Florida Board of Conservation
Division of Salt Water Fisheries

CLAMS AND OYSTERS IN CHARLOTTE COUNTY AND VICINITY

by

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FOREWORD

Fishing is Florida's oldest industry. Florida saltwaters produce a greater variety of marine products, including game and food fishes, than any other State. The combined value of the commercial and sports fisheries, established by state-wide professional surveys, is at least $300,000,000 yearly. The whole State, and all 35 coastal counties in particular, share in this wealth - a gift of Nature - so long as they judiciously exploit their shorelines, saltwaters and submerged bottoms. The State Board of Conservation has a vested interest in seeing that this is done. It is charged with the supervision, conservation and development of the different fisheries through scientific management, control and aquaculture based on research. The job is difficult. Problems are acute because rapid urbanization has accelerated lucrative waterfront development and unfavorable changes in marine environments.

Damage to our multi-million dollar fisheries is not inherent in urbanization unless planning is poor and short-sighted and destructive dredging, filling and pollution are condoned because of apathy, ignorance or greed.

Coastal, estuarine and island development can be planned to best serve conservation. The State Board of Conservation stands ready to aid and advise counties, other governmental units and private interests in the best known ways to sustain and further marine productivity.

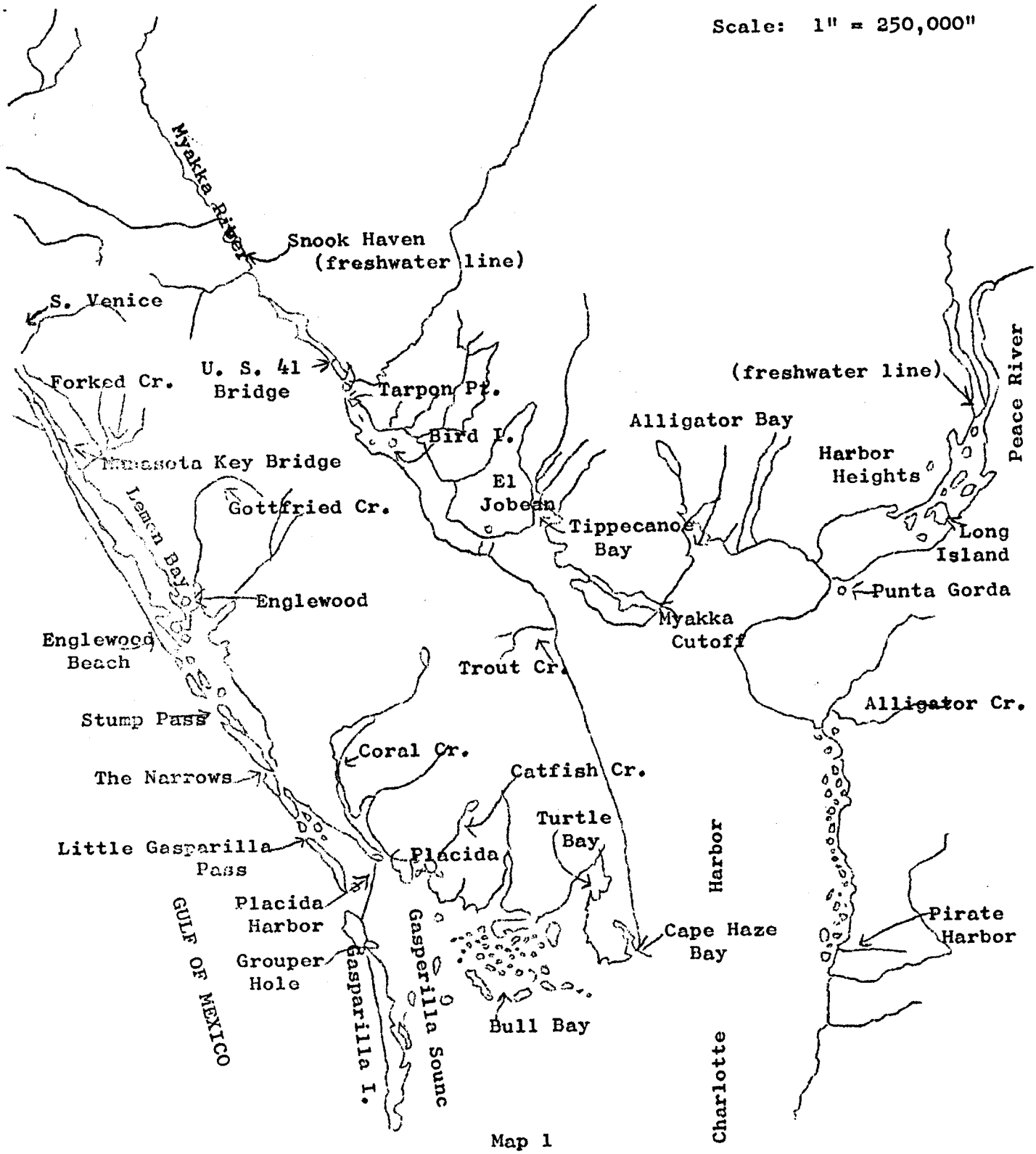
CLAMS AND OYSTERS IN CHARLOTTE COUNTY AND VICINITY

Introduction

Charlotte is a county of change. Its population has tripled in the last decade. Most of the new population is concentrated in waterfront communities whose homesites have been created by digging canals to drain raw upland and provide navigable waterways. This surge of people makes it imperative that affected shorelines, saltwaters and submerged bottoms be judiciously exploited. Fortunately, hydraulic dredging and filling of submerged land to make residential finger fills has not been widely practiced in Charlotte as in Pinellas, Dade and Palm Beach Counties where productive bay bottoms have been extensively destroyed.

As pollution, pests and diseases, and declining yield continue to plague northern shellfish areas, interest and enthusiasm in Florida as a commercial shellfish producer grows. In our warm waters, clams and oysters reach marketable sizes in about one-half the time they do in New England and the Middle Atlantic States. Charlotte and Okaloosa Counties have experienced the greatest increase in commercial shellfishing activity and interest in Florida. This study has been made in recognition of the important role Charlotte County is playing in the Florida seafood industry.

