

DEPARTMENT OF COMMERCE

BUREAU OF FISHERIES

HUGH M. SMITH, Commissioner

CONDITION AND EXTENT OF THE NATURAL
OYSTER BEDS AND BARREN BOTTOMS IN
THE VICINITY OF APALACHICOLA, FLA.

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APPENDIX V TO THE REPORT OF THE U. S. COMMISSIONER
OF FISHERIES FOR 1916



Bureau of Fisheries Document No. 841

WASHINGTON
GOVERNMENT PRINTING OFFICE

1917

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25 CENTS PER COPY

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By ERNEST DANGLADE, *Scientific Assistant, Bureau of Fisheries.*

INTRODUCTION.

The survey began on January 16, 1915, in the western portion of St. George Sound about 1 mile east of the first oyster bed and was completed April 16 at the western extremity of St. Vincent Sound. The Fisheries steamer *Fish Hawk*, in command of Boatswain J. J. O'Brien, arrived off Apalachicola, Fla., December 21, 1914, and served as the base of operations. The interval from the arrival of the vessel until the beginning of the survey was utilized in recovering triangulation stations established by the United States Coast and Geodetic Survey, constructing signals over these stations, and selecting prominent points for additional and auxiliary signals.

During the progress of the survey 43 signals were built, 3 of which, owing to the low elevation of the shore and the width of Apalachicola Bay, were much larger than any heretofore erected by this Bureau. The signals were anchored and secured by guy lines of telephone wire. Including range beacons, Cape St. George Lighthouse, and other fixed objects, a total of 56 signals were in use. Figure 1 is from a photograph of the signal built on St. Vincent Point.

Permanent cement monuments, in the top of each of which there is a 3-inch brass disk inscribed "U. S. Bureau of Fisheries, 1915," were planted under signals Marsh, Yent, Fet, Cedar, and Schep.

During the early part of the investigation the weather was unfavorable on account of high winds or haze, but there were no violent storms and but few heavy rains. The latter part of the season, especially during the month of April, was almost ideal for both hydrographic work and biological investigations.

Gasoline motor boats were used for the work and proved to be entirely satisfactory for the needs of the party. They were better and more economical than the steam launches employed on previous oyster surveys.

Throughout the survey Boatswain J. J. O'Brien, United States Navy, and Templeton Van de Bogert were the observers. The latter

also did practically all the plotting and made the smooth sheet and chart. The tide-gauge observations were made at Apalachicola by Thomas J. Adams and J. H. Marshall and at the station on St. Vincent Island by Oscar Barrow, all of the *Fish Hawk*. At the remaining stations the readings were made by either civilians or by members of the working party detailed for that purpose. The survey was greatly facilitated by the zeal and interest taken by those engaged in the work.

During the season of 1895-96 the Bureau made a survey of the oyster beds in these waters " from Indian Pass to and including Cat Point, Bulkhead, and East Hole Bars.

HISTORICAL DATA.

Although no written word is left of their labors, the first persons engaged in the oyster industry in this region were undoubtedly the aborigines. These people were evidently keenly observant of the economic worth of oysters and carried on the fishery quite extensively for a long time, as is indicated by the presence of large quantities of oyster shells in long windrows and piles on the banks. This is particularly noticeable along the north shore of the western half of St. Vincent Sound.

The following brief account of this oyster region, covering a period of 80 years, is based on data kindly furnished by John G. Ruge and others of Apalachicola, Fla., and also from the report of the previous survey.

Oysters were first taken for the local market in 1836, but the industry did not attain much importance until 1850. It continued rather active until the Civil War, when work practically ceased. The beds meanwhile improved and were in very good condition. After the war the oyster business was again taken up, but it was not until 1878 that it was carried on at all extensively. It then continued active for about eight years, when, on January 12, 1886, the greater part of the oysters, owing to a series of low tides, was materially injured by a hard freeze. The reefs, however, recovered and the season of 1890-91 was very productive.

During the winter of 1893-94 the beds of St. Vincent Sound and Apalachicola Bay were nearly destroyed, and for the next two years practically no oysters were taken from these places. Meanwhile Cat Point, Bulkhead, and Porter Bars furnished the greater part of the oysters brought to market.

On October 8, 1894, a heavy gale caused many of the oysters to be covered with sand and mud. Then this was followed by a freeze on December 29 and for several days the temperature fell to 14° F.,

* Report of a survey of the oyster regions of St. Vincent Sound, Apalachicola Bay, and St. George Sound, Fla. By Lieut. Franklin Swift, U. S. Navy. Report of the Commissioner for 1896, p. 187-221.

killing many of the oysters that were not protected by sand and mud. On February 7, 1895, the thermometer registered 10° F., being the lowest known in that section, it is said, for 60 years. The fishermen could not catch enough oysters the next year to make a living, and consequently the plants operated for only a short time.

Up to this time the shipments of raw oysters were mainly in the shell to local or near-by points, but during this season the first active shipments of shucked raw oysters were made.

Another freeze occurred on January 28, 1897; at a time when the tide was very low. Owing to the exposure many oysters were destroyed and for the season 1896-97 the dealers handled only about one-half the quantity of the usual yield. However, during the following season, although of shorter duration, production was increased, showing that the beds were recovering in productivity.

On August 2, 1898, a severe gale covered some of the oysters with sand and mud, and in September of that year a very heavy freshet occurred, the combined effects being the destruction of many of the oysters at Cat Point and practically all at St. Vincent. On February 12, 1899, there was another freeze, the temperature dropping to 10° for a few days, but not for as long duration as in 1895. The operation of the two canneries and the shipments of raw oysters during the season of 1898-99 were nearly equal to those for seasons prior to 1895, thus again showing the great productivity of the bars. The output for 1899-1900 was less than for the preceding season, but there was an increase of about 50 per cent in 1900-1901.

A temperature of 20° F., December 16 to 18, 1901, did not result seriously to the oysters, and the output of the canneries and raw shipments for 1901-2 increased, although the season was shorter than the year before. The following year gave about the same returns.

A gale on August 13 and 14, 1903, covered the oysters on Porter Bar with sand and mud, practically destroying them. Cat Point and East Hole Bars were also injured, and St. Vincent Bar, which was regaining its productivity after the disaster of 1898, was covered with sand. The season's operation was very short and the output greatly reduced.

The season of 1904-5 was mostly very favorable. A strike closed one canning plant shortly after it started, but did not interfere with the other. The shipments of raw stock, however, were about as usual, and in the aggregate the output was fully equal to the previous year. There was a temperature of 22° F., February, 1905, but as the winds were favorable for high tides the oysters were not affected.

Although a heavy gale on September 27, 1906, covered many oysters with mud and sand, they were able to recover readily and the damage was slight. The yield of the two seasons, 1905-7, was about normal. The total output from all sources for 1907-8 was quite large. During

the first week of May, 1908, there was a very high freshet accompanied by southeast winds, which prevailed for three days, but they were followed by heavy northwest winds, which drove the fresh water to the eastward, without forming mud deposits, leaving the oysters uninjured. A temperature of 22° F. on February 1, 1909, produced no serious results, and about the middle of March of the same year a heavy freshet occurred, but the prevailing winds forced the fresh water out to East Pass, and, fortunately, it was too early in the season to have any effect on the spat.

On September 20 and 21, 1909, a gale occurred which did but little harm at this place, although there was very extensive damage on Mississippi Sound, and on October 11 and 12 there was another storm, but, owing to the direction of the wind, the oyster reefs escaped practically unharmed.

During the second and third weeks of April, 1910, there was a freshet, but the prevailing wind carried the water eastward, so that the deposit of silt was not sufficient to smother the spat.

The yields for the seasons 1910-1914 were equal to the average. For 1913-14 there were gathered 240,436 tubs, or so-called bushels, statistically reported by the Florida State Shell Fish Commissioner as 120,218 barrels.

The season of 1914-15 bid fair to be a good one, but, incident to the European war, there was less demand for steamed oysters or raw material. So for this season the yield was but 144,940 tubs, or 72,470 barrels.

There was a freshet in January, 1915, but little, if any, damage was done.

METHODS OF THE SURVEY.

The methods employed were those pursued in former surveys of like character, and are explained in detail in a description of the beds of the James River,^a from which some of the following is repeated:

A "boat sheet" was prepared, on which were accurately platted the positions, as determined by triangulation, of lighthouses, buildings, tripods, etc., used as signals. These data were furnished by the United States Coast and Geodetic Survey.

The oyster beds were discovered by soundings with a lead line, but principally by means of a length of chain dragged over the bottom at the end of a copper wire running from the sounding boat. The wire was wound on a reel, and its unwound length was adjusted to the depth of water and the speed of the launch, so that the chain was always on the bottom. Whenever the chain touched a shell or an oyster the shock or vibration was transmitted up the wire to the hand

of a man whose sole duty it was to give heed to such signals and report them to the recorder.

The launches from which the soundings were made were run at a speed between 3 and 4 miles per hour. At intervals of three minutes—in some cases two minutes—the position of the boat was determined by two simultaneous sextant observations of the angles between a set of three signals, the middle one of which was common to the two angles, the position being immediately platted on the boat sheet. At regular intervals of 15 seconds, as measured by a clock under the observation of the recorder, the leadsman made a sounding and reported to the recorder the depth of the water and the character of the bottom, immediately after which the man at the wire reported the character of the chain indications since the last sounding—that is, whether they showed barren bottom or dense, scattering, or very scattering growths of oysters.

With the boat running at 3 miles per hour the soundings were between 60 and 70 feet apart, and, as the speed of the boat was uniform, the location of each was determinable within a yard or two by dividing the platted distance between the positions determined by the sextant by the number of soundings. The chain, of course, gave a continuous indication of the character of the bottom, but the record was made at the regular 15-second intervals observed in sounding.

The chain, while indicating the absence or the relative abundance of objects on the bottom, gives no information as to whether they are shells or oysters, nor, if the latter, their size and condition. To obtain these data it was necessary to supplement the observations already described by others more definite in respect to the desired particulars. Whenever, in the opinion of the officer in charge of the sounding boat, such information was required, a numbered buoy was dropped, the time and number being entered in the sounding book. A launch, which followed the sounding boat, anchored alongside the buoy, and a quantity of the oysters and shells were tonged up, separated by sizes, and counted.

This boat at each station made a known number of "grabs" with the oyster tongs, exercising care to clean the bottom of oysters as thoroughly as possible at each grab. In a given depth of water and using the same boat and tongs, an oysterman will cover practically the same area of the bottom at each grab, but, other factors remaining the same, the area of the grab will decrease with an increase in the depth.

Careful measurements were made and tabulated showing the area per grab covered by the tonger employed on the work at each foot of depth of water and for each pair of tongs and boat used. With these data, and knowing the number of "grabs," the number of

^a Moore, H. F.: Condition and extent of the oyster beds of James River, Va. Bureau of Fisheries document no. 729.

oysters of each size per square yard of bottom was readily obtainable by simple calculation. The following example will illustrate the data obtained and the form of the record:

DEPARTMENT OF COMMERCE.	
BUREAU OF FISHERIES.	
<i>Field record of examinations of oyster beds.</i>	
Serial number, 1001. General locality, <i>Apalachicola Bay.</i>	
Local name of oyster ground, <i>St. Vincent Bar.</i>	
Date, <i>March 25, 1915.</i>	Time, <i>3.15 p. m.</i>
Angle, <i>K 69-70.</i>	Buoy No. <i>7.</i>
Depth, <i>4 feet.</i>	Bottom, <i>Hard.</i>
Bottom soundings, —	Average, —
Density, —	Temperature, —
Condition of water, <i>Clear.</i>	Stage of tide, <i>Ebb.</i>
Tongman, <i>Meyer.</i>	Boat, <i>No. 2.</i>
Number grabs made, <i>8.</i>	Tongs, <i>12 C.</i>
Total area covered, <i>3.05 square yards.</i>	
Number oysters taken { — 1 in., 0.	1 in.—X in., <i>21.</i>
Quantity shells, <i>32.</i>	4 in., <i>17.</i>
Result { Spat per square yard, 0.	Dead, <i>5.</i>
Culls per square yard, <i>6.9.</i>	
Counts per square yard, <i>17.1.</i>	
X in. = cull limit prescribed by law.	

This furnishes an exact statement of the condition of the bed at the spot, which can be platted on the chart with error in position of not more than a few yards. From the data obtained a close estimate may be formed of the number of bushels of oysters and shells per acre in the vicinity of the examination, and, by multiplying the observations, for the bed as a whole. In the course of the survey 1,306 observations were made at various places, both on the natural rocks and on the barren bottoms.

In estimating the productiveness of the bottoms it appeared desirable to use the method employed in Delaware Bay^a rather than that followed in the James River survey.

Where tongs are used exclusively a bed with a given quantity of oysters lying in shoal water is more valuable commercially than one with the same quantity of oysters in deeper water, owing to the fact that the labor of the tonger is more efficient on the former. As has been pointed out, the area covered by a "grab" decreases with the depth, other factors being the same; and, moreover, the deeper the water the greater is the labor involved in making the grab and the smaller is the number of grabs which can be made in a given time. Where, however, the depth is practically uniform and shoal, as in

the region treated in this report, it is unnecessarily refined and laborious to make such allowance for depth, and it is nearly as accurate and satisfactory to rate the bottoms in accordance with an arbitrary standard.

In this report the classification of the relative productiveness of the various beds and parts of beds, as exhibited on the chart and discussed in the text, is as follows:

Dense growth.....	Bearing over 150 bushels per acre.
Scattering growth.....	Bearing between 75 and 150 bushels per acre.
Very scattering growth.....	Bearing between 25 and 75 bushels per acre.
Depleted bottom.....	Bearing less than 25 bushels per acre.

This classification refers solely to oysters of a size assumed to be large enough for the market, in this case to those 3 inches or more in length. As the classification takes no account of the smaller oysters, certain areas bearing a heavy growth of young may be described and shown on the charts as depleted, owing to the paucity of mature oysters. While the charts can not indicate this, the descriptions of the beds show it in all cases. The charts show in general terms the character of the beds in respect to the product available for market, so far as mere size of the oysters is concerned, at the time of the survey. If the oysters were of ordinarily good condition and shape, the areas indicated as bearing dense and scattering growth would yield a product sufficient to make tonging remunerative under the economic conditions existing. Where the market oysters are rated as very scattering, the growth is insufficient to support a fishery at the low price which the product would yield. The depleted bottom is that on which the product of market oysters, at the time of the survey, was very small, and is not necessarily formerly productive bottom now denuded, as might be supposed from a strict definition of the descriptive term employed. On the contrary, it may be formerly barren bottom now coming into production.

