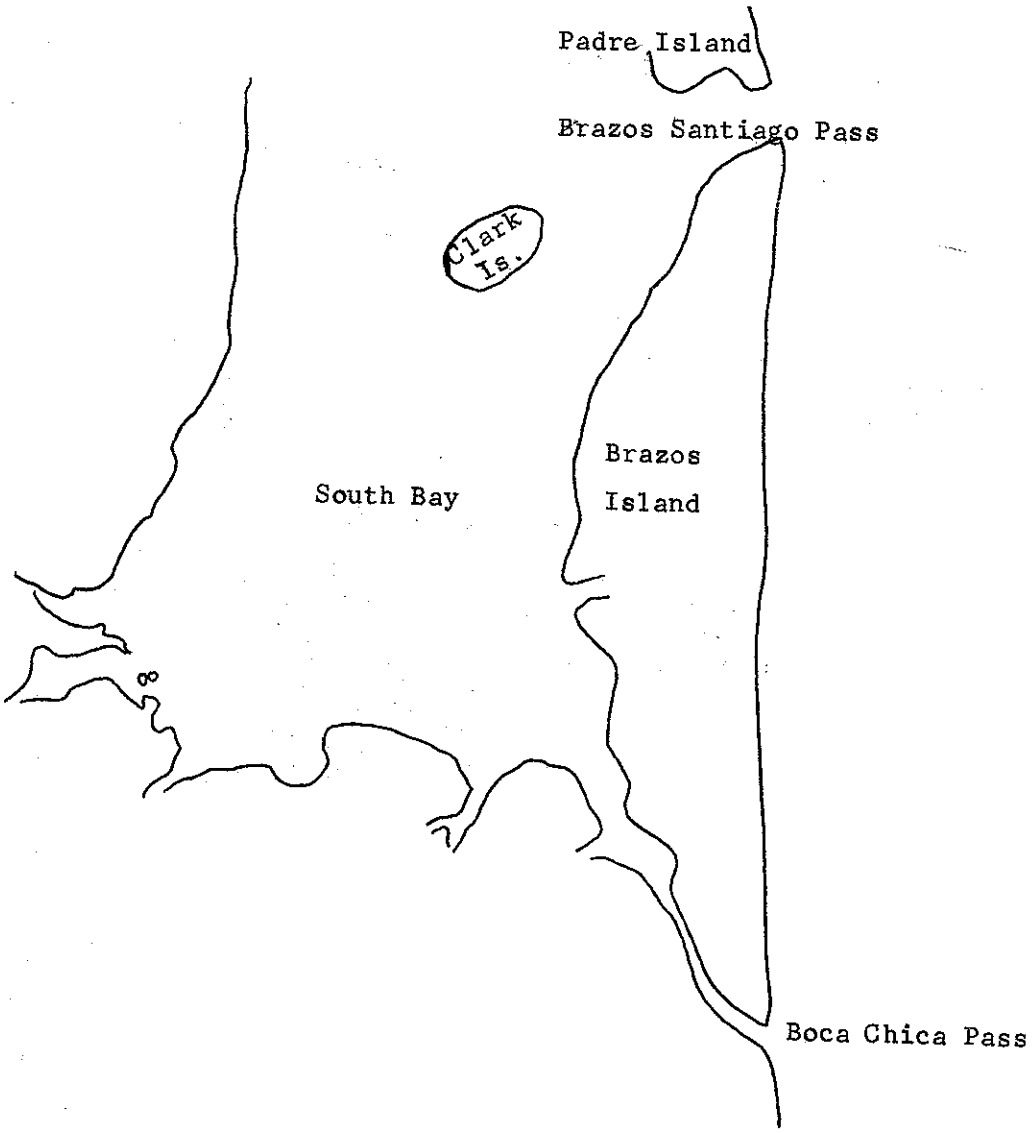
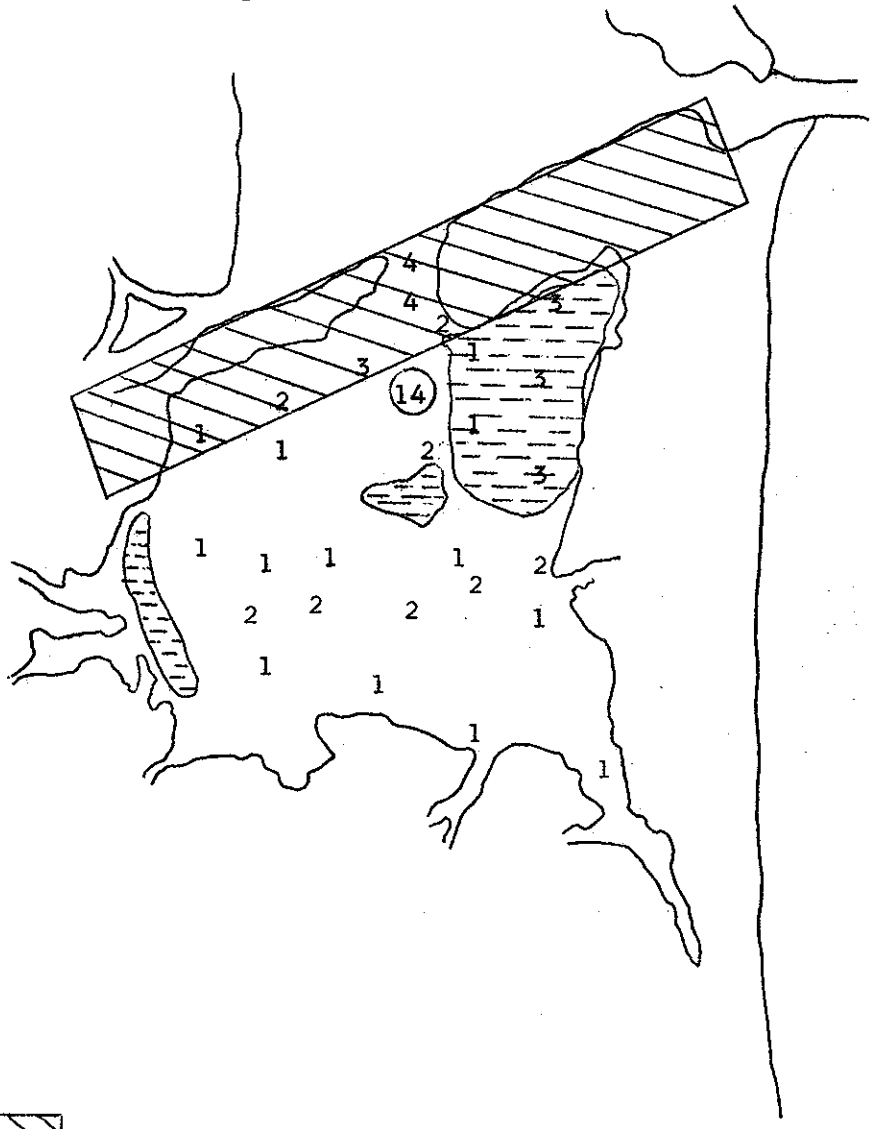


Figure III

South Bay Water Depth in Feet at Mean Low Tide



Area Directly Affected by Spoil Deposition.

14 Station Location

Presently Harvested Oyster Areas.

FIGURE IV

South Bay Oyster Condition

Date	Number	Shell Factor			% Solids			Condition factor		
		Min.	Max.	Ave.	Min.	Max.	Ave.	Min.	Max.	Ave.
30 November 1959	4 oysters	1.07	1.39	1.27	7.4	16.6	12.3	2.9	25.0	8.6
8 March 1960	6 oysters	1.05	2.54	2.24	12.0	20.9	15.0	5.0	25.0	9.6
7 April 1960	10 Oysters	1.10	1.90	1.46	11.6	22.7	16.2	5.2	25.0	11.8
5 May 1960	6 oysters	1.39	2.03	1.73	16.0	29.0	21.0	2.6	8.8	5.2
22 June 1960	6 oysters	1.62	2.69	1.90	16.7	25.0	21.5	3.1	8.6	6.9