If the present boom in shellfish harvesting and culture is to continue and succeed, bulkhead lines will have to be set at or near mangrove shorelines and dredging as well as filling limited by the bulkhead lines. The most realistic method to assure marine productivity is to allow those low shorelands lying in the path of urbanization to be raised to levels suitable for human habitation with fill material obtained from draglining canals inside bulkhead lines.



Map 1

Reference points and bodies of water in Charlotte County and vicinity

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Field investigations for this report were made intermittently from June 5 through June 21, 1962 with the assistance of Officers William King and Luke Wolcott of the Florida Conservation Patrol. Map 1 has been prepared to orient the reader to reference points and bodies of water. Water salinities and temperatures, tides, bottom types, abundance and quality of clams and oysters, and shellfish predators were noted.

Three species of bivalve mollusks have commercial significance in Charlotte County and vicinity.

The Southern Quahog or hardshell clam, Mercenaria campechiensis, is being harvested extensively from productive natural beds along the inside of Gulf barrier islands.

The eastern oyster, Crassostrea virginica, is the basis for extensive leasing of submerged bottoms especially in Turtle and Bull Bays. Oyster harvesting has been mostly from natural bars also. These public bars are closed to oystering from May 1st to September 1st each year so that now oyster activity is limited mainly to seeding of leases. 'Coon oysters refer to oysters that are stunted, poor quality and usually overcrowded. As spat or baby oysters, they settle in unfavorable locations. If culled and moved to favorable environment, they can reach marketable size and quality.

Large beds of the Rangia marsh clam, Rangia cuneata, in the brackish-freshwater zones of the Myakka and Peace Rivers have commercial concentrations if processing proves economically feasible, marketing outlets materialize and river water is certified for shellfish harvesting.

Recorded hardshell clam production began in Florida in 1880, increased significantly in 1908 with exploitation of large clam beds in Collier and Monroe Counties near the Ten Thousand Islands, grew steadily until the peak year of 1932, remained at a high level through most of World War II and plummeted to a beginning low by 1950. From 1950

production increased modestly, as shown on Table 1, until February 1962 when intensive harvesting of natural clam beds in Charlotte County and vicinity began. Table 2 shows the dramatic jump in Charlotte County hardshell clam production preceded two months earlier by a sharp rise in oyster production. Development of marketing outlets in Middle Atlantic States caused the increase in hardshell clam harvesting.

Most shellfish leases have been for oysters. One oyster-shucking plant operated in Placid this past season. Another is being constructed nearby. It is very doubtful that production from natural bars in the area could ever support two oyster houses. Leases will have to be brought into production where mechanical harvesting is allowed. Oyster shell planting for cultch was observed in Turtle Bay during field work for this report. Oyster seed was being collected from 'coon oyster bars in Gasparilla Sound.

Florida oysters and hardshell clams follow different paths to the consumer. The oyster season coincides chiefly with the winter tourist season. Most local oysters are consumed raw on-the-half-shell. Besides shucking, and packing and chilling, processing of Florida oysters is limited. Summer condition is poor because of spawning. The hardshell clam is usually processed into chowder or a canned minced product. A spawning condition is not so marked and there is no closed season denoting a period of poor quality.

Mechanical harvesting of clams and oysters lying in the path of the West Coast Intracoastal Waterway is planned after contracts are let for waterway dredging in Charlotte Harbor, Gasparilla Sound, Placida Harbor and Lemon Bay. The waterway route generally follows deeper water where harvesting of clams or oysters by hand or hand implements is difficult or impossible especially for clams. Mechanical harvesting is not allowed on public shellfish beds but in this case it would be permitted because of the

TABLE I

Clam Production in Florida

(Pounds)*

YEAR	EAST COAST	WEST COAST	TOTAL
1880	5,000	-----	5,000
1908	57,000	182,000	239,000
1923	5,000	602,000	607,000
1930	49,840	661,736	711,576
1932	12,000	1,108,812	1,120,812
1940	6,700	701,100	707,800
1945	3,000	687,700	690,700
1950	900	4,400	5,300
1955	6,300	15,700	22,000
1960	2,134	23,893	26,027

* 5.20 pounds of meat per U. S. Standard Bushel (Florida East Coast)

8.00 pounds of meat per U. S. Standard Bushel (Florida West Coast)

TABLE 2

Commercial hardshell clam and oyster production in Charlotte County since increased exploitation of natural beds*

DATE	HARDSHELL CLAMS (pounds of meat)	OYSTERS
May 1961	------	Closed
June 1961	------	season
July 1961	------	for
August 1961	------	Oysters
September 1961	------	-------
October 1961	------	192
November 1961	------	2,204
December 1961	88	24,035
January 1962	------	-------
February 1962	74,130	15,512
March 1962	22,330	8,524
April 1962	36,960	10,592

* Taken from Florida Landings compiled by U. S. Fish and Wildlife Service in cooperation with Florida State Board of Conservation and the University of Miami Marine Laboratory.

probable destruction of shellfish by dredging, spoiling or siltation. Special attention was given to waterway considerations during field studies. The inherent difficulties in mechanical harvesting of shellfish before the waterway route is marked for dredging are obvious.