The barren bottom, which is that totally devoid of oysters, and in most cases of shells, vastly exceeds the oyster bottom in extent. Its interest in connection with the survey lies in its relative availability for oyster culture; that is, whether or not its general character is such as to enable it to become productive if proper measures to that end be taken. The most important consideration is, usually, the character and degree of stability of its constituent materials. If the bottom be too soft, the shells and oysters deposited thereon will soon become engulfed.

In the earlier surveys the method ordinarily used by oystermen was employed, the consistency of the bottom being determined by probing with a pole. By noting the resistance which the bottom imposes to the penetration of the probe, the observer forms an opinion of its relative hardness and of its suitability in that respect for oyster

^a Moore, H. F.: Condition and extent of the natural oyster beds of Delaware. Bureau of Fisheries document no. 745, 1911.

culture. In many cases different observers will not agree as to the proper term by which to describe the bottom so tested, and it is therefore difficult to convey to another the meaning desired. To overcome this difficulty an instrument^a has been devised which gives these data mechanically, by measuring the number of inches the bottom is penetrated by a plunger of a constant weight and size falling through a uniform distance. The instrument is used from an anchored boat, from 6 to 10 tests being made at each station. Any readings which are markedly higher or lower than the others are discarded on the assumption that the plunger has fallen into a crab hole or other depression, or that it has encountered a shell or similar accidental obstruction. The average of the remaining depths of penetration, as indicated on the scale of inches inscribed on the rod, is regarded as the measure of the consistency of the bottom.

The following designations used to indicate the different degrees of hardness, as shown by the instrument, are arbitrary, although based on the terms used by the oyster growers:

Hard.....	Penetration less than 4 inches.
Stiff.....	Penetration between 4 and 8 inches.
Soft.....	Penetration between 8 and 13 inches.
Very soft.....	Penetration between 13 and 18 inches.
Ooze.....	Penetration over 18 inches.

These various types of bottom are shown on the chart by means of circles, the relative area of black included within them indicating the relative degree of hardness, as follows: Hard, a black circle; stiff, a black semicircle; soft, a black quadrant; very soft, two crossing diameters; ooze, one diameter.

The bottoms classed as hard and stiff, those in which the plunger will not penetrate more than 8 inches, are suitable for planting without preparation, provided they are not composed of shifting sand. As sand invariably gives a reading of less than 4 inches, and is therefore rated as "hard," it follows that all "stiff" bottom shown on the chart by a black semicircle can be accepted as safe for planting. Part of the hard bottom is composed of mud and part of sand. The former may be accepted without hesitation, but the latter should be examined with respect to its liability to shift. Soft bottom should be planted with care, and toward its upper or less consistent limits may require some preliminary hardening with shells or sand. Very soft bottom and ooze should not be considered, as oysters planted there will sink, and if not killed, as is probable, will be ill-shaped and inferior in every respect. The ratings on which the classification is based have been checked by observation on bottoms actually used for oyster culture in Chesapeake Bay.

^a Illustrated and described in "Condition and extent of the natural oyster beds and barren bottoms of Mississippi Sound, Alabama," By H. F. Moore. Bureau of Fisheries document no. 769.

The instrument employed has been thoroughly tested and is reliable for the purposes of oyster surveys, but there may be errors in cases where hard bottom is overlaid by several inches of soft mud and ooze. Such bottoms are always readily detected by probing with a pole.

THE BAY AND SOUNDS.

The oyster grounds and barren bottoms covered by the present survey and reported on in this paper embrace all of Apalachicola Bay and St. Vincent Sound and the western part of St. George Sound. Neither East Bay, with the exception of its southern border, nor Indian Lagoon at the extreme western limits of St. Vincent Sound were included in the work. Although bearing some good oysters, they were not deemed of sufficient economic importance to warrant the expenditure of the time and money. Sheephead and Big Bayous on the northern shore of St. Vincent Island have some good oyster growths, but as these were within the confines of the island they were not examined.

St. George Sound lies within the southern limits of Franklin County, Fla., and is situated between the mainland and St. James Island on the north and east and St. George and Dog Islands and Dog Island Reef on the south. It connects with the Gulf of Mexico at East Pass, Duer Channel, and the shallow water on Dog Island Reef. On the west it unites with Apalachicola Bay on a line between Cat Point and St. George Island. Its length is about 26 miles, and it has an average width of about $3\frac{1}{2}$ miles. Carrabelle River is the only stream flowing into the sound. As only the western portion of the sound supports productive oyster beds, the survey was conducted westward from signals Marsh and Spartan. This part of the sound has an area of about 34 square miles and measures about 7 by $4\frac{1}{2}$ miles and carries about 9 feet at low water. It contains many bars and shoals but is well buoyed for navigation.

Apalachicola Bay is bounded on the north by the mainland and East Bay, on the east by St. George Sound, on the south by St. George Island, and on the west by St. Vincent Island and Sound. Its length is about 14 miles and the greatest width about 7 miles. The direct connection with the Gulf is through West Pass. There are three dredged channels, one through Bulkhead to St. George Sound, one near West Pass, and one in the vicinity of Apalachicola, which afford depths for moderate-draft vessels. The bay receives the waters from the Apalachicola, St. Marks River, and other affluents of East Bay. The greater part of the oyster bars are located in the western portion of the bay; elsewhere the bottom is generally barren and soft.

St. Vincent Sound, a rather shallow body of water, is the western extension of Apalachicola Bay. Beginning with the line between Green and St. Vincent Points it reaches to Indian Pass, a distance of, approximately, $9\frac{1}{2}$ miles. Its width at the eastern end is about 3 miles, and it gradually tapers toward the west until it is about three-fourths mile in width. It has an approximate area of 18 square miles. With the exception of the shallow water along the shore, the eastern third of the sound generally has a soft bottom; the central section contains the greater number of oyster bars; while the western section though practically devoid of large oyster bars, has a hard or shell-gravel bottom. The sound receives no fresh water other than the surface drainage of the adjacent lands and that coming indirectly from the Apalachicola, St. Marks, and other affluents of East Bay.

The greatest depth recorded in St. George Sound was 35 feet; in Apalachicola Bay 13 feet, excepting in dredged channels; in St. Vincent Sound 33 feet; West Pass 55 feet; and Indian Pass 20 feet. On the bar beyond Indian Pass a depth of $6\frac{1}{2}$ feet was found.

The area surveyed embraces, approximately, 130 square miles, of which about 119 square miles consisted of barren bottoms and 11.1 square miles comprised the oyster bars and reefs. The total length of the sounds and bay is about 30 miles and the average width about 4.4 miles.

During the progress of the survey 35,549 soundings were made over a distance of 666.1 miles, and 3,492 sextant angles determined the various positions of the boat. Observations by means of the chain were made constantly throughout the entire distance run by the sounding boat, the oysters were tonged up, examined, and counted at 577 places, and the barren bottoms were tested at 729 stations.

DESCRIPTION OF NATURAL BEDS.

1. GOOSE ISLAND BAR (ST. GEORGE SOUND).

This, the easternmost oyster bar of St. George Sound, is located along the southern border of the sound in the vicinity of Goose Island. Its length, in an east and west direction, is about 1 mile, the average width is nearly one-fourth mile, and the area is about 150 acres. It is directly connected with Silvia Bar by a narrow neck of dense oysters having a width of approximately 150 yards.

The bar lies in rather shallow water, ranging from $2\frac{1}{2}$ to $5\frac{1}{2}$ feet in depth, and, with the exception of both the east and west extremities, is but slightly elevated above the general level of the sound. The bottom, for the most part, is composed of firm hard sand. The area, condition of growth, and estimated content of this bar are shown in the following tables:

OYSTER GROWTH ON GOOSE ISLAND BAR.

Character of oyster growth.	Area.	Oysters per acre.			Estimated content of oysters.
		Under 3 inches.	Over 3 inches.	Total.	
Dense.....	Acres. 24	Bushels. 115	Bushels. 358	Bushels. 473	Bushels. 11,352
Very scattering.....	128	24	58	82	10,332
Total.....	150				21,684

DETAILS OF EXAMINATION OF GOOSE ISLAND BAR.

Station.	Date of examination.	Depth of water.	Area covered.	Oysters caught per square yard.			Shells per square yard.	Estimated quantity oysters per acre.			Character of oyster growth.
				Spat.	Gulls.	Counts.		Seed.	Market.	Total.	
	1915.	Feet.	Sq. yds.					Bush.	Bush.	Bush.	
65.....	Jan. 23	3.0	2.04	0	4.8	12.4	10	41	286	327	Dense.
87.....	do....	5.5	1.87	6.4	12.3	18.5	15	159	382	541	Do.
373.....	Feb. 11	5.0	2.55	0	17.2	17.0	10	146	406	552	Do.
41.....	Jan. 21	2.0	3.56	.3	2.5	2.5	2	24	58	82	Very scattering.

That portion of the bar immediately contiguous to Goose Island, and containing about five-sixths of the total area, has but a scattering growth of oysters, while the remaining portion, which lies to the extreme west, has a dense growth. The oysters occur generally in large clusters, with sharp edges. Mussels were only fairly abundant, but the greatest disadvantage to the growth of oysters was the presence of both red and green algæ, which at times was in quantities sufficient to smother the oysters. Tonging was not carried on extensively, especially on the very scattering area, and during our observations only one or two boats were engaged in the fishery on the dense portion.

2. SILVIA BAR.

This comparatively small bed of 69 acres is directly connected with Goose Island bed on the east and Drum Bar on the southeast. There are, however, no distinct lines of demarcation separating the three beds, the divisions being more or less arbitrarily made. The bed is very irregular in shape, the northernmost half consisting of a projecting point bearing a crude resemblance in outline to a turtle's head. Its length is about five-eighths of a mile and the average width approaches 200 yards. The depth of water is from $2\frac{1}{2}$ to 9 feet, while the bed is elevated above the immediate level from $1\frac{1}{2}$ to 8 feet, the greatest difference being along the western border, which is near the ship channel. The bottom consists of sand or sand and mud.

The bed is composed of dense, scattering, and very scattering growths, as shown in the following tables:

OYSTER GROWTH ON SILVIA BAR.

Character of oyster growth.	Area.	Oysters per acre.			Estimated content of oysters.
		Under 3 inches.	Over 3 inches.	Total.	
	Acres.	Bushels.	Bushels.	Bushels.	Bushels.
Dense.....	57	136	337	473	26,961
Scattering.....	4	165	104	269	1,076
Very scattering.....	8	4	67	71	508
Total.....	69				28,505

DETAILS OF EXAMINATION OF SILVIA BAR.

Station.	Date of examination.	Depth of water.	Area covered.	Oysters caught per square yard.			Shells per square yard.	Estimated quantity oysters per acre.			Character of oyster growth.
				Spat.	Culls.	Counts.		Seed.	Market.	Total.	
		Fect.	Sq. yds.					Bush.	Bush.	Bush.	
77.....	1915. Jan. 23	7.5	1.55	20.0	13.5	20.0	4	255	463	718	Dense.
78.....	do.....	9.0	1.55	5.1	13.9	22.5	17	161	520	681	Do.
79.....	do.....	8.5	1.55	2.9	3.8	4.5	4	57	104	161	Do.
80.....	do.....	3.5	2.70	6.3	5.9	8.1	25	104	187	291	Do.
81.....	do.....	6.0	1.75	3.4	17.3	20.6	30	176	475	651	Do.
372.....	Feb. 11	8.0	2.04	1.4	3.9	11.7	10	33	270	303	Do.
91.....	Jan. 23	7.0	1.55	9.7	9.7	4.5	24	165	104	269	Scattering.
371.....	Feb. 11	10.0	2.04	1.4	0.5	2.9	5	4	67	71	Very scattering.

The oysters of this bar occur in clusters of rather good shape, excepting a few of the raccoon or scissor-bill type on the top of the bar. Some algæ, a few mussels, barnacles, *Martesia*, and coral were observed at nearly all of the stations. The oysters, on the day of the examination, were generally of good flavor and fat, more especially on the western and southwestern limits of the bed.

3. DRUM BAR.

This bar may be considered as the southward extension of Silvia Bar, with which it is connected. It forms a somewhat irregular half circle in outline. The depth of water on the bed varies from 2½ to 9 feet. The elevation above the surrounding bottoms is from 1 to 3 feet. The dimensions are approximately 1 mile in length by 350 yards in width. The area is 111 acres, of which about 73 per cent supports dense growth, the remainder being depleted. The bottom is generally hard, excepting along the southern border, where it is composed of mud or mud and sand. The extent and general condition of the bed are shown in the following tables:

OYSTER GROWTH ON DRUM BAR.

Character of oyster growth.	Area.	Oysters per acre.			Estimated content of oysters.
		Under 3 inches.	Over 3 inches.	Total.	
	Acres.	Bushels.	Bushels.	Bushels.	Bushels.
Dense.....	81	108	336	444	35,964
Depleted.....	30	32	12	44	1,320
Total.....	111				37,284

DETAILS OF EXAMINATION OF DRUM BAR.

Station.	Date of examination.	Depth of water.	Area covered.	Oysters caught per square yard.			Shells per square yard.	Estimated quantity oysters per acre.			Character of oyster growth.
				Spat.	Culls.	Counts.		Seed.	Market.	Total.	
		Fect.	Sq. yds.					Bush.	Bush.	Bush.	
68.....	1915. Jan. 23	5.0	2.00	1.5	9.5	20.0	13	81	462	543	Dense.
73.....	do.....	9.0	1.55	9.3	11.9	33.1	54	180	774	954	Do.
76.....	do.....	9.5	1.55	8.7	8.1	6.8	12	143	157	300	Do.
84.....	do.....	7.5	1.55	1.9	14.8	9.0	10	142	208	350	Do.
85.....	do.....	8.0	1.55	2.6	4.5	5.1	8	60	118	178	Do.
86.....	do.....	5.0	2.00	1.5	13.0	11.5	28	123	255	378	Do.
366.....	Feb. 11	8.0	2.04	2.5	10.8	23.1	15	92	533	625	Do.
367.....	do.....	6.5	2.12	5.6	10.4	10.8	9	88	250	338	Do.
368.....	do.....	5.0	2.55	4	16.1	21.2	21	137	490	627	Do.
369.....	do.....	6.5	2.38	1.2	3.4	4.6	9	29	106	135	Do.
74.....	Jan. 23	11.0	1.55	0	7.5	0	4	64	0	64	Depleted.
370.....	Feb. 11	7.0	2.04	0	0	1.0	3	0	23	23	Do.

The oysters are found in large irregular clusters with sharp edges, but occasionally they are taken as singles. On the upper half of the bar they are of rather good quality, but on the lower portion they are inclined to be watery and in poor condition, more particularly on the softer bottoms, where they are but seldom fished. A number of barnacles, mussels, and an extensive growth of algæ were observed on the oysters.