"Discovery" of the large beds of Rangia clams this year has roused considerable interest in molluscan circles. Dr. Joseph P. Morrison, Acting Curator, Division of Mollusks, U. S. National Museum, stated in a letter to Dr. Robert F. Hutton:

> "The bivalves you sent for identification, collected north of Punta Gorda in the Peace River estuary, are readily identifiable as Rangia cuneata (Gray).
>
> The U. S, National Museum has eastern Florida records of this species only from the St. Johns River (South of Jacksonville), and from Lake Worth at Boynton. I have seen specimens from near Stuart, Florida, in the Museum of Comparative Zoology collection at Cambridge. On the west coast we have it from the Caloosahatchie River near Fort Myers; from the East and Wakulla Rivers in the St. Marks region; from Apalachicola; and from Pensacola.
>
> Your specimens from the Peace River extuary help to fill in the zoogeographic story of this brackish water species. It should also be abundant in the lower Myakka River. You may recall that this is one species that I am still searching for in the Tampa Bay area, to parallel its fossil occurrence there. Does it live in the Manatee River?
>
> Rangia cuneata is an edible clam, belonging to the family Mactridae. It is a close relative of the Hen or Surf Clam, Spisula solidissima, one of the important clams commercially fished off the Middle Atlantic States, and canned at Cape May, New Jersey, by the Snow and other companies. J. A. Singley in 1893 reported that Rangia cuneata (from the Galveston region) had been canned and sold commercially by the Givens Oyster Company under the name of "Little Neck Clams". This report is in Singley's "Texas Mollusca", a part of the 4th. Annual Report (1892) of the Geological Survey of Texas. Rangia cuneata (presumably from Vera Cruz coastal lagoons) is also served in restaurants in Mexico as far inland as Pachuca, Hidalgo, in a clams and rice dish called "Paella a Valenciana".

Hydrographic studies (see Map 2 and Table 3):

Water salinity is to the shellfish farmer what soil pH is to the general farmer. Hardshell clams, oysters and Rangia clams have different optimal ranges of salinity just as wheat, corn and rye do for pH. Lime and fertilizer can alter soil conditions for the land farmer but his

saltwater counterpart can do little to his saltwater except carefully choose his lease site based on rainfall data, freshwater drainage patterns, known salinities and species preference.

Bottom samples of water in depths exceeding four feet are always checked for salinity stratification between a lighter, fresher surface layer and a heavier, saltier bottom layer. Surface salinity determinations alone may result in the choice of bottom sites where salinities are high enough to harbor marine predators or lead to the rejection of suitable bottoms where salinities are actually favorable to oysters.

Ocean salinity is 35-36 o/oo (parts per thousand salt). Near oceanic salinity is best for the hardshell clam which does not tolerate salinities under 20 o/oo. The oyster has a wider range of salinity tolerance but it does best where river water and freshwater effluents (vitamins, nutrients, etc.) are well mixed with ocean water and where the salinity is low enough to discourage predators and diseases with marine affinities but still high enough to give the oyster a pleasing salty taste. Zones of optimum salinities change year to year with rainfall totals and distribution but a general criterion to follow is to choose sites that register no more than 30 o/oo during the dry season or less than 8 o/oo during the rainy season. The best oysters usually come from areas of small or gradual salinity variations. Of course, salinity determinations made in years of extreme drouth or rainfall make long-range recommendations for lease sitesprecarious. Less is known about the optimal salinity requirements for the Rangia clam, particularly for its upper ranges. Generally, it seems to thrive best in waters that change from fresh (o/oo) to brackish from wet to dry season. Rangia clams taste best from saltier waters, however.

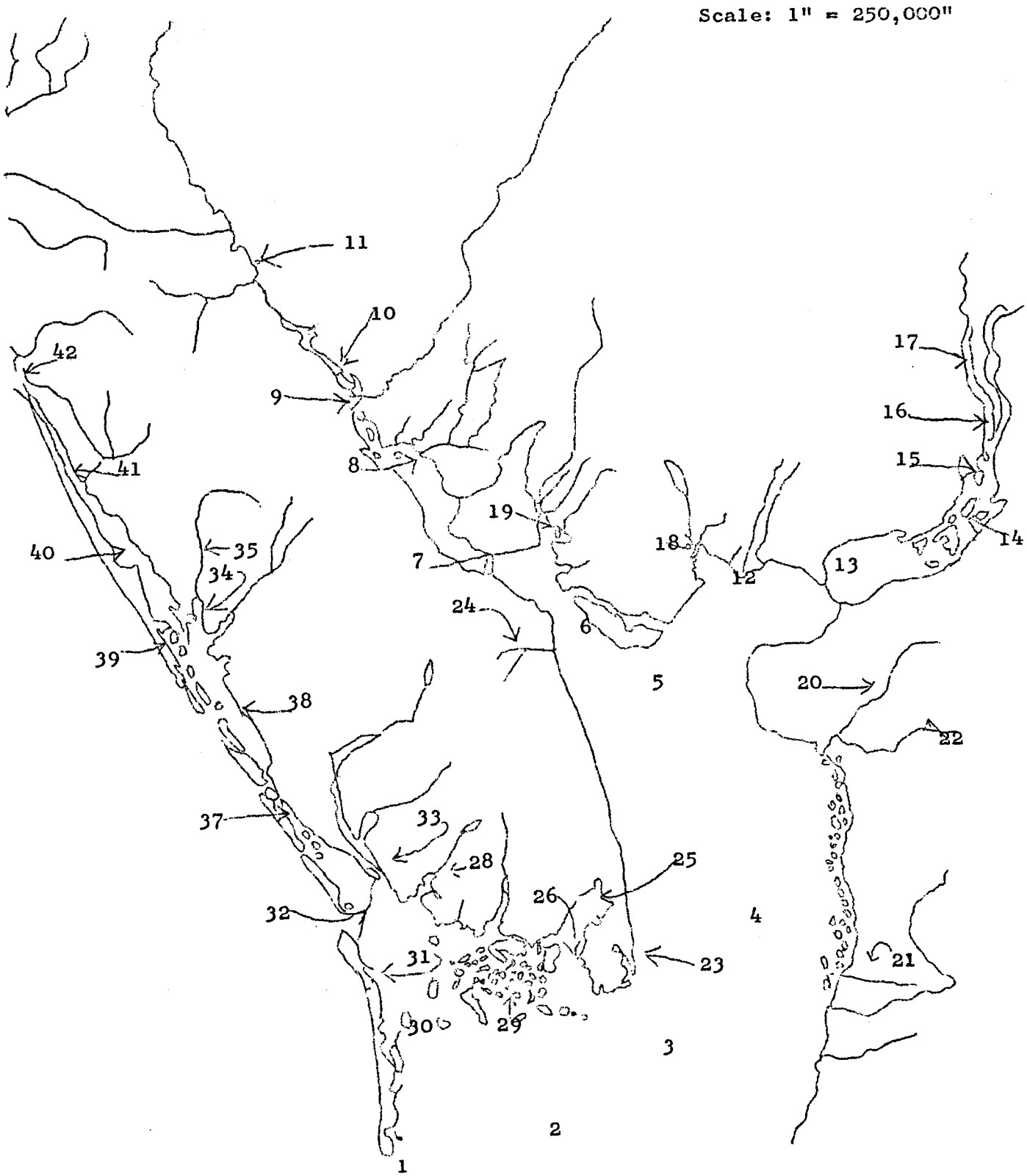
Large canals draining raw upland, creating waterfront real estate and emptying into the Peace River, Myakka River and Alligator Bay have