4. SAND FLAT.

This beach bed is situated off Shell Point of St. George Island and is south of Drum Bar and separated from it by a narrow channel having a depth of 5 to 7 feet. It measures about one-half mile in length by one-eighth mile in width and has an area of 40 acres. The depth of water ranges from 1½ to 5 feet. The bottom is hard firm sand. The northern rim of the bed is about 2 feet above the adjacent bottoms, while the southern portion becomes gradually shallower to the water's edge. The tables given herewith present in outline the general conditions on this bed:

OYSTER GROWTH ON SAND FLAT.

Character of oyster growth.	Area.	Oysters per acre.			Estimated content of oysters.
		Under 3 inches.	Over 3 inches.	Total.	
Dense.....	20	77	231	308	6,180
Scattering.....	20	77	115	192	3,840
Total.....	40				10,000

DETAILS OF EXAMINATION OF SAND FLAT.

Station.	Date of examination.	Depth of water.	Area covered.	Oysters caught per square yard.			Shells per square yard.	Estimated quantity oysters per acre.			Character of oyster growth.
				Spat.	Culls.	Counts.		Seed.	Market.	Total.	
83.....	1915. Jan. 23	Feet. 5.0	Sq. yds. 2.00	0	9.0	10.0	2	Bush. 77	Bush. 231	Bush. 308	Dense.
75.....	do.....	4.5	2.23	1.4	7.7	5.0	12	77	115	192	Scattering.

The northeastern half of the bar supports dense growth of oysters, the remaining portion being scattering. Practically no fishing is carried on at this place, as beach oysters usually lack flavor and fatness. No doubt the character of the mollusks would be improved if the clusters were broken up and culled. Some mussels, barnacles, and marine algæ were found growing on the oysters.

5. PELICAN BAR.

This bar is located about three-eighths mile north of Goose Island and, exclusive of the eastern projection, is somewhat rudely circular in outline. The depth of water is from 1½ to 5½ feet, the greatest depth being along the western margin. The bar extends in an east-and-west direction for five-eighths mile and averages about one-fourth mile in width. It has an area of 97 acres. The entire bed is fairly well raised above the neighboring bottoms from ½ to 3½ feet. The following tables show the data obtained from this bed:

OYSTER GROWTH ON PELICAN BAR.

Character of oyster growth.	Area.	Oysters per acre.			Estimated content of oysters.
		Under 3 inches.	Over 3 inches.	Total.	
Dense.....	69	97	453	550	37,950
Scattering.....	17	106	180	286	4,012
Very scattering.....	6	30	46	76	456
Depleted.....	5	19	21	40	200
Total.....	97				42,618

DETAILS OF EXAMINATION OF PELICAN BAR.

Station.	Date of examination.	Depth of water.	Area covered.	Oysters caught per square yard.			Shells per square yard.	Estimated quantity oysters per acre.			Character of oyster growth.
				Spat.	Culls.	Counts.		Seed.	Market.	Total.	
59.....	1915. Jan. 23	Feet. 3.0	Sq. yds. 2.05	0	1.7	22.7	1	Bush. 14	Bush. 524	Bush. 538	Dense.
60.....	do.....	5.0	2.00	0.5	8.0	23.0	15	72	531	603	Do.
61.....	do.....	4.5	2.23	0	3.1	23.1	7	26	533	559	Do.
62.....	do.....	5.0	2.00	15	16.5	25.0	25	145	577	722	Do.
89.....	do.....	6.0	1.75	0	6.8	6.8	14	58	157	215	Do.
90.....	do.....	7.5	1.55	3.2	25.8	22.6	20	246	522	768	Do.
108.....	Jan. 25	8.0	2.95	3	13.9	14.3	3	113	330	443	Do.
88.....	Jan. 23	6.0	1.75	6.8	12.0	5.7	9	160	132	292	Scattering.
107.....	Jan. 25	5.0	2.00	1.0	6.0	5.5	5	51	127	178	Do.
42.....	Jan. 21	5.0	2.00	5.5	3.0	2.0	2	30	46	76	Very scattering.
58.....	Jan. 23	4.5	2.23	5.3	2.2	.9	9	19	21	40	Depleted.

The greater part of the bar has dense growth of oysters, a portion of the southern and western borders has scattering growth, while to the eastward very scattering and depleted areas are found. The oysters occur in rather large clusters and, as a rule, are only of fair quality. The bed is not extensively fished, although some factory stock is taken. Mussels and barnacles were not excessive, but some of our stations revealed an extra heavy growth of algæ.

6. NORTH LUMP.

This small patch of 10 acres is situated about 600 yards due north of Pelican Bar and a short distance south of the center of the sound. It is cordate, or trilobe, in form, measuring about 300 yards in length and 160 yards in width. At mean low water the depth is from 4 to 11 feet, the greatest depth being on the south and west central portions. The adjoining bottoms, which are composed of soft to stiff mud, have a depth of 11 to 14 feet. The following tables show the area of the different growths and details of examination of this bed:

OYSTER GROWTH ON NORTH LUMP.

Character of oyster growth.	Area.	Oysters per acre.			Estimated content of oysters.
		Under 3 inches.	Over 3 inches.	Total.	
Scattering.....	6	81	145	226	1,130
Depleted.....	5	7		7	35
Total.....	10				1,165

DETAILS OF EXAMINATION OF NORTH LUMP.

Sta- tion.	Date of exami- nation.	Depth, of water.	Area, cov- ered.	Oysters caught per square yard.			Shells per square yard.	Estimated quantity oysters per acre.			Character of oyster growth.
				Spat.	Culls.	Counts.		Seed.	Mar- ket.	Total.	
111.....	1915. Jan. 25	<i>Fect.</i> 11.5	<i>Sq. yds.</i> 1.55	1.3	10.9	7.1	1	<i>Bush.</i> 93	<i>Bush.</i> 164	<i>Bush.</i> 257	Scattering.
116.....	do.	6.0	1.75	0	9.1	8.0	2	77	185	262	Do.
110.....	do.	5.0	2.00	2.0	11.0	5.5	4	93	127	220	Do.
112.....	do.	7.5	1.55	0	7.1	4.5	15	60	104	164	Do.
109.....	do.	9.0	1.55	0	2.6	0	13	22	0	22	Depleted.
113.....	do.	a 12.0									Do.
114.....	do.	8.0	1.55	0	.6	0	20	5	0	5	Do.
115.....	do.	a 13.5									Do.

a Hard bottom.

The oysters are in sharp-edged clusters of good shape, and when examined were in good condition and flavor, but fresh. It was stated that two men could tong 20 barrels in one and one-half days.

7. GREEN POINT BAR AND ADJACENT PATCH.

Green Point Bar is situated about $1\frac{1}{2}$ miles off the main shore of the sound and about the same distance north of North Lump. Its dimensions are about five-eighths mile in length by one-eighth mile in width. Including the adjacent patch 300 yards to the north, the area is approximately 57 acres. The bar is well raised above the contiguous bottoms and has a depth of 3 to $5\frac{1}{2}$ feet at mean low water. The upper limits of the bar have very scattering growth, the central portion is dense, while the lower third has dense, scattering, and depleted areas. The small patch has very scattering growth and depleted bottoms.

The oysters occur in small clusters or singles of fair shape, and when examined were fat, of good flavor, but fresh. Red and green algæ and *Martesia* were noted. The bed is fished for raw stock, but not extensively.

The general conditions on the bar and patch are shown in the following tables:

OYSTER GROWTH ON GREEN POINT BAR AND ADJACENT PATCH.

Character of oyster growth.	Area.	Oysters per acre.			Esti- mated content of oysters.
		Under 3 inches.	Over 3 inches.	Total.	
Dense.....	<i>Acres.</i> 21	<i>Bushels.</i> 106	<i>Bushels.</i> 194	<i>Bushels.</i> 300	<i>Bushels.</i> 6,300
Scattering.....	9	24	132	156	1,404
Very scattering.....	17	21	67	88	1,496
Depleted.....	10	21	20	41	410
Total.....	57				9,610

DETAILS OF EXAMINATION OF GREEN POINT BAR AND ADJACENT PATCH.

Sta- tion.	Date of exami- nation.	Depth, of water.	Area, cov- ered.	Oysters caught per square yard.			Shells per square yard.	Estimated quantity oysters per acre.			Character of oyster growth.
				Spat.	Culls.	Counts.		Seed.	Mar- ket.	Total.	
96.....	1915. Jan. 25	<i>Fect.</i> 6.5	<i>Sq. yds.</i> 1.62	10.3	9.7	7.9	18	<i>Bush.</i> 170	<i>Bush.</i> 183	<i>Bush.</i> 353	Dense.
98.....	do.	5.0	2.00	5.5	5.0	8.0	38	89	185	274	Do.
99.....	do.	4.0	2.46	2.4	4.4	9.3	6	58	215	273	Do.
97.....	do.	4.0	2.46	1.6	1.2	5.7	10	24	132	156	Scattering.
35.....	Jan. 21	6.0	1.75	0	2.3	3.1	18	19	72	91	Very scattering.
101.....	Jan. 25	7.0	1.55	5.7	2.7	2.7	8	23	62	85	Do.
29.....	Jan. 21	8.0									Depleted.
30.....	do.	8.0									Do.
31.....	do.	7.0									Do.
40.....	Jan. 23	6.0	1.75	1.1	1.1	1.7	5	19	39	58	Do.
95.....	Jan. 25	8.0	1.55	1.3	1.3	0	4	22	0		Do.

8. PLATFORM BAR.

This long narrow bar is located a little south of the center of the sound, and extends from Porter Light west by north for three-quarters of its length, thence the trend is due north. Its dimensions are, approximately, $2\frac{1}{4}$ miles in length by one-fourth mile in width. Its area is about 339 acres. The bar has a depth of water ranging from 3 to 7 feet and is elevated above the contiguous bottoms from 1 to 20 feet, the greatest difference abutting the channel in the vicinity of the light at the eastern extremity. The bottom is generally firm and consists of mud and sand, although the margins are occasionally found to be rather soft. Over 60 biological stations were made, the results of which are given in the following tables:

OYSTER GROWTH ON PLATFORM BAR.

Character of oyster growth.	Area.	Oysters per acre.			Esti- mated content of oysters.
		Under 3 inches.	Over 3 inches.	Total.	
Dense.....	<i>Acres.</i> 332	<i>Bushels.</i> 111	<i>Bushels.</i> 671	<i>Bushels.</i> 782	<i>Bushels.</i> 259,624
Very scattering.....	5	0	18	18	90
Depleted.....	2	0	0	0	0
Total.....	339				259,714

DETAILS OF EXAMINATION OF PLATFORM BAR.

Station.	Date of examination.	Depth of water.	Area covered.	Oysters caught per square yard.			Shells per square yard.	Estimated quantity oysters per acre.			Character of oyster growth.
				Spat.	Culls.	Counts.		Seed.	Mar-ket.	Total.	
	1915.	<i>Fect.</i>	<i>Sq. yds.</i>					<i>Bush.</i>	<i>Bush.</i>	<i>Bush.</i>	
70	Jan. 23	5.0	2.00	1.5	11.5	11.0	46	111	254	365	Dense.
71	do.	5.0	2.00	1.0	11.5	5.5	40	107	127	234	Do.
173	Jan. 28	7.0	2.04	0	12.8	31.9	3	109	730	839	Do.
174	do.	6.0	2.21	0	9.9	19.9	4	84	400	544	Do.
175	do.	5.0	2.55	8.6	22.7	37.7	3	193	856	1,049	Do.
177	Jan. 30	7.5	2.04	0	39.8	34.4	6	338	786	1,124	Do.
184	do.	3.0	3.66	0	11.8	15.6	7	100	360	460	Do.
185	do.	4.0	3.05	0	5.5	18.0	8	47	415	462	Do.
186	do.	5.0	2.55	8	22.3	33.4	4	189	773	962	Do.
187	do.	6.0	2.21	2.7	20.4	39.9	7	173	922	1,095	Do.
199	do.	6.0	2.21	1.8	15.4	29.4	7	131	679	810	Do.
200	do.	5.0	2.55	8	12.2	20.8	8	104	618	722	Do.
201	do.	5.0	2.55	4	21.2	30.9	7	180	714	894	Do.
202	do.	5.0	2.55	0	11.8	22.4	8	100	515	615	Do.
204	do.	4.0	3.05	0	11.8	11.4	6	100	332	432	Do.
205	do.	4.5	2.75	3.3	16.0	60.7	15	136	1,402	1,538	Do.
206	do.	6.5	2.12	2.9	8.1	25.2	5	69	582	651	Do.
207	do.	7.0	2.04	0	13.7	27.0	3	110	624	740	Do.
208	do.	8.0	2.04	0	3.9	2.9	2	33	67	100	Do.
209	do.	8.5	2.04	0	14.7	13.2	5	125	305	430	Do.
210	do.	6.5	2.12	0	21.4	41.5	4	182	959	1,141	Do.
218	Feb. 2	9.0	2.04	0	13.8	17.2	1	117	397	514	Do.
219	do.	9.0	2.04	5	3.9	8.8	5	43	203	236	Do.
220	do.	7.0	2.04	2.9	14.7	25.5	7	125	589	714	Do.
221	do.	5.0	2.55	4	15.3	14.5	5	180	335	465	Do.
222	do.	3.5	3.35	4.5	10.1	21.5	6	137	496	633	Do.
223	do.	5.5	2.38	1.3	19.7	34.0	2	167	785	952	Do.
224	do.	5.0	2.55	8	22.7	35.3	13	193	816	1,009	Do.
225	do.	5.0	2.55	0	31.3	64.2	6	268	1,483	1,749	Do.
226	do.	5.0	2.55	1.0	13.3	21.2	7	118	594	682	Do.
374	Feb. 11	5.0	2.55	0	3.1	9.4	7	26	217	243	Do.
375	do.	5.0	2.55	0	17.2	32.2	12	140	744	890	Do.
377	do.	6.0	2.21	0	21.2	58.7	7	180	1,355	1,535	Do.
378	do.	5.5	2.38	0	16.4	50.3	10	139	1,301	1,440	Do.
379	do.	4.5	2.80	0	10.7	33.2	8	91	760	857	Do.
380	do.	6.5	2.12	0	14.2	44.3	6	121	1,025	1,046	Do.
381	do.	5.5	2.38	4	10.9	37.4	6	94	864	958	Do.
382	do.	5.0	2.55	0	10.2	27.4	10	87	684	721	Do.
383	do.	4.0	3.05	0	0.2	14.4	3	53	332	385	Do.
384	do.	5.0	2.55	0	14.5	23.2	30	123	535	658	Do.
385	do.	7.0	2.04	0	23.1	60.7	3	196	1,541	1,737	Do.
386	do.	6.0	2.21	0	10.0	31.2	9	85	721	806	Do.
387	do.	4.0	3.05	0	10.7	14.4	11	91	332	423	Do.
388	do.	4.0	3.05	0	7.2	27.8	6	61	642	703	Do.
389	do.	6.0	2.21	9	13.1	44.3	9	111	1,025	1,130	Do.
392	do.	8.0	2.04	0	6.4	29.4	5	54	680	734	Do.
393	do.	7.0	2.04	0	7.3	35.8	6	62	827	889	Do.
394	do.	4.5	2.80	0	10.7	33.5	6	91	774	865	Do.
395	do.	4.5	2.80	0	11.0	29.0	7	93	684	777	Do.
396	do.	4.5	2.80	0	12.1	18.2	6	103	420	523	Do.
397	do.	5.0	2.55	0	15.3	41.6	7	130	902	1,002	Do.
398	do.	5.0	2.55	0	10.8	40.3	12	143	925	1,068	Do.
399	do.	8.5	(a)	0							Do.
401	do.	4.5	2.80	0	10.7	39.3	3	91	907	998	Do.
402	do.	6.0	2.21	0	9.5	26.2	6	81	605	686	Do.
403	do.	7.0	2.04	0	7.3	21.1	11	62	480	548	Do.
405	do.	5.0	2.55	1.2	6.7	25.5	10	57	581	638	Do.
406	do.	5.0	2.55	0	19.6	58.8	10	167	1,353	1,525	Do.
407	do.	7.0	2.04	5	9.8	43.6	4	83	1,008	1,091	Do.
408	do.	7.0	2.04	2.5	10.8	45.1	16	92	1,040	1,132	Do.
409	do.	9.0	2.04	0	4.4	28.4	3	37	655	692	Do.
400	do.	8.0	2.04	0	0	3.4	1	0	78	78	Do.
404	do.	9.0	2.04	0	0	4.4	2	0	101	101	Do.
390	do.	8.0	2.04	0	0	1.5	2	0	35	35	Do.
391	do.	9.0	(b)								Very scattering.
370	do.	9.5	(a)								Depleted.

a Hard bottom.

b Hard mud and sand.

The entire bar, with the exception of two small tracts totaling 7 acres and a mud hole of about 5 acres northwest of the light, supports dense growth of oysters. For the most part, the oysters occur in large, irregular clusters, and are inclined to be flattish and, at times, of the scissor-bill type. The quality varies from poor to fair, and during the examination they were fresh and rather watery. It appears that the bed is not worked enough to break up the clusters to obtain the best results. The fishery is pursued chiefly for steam stock. The daily yield is from 15 to 25 tubs for two men; price, about 35 cents per tub. Mussels and barnacles were not plentiful, but on some of the stations an abundance of algæ occurred on the clusters. One rather large drill was found, but no injured oysters having drill holes were observed.

9. PORTER BAR.

This fine bed, slightly more than 1 mile north of Platform Bar, consists of a tongue-like projection, which, from its origin of a skirting of oysters along the main shore, reaches in a southeasterly direction for a distance of 2½ miles. It is about 320 yards wide and has an area of 260 acres. The depth of water is from 2 to 6 feet, while the adjoining grounds are from 2 to 7 feet deeper. The bed is, therefore, well elevated, and, as the tide ebbs and flows almost at right angles to its length, the oysters are generally kept clean and are furnished with an abundance of food material. The bar has a firm foundation and for the most part is sand or gravel, although some of our stations revealed considerable mud. The following tables indicate its area and distribution of oyster growth:

OYSTER GROWTH ON PORTER BAR.

Character of oyster growth.	Area.	Oysters per acre.			Estimated content of oysters.
		Under 3 inches.	Over 3 inches.	Total.	
	<i>Acres.</i>	<i>Bushels.</i>	<i>Bushels.</i>	<i>Bushels.</i>	<i>Bushels.</i>
Dense.....	114	94	248	342	38,988
Scattering.....	0	53	114	167	1,503
Very scattering.....	25	12	47	59	1,475
Depleted.....	112	27	25	52	5,824
Total.....	260				47,790

DETAILS OF EXAMINATION OF PORTER BAR.

Station.	Date of examination.	Depth of water.	Area covered.	Oysters caught per square yard.			Shells per square yard.	Estimated quantity oysters per acre.			Character of oyster growth.
				Spat.	Culls.	Counts.		Seed.	Market.	Total.	
	1915.	Feet.	Sq. yds.					Bush.	Bush.	Bush.	
117....	Jan. 25	8.5	1.55	0	5.1	9.0	1	43	208	251	Dense.
118....	do.	6.0	1.75	0	20.6	12.6	7	175	291	466	Do.
119....	do.	8.5	1.55	0	3.8	4.5	10	32	104	136	Do.
120....	do.	7.0	1.55	7.6	15.9	10.8	20	135	249	384	Do.
124....	do.	4.5	2.23	1.8	10.8	7.1	3	92	164	256	Do.
127....	do.	6.5	1.62	3.2	5.3	10.7	6	45	247	292	Do.
128....	do.	6.0	1.75	4.0	10.8	18.8	4	92	434	526	Do.
131....	do.	5.5	1.87	.5	11.2	14.9	4	95	344	439	Do.
132....	do.	3.5	2.70	2.9	6.3	6.7	10	54	154	208	Do.
134....	do.	6.5	1.62	0.6	7.3	13.9	4	62	321	383	Do.
135....	do.	4.5	2.23	2.6	11.5	9.3	5	98	215	313	Do.
140....	do.	5.5	1.87	8.0	19.8	9.1	14	168	210	378	Do.
142....	do.	6.0	1.75	9.1	10.0	12.0	3	136	277	413	Do.
123....	do.	6.5	1.62	1.8	9.7	4.3	11	82	99	181	Scattering.
125....	do.	7.0	1.55	1.9	6.4	5.7	3	54	132	186	Do.
143....	do.	4.5	2.23	2.6	2.6	4.8	3	22	111	133	Do.
121....	do.	6.5	1.62	0	1.8	2.4	9	9	55	64	Very scattering.
122....	do.	9.0	1.55	1.9	1.3	1.9	7	9	44	53	Do.
133 a	do.	7.5	1.55	0	1.3	1.3	1	9	30	39	Do.
141....	do.	4.5	2.23	3.5	2.2	2.6	9	19	60	79	Do.
129....	Jan. 25	8.0	1.55	0	1.4	0	3	12	0	12	Do.
136....	do.	5.0	2.00	2.5	2.0	1.0	3	17	23	40	Depleted.
137....	do.	7.5	1.55	5.7	3.1	1.9	3	26	25	51	Do.
138....	do.	7.0	1.55	4.4	1.9	1.3	2	16	24	40	Do.
139....	do.	5.5	1.87	.5	.5	1.6	6	4	25	29	Do.
144....	do.	3.5	2.70	3.3	5.8	1.8	12	40	25	74	Do.
166....	Jan. 28	4.0	3.05	4.9	7.5	1.6	6	64	25	89	Do.
167....	do.	3.0	3.65	.3	3.3	2.5	3	28	58	86	Do.

a Off edge of bar.

The dense and depleted areas occupy about 43 per cent each of the entire bar, the remaining portions being populated by scattering or very scattering growth. The oysters, which occur both in clusters and as singles, are of good shape and size. At the time of the investigation they were fat, of good quality, and in demand. They hold their flavor after being shucked, command a higher price per tub than the product of the neighboring beds, and are considered to be the best grade in St. George Sound. From three to five schooners were engaged in the industry on this bar. But very few mussels, barnacles, or coral were noted, although there was some algæ along the inner limits of the bar.

The shape of this bed and its position in the sound subject it adversely, more than otherwise would happen, to the occasional violent storms and render it liable to almost complete destruction. Conditions of this kind have occurred, and it required some years to reestablish its former productiveness.

10. PEANUT PATCH.

From its union with the southeastern extremity of Cat Point Bar this patch has a due east course for 1 mile, with an average breadth of about 330 yards and an area of 123 acres. In outline it bears a crude resemblance to a peanut. The depth of water is from 4½ to 7 feet

and averages about 6 feet. The connecting grounds on the north side are about 1 foot below the bed, but on the south side, being near the channel, they are 3 or 4 feet deeper. The bottom consists mostly of mud. The patch is composed entirely of dense growth, as shown in the following tables:

OYSTER GROWTH ON PEANUT PATCH.

Character of oyster growth.	Area.	Oysters per acre.			Estimated content of oysters.
		Under 3 inches.	Over 3 inches.	Total.	
Dense.....	Acres. 123	Bushels. 140	Bushels. 547	Bushels. 687	Bushels. 84,501

DETAILS OF EXAMINATION OF PEANUT PATCH.

Station.	Date of examination.	Depth of water.	Area covered.	Oysters caught per square yard.			Shells per square yard.	Estimated quantity oysters per acre.			Character of oyster growth.
				Spat.	Culls.	Counts.		Seed.	Market.	Total.	
	1915.	Feet.	Sq. yds.					Bush.	Bush.	Bush.	
241....	Feb. 3	6.0	2.21	0	13.6	14.9	4	121	396	517	Dense.
242....	do.	6.0	2.21	0	18.5	15.8	5	165	420	585	Do.
250....	do.	6.0	2.21	0	22.0	19.0	7	169	506	675	Do.
251....	do.	5.5	2.38	.8	10.5	10.5	4	93	279	372	Do.
260....	do.	7.0	2.04	0	8.8	12.3	2	78	327	405	Do.
261....	do.	6.0	2.21	1.4	9.9	26.2	1	88	696	784	Do.
268....	do.	6.0	2.21	0	13.1	10.4	9	110	277	387	Do.
269....	do.	6.0	2.21	2.3	18.5	22.2	5	165	591	756	Do.
270....	do.	6.0	2.21	.9	30.3	22.2	8	260	591	851	Do.
271....	do.	6.5	2.12	.9	30.6	19.8	10	260	526	788	Do.
457....	Feb. 15	7.0	2.04	0	16.2	34.3	10	138	792	930	Do.
458....	do.	7.5	2.04	1.5	16.2	52.4	2	144	1,394	1,538	Do.
459....	do.	8.0	2.04	0	6.9	20.1	6	61	535	596	Do.
494....	Feb. 17	7.0	2.04	0	2.0	6.4	0	13	170	183	Do.
495....	do.	7.0	2.04	0	25.0	26.7	0	222	710	932	Do.

The oysters were found mostly in clusters, although some singles were noted. A number of the stations, especially on the eastern half of the bed, showed rather a large percentage of the raccoon or scissor-bill type. On the days of the examination the oysters varied in quality from poor to good, the better grades being on the central and west portions of the bed. They are used largely for steam stock. Barnacles, mussels, coral, and *Martesia* were observed at nearly all of the stations, but in small quantities.

11. CAT POINT BAR.

It may be said that this large, productive bar has its origin in a broad skirting of dense growth along the north shore at Cat Point and spreads southward to the dredged channel or cut-in line of beacons B. C. F. and B. C. R. The channel is recognized as an arbitrary line of demarcation. The bed, however, extends entirely across the sound to St. George Island, a distance of about 4 miles.

The eastern boundary is practically a straight line running in a south-southeast direction to Peanut Patch. The western boundary is indented and very irregular and has two rather prominent projections and two corresponding inlets or bays. It has a length of about 2 miles, an average width of five-eighths mile, and an area of 794 acres. The depth of water ranges from 3 to 7 feet, the greater depth being along the east and west terminations. Through the center of the bed there is a rather broad north and south ridge, which slopes both to the east and west. The marginal elevations are from 1 to 2 feet above the adjacent regions. The bottom is firm and in good condition, excepting that the east and west borders are inclined to be soft or muddy.

The present limits of the bed have not changed greatly since the survey made 20 years ago. It appears, however, that there has been a gradual shifting to the westward and that the western border has become more irregular and indented. The width has remained nearly constant.

The greater part of the bar is covered by dense growth, within which are four patches of scattering growth and one small area of depleted bottom. The oysters are found mostly in rather small clusters and singles. Not many of the raccoon or scissor-bill type were observed. They vary in flavor from fair to good and fatten readily when the comparatively fresh and food-laden water from East Bay flows over the bed.

The bar is extensively fished and has been a good producer. During the survey as many as 38 oyster schooners were engaged in the industry at one time. There were shipped daily to Carrabelle, Fla., from this and some of the bars to the eastward from 75 to 150 gallons of oysters. Out of 100 gallons of freshly shucked stock there was only about 1 quart of dark or discarded oysters of poor quality. No pink or yellow color was observed or reported from this bed. The oysters will yield about 1½ gallons per tub of 2.2 standard bushels.

There were many mussels and barnacles and some *Martesia* in the old shells. Algæ were found on the clusters near shore.

The following tables show the area and distribution of oyster growth:

OYSTER GROWTH ON CAT POINT BAR.

Character of oyster growth.	Area.	Oysters per acre.			Estimated content of oysters.
		Under 3 inches.	Over 3 inches.	Total.	
		Bushels.	Bushels.	Bushels.	Bushels.
Dense.....	686	78	473	551	377,996
Scattering.....	102	40	164	15,708	604
Depleted.....	6	63	21	84	
Total.....	794				394,198

DETAILS OF EXAMINATION OF CAT POINT BAR.