resulted in salinities that change more rapidly and go lower than when freshwater seeped slowly through pine flatlands, marshes and mangrove swamps into Charlotte Harbor. Attached animals such as the oyster cannot escape abruptly decreased salinities. They die or deteriorate from enormous metabolic regulatory problems.

Water temperatures conducive to yearly spawning of the eastern oyster are never a limiting factor in Florida. Minimum spawning temperatures from 60-68°F. are common even in winter and optimum spawning temperatures from 80.5-82.5°F. are reached in late spring when shell plantings for cultch are recommended. Some northern areas fail to have oyster reproduction because of cold water in spring and summer. Colder winters with lowered water temperatures are more conducive to oysters "fattening" up than warm winters. This "fattening" is actually the storage of glycogen, animal starch.

The combined Peace and Myakka Rivers are one of the major drainage basins of Florida with a total watershed of approximately 2500 square miles. Because of this, Charlotte Harbor is one of the major estuaries where freshwater and ocean water mix but tidal ranges are not great enough to get any drastic differences in salinities between high and low tides.

Initial hydrographic stations were made on June 5 in Charlotte Harbor, Myakka River and Peace River before a bad drouth was broken by summer rain. For quick reference, the salinities of June 5 and other representative ones have been charted on Map 3. All salinities, tempertures and related data for the stations located on Map 2 are given in Table 3. Seven salinities at correlative stations made during a rainy period and year (1960) are charted on Map 4 for comparison. Rainfall for seven months preceding the September 1960 sampling totaled 40.44 inches, for seven months preceding June 1962 only 6.24 inches. Resulting differences in salinities are extreme. They are discussed in the sections on bodies of water.



Map 2

Location of hydrographic stations made in Charlotte County and vicinity (June 5-21, 1962; see Tabe 3)

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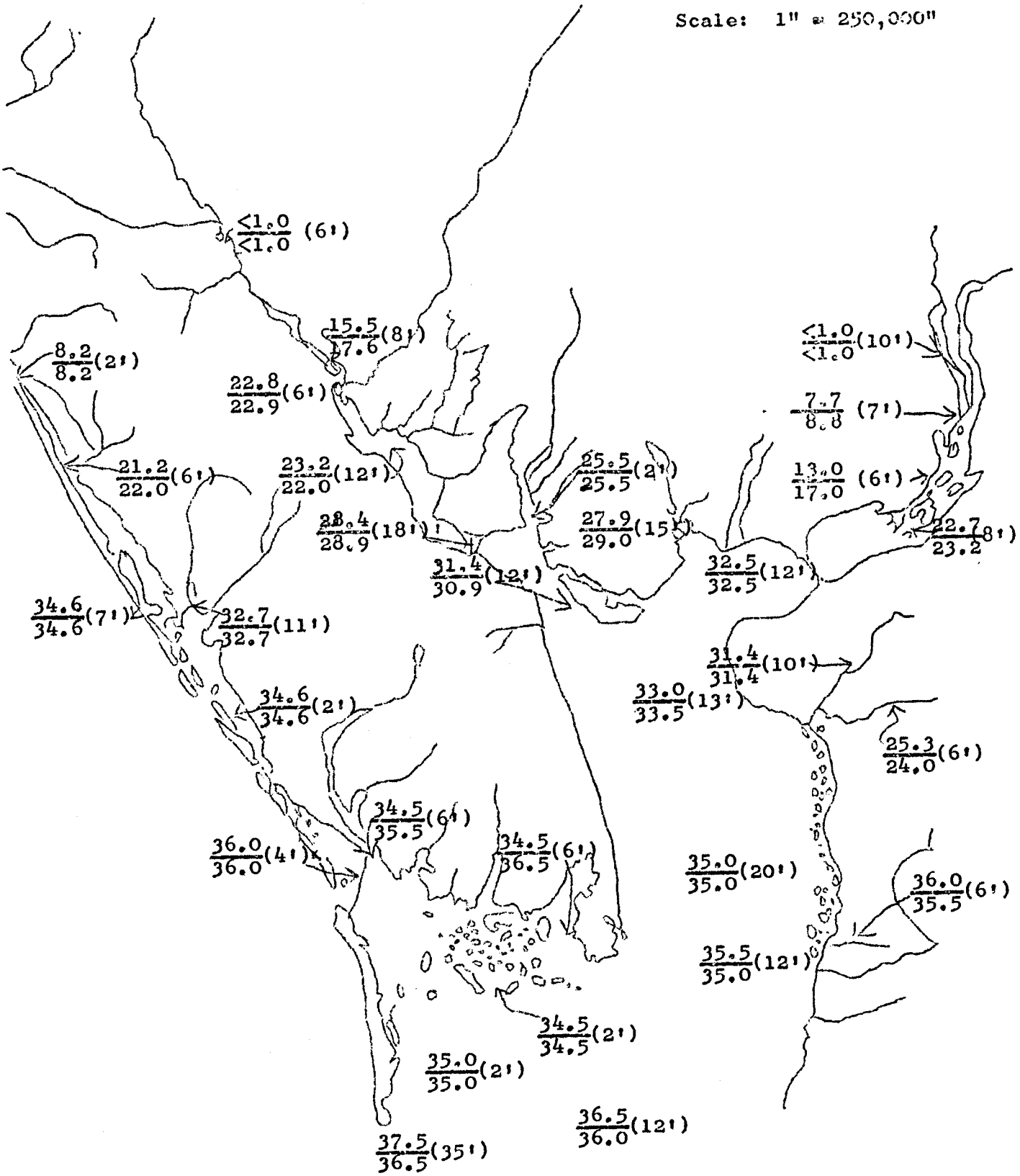

Map 3

Representative water salinities ($\frac{\text{surface o/oo}}{\text{bottom o/oo}}$) and depths (ft.) in Charlotte County and vicinity (June 1962)

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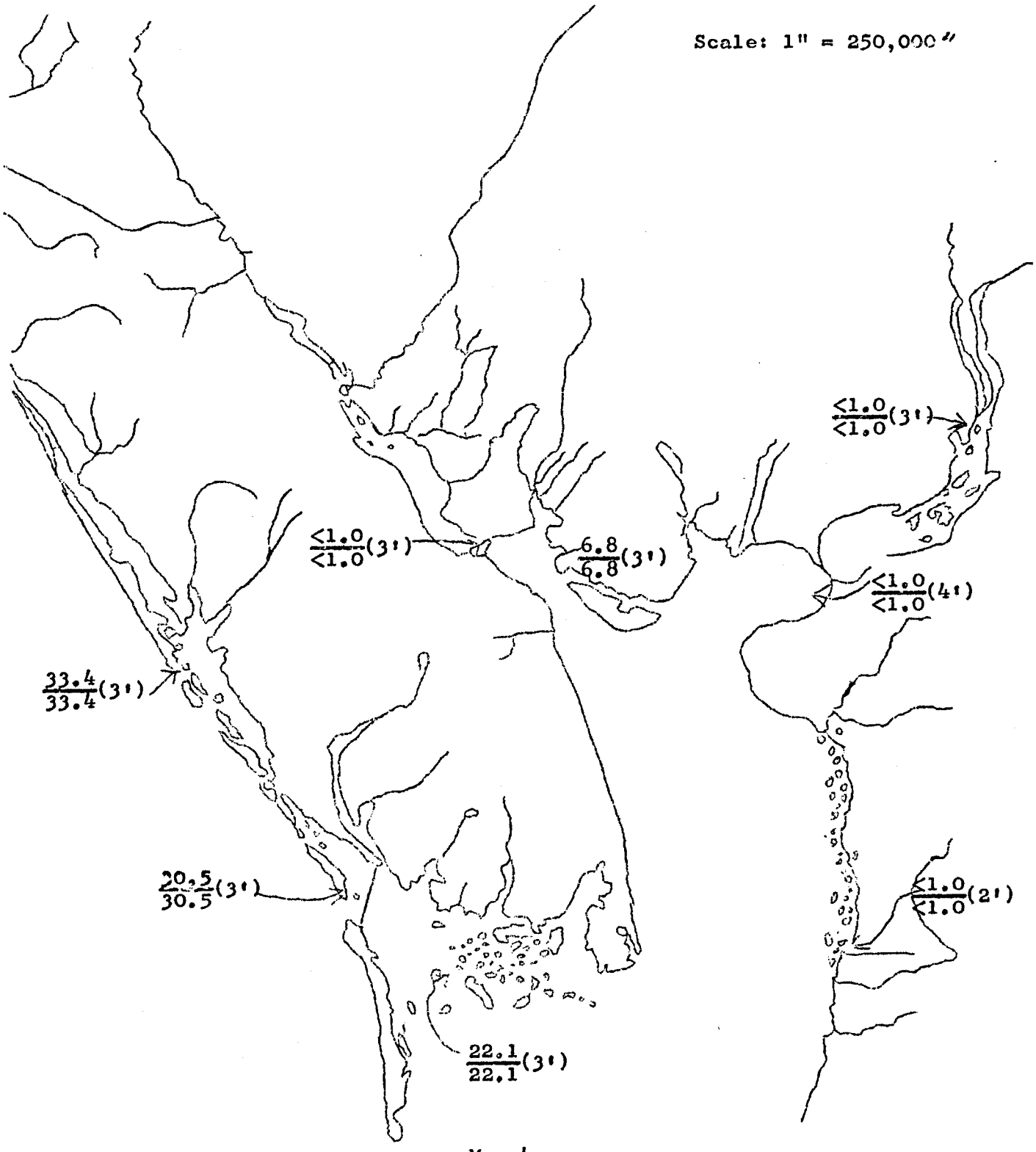

Map 4

Water salinities ($\frac{\text{surface o/oo}}{\text{bottom o/oo}}$) and depth (ft.) taken in Charlotte County (September 1960)

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CS NO.: 62-1

Table 3

Hydrographic data for stations located on Map 2

STATION	DATE	TIME	TIDE	MOON PHASE	WATER °C.	WATER o/oo	DEPTH (ft.)	BOTTOM
1.	VI- 5-62	0850	SL	NM	29.2	37.5 36.5	36	hard sand
2.	"	0915	SL	NM	29.2	36.5 36.0	12	hard sand
3.	"	0930	SL	NM	28.1	35.5 35.8	12	hard sand
4.	"	0950	SL	NM	28.0	35.0 35.0	20	hard mud
5.	"	1000	SL	NM	28.3	33.0 33.5	13	hard mud
6.	"	1020	SL	NM	28.3	31.4 30.9	12	soft mud
7.	"	1045	SL	NM	28.3	28.4 28.9	18	sandy mud
7.	VI- 7-62	1100	E	FQ	30.0	28.6 29.5	18	sandy mud
7.	VI-21-62	1030	SH	FM	28.7	19.3 23.3	18	sandy mud
8.	VI- 5-62	1055	SL	NM	28.2	23.2 22.0	12	mud
9.	"	1100	SL	NM	29.5	22.8 22.9	8	mud
10.	"	1115	SL	NM	30.1	15.5 17.6	8	mud
10.	VI-16-62	1230	F	FQ	29.8	13.0 11.6	10	mud
11.	VI- 5-62	1155	SL	NM	30.2	<1.0 <1.0	6	mud