Station.	Date of examination.	Depth of water.	Area covered.	Oysters caught per square yard.			Shells per square yard.	Estimated quantity oysters per acre.			Character of oyster growth.
				Spat.	Culls.	Counts.		Seed.	Market.	Total.	
276....	1915. Feb. 3	Feet. 3.5	Sq. yds. 3.35	2.7	8.9	7.1	3	Bush. 79	Bush. 159	Bush. 288	Dense.
277....	do.	3.5	3.35	2.8	9.2	8.1	3	82	216	298	Do.
278....	do.	3.5	3.35	2.4	16.1	12.5	5	143	332	475	Do.
279....	do.	7.0	2.04	0	7.3	10.3	5	65	274	339	Do.
281....	do.	6.5	2.12	0	11.3	17.5	8	101	465	566	Do.
282....	do.	7.0	2.04	0	13.7	20.9	9	122	547	669	Do.
283....	do.	6.0	2.21	0	19.9	33.9	12	177	902	1,079	Do.
297....	do.	7.0	2.04	0	2.5	26.5	5	32	705	737	Do.
298....	do.	4.5	2.80	1.3	11.3	15.7	4	105	417	522	Do.
300....	do.	5.5	2.38	1.4	5.5	22.3	7	45	593	638	Do.
301....	Feb. 4	4.5	2.80	1.1	17.5	21.1	9	156	561	717	Do.
324....	Feb. 9	7.0	2.04	1.5	2.0	17.2	14	18	475	493	Do.
363....	Feb. 10	4.0	3.05	0	4.3	11.1	2	38	285	323	Do.
365....	do.	5.0	2.55	0	20.4	21.6	15	182	574	756	Do.
410....	Feb. 12	4.5	2.80	0	17.2	38.2	0	153	1,002	1,155	Do.
411....	do.	6.0	2.21	0	11.3	19.9	5	101	529	630	Do.
412....	do.	5.0	2.55	0	2.7	9.4	0	24	250	274	Do.
413....	do.	5.0	2.55	0	0.3	13.3	0	56	354	410	Do.
417....	Feb. 15	8.0	2.04	0	2.5	11.3	7	22	300	322	Do.
418....	do.	4.5	2.80	0	6.8	7.5	11	60	200	260	Do.
419....	do.	4.0	3.05	3	9.8	23.6	4	87	625	715	Do.
421....	do.	8.0	2.04	0	4.4	23.6	8	39	625	664	Do.
422....	do.	8.0	2.04	0	6.9	24.5	1	61	652	713	Do.
423....	do.	7.0	2.04	0	6.9	31.4	5	61	835	896	Do.
424....	do.	5.0	2.55	0	5.9	18.5	2	52	439	491	Do.
425....	do.	5.0	2.55	0	11.4	33.7	5	102	897	999	Do.
426....	do.	5.0	2.55	0	13.3	18.1	8	118	482	600	Do.
427....	do.	5.0	2.55	0	16.5	16.5	7	147	439	586	Do.
429....	do.	8.5	2.04	0	10.3	13.7	4	92	364	456	Do.
431....	do.	5.0	2.55	0	7.1	16.1	3	63	428	491	Do.
433....	do.	6.0	2.21	0	3.6	15.4	3	32	409	441	Do.
434....	do.	8.0	2.04	0	11.8	15.2	2	105	404	509	Do.
435....	do.	7.0	2.04	2.0	14.2	22.6	1	126	601	727	Do.
436....	do.	5.0	2.55	0	5.5	23.6	4	49	625	677	Do.
437....	do.	4.0	3.05	0	18.7	30.2	9	165	804	969	Do.
438....	do.	4.0	3.05	0	11.8	24.9	4	105	602	707	Do.
449....	do.	5.5	2.38	0	8.8	20.6	3	73	548	626	Do.
450....	do.	7.0	2.04	0	16.7	44.6	4	149	1,186	1,335	Do.
467....	Feb. 16	9.0	2.04	0	7.2	19.1	2	64	192	256	Do.
468....	do.	5.5	2.38	4	6.7	10.1	0	80	208	328	Do.
470....	do.	5.0	2.55	8	15.7	16.1	2	140	428	568	Do.
471....	do.	5.0	2.55	8	12.9	12.5	4	115	332	447	Do.
472....	do.	7.0	2.04	2.4	6.4	15.7	0	57	417	474	Do.
473....	do.	8.0	2.04	5	3.4	9.3	0	30	238	268	Do.
475....	do.	8.0	2.04	1.0	5.4	15.7	1	48	417	465	Do.
476....	do.	8.0	2.04	0	6.9	13.7	1	61	364	425	Do.
477....	do.	5.0	2.55	0	0.3	14.5	1	56	386	442	Do.
478....	do.	5.0	2.55	0	1.2	10.9	2	11	290	301	Do.
479....	do.	5.0	2.55	2.7	3.9	5.9	0	35	167	192	Do.
480....	do.	6.0	2.21	0	6.8	21.7	2	61	576	637	Do.
481....	do.	8.5	2.04	0	6.4	12.8	1	57	340	397	Do.
482....	do.	8.0	2.04	0	4.9	11.3	3	43	301	344	Do.
485....	do.	7.5	2.04	1.0	2.5	16.2	3	22	431	453	Do.
488....	do.	8.0	2.04	2.0	3.9	14.7	0	35	391	426	Do.
491....	do.	8.0	2.04	0	1.0	10.8	0	9	287	296	Do.
493....	do.	4.5	2.38	1.8	8.9	18.6	3	79	495	574	Do.
275....	Feb. 3	3.0	3.65	8	3.1	4.1	1	28	109	137	Scattering.
280....	do.	6.0	2.21	0	3.2	4.5	2	28	119	147	Do.
296....	Feb. 4	6.5	2.12	0	5.5	4.2	1	4	112	116	Do.
299....	do.	5.0	2.55	0	1.2	3.9	8	11	104	115	Do.
304....	Feb. 10	7.0	2.04	0	4.4	3.9	10	39	104	143	Do.
414....	Feb. 12	5.0	2.55	4	3.5	5.1	4	31	136	167	Do.
415....	do.	6.0	2.21	0	2.7	5.4	3	24	144	168	Do.
420....	Feb. 15	4.5	2.80	0	2.8	4.8	4	25	122	147	Do.
428....	do.	8.0	2.04	0	2.9	2.9	2	26	77	103	Do.
430....	do.	6.0	2.21	0	6.3	5.4	6	56	143	199	Do.
469....	Feb. 16	5.0	2.55	1.2	3.5	3.1	2	31	82	113	Do.
486....	do.	5.5	2.38	1.3	2.5	4.6	0	22	122	144	Do.
487....	do.	5.0	2.55	2.4	7.1	5.1	1	63	136	199	Do.
489....	do.	8.0	2.04	1.5	10.8	5.4	0	96	144	240	Do.
490....	do.	6.0	2.21	0	1.8	2.3	0	15	61	77	Do.
492....	do.	6.0	2.21	0	15.4	4.1	10	137	109	246	Do.
432....	Feb. 15	5.0	2.55	0	7.1	.8	5	63	21	84	Depleted.

12. BULKHEAD AND EAST HOLE BARS.

These two large, continuous reefs may, for the purposes of this discussion, be designated as one body. They lie in a broad, but gradually narrowing, band reaching in a southeast direction from the dredged channel or cut, immediately south of Cat Point Bar, to St. George Island. The bars have a length of nearly 3 miles, an average width of about three-fourths mile, and an approximate area of 1,379 acres. The northernmost portion is locally denominated Bulkhead Bar, the remaining part East Hole Bar. There appears to be no distinct line of separation between the beds, but there is a difference in the quality of the stock.

With the exception of a projection on the extreme west border and an indentation or bay at the southeast corner the outlines of the beds are fairly straight. The depth of water (mean low level) is from 5½ to 9 feet on the upper part and from 1½ to 5½ feet on the lower. The bottoms are composed of mud, or mud and sand, with some shell, and are raised above the adjacent territory from 1 to 5 feet. The beds appear to have progressed slightly westward during the last 20 years.

About 95 per cent of the total area of the beds has dense growth. The remaining portion, consisting of 57 acres situated off St. George Island, has scattering or very scattering growths and depleted bottoms. The oysters occur in clusters and as singles, generally of good shape, although at several stations the clustered raccoon type predominated, particularly on the denser and unworked areas. At the time of the examination the quality of the material varied from poor to good, the better grades being found along the upper and central parts of East Hole Bar. Mussels and barnacles were plentiful at several stations. Algæ were abundant especially near the south shore.

But very little oystering was being pursued on Bulkhead Bar during the survey. It was stated that the product from this bed is used more particularly for steam stock. It appears that this bar would be improved by more extensive fishing. From six to eight boats were engaged in the fishery on east Hole Bar and were obtaining a good yield and satisfactory prices.

More than 90 biological stations were made on these bars. The areas, details of examination, and other data are given in the following tables:

OYSTER GROWTH ON BULKHEAD AND EAST HOLE BARS.

Character of oyster growth.	Area.	Oysters per acre.			Estimated content of oysters.
		Under 3 inches.	Over 3 inches.	Total.	
	<i>Acres.</i>	<i>Bushels.</i>	<i>Bushels.</i>	<i>Bushels.</i>	<i>Bushels.</i>
Dense.....	1,322	120	789	909	1,201,698
Scattering.....	12	53	112	170	2,040
Very scattering.....	30	39	53	92	2,760
Depleted.....	15	13	13	26	390
Total.....	1,379				1,206,888

DETAILS OF EXAMINATION OF BULKHEAD AND EAST HOLE BARS.

Station.	Date of examination.	Depth of water.	Area covered.	Oysters caught per square yard.			Shells per square yard.	Estimated quantity oysters per acre.			Character of oyster growth.
				Spat.	Culls.	Counts.		Seed.	Market.	Total.	
		<i>Fect.</i>	<i>Sq. yds.</i>					<i>Bush.</i>	<i>Bush.</i>	<i>Bush.</i>	
302.....	1915. Feb. 4	6.5	2.12	0	14.6	22.2	9	130	580	710	Dense.
303.....	do.....	10.0	2.04	2.9	8.8	18.6	9	78	495	573	Do.
304.....	do.....	7.5	2.04	2.4	15.2	43.2	3	135	1,148	1,283	Do.
305.....	do.....	11.0									Do.
306.....	do.....	8.0	2.04	2.0	11.8	15.2	2	105	404	509	Do.
307.....	do.....	8.5	2.04	0	10.8	14.7	7	96	391	487	Do.
309.....	do.....	9.5	2.04	.5	9.8	22.1	5	87	687	674	Do.
310.....	do.....	9.0	2.04	2.0	16.9	22.1	4	61	657	643	Do.
311.....	do.....	9.0	2.04	0	15.2	40.6	4	135	1,080	1,215	Do.
312.....	do.....	8.5	2.04	0	24.5	26.5	5	218	704	922	Do.
313.....	do.....	8.0	2.04	0	6.9	24.5	12	61	652	713	Do.
314.....	do.....	6.5	2.38	0	10.5	34.4	12	93	914	1,007	Do.
315.....	do.....	6.5	2.38	0	21.4	44.2	7	191	1,173	1,364	Do.
316.....	do.....	8.5	2.04	0	18.6	42.7	5	106	1,135	1,301	Do.
317.....	do.....	7.5	2.04	0	31.8	53.4	12	283	1,419	1,702	Do.
318.....	Feb. 9	8.0	2.04	0	19.1	20.6	16	170	647	717	Do.
319.....	do.....	8.0	2.04	0	18.1	26.9	17	161	715	876	Do.
321.....	do.....	7.0	2.04	3.9	26.0	47.5	16	232	1,263	1,495	Do.
322.....	do.....	5.0	2.65	0	18.1	23.6	10	161	626	787	Do.
323.....	do.....	8.0	2.21	0	3.6	9.1	6	32	242	274	Do.
326.....	do.....	8.5	2.04	0	8.8	14.2	4	78	378	456	Do.
327.....	do.....	8.5	2.12	0	13.7	31.6	9	122	841	963	Do.
328.....	do.....	5.0	2.65	.4	19.2	25.9	12	171	687	858	Do.
329.....	do.....	10.5	2.04	.5	10.8	16.7	16	96	444	540	Do.
330.....	do.....	6.5	2.12	0	11.3	17.9	8	101	476	577	Do.
331.....	do.....	5.0	2.65	0	14.5	27.5	8	129	732	861	Do.
332.....	do.....	5.0	2.65	0	18.8	46.7	12	107	1,242	1,409	Do.
333.....	do.....	4.5	2.80	0	13.2	33.6	7	117	884	1,001	Do.
336.....	do.....	6.5	2.38	1.3	15.9	35.7	9	141	950	1,091	Do.
337.....	do.....	5.0	2.65	0	6.3	18.0	8	56	479	535	Do.
338.....	do.....	6.5	2.12	0	15.1	48.6	13	134	1,292	1,426	Do.
339.....	do.....	6.5	2.12	1.4	25.4	42.8	14	226	1,140	1,366	Do.
340.....	do.....	6.5	2.12	0	10.8	33.0	13	96	878	974	Do.
346.....	do.....	10.0	2.04	0	3.9	18.6	7	35	494	529	Do.
347.....	do.....	7.0	2.04	0	12.2	22.6	12	109	601	710	Do.
348.....	do.....	7.0	2.04	1.0	13.2	70.2	12	117	1,865	1,982	Do.
349.....	do.....	7.0	2.04	0	19.6	24.5	13	175	652	827	Do.
439.....	Feb. 15	7.5	2.04	0	12.2	29.9	3	109	795	904	Do.
440.....	do.....	6.5	2.12	0	8.0	42.5	3	71	1,130	1,201	Do.
441.....	do.....	6.5	2.12	0	6.1	29.3	5	54	779	833	Do.
442.....	do.....	6.0	2.21	.9	6.8	19.9	6	61	529	590	Do.
443.....	do.....	7.0	2.04	1.5	14.7	20.6	5	131	647	878	Do.
444.....	do.....	6.0	2.21	0	7.7	10.0	5	669	266	335	Do.
445.....	do.....	6.5	2.12	0	14.2	21.7	8	126	577	708	Do.
446.....	do.....	6.5	2.12	1.9	28.8	52.4	11	256	1,391	1,647	Do.
447.....	do.....	7.5	2.04	.5	11.6	17.2	10	103	457	560	Do.
448.....	do.....	10.0	2.04	0	6.4	15.2	2	67	404	481	Do.
451.....	do.....	8.5	2.04	0	12.3	17.2	7	110	457	567	Do.
452.....	do.....	9.5	2.04	0	7.4	47.1	2	66	1,252	1,318	Do.
453.....	do.....	8.0	2.04	0	11.8	28.4	4	105	755	860	Do.
454.....	do.....	9.0	2.04	0	14.7	91.2	3	131	2,425	2,556	Do.
455.....	do.....	8.5	2.04	0	11.3	42.2	5	96	975	1,071	Do.
456.....	do.....	10.5	2.04	0	6.9	11.8	2	59	272	331	Do.

DETAILS OF EXAMINATION OF BULKHEAD AND EAST HOLE BARS—Continued.