Table 3

(continued)

Hydrographic data for stations located on Map 2

STATION	DATE	TIME	TIDE	MOON PHASE	WATER °C	WATER o/oo	DEPTH (ft.)	BOTTOM
12.	VI- 5-62	1400	F	NM	32.0	32.5 32.5	12	hard mud
13.	"	1420	F	NM	32.0	29.4 31.0	10	sandy mud
13.	VI- 6-62	0920	SL	NM	29.2	27.3 28.4	8	sandy mud
13.	VI-21-62	0945	SH	FM	28.5	14.2 14.5	9	sandy mud
14.	VI- 5-62	1430	F	NM	32.0	22.7 23.2	8	sandy mud
14.	VI- 6-62	1015	SL	NM	28.0	16.2 17.3	8	sandy mud
15.	VI- 5-62	1440	F	NM	30.0	13.0 17.6	6	sandy mud
15.	VI- 6-62	1250	F	NM	32.0	8.8 10.0	6	sandy mud
16.	VI- 5-62	1500	F	NM	30.0	7.7 8.8	7	mud
17.	"	1515	F	NM	30.0	<1.0 <1.0	10	mud
18.	VI- 6-62	1430	F	NM	31.8	27.9 29.0	15	mud
19.	VI- 7-62	1500	F	FQ	32.0	25.5 25.5	2	soft mud
20.	VI- 8-62	0900	SH	FQ	29.2	31.4 31.4	10	mud
21.	"	1000	SH	FQ	30.0	36.0 35.5	6	mud and rock

Table 3

(continued)

Hydrographic data for stations located on Map 2

STATION	DATE	TIME	TIDE	MOON PHASE	WATER °C.	WATER o/oo	DEPTH (ft.)	BOTTOM
22.	VI- 8-62	1045	SH	FQ	32.0	25.3 24.0	6	sandy mud
22.	VI-21-62	0920	SH	FM	28.0	<1.0 12.6	7	sandy mud
23.	VI-12-62	1200	SH	FM	29.1	34.5 34.5	2	mud
24.	"	1330	SH	FM	29.1	26.3 26.3	2	mud
25.	VI-13-62	1700	E	FM	29.9	17.1 17.1	2	mud and rock
26.	"	1745	E	FM	29.8	34.5 36.5	6	sandy mud
27.	VI-14-62	1015	SL	FM	28.8	36.5 36.5	3	sandy mud
28.	"	1030	SL	FM	29.1	35.0 35.0	3	sandy mud
29.	"	1100	F	FM	29.1	34.5 34.5	2	sandy mud
30.	"	1200	F	FM	30.2	35.0 35.0	2	shell
31.	"	1230	F	FM	31.0	35.4 35.4	5	sandy mud
32.	"	1310	F	FM	31.0	35.0 35.0	5	shell
33.	"	1345	F	FM	30.9	34.5 35.5	6	shell
33.	VI-21-62	1110	SH	FM	29.0	33.6 33.6	7	shell

Table 3

(continued)

Hydrographic data for stations located on Map 2

STATION	DATE	TIME	TIDE	MOON PHASE	WATER °C.	WATER o/oo	DEPTH (ft.)	BOTTOM
34.	VI-16-62	1155	F	FM	29.1	32.7 32.7	11	sand & shell
34.	VI-21-62	1130	SH	FM	29.0	32.4 33.0	6	sand & shell
35.	VI-16-62	1205	F	FQ	28.8	7.2 26.3	7	mud
36.	VI-20-62	0900	F	FM	30.8	36.0 36.0	4	sandy mud
37.	"	0945	F	FM	31.0	35.5 35.5	8	sandy mud
38.	"	1030	F	FM	31.7	34.6 34.6	2	sandy mud
39.	"	1110	F	FM	31.2	35.5 35.5	10	sandy mud
40.	"	1215	F	FM	31.2	34.6 34.6	7	sandy mud
41.	"	1310	F	FM	31.4	21.2 22.0	6	mud
41.	VI-21-62	1330	SH	FM	29.8	22.3 22.3	6	mud
42.	"	1350	SH	FM	29.6	8.2 8.2	2	mud

Tides: E = Ebb
SL = Slack Low
F = Flood
SH = Slack High

BODIES OF WATER

(see Map 1)

Stations referred to in the following discussions are located on Map 2 and listed in Table 3.

Peace River:

Oyster growth and condition were disappointing on concrete pilings at the Punta Gorda highway bridge and the old bridge now used for fishing. Slime and barnacles covered flat oysters of non-marketable sizes. After summer rains began, salinity dropped from 29.4 to 14.2 at the bridge with no significant stratification between surface and bottom samples; in September 1960 shortly after hurricane Donna, the water was fresh (<1.0 o/oo). As mentioned earlier, 40.44 inches of rainfall in seven months preceded the 1960 readings and only 6.24 the 1962 readings.

Dense concentrations of Rangia clams were found at Long Island and Harbor Heights and between these two locations wherever a soft muddy bottom and black rush (Juncus roemerianus) prevail. Rangia clams are present from Long Island to the legal freshwater line (Station 16) where a tidal interface was observed. These clams were salty tasting during the drouth but lost their tang after summer rains lowered salinities.

Pollution control is vital if Rangia clams from the Peace River are to be successfully exploited commercially. In the past effluents from phosphate fertilizer plants have been a problem. Additionally, septic tank discharges into the river during the summer rainy season must be considered.

Alligator Bay

The best oysters found during the field survey for this report were in this small, mangrove-lined bay. They were cupped, clean, good tasting

3 1/2 to 6 inches long. The oysters are mostly around mangroves and on a soft, mud bottom. Crown conchs, the most common oyster predator in south Florida, are scarce or absent. Salinities were 27.9-29.0 o/oo (Station 18); in September 1960, 6.8 o/oo.

The fate of this area for continued quality oysters rests with future real estate development. If Port Charlotte expands to change the mangrove zones into waterfront real estate by dredging and filling, shellfish potential is questionable. Oyster leases have been applied for at the mouth of Alligator Bay.

Myakka Cutoff:

Most oysters examined were narrow and flat. Mud bottoms predominate. The shorelines are dominated by red mangroves with some cordgrass. Good oysters are reputed to come from this area on the Alligator Bay side during certain winters.

Tippecanoe Bay:

Fat cup oysters were discovered at the head of the bay. These were 3 1/2 to 4 1/2 inches long and on a soft mud bottom. They were in bars near mangroves and also in open water. Few oysters were actually growing on prop roots of red mangroves. Oysters opened were in good condition and tasty but somewhat muddy. This small bay should be good for oyster leases. There is access to its shoreline by road where oysters could be loaded on trucks or a shucking house could be located.

Myakka River:

There is a good set of oysters from the water surface to bottom on pilings of the El Jobean railroad bridge. These oysters were in good condition except for fouling organisms on the shells. Oyster set was

much less on the new highway bridge parallel with the railroad bridge. El Jobean is a key salinity station (Station 7) like the Punta Gorda bridge across Peace River. After summer rains began, the salinity dropped but did not begin to approach that of September 1960 when the river was completely fresh. Broken submerged pilings make oyster tonging difficult under the railroad bridge. This station usually should have good oysters during drouth years. No crown conchs were seen.

Scattered oysters are found north of El Jobean but there appeared to be none of any commercial quantity or marketable quality.

The Rangia marsh clam is distributed from about two miles north of the El Jobean bridges to two miles north of the bridge across Highway U. S. 41. Densest concentrations are found from Bird Island to Tarpon Point wherever black rush dominated the shoreline and soft mud the bottom as in Rangia beds in Peace River.

Alligator Creek (Located south of Punta Gorda):

Drainage canals creating waterfront property have been cut into the north and south forks of Alligator Creek. Rock has been exposed along the canal edges where oysters have set and reached marketable size and quality but oyster shells are brittle contrasted with those in natural watercourses. The same brittleness has been noted before in Pirate Harbor under similar conditions. The effect of summer rains on salinity and stratification showed up well at Station 22 where surface readings dropped 24.3 o/oo and bottom readings 11.4 o/oo (see Table 3) in 13 days.

Pirate Harbor:

Salinities were very high (oceanic actually) compared to <1.0 o/oo in September 1960. Fat oysters six to eight inches long were harvested from here in the winter of 1960-61. This year oysters have done poorly

and most have died including ones that Officer King transplanted from Turtle Bay. Young oysters were also dead. Shells were badly fouled by mussels. Those oysters still living had a very salty taste.

Cape Haze Bay:

This small bay was checked because its protected water would offer calm harvesting during northwesterly winds that occur in winter. Only 'coon oysters were found and these confined to mangrove margins. Crown conch egg cases were present.

Trout Creek:

Only 'coon oysters attached to mangrove roots were found. Good quality oysters have been reported in other years but their absence here while being found in Tippecanoe and Alligator Bays is difficult to explain.

Charlotte Harbor:

Oysters of marketable size and quality seem to be missing from this large estuary. Hydrographic conditions should be favorable for oysters from the confluence of Myakka and Peace Rivers south to Cape Haze Bay. The lack of suitable bottom materials (rock,planted cultch) is probably the limiting factor. One oldtimer reported a deepwater bar northwest of Pirate Harbor in former years but there is no evidence of it now. Upper Charlotte Harbor would merit some experimental cultch planting to substantiate oyster culture potential. Any plantings, public or private, would be best off the Cape Haze peninsula where they would be in the lee of northwesterlies during the winter harvesting season.

Turtle Bay:

This bay and Bull Bay are the scenes of most oyster lease activity in Charlotte County. When sampled, salinities decreased from oceanic to

about one-half that of seawater from lower to upper Turtle Bay. One large public oyster bar lies at the mouth of Turtle Bay. Oyster growth and quality are best along the north or deep water side of this bar. Only 'coon oysters growing on or near red mangroves were found in upper Turtle Bay and these were scarce. Mud overlying rock typifies most of the upper bay bottom. Rock becomes exposed toward the head of the bay. Crown conchs are plentiful especially near the mouth of the bay. A moderate set of young oysters was observed on shell cultch planted two months before this survey. Shell for cultch was being planted during this survey by blowing it off a small barge with water pressure.

The shell was being mounded in rows on a grassy bottom. Screened rack culture of seed oysters is being tried to control predations by conchs.

Bull Bay:

'Coon oysters are abundant near mangrove islands. One public bar in open water near a red mangrove tuft has been heavily harvested. Most oysters were heavily fouled by barnacles. Dense tunicate (sea squirt) growth indicated prevailing high salinities. Crown conchs and their egg cases are abundant.

Catfish Creek:

Sea urchins (pincushions) and crown conch eggs were abundant and a sign of prevailing high salinities. 'Coon oysters covered by barnacles predominated. One submerged open water bar about one-third up Catfish Creek had a few commercial quality oysters. This 'coon oyster area would be a good source of seed for leases.

Coral Creek:

A dense set of oysters, mostly 'coon but some cupped were attached

to pilings of the railroad bridge. Oyster set was much less at the highway bridge. The upper end of Coral Creek is dammed to provide freshwater reservoir for the Cape Haze development. Coral Creek could be another source of seed oysters for leases.

Gasparilla Sound:

Twelve spoil banks will be placed east of the intracoastal waterway route which runs the length of Gasparilla Sound. Hardshell clams are most concentrated along the inside of Gasparilla Island wherever a firm, sticky mud bottom with seagrass is found. Most of the clams are west of the waterway route on shoals where hand harvesting has been productive but there are probably enough in the deeper water with a sand bottom to justify mechanical dredging when waterway dredging is imminent.

The Grouper Hole, a small embayment formed by a mangrove projection of Gasparilla Island, supports one of the best hardshell clam beds in Florida. Hundreds of bushels of clams have been taken from its muddy, grassy bottom by tonging in recent months and there are still many clams to harvest. This site was checked in February 1961 during a bulkhead line survey when large clams were growing three and four thick in many spots with 15 to 20 clams per square yard. Thinning them out would improve individual quality but it will be important to study long-term effects of intensive harvesting on this clam population.