Station.	Date of examination.	Depth of water.	Area covered.	Oysters caught per square yard.			Shells per square yard.	Estimated quantity oysters per acre.			Character of oyster growth.
				Spat.	Culls.	Counts.		Seed.	Market.	Total.	
480....	1915. Feb. 15	10.0	Sq. fms. 2.04	0	15.7	28.9	3	Bush. 140	Bush. 796	Bush. 936	Dense.
481....	do.	9.0	2.04	0	9.3	26.0	3	83	691	774	Do.
482....	do.	7.0	2.04	3.4	17.7	75.4	7	155	1,995	2,150	Do.
483....	do.	7.5	2.04	0	9.3	36.8	3	83	979	1,062	Do.
484....	do.	7.0	2.04	0	14.2	31.4	4	126	835	961	Do.
485....	do.	8.0	2.04	0	16.2	62.2	5	144	1,055	1,799	Do.
486....	do.	10.0	2.04	0	12.7	15.7	8	113	417	530	Do.
496....	Feb. 17	9.5	2.04	0	10.3	15.2	0	92	405	497	Do.
497....	do.	8.0	2.04	0	13.6	29.4	0	165	782	947	Do.
498....	do.	6.5	2.12	0	10.4	17.9	0	93	476	569	Do.
499....	do.	6.0	2.21	1.8	14.6	27.6	0	129	735	864	Do.
500....	do.	6.5	2.38	0	10.5	18.5	0	93	492	585	Do.
501....	do.	6.0	2.21	0	12.7	36.2	0	113	964	1,077	Do.
502....	do.	6.0	2.65	0	6.1	15.7	0	45	413	463	Do.
503....	do.	5.0	2.65	0	11.4	28.2	0	102	751	853	Do.
504....	do.	7.0	2.04	2.0	3.9	31.4	0	35	836	871	Do.
505....	do.	9.0	2.04	0	12.7	32.8	1	113	874	987	Do.
506....	do.	10.0	2.04	0	8.3	31.9	1	74	849	923	Do.
507....	do.	6.0	2.21	0	5.4	39.8	1	48	1,059	1,107	Do.
508....	do.	5.0	2.65	0	13.7	44.7	0	122	1,189	1,311	Do.
509....	do.	5.5	2.38	0	6.3	33.6	1	56	894	950	Do.
510....	do.	6.0	2.21	0	10.0	25.8	3	80	686	775	Do.
511....	do.	6.5	2.12	0	9.0	35.8	0	80	953	1,033	Do.
512....	do.	6.0	2.21	0	17.6	41.2	0	156	1,095	1,251	Do.
513....	do.	5.0	2.65	0	8.6	26.3	1	76	700	776	Do.
514....	do.	10.0	2.04	2.5	12.3	18.2	1	109	484	593	Do.
515....	do.	9.0	2.04	0	21.1	53.5	1	188	1,442	1,630	Do.
516....	do.	6.0	2.21	0	14.9	17.6	3	132	468	600	Do.
517....	do.	5.5	2.38	0	8.4	20.6	1	75	548	623	Do.
519....	do.	4.0	3.05	0	10.5	9.5	2	93	252	345	Do.
520....	do.	8.0	2.04	0	12.3	24.1	3	109	641	750	Do.
521....	do.	10.0	2.04	.5	5.0	14.2	4	53	378	431	Do.
523....	do.	4.0	3.05	.6	8.8	15.9	4	78	423	501	Do.
525....	do.	6.0	2.21	0	21.3	34.9	1	139	930	1,119	Do.
526....	do.	6.5	2.12	0	17.4	25.4	4	155	675	830	Do.
522....	do.	3.5	3.35	0	6.6	4.2	5	58	112	170	Scattering.
285....	Feb. 3	2.0	4.50	1.8	4.4	2.0	2	39	53	92	Very scattering.
518....	Feb. 17	7.0	2.04	0	1.5	.5	0	13	13	25	Depleted.

13. PATCHES EAST OF BULKHEAD AND EAST HOLE BARS.

There is a small patch of 3 acres just offshore of St. George Island and about three-fourths mile east of Bulkhead Point. It has a depth of water of $3\frac{1}{2}$ feet and a sandy bottom with but little or no elevation. The patch has dense growth of clustered oysters, on which were many mussels and both red and green algæ. The oysters were fresh and not in good condition at the time of the investigation.

Another patch of 2 acres is situated about five-eighths mile due north of Bulkhead Point. The bottom is composed of mud, sand, and shells and is practically on a level with the adjacent grounds. The depth of water is 9 feet. The oysters are found in clusters and consist mostly of the raccoon or scissor-bill type. About 12 per cent were dead. Mussels and barnacles were noted.

The following tables show the data obtained from these patches:

OYSTER GROWTH ON PATCHES EAST OF BULKHEAD AND EAST HOLE.

Character of oyster growth:	Area.	Oysters per acre.			Estimated content of oysters.
		Under 3 inches.	Over 3 inches.	Total.	
Dense.....	Acres. 5	Bushels. 109	Bushels. 288	Bushels. 397	Bushels. 1,985

DETAILS OF EXAMINATION OF PATCHES EAST OF BULKHEAD AND EAST HOLE BARS.

Station.	Date of examination.	Depth of water.	Area covered.	Oysters caught per square yard.			Shells per square yard.	Estimated quantity oysters per acre.			Character of oyster growth.
				Spat.	Culls.	Counts.		Seed.	Market.	Total.	
285....	1915. Feb. 3	Feet. 3.5	Sq. yds. 3.35	0	13.7	9.5	1	Bush. 122	Bush. 263	Bush. 385	Dense.
287....	do.....	10.5	2.04	4.4	10.8	11.7	6	95	312	408	Do.

14. PELICAN BAR (APALACHICOLA BAY).

This bar or reef is situated in Apalachicola Bay about 1 mile west of East Hole and immediately north of Signal Wharf. From shore it extends northeastward for about one-half mile, thence turns west by north and follows this direction for 1 mile. It has an average width of a little over 500 yards and an area of 298 acres. The dense area, with the exception of a small patch on the western margin, occupies the central portion of the bed and is practically surrounded by very scattering growth or depleted bottoms. The depth of water is from one-half foot to $5\frac{1}{2}$ feet on the bar, the limits of which are but slightly elevated above the adjoining grounds. The bottom is hard sand with some mud and shells.

During the last 20 years the bed has grown in all directions to about six times its former size. The increase is especially noticeable on the south and west.

The oysters were found in clusters of rather good shape and size, although some stations revealed a number of scissor-bills. The quality ranged from poor to good. The better grades, as a rule, were taken on the dense growth. At the time of the examination only one or two boats were tonging on the bar. Mussels, barnacles, and algæ were observed at several points.

The following tables exhibit the results of the examination of this bed:

OYSTER GROWTH ON PELICAN BAR.

Character of oyster growth.	Area.	Oysters per acre.			Estimated content of oysters.
		Under 3 inches.	Over 3 inches.	Total.	
Dense.....	Acres. 91	Bushels. 116	Bushels. 583	Bushels. 699	Bushels. 63,699
Very scattering.....	110	58	52	110	12,100
Depleted.....	97	10	3	13	1,261
Total.....	298				76,970

DETAILS OF EXAMINATION OF PELICAN BAR.

Station.	Date of examination.	Depth of water.	Area covered.	Oysters caught per square yard.			Shells per square yard.	Estimated quantity oysters per acre.			Character of oyster growth.
				Spat.	Culls.	Counts.		Seed.	Market.	Total.	
534....	1915. Feb. 18	Feet. 5.0	Sq. yds. 2.55	0.4	18.0	20.4	3	Bush. 160	Bush. 543	Bush. 703	Dense.
535....	do. do.	7.0	2.04	0	13.2	12.7	2	117	338	455	Do.
557....	Feb. 22	7.0	2.04	0	13.2	30.2	15	117	1,042	1,159	Do.
558....	do. do.	7.0	2.04	0	14.2	31.4	17	126	835	961	Do.
559....	do. do.	7.5	2.04	0	6.4	15.7	7	57	417	474	Do.
562....	do. do.	6.0	2.21	.5	9.0	28.5	5	80	758	838	Do.
563....	do. do.	5.0	2.55	2.0	16.5	21.6	14	147	575	722	Do.
569....	do. do.	8.0	2.04	0	16.7	46.6	2	149	1,239	1,388	Do.
567....	do. do.	6.5	2.12	0	17.5	22.2	3	156	591	747	Do.
568....	do. do.	7.5	2.04	2.5	24.0	19.1	0	214	508	722	Do.
571....	do. do.	8.0	2.04	0	17.2	30.4	0	163	809	962	Do.
570....	do. do.	7.0	2.04	1.5	3.4	9.8	3	30	239	269	Do.
574....	do. do.	7.0	2.04	1.0	8.3	18.1	2	74	481	555	Do.
575....	do. do.	4.5	2.80	2.9	8.9	8.6	1	79	220	308	Do.
576....	Feb. 24	5.0	2.55	0	9.8	14.5	3	87	388	473	Do.
585....	Feb. 25	5.0	2.55	.4	12.2	12.5	1	109	332	441	Do.
560....	Feb. 22	4.0	3.05	.7	8.5	3.3	0	76	88	164	Very scattering.
561....	do. do.	4.0	3.05	0	5.2	1.6	1	40	42	88	Do.
564....	do. do.	4.5	0	5.4	1.4	.2	2	48	37	85	Do.
577....	Feb. 24	7.0	2.04	0	6.9	1.5	2	61	40	101	Do.
550....	Feb. 22	8.0	2.04	.5	.5	0	5	4	0	4	Depleted.
565....	do. do.	6.0	2.21	0	3.6	0	1	32	0	32	Do.
569....	do. do.	9.0	2.04	0	.5	.5	1	4	13	17	Do.
573....	do. do.	6.5	2.12								Do.

^a 30 oysters, all dead.

15. PATCHES BETWEEN EAST HOLE AND PELICAN BARS.

These three small patches, less than a half-mile off St. George Island, are situated between East Hole and Pelican Bars. The combined area is 43 acres, the greater part of which has dense growth of clustered oysters of fair quality. The largest patch, somewhat crescent-shaped, measures about three-eighths mile in length by one-eighth mile in width and contains about 30 acres. The other patches are nearly circular in outline. The bottom is hard sand with mud and shells. No oystering was being conducted on these lumps at the time of the survey.

The general extent and condition of the patches are shown in the following tables:

OYSTER GROWTH ON PATCHES BETWEEN EAST HOLE AND PELICAN BARS.

Character of oyster growth.	Area.	Oysters per acre.			Estimated content of oysters.
		Under 3 inches.	Over 3 inches.	Total.	
Dense.....	Acres. 38	Bushels. 75	Bushels. 448	Bushels. 523	Bushels. 19,874
Scattering.....	5	60	100	160	800
Total.....	43				20,674

DETAILS OF EXAMINATION OF PATCHES BETWEEN EAST HOLE AND PELICAN BARS.

Station.	Date of examination.	Depth of water.	Area covered.	Oysters caught per square yard.			Shells per square yard.	Estimated quantity oysters per acre.			Character of oyster growth.
				Spat.	Culls.	Counts.		Seed.	Market.	Total.	
352....	1915. Feb. 9	Feet. 9.0	Sq. yds. 2.04	0	7.3	8.8	2	Bush. 65	Bush. 234	Bush. 299	Dense.
579....	Feb. 24	8.5	2.04	0	11.3	14.7	5	100	391	491	Do.
580....	do. do.	6.0	2.21	0.5	7.7	19.5	4	69	518	587	Do.
581....	do. do.	5.0	2.55	0	12.9	35.3	2	115	938	1,053	Do.
582....	do. do.	6.0	2.21	0	2.7	5.9	4	24	157	181	Do.
533....	Feb. 18	4.0	3.05	1.6	10.5	2.9	2	93	77	170	Scattering.
578....	Feb. 24	4.5	2.80	0	2.9	4.6	2	26	122	148	Do.

16. EAST LUMPS.

These three unimportant lumps off East Bay, situated midway between Cat Point and Bulkhead Bars on the east and Norman Bar on the west, have a combined area of 224 acres. The largest and northernmost lump has a length in a north and south direction of about seven-eighths mile, a width of one-fourth mile, and an area of 144 acres, the greater part of which is covered with dense growth. It has a depth of water of 5½ to 6 feet and but very little or no elevation above the surrounding bottoms. On the edges of the bar there is black mud and more or less covered oysters.

The second lump has an area of 25 acres, a depth of water of 6 to 7 feet, and an elevation of about 1 foot along the northern limits. The extreme western portion has dense growth; otherwise it is very scattering.

The third or southernmost lump has an area of about 55 acres, a depth of water of 8 or 9 feet, and supports dense and very scattering growths and depleted bottoms.

Comparing the present chart with the one made 20 years ago by this Bureau, it is observed that the first two or northernmost lumps

are but the remains of a long, narrow reef which had at that time scattering growths of oysters. It measured then about 3 miles in length by one-fourth mile in width. The third lump is comparatively new, having been built up on a hard sand bottom within recent years.

The oysters of these lumps are largely clusters of the raccoon or scissor-bill type and are covered with hundreds of small mussels and small barnacles. Some of the oysters are of good shape, but they are inclined to be flattish and generally of poor quality and flavor. The central part of the largest lump has a good, firm foundation, which would produce a fair marketable product if the clusters were broken up and culled; otherwise it does not appear to yield oysters of merchantable quality. This part of the bay is evidently filling in with mud and silt and is, therefore, hardly worth the labor necessary to obtain good oysters.

One Florida tub of mostly clustered and uncultured oysters from these lumps gave the following results: Small oysters, 67; counts, 152; large, 180; dead, 13; shells, 30; total, 442.

The following tables furnish further data of a general character:

OYSTER GROWTH ON EAST LUMPS.

Character of oyster growth.	Area.	Oysters per acre.			Estimated content of oysters.
		Under 3 inches.	Over 3 inches.	Total.	
Dense.....	Acres. 108	Bushels. 102	Bushels. 453	Bushels. 555	Bushels. 93,240
Scattering.....	4	18	77	95	380
Very scattering.....	24	44	54	98	2,332
Depleted.....	28				
Total.....	224				95,972

DETAILS OF EXAMINATION OF EAST LUMPS.

Station.	Date of examination.	Depth of water.	Area covered.	Oysters caught per square yard.			Shells per square yard.	Estimated quantity oysters per acre.			Character of oyster growth.
				Spat.	Culls.	Counts.		Seed.	Market.	Total.	
544.....	1915, Feb. 18	Feet. 7.0	Sq. yds. 2.04	0	11.8	13.2	2	Bush. 105	Bush. 351	Bush. 456	Dense.
547.....	Feb. 22	8.0	2.04	0	8.8	19.0	6	78	521	599	Do.
548.....	do.....	8.0	2.04	0	8.8	18.1	4	78	481	559	Do.
549.....	do.....	8.0	2.04	0	2.9	9.8	4	20	261	287	Do.
550.....	do.....	8.0	2.04	0	4.4	23.5	6	39	625	664	Do.
737.....	Mar. 9	7.0	2.04	0	10.7	25.0	7	148	605	813	Do.
738.....	do.....	7.0	2.04	0	10.2	17.0	3	144	468	612	Do.
739.....	do.....	7.0	2.04	0	15.7	11.8	3	130	314	453	Do.
740.....	do.....	7.0	2.04	0	7.3	10.3	3	65	274	339	Do.
741.....	do.....	7.5	2.04	0	5.4	12.2	3	48	324	372	Do.
742.....	do.....	8.0	2.04	0	9.8	13.2	2	87	351	438	Do.
743.....	do.....	7.5	2.04	0	9.8	5.9	1	87	157	244	Do.
744.....	do.....	7.0	2.04	0	12.2	24.0	0	108	939	747	Do.
745.....	do.....	7.0	2.04	0	6.9	7.8	0	61	207	268	Do.

DETAILS OF EXAMINATION OF EAST LUMPS—Continued.