Very stunted 'coon oysters grow on top of Three Sisters reef which has shell at least two feet thick. This crowded oyster bar lies in the path of the waterway and is a potential source of seed and shell for oyster leases. Most oysters found in Gasparilla Sound are around mangrove islands especially on the mainland side where oyster seed was being collected during this survey.

Placida Harbor:

Hardshell clams are abundant at the island side of the Placida-Boca Grande railroad trestle but less so than farther south in Gasparilla sound. Many clams were killed and their shells exposed in dredging and filling the Gasparilla Island causeway approach to the new highway bridge to Placida. Oyster set is slight on the highway bridge but becomes dense on the railroad trestle at the mainland end where freshwater and upland effluents are less diluted by strictly saline waters. This same effect, but less pronounced, was noticed at the El Jobean railroad trestle across Myakka River. Tunicates were very common at the Placida end of the railroad bridge.

Northerly from the highway bridge, hardshell clams are found mainly near the barrier island side of Placida Harbor with scattered quantities found in deeper water the waterway route follows near the mainland. Scattered hardshell clams are found near Little Gasparilla Pass which was badly silted by Hurricane Donna; oysters are not significant in this area.

The Narrows (from Placida Harbor to southern Lemon Bay):

Large hardshell clams have been heavily harvested just north of the Cape Haze development bridge at the widest part of the Narrows. Clams are still abundant. Oysters, mostly 'coon, are limited to the red mangrove margins. This is primarily a tonging area because water depths average about 5 ft. M.L.W. Dredging of the intracoastal waterway will probably do more proportionate damage to shellfish in this narrow section than anywhere else because of this narrowness and of the restricted tidal flushing of silt that can be expected. Water turbidity was great during the study. A narrow dredge cut has been made northerly to Lemon Bay for navigational purposes. Salinities were near-oceanic and bottoms predom-

inantly sand mud with attached seagrass.

Lemon Bay:

This bay has been noted along the Florida Gulf coast for its hard-shell clams and oysters. During the survey, six boats with 10 hand-clammers were working productive clam beds south of Stump Pass on the barrier island side of the bay. Clams are found from Stump Pass north to the Englewood Beach bridge in the shallow seagrass beds also on the barrier island side. 'Coon oysters are plentiful near mangroves at the mouths of Gottfried Creek and several smaller creeks that flow into Lemon Bay on the mainland side.

Hardshell clams are found in water five to eight feet deep north of the Englewood Beach bridge. These have been heavily tonged in recent months. Clams are also present in shoals north of the bridge but not in such dense concentrations as farther south where freshwater flow is not prominent during the rainy season.

A large oyster bar with commercial quality oysters but also many dead one lies about 300 yards southwest of the Lemon Bay Fisheries Company at Englewood. This bar is mostly subtidal. It had the best oysters found besides those in Tippecanoe and Alligator Bays. 'Coon oyster bars with many dead oysters were found along the mainland side of the bay at a mangrove point midway between Englewood and Forked Creek and at Forked Creek. These bars would probably have marketable oysters in the deeper water around their peripheries in years with adequate rainfall. 'Coon oysters and some cupped three-inch oysters were attached to pilings of the Manasota Key bridge where salinities had decreased to 22.0 o/oo from near-oceanic in lower Lemon Bay. Many more oysters were living in the reduced salinity. One more hydrographic station (42) was made at the head of Lemon Bay where the salinity was less than one-

fourth oceanic.

The intracoastal waterway alignment proceeds through approximately the middle of Lemon Bay north of the Englewood Beach bridge where the bay narrows and clams and marketable oysters lie in the path of dredging. South of the Englewood Beach bridge, the waterway alignment lies east of commercial clam beds but most spoiling will be west of the waterway route on mangrove islands or in open water.

CONCLUSIONS

Because of a bad drouth preceding field investigations for this report water salinities in clam and oyster habitats were abnormally high. Several locations that were fresh (<1.0 o/oo) in September 1960 had readings near that of full strength seawater.

The Peace River bridge at Punta Gorda and the Myakka River bridge at El Jobean are two of the most strategic spots in checking salinities for stratification and the influence of upland watershed and freshwater flow into an estuary (Charlotte Harbor).

The best quality oysters of marketable size found during this survey were in Alligator Bay, Tippecanoe Bay, Lemon Bay near Englewood and Alligator Creek.

More young oysters were alive in those areas where freshwater concentration can discourage marine predators and diseases such as upper Lemon Bay, Coral Creek and Myakka River at El Jobean.

The crown conch, locally the most important oyster predator was observed to be the most abundant in Bull Bay and Turtle Bay. The two bays are center of oyster lease and culture activities.

Heavily populated beds of Rangia marsh clams in the Peace and Myakka Rivers could probably support a commercial fishery if processing proves economically feasible, marketing outlets develop and sources of river

pollution are controlled.

Rangia clams seem to do best where the freshwater-brackish water zone shifts back and forth from rain to drouth.

Hardshell clams are most plentiful on the Gulf side of Gasparilla Sound, Placida Harbor and southern Lemon Bay where seagrasses grow on soft, sticky, sandy mud bottoms along the barrier islands. These clam concentrations lie west of the intracoastal waterway alignment and are shallow enough for hand digging or tonging.

Less dense concentrations of hardshell clams are found in deeper water on harder, sandier bottoms in Gasparilla Sound and Placida Harbor. These areas would be most affected by dredging and spoiling for the waterway. Oysters involved are mostly 'coon but suitable for seeding leases.

Commercial hardshell clams would be most affected by the intracoastal waterway development in the Narrows between Placida Harbor, where large clams are plentiful and 'coon and some cup oysters lie along the mangrove shoreline, and in Lemon Bay in deeper water (six to eight feet) just north of the Englewood Beach bridge. The only oyster bar with significant commercial quantity and quality of oysters subject to the effects of waterway development was in Lemon Bay off Englewood.