Station.	Date of examination.	Depth of water.	Area covered.	Oysters caught per square yard.			Shells per square yard.	Estimated quantity oysters per acre.			Character of oyster growth.
				Spat.	Culls.	Counts.		Seed.	Market.	Total.	
746.....	1915, Mar. 9	Feet. 7.0	Sq. yds. 2.04	0	11.8	18.2	1	Bush. 105	Bush. 485	Bush. 590	Dense.
747.....	do.....	7.5	2.04	0	6.4	20.4	0	57	703	760	Do.
748.....	do.....	7.0	2.04	0	13.2	17.2	1	117	457	574	Do.
749.....	do.....	7.0	2.04	0	19.1	20.0	4	170	692	862	Do.
750.....	do.....	7.0	2.04	0	20.1	19.6	2	178	521	699	Do.
751.....	do.....	7.0	2.04	0	20.4	12.2	0	235	301	536	Do.
752.....	do.....	7.0	2.04	0	23.6	18.6	1	210	490	700	Do.
753.....	Feb. 22	11.0	2.04	0	4.4	10.8	4	39	287	326	Do.
754.....	Mar. 9	8.0	2.04	0	7.8	18.1	1	69	446	515	Do.
755.....	do.....	8.5	2.04	0.5	8.8	16.2	1	78	400	478	Do.
756.....	do.....	10.0	2.04	0	7.4	20.6	3	60	509	575	Do.
757.....	do.....	10.5	2.04	0	10.3	23.6	2	91	582	673	Do.
758.....	do.....	10.0	2.04	0	15.2	30.4	5	135	750	885	Do.
759.....	Feb. 10	6.0	2.21	0	2.0	2.9	2	18	77	95	Scattering.
760.....	Mar. 9	8.5	2.04	0	2.0	2.4	0	26	50	85	Very scattering.
761.....	do.....	10.0	2.04	-0	6.9	2.0	5	61	49	110	Do.
762.....	do.....	10.5	(a)								Depleted.

a Medium bottom.

17. NORMAN BAR.

This bar, which lies off East Bay, is composed of four small, productive patches having an aggregate area of about 45 acres. It is situated approximately 1 mile west of East Lumps and 2 miles east of the jetty. The three upper patches are raised about 1 foot above the neighboring floor and lie in 5½ to 6 feet of water. The lower or southernmost patch has about the same elevation, but is in slightly deeper water, being located near the channel. The bottom is sand and mud.

The three upper parts of the bar were formerly united into one long narrow bed, which extended farther northward and eastward than the present patches, but not so far to the south. The lower patch appears to have changed its shape somewhat and to have progressed both to the south and west.

The bed has dense growth throughout. The oysters are generally of good shape and occur in clusters with sharp edges. Not many mussels and barnacles were observed. On the southwest border of the upper patch the bottom was largely mud and black shells on which were growing raccoon oysters. At the time of the investigation the oysters were rather fresh, but fat and in good condition. This bar has not been worked much for the last two years, except during the rush season, when a few boats make quick trips with their catch to the market.

The growth and details of examination are given in the following tables:

OYSTER GROWTH ON NORMAN BAR.

Character of oyster growth.	Area.	Oysters per acre.			Estimated content of oysters.
		Under 3 inches.	Over 3 inches.	Total.	
Dense.....	Acres. 45	Bushels. 61	Bushels. 518	Bushels. 577	Bushels. 25,965

DETAILS OF EXAMINATION OF NORMAN BAR.

Station.	Date of examination.	Depth of water.	Area covered.	Oysters caught per square yard.			Shells per square yard.	Estimated quantity oysters per acre.			Character of oyster growth.
				Spat.	Culls.	Counts.		Seed.	Market.	Total.	
553.....	1915. Mar. 1	Feet. 8.0	Sq. yds. 2.04	0	4.4	18.7	0	Bush. 39	Bush. 338	Bush. 377	Dense.
554.....	do.....	8.0	2.04	1.5	3.4	24.5	0	30	606	636	Do.
555.....	do.....	7.5	2.04	2.9	7.8	32.4	7	70	800	870	Do.
557.....	do.....	7.5	2.04	1.0	9.3	41.2	6	83	1,018	1,101	Do.
559.....	do.....	8.5	2.04	0	3.9	12.2	12	35	302	337	Do.
560.....	do.....	7.0	2.04	2.9	6.9	11.3	1	61	279	340	Do.
561.....	do.....	6.5	2.12	0	8.0	26.9	6	71	664	735	Do.
562.....	do.....	8.0	2.04	2.9	10.3	27.9	6	92	690	782	Do.
563.....	do.....	7.0	2.04	0	4.9	22.1	4	44	546	590	Do.
564.....	do.....	8.0	2.04	0	2.5	13.7	3	22	338	360	Do.
565.....	do.....	7.0	2.04	0.3	9.3	9.8	6	83	242	325	Do.
566.....	do.....	7.0	2.04	0	11.8	14.7	6	105	363	468	Do.

18. THIGPEN BAR.

This bar, consisting of two small patches, is situated about $1\frac{1}{2}$ miles south of Apalachicola and five-eighths mile west of the jetty. It has a depth of water of $5\frac{1}{2}$ to 6 feet and practically no elevation above the adjacent soft bottoms. The bed is composed principally of mud and some black shells, with underlying hard sand. During the last 20 years it has decreased in extent from a long continuous bar of 13 acres to about 4 acres. This is, perhaps, due to a deposit of silt from the recent dredgings in the channel along the jetty.

The bar has dense growth. The oysters occur in clusters and singles and are generally of good shape and size. They were found to be fat and of good flavor. Many mussels and some barnacles were noted. Very little or no fishing was being conducted on this bar at the time of the investigation.

A small patch of about 2 acres in extent, apparently the remnant of a larger area, is situated a short distance south of the jetty. Depth of water is about 6 feet. The bottom is hard and consists of mud and buried shells.

The annexed tables show the area and distribution of oyster growth on Thigpen Bar.

OYSTER GROWTH ON THIGPEN BAR.

Character of oyster growth.	Area.	Oysters per acre.			Estimated content of oysters.
		Under 3 inches.	Over 3 inches.	Total.	
Dense.....	Acres. 4	Bushels. 81	Bushels. 255	Bushels. 336	Bushels. 1,344

DETAILS OF EXAMINATION OF THIGPEN BAR.

Station.	Date of examination.	Depth of water.	Area covered.	Oysters caught per square yard.			Shells per square yard.	Estimated quantity oysters per acre.			Character of oyster growth.
				Spat.	Culls.	Counts.		Seed.	Market.	Total.	
795.....	1915. Mar. 15	Feet. 5.0	Sq. yds. 2.55	0	9.0	8.2	1	Bush. 80	Bush. 214	Bush. 294	Dense.
808.....	Mar. 19	6.0	2.21	0	8.1	11.8	1	82	297	379	Do.

19. WEST LUMP AND ADJACENT PATCH.

This bar, lying a short distance northwest of the center of Apalachicola Bay, is situated about 2 miles southwest of the entrance to the dredged channel at the jetty. It is somewhat scythe-shaped in outline, measures about three-fourths mile in length, and 300 yards in width, and is 74 acres in extent. The depth of water is from $4\frac{1}{2}$ to 6 feet. The bottom is composed of mud, sand, and shells and is raised 1 to 2 feet above the neighboring grounds. The bed supports a dense growth, excepting where scattering oysters were found on the projecting arm of the northwest border. During the interval since the last survey the bar appears to have shifted its position very slightly to the southwest and has maintained its average length and breadth fairly well. However, the eastern extremity has broadened somewhat, and the projecting arm is of recent growth.

The oysters were in rather small clusters or singles of general good shape, and at the time of the investigation (March 15) were fat, becoming milky, and varied in quality from poor to good. Mussels and barnacles in small numbers were observed at most of the stations. This bar is fished principally for raw stock.

The small patch, about one-half mile north of the lump, has a length of about three-eighths mile, a width of 140 yards, and contains approximately 17 acres, nearly three-quarters of which has dense growth, the remainder being very scattering. It is the remnant of a long, slender bar that had a length of about $1\frac{1}{2}$ miles. The bottom, composed of mud and sand, with some black shells, has an elevation of about 1 foot. The depth of water is $5\frac{1}{2}$ to 7 feet. The oysters are in clusters of good shape, although some were flattish and of the

scissor-bill type. A number of the older shells were burrowed by the boring clam, *Martesia*. The oysters were fat and becoming milky. The best quality was found on the upper two-thirds of the patch. They are fished for raw stock.

The following tables give the data obtained from the lump and patch:

OYSTER GROWTH ON WEST LUMP AND ADJACENT PATCH.

Character of oyster growth.	Area.	Oysters per acre.			Estimated content of oysters.
		Under 3 inches.	Over 3 inches.	Total.	
	Acres.	Bushels.	Bushels.	Bushels.	Bushels.
Dense.....	75	71	425	496	37,206
Scattering.....	11	29	126	155	1,705
Very scattering.....	5	0	62	62	310
Total.....	91				39,215

DETAILS OF EXAMINATION OF WEST LUMP AND ADJACENT PATCH.

Station.	Date of examination.	Depth of water.	Area covered.	Oysters caught per square yard.			Shells per square yard.	Estimated quantity oysters per acre.			Character of oyster growth.
				Spat.	Culls.	Counts.		Seed.	Market.	Total.	
	1915.	Feet.	Sq. yds.					Bush.	Bush.	Bush.	
809	Mar. 15	6.5	2.12	1.9	11.3	17.5	8	96	731	827	Dense.
813	do.	7.0	2.04	0	8.3	16.6	4	70	354	424	Do.
814	do.	7.0	2.04	0	11.3	17.1	3	96	364	460	Do.
815	do.	9.0	2.04	2.7	8.3	25.0	3	70	532	602	Do.
817	do.	8.0	2.04	0	12.7	18.1	5	103	386	489	Do.
819	do.	8.0	2.04	0	7.4	39.2	6	63	835	898	Do.
823	do.	7.0	2.04	0	4.4	24.0	20	37	511	548	Do.
826	do.	7.0	2.04	0	9.9	8.8	10	84	166	250	Do.
828	do.	6.0	2.21	0	9.0	10.8	0	77	230	307	Do.
829	do.	7.0	2.04	0	5.4	22.1	5	46	470	516	Do.
830	do.	8.0	2.04	0	4.4	11.3	1	37	240	277	Do.
831	do.	8.0	2.04	1.0	7.4	13.7	3	63	282	345	Do.
822	do.	9.0	2.04	0	3.4	5.0	1	29	126	155	Scattering.
810	do.	8.5	2.04	0	0	2.0	0	0	62	62	Very scattering.

20. PATCH OFF NEW INLET.

This small circular patch of 5 acres is situated about 3 miles due south of West Lump and one-half mile off St. George Island at Signal Scaffold. It has a depth of water of about 3½ feet and lies on a hard sand shelf, to the north of which is a soft mud bottom in 8 to 12 feet of water. This district was a few years ago in or near the channel of an inlet or pass called New Inlet, connecting Apalachicola Bay with the Gulf of Mexico. The inlet is now completely filled with sand.

The oysters were dense, of clear shell, and in good-shaped clusters. They were fat, salty, and milky (March 18). Green and brown algae, a few sea shells, sand collars, sandworms, etc., were observed. Very little or no fishing was being carried on at this place. A station

on the patch showed 35 bushels of seed and 196 bushels of marketable oysters per acre, making; all told, for the patch 175 bushels of seed and 980 bushels of marketable oysters.

21. HAGEN FLAT.

Hagen Flat, situated in the southwestern part of Apalachicola Bay, is about five-eighths mile east of St. Vincent Bar and nearly 3 miles north of St. George Island. It has a length, in an east and west direction, of about five-eighths mile, a maximum width of one-fourth mile, and an area of 62 acres. The depth of water ranges from 5½ to 6 feet along the southern termination to 7 feet at the northeastern limits. The bed is well elevated, being from 1 to 3 feet above the general level, and has a good solid foundation of sand and mud. We were able to penetrate the crust only about 5 or 6 inches with the testing pole.

During the last 20 years the bar appears to have changed its shape from a large Y and to have moved westward about one-fourth mile. It also has built up from a bed of dead shells to practically a dense growth throughout.

We found the oysters of this flat to be strong and vigorous, well-shaped, fat, of good flavor, but rather salty. They occur in both small and large clusters with sharp edges. One drill was taken, and but few dead oysters and mussels were noted. The bar is not fished extensively.

The following tables exhibit the growth of the oysters and details of examination:

OYSTER GROWTH ON HAGEN FLAT.

Character of oyster growth.	Area.	Oysters per acre.			Estimated content of oysters.
		Under 3 inches.	Over 3 inches.	Total.	
	Acres.	Bushels.	Bushels.	Bushels.	Bushels.
Dense.....	54	99	634	733	39,532
Scattering.....	8	25	94	119	952
Total.....	62				40,534

DETAILS OF EXAMINATION OF HAGEN FLAT.

Station.	Date of examination.	Depth of water.	Area covered.	Oysters caught per square yard.			Shells per square yard.	Estimated quantity oysters per acre.			Character of oyster growth.
				Spat.	Culls.	Counts.		Seed.	Market.	Total.	
	1915.	Feet.	Sq. yds.					Bush.	Bush.	Bush.	
895	Mar. 19	9.0	2.04	0	9.9	23.1	3	84	402	576	Dense.
902	do.	8.0	2.04	0	4.9	28.4	3	42	605	647	Do.
904	do.	8.0	2.04	0.5	19.6	27.4	4	107	583	750	Do.
1040	Mar. 26	8.5	2.04	0	12.2	58.9	6	173	1,425	1,698	Do.
1041	do.	7.0	2.04	0	2.0	6.9	3	23	167	195	Do.
1042	do.	8.5	2.04	0	0.9	22.1	1	98	535	633	Do.
894	Mar. 19	10.0	2.04	0	2.9	4.4	3	25	94	119	Scattering.

22. GREEN POINT FLAT.

This roughly crescent-shaped flat of 170 acres, is located in the northwestern part of Apalachicola Bay, about 1½ miles south of Green Point and 2 miles east by north of St. Vincent Point. The approximate dimensions are 1 mile long by one-fourth mile wide. It has a depth of 5 to 6 feet at mean low tide. With the exception of a limited portion of the southeast border, which has an elevation of about 1 foot, the flat is practically on a level with the connecting barren grounds. The bottom is mud and sand on a hard sand foundation.

The bed has grown up within recent years on a hard to stiff bottom of the area stretching from Green Point to the head of St. Vincent Bar, and it appears that it would be greatly improved and produce a better grade of stock if it were planted extensively with shells in order to raise it above the general level of the contiguous bottoms.

The entire flat has dense growth. The oysters were found in large sharp-edged clusters, usually of a poor or scissor-bill type, with many attached mussels and some barnacles. The quality was generally poor and watery, although some oysters were fat and in good condition. From 2 to 10 dead or smothered oysters were noted at nearly every station, and at some places the cultch was black shells. This bar is oystered but very little.

The following tables present the conditions of this bar:

OYSTER GROWTH ON GREEN POINT FLAT.

Character of oyster growth.	Area.	Oysters per acre.			Estimated content of oysters.
		Under 3 inches.	Over 3 inches.	Total.	
Dense.....	Acres. 170	Bushels. 105	Bushels. 414	Bushels. 519	Bushels. 88,230

DETAILS OF EXAMINATION OF GREEN POINT FLAT.

Station.	Date of examination.	Depth of water.	Area covered.	Oysters caught per square yard.			Shells per square yard.	Estimated quantity oysters per acre.			Character of oyster growth.
				Spat.	Culls.	Counts.		Seed.	Mar-kot.	Total.	
785.....	1915. Mar. 10	Feet. 7.5	Sq. yds. 2.04	0	2.4	14.7	4	Bush. 28	Bush. 391	Bush. 419	Dense.
786.....	do.....	7.0	2.04	0	6.4	9.9	2	75	294	369	Do.
787.....	do.....	7.5	2.04	0	4.4	18.2	1	52	351	403	Do.
788.....	do.....	8.0	2.04	0	12.2	17.6	2	144	468	612	Do.
909.....	Mar. 19	7.0	2.04	0	8.8	21.1	6	104	501	605	Do.
910.....	do.....	7.0	2.04	0	11.3	13.7	2	132	364	496	Do.
911.....	do.....	8.0	2.04	0	9.3	17.6	3	110	468	578	Do.
944.....	Mar. 24	6.0	2.21	0	10.4	17.7	5	123	471	594	Do.
945.....	do.....	6.0	2.21	0	3.2	4.5	4	38	120	158	Do.
949.....	do.....	6.0	2.21	0	9.5	18.1	3	112	481	593	Do.
1080.....	Apr. 5	7.0	2.04	0.5	5.9	5.4	7	70	143	213	Do.
1081.....	do.....	7.0	2.04	0	5.4	7.4	10	64	197	261	Do.
1082.....	do.....	6.5	2.12	0	7.1	25.4	9	83	675	758	Do.
1083.....	do.....	7.0	2.04	0	12.2	14.2	17	144	378	522	Do.
1084.....	do.....	7.5	2.04	0	23.1	19.1	9	273	507	780	Do.
1085.....	do.....	6.5	2.12	0	10.8	29.7	25	127	790	917	Do.

23. LUMPS BETWEEN HAGEN AND GREEN POINT FLATS.

Six small lumps situated between Hagen and Green Point Flats, a distance of about 2½ miles, range in size from 1 to 8 acres, with an aggregate area of 25 acres. They have a depth of water from 6 to 7 feet and an elevation of about 1 foot. The bottom is sand and mud.

The northernmost lump is of recent origin and has dense growth. The character and quality of the oysters are about equal to those of Green Point Flat.

The oysters of the two lumps near Hagen Flat are of dense growth and are about on a par with the product of that flat. These lumps appear to be progressing slowly westward.

Of the three intervening lumps, two have dense and one very scattering growth. At the time of the investigation the oysters were fat, in good condition, of good shape, and in rather small clusters. Very few mussels were noted. These lumps are the remnants of an extended area of scattered oysters with some dense growth.

The area and details of examination of the six lumps are given in the following tables:

OYSTER GROWTH ON LUMPS BETWEEN HAGEN AND GREEN POINT FLATS.

Character of oyster growth.	Area.	Oysters per acre.			Estimated content of oysters.
		Under 3 inches.	Over 3 inches.	Total.	
Dense.....	Acres. 22	Bushels. 56	Bushels. 468	Bushels. 524	Bushels. 11,528
Very scattering.....	3	6	26	32	96
Total.....	25				11,624

DETAILS OF EXAMINATION OF LUMPS BETWEEN HAGEN AND GREEN POINT FLATS.

Station.	Date of examination.	Depth of water.	Area covered.	Oysters caught per square yard.			Shells per square yard.	Estimated quantity oysters per acre.			Character of oyster growth.
				Spat.	Culls.	Counts.		Seed.	Mar-ket.	Total.	
837.....	1915. Mar. 19	Feet. 9.0	Sq. yds. 2.04	0	0.5	7.8	1	Bush. 6	Bush. 208	Bush. 214	Dense.
890.....	do.....	7.5	2.04	0	1.0	23.6	5	9	502	511	Do.
891.....	do.....	9.0	2.04	0	8.8	23.1	2	75	492	567	Do.
892.....	do.....	8.5	2.04	0	19.1	20.1	0	162	428	590	Do.
906.....	do.....	8.5	2.04	0	5.4	16.2	2	42	345	391	Do.
914.....	do.....	9.0	2.04	0	4.9	19.0	2	48	417	465	Do.
915.....	do.....	9.0	2.04	0	6.4	41.0	0	54	886	940	Do.
889.....	do.....	8.0	2.04	0	4.5	1.0	2	6	26	32	Very scattering.

24. ST. VINCENT BAR.

This interesting bar or reef is located in the southwestern part of Apalachicola Bay, about 3 miles from West Pass. It begins with a fringe of very scattering growth of oysters at St. Vincent Point near the northeast limits of St. Vincent Island, extends eastward for some-

thing more than a mile, then turns abruptly southward and continues in that direction for about 4 miles. It is within 1½ miles of St. George Island, in the vicinity of Cape St. George Lighthouse. The average width is slightly less than one-half mile. The area is approximately 1,414 acres, of which about 41 per cent is dense growth, 27 per cent very scattering, and about 15 per cent each of scattering growth and depleted bottoms. The depth of the main bar at mean low water is about 2 to 4 feet on the western border and 6 to 8 feet on the eastern border, while on the northwestern portion it is from 3 to 6 feet, with parts exposed and others awash at low tide. The adjacent bottoms on the western side are 3 to 4 feet deeper than the bar and 1 to 2 feet deeper on the eastern side. The west portion is, therefore, rather steep, while on the east a more gradual incline is found. The southern extremity, which is about a half mile from the ship channel, has an elevation from 5 to 9 feet. The northern limits have little or no elevation. The bed has a good foundation and is composed of sand and shells; with some mud along the eastern side. The west portion is very compact and solid.

This bar is fortunate in its elevation and situation with reference to West Pass and the currents, in that during the fluctuation of the tides it has a rapid change of water. On the other hand, however, its position is unfortunate during violent storms, for the long continuance of salt water or a deposit of sediment or sand may smother the oysters.

With the exception of its detachment from Silva Bar, the reef has maintained its general shape and position in the bay during the last 20 years. During this period, however, it has become wider by approximately 300 yards, the northeastern portion has extended eastward, and the other sections have broadened principally to the westward. The lower two-thirds of the bar has recovered, to a considerable extent, from a bed of dead oysters or depleted bottom to a fair or good producer.

It is interesting to note that this bar has been depleted a number of times by storms or overfishing and has always recovered satisfactorily.

Inasmuch as the bar was showing signs of depletion, it was closed to the public by order of the Florida Shell Fish Commissioner during the latter half of the 1914-15 oyster season. It was closed, also, for the season 1912-13.

The oysters were found in small clusters or singles of good shape. During the survey they were, for the most part, fat, salty, of good flavor, and from good to excellent quality. Very few detrimental factors, such as mussels, barnacles, coral, and algæ, were noted, although two dead drills, some black shells, and slimy mud were observed at some stations along the eastern limits of the bar.

Seventy-nine biological stations were made on this bar, the data of which follow:

OYSTER GROWTH ON ST. VINCENT BAR.

Character of oyster growth.	Area.	Oysters per acre.			Estimated content of oysters.
		Under 3 inches.	Over 3 inches.	Total.	
Dense.....	Acres. 585	Bushels. 68	Bushels. 378	Bushels. 446	Bushels. 260,910
Scattering.....	218	27	113	140	30,520
Very scattering.....	391	16	50	66	25,803
Depleted.....	220	29	17	46	10,120
Total.....	1,414				327,356

DETAILS OF EXAMINATION OF ST. VINCENT BAR.

Station.	Date of examination.	Depth of water.	Area covered.	Oysters caught per square yard.			Shells per square yard.	Estimated quantity oysters per acre.			Character of oyster growth.
				Spat.	Culls.	Counts.		Seed.	Market.	Total.	
	1915.	Fect.	Sq. yds.					Bush.	Bush.	Bush.	
957....	Mar. 24	7.5	2.04	0	3.9	8.8	2	55	213	268	Dense.
958....	do.....	7.0	2.04	0	2.0	10.3	5	28	250	278	Do.
959....	do.....	7.0	2.04	0	3.9	11.8	1	55	288	341	Do.
960....	do.....	6.0	2.21	0	2.3	27.2	7	33	659	692	Do.
961....	do.....	6.0	2.21	0	0.9	10.4	4	13	252	265	Do.
962....	do.....	4.0	3.05	0	4.9	14.4	6	69	349	418	Do.
963....	do.....	4.5	2.80	0	2.5	7.9	5	36	191	227	Do.
964....	do.....	7.5	2.04	0.5	3.4	6.9	0	48	167	215	Do.
965....	Mar. 25	8.0	2.04	0	1.0	6.4	2	14	165	169	Do.
968....	do.....	6.0	2.55	0	6.9	14.2	7	98	344	442	Do.
969....	do.....	4.5	2.80	0	16.1	38.8	9	229	940	1,169	Do.
970....	do.....	5.5	2.38	0	6.3	27.3	0	89	670	759	Do.
985....	do.....	6.5	2.12	0	1.9	17.4	5	27	421	448	Do.
986....	do.....	6.5	2.12	0	4.2	11.3	3	60	273	333	Do.
987....	do.....	7.0	2.04	0	1.5	21.6	3	21	522	543	Do.
988....	do.....	7.0	2.04	0	1.5	18.6	2	21	449	470	Do.
989....	do.....	7.0	2.04	0	6.4	21.1	2	91	510	601	Do.
990....	do.....	7.0	2.04	0	4.9	10.8	2	70	261	331	Do.
991....	do.....	7.0	2.04	0	13.2	33.8	5	187	817	1,004	Do.
992....	do.....	6.0	2.21	.5	3.2	19.6	3	45	474	519	Do.
993....	do.....	5.0	2.55	0	.4	10.9	1	6	264	270	Do.
994....	do.....	5.0	2.55	1.0	1.2	11.4	8	17	276	293	Do.
1001....	do.....	4.0	3.05	0	6.9	17.1	10	98	414	512	Do.
1002....	do.....	4.5	2.80	0	2.5	9.3	5	35	225	260	Do.
1004....	do.....	5.0	2.55	.4	2.0	23.9	4	28	578	606	Do.
1009....	do.....	4.0	3.05	0	10.1	15.7	2	143	379	522	Do.
1015....	Mar. 26	7.0	2.04	0	17.1	22.6	15	242	546	788	Do.
1016....	do.....	5.0	2.55	0	9.4	32.2	10	137	778	915	Do.
1018....	do.....	3.0	3.65	0	5.5	8.2	14	78	198	276	Do.
1019....	do.....	7.0	2.04	0	7.4	7.4	5	105	179	284	Do.
1020....	do.....	4.0	3.05	.7	6.6	12.5	3	94	302	396	Do.
1022....	do.....	7.0	2.04	0	3.9	6.4	3	55	154	209	Do.
1024....	do.....	4.5	2.80	0	2.5	13.3	5	35	322	357	Do.
1027....	do.....	5.0	2.55	0	3.1	14.1	10	44	341	385	Do.
1031....	do.....	5.0	2.55	.8	2.4	18.0	8	34	436	470	Do.
1032....	do.....	4.0	3.05	0	2.6	6.6	7	37	160	197	Do.
1035....	do.....	5.0	2.55	0	2.7	12.9	6	38	311	349	Do.
1038....	do.....	5.0	2.55	0	5.5	16.1	0	78	389	467	Do.
1043....	do.....	7.0	2.04	0	1.5	6.9	0	21	167	188	Do.
1044....	Mar. 27	5.0	2.55	0	4.3	8.2	4	61	198	259	Do.
1110....	Apr. 6	6.0	2.21	0	5.2	25.0	8	74	605	679	Do.
1208....	Apr. 8	4.0	3.05	0	8.8	14.7	16	94	447	541	Do.
950....	Mar. 24	8.0	2.04	0	0	5.4	2	0	131	131	Scattering.
965....	Mar. 25	8.5	2.04	0	1.0	4.4	5	14	107	121	Do.
971....	do.....	8.0	2.04	0	1.0	5.4	3	14	131	145	Do.
975....	do.....	8.0	2.04	0	1.0	3.9	2	14	94	108	Do.
976....	do.....	8.0	2.04	0	1.5	4.4	3	21	107	128	Do.
1003....	do.....	4.5	2.80	0	2.2	3.6	2	31	87	118	Do.
1007....	do.....	6.0	2.21	.5	3.2	5.9	2	45	143	188	Do.

DETAILS OF EXAMINATION OF ST. VINCENT BAR—Continued.

Station.	Date of examination.	Depth of water.	Area covered.	Oysters caught per square yard.			Shells per square yard.	Estimated quantity oysters per acre.			Character of oyster growth.
				Spat.	Culls.	Counts.		Seed.	Market.	Total.	
1017...	1915. Mar. 26	7.0	2.04	0	1.0	3.9	13	Bush.	Bush.	Bush.	Scattering.
1021...	do.	7.5	2.04	0	4.4	3.4	6	14	94	108	Do.
1023...	do.	7.5	2.04	0	1.8	3.2	11	62	82	144	Do.
1028...	do.	4.5	2.80	0	1.8	5.7	2	26	77	103	Do.
1030...	do.	6.5	2.12	0	1.8	5.7	2	26	138	164	Do.
1037...	do.	7.0	2.04	0	1.6	5.9	5	21	143	164	Do.
1043...	do.	7.0	2.04	0	1.6	3.9	5	7	94	101	Do.
1044...	do.	4.5	2.80	0.7	1.8	5.5	6	26	133	159	Do.
1211...	Apr. 8	7.0	2.04	0	1.5	5.9	2	21	143	164	Do.
987...	Mar. 25	7.5	2.04	0	8.3	3.4	0	89	103	192	Do.
973...	do.	8.5	2.04	0	0	2.0	5	0	48	48	Very scattering.
974...	do.	8.5	2.04	0	0	1.5	4	0	36	36	Do.
983...	do.	8.0	2.04	0	1.6	2.4	3	21	58	79	Do.
984...	do.	8.0	2.04	0	1.6	2.0	3	7	48	55	Do.
1000...	do.	7.5	2.04	0	1.6	2.9	2	7	70	77	Do.
1005...	do.	4.0	3.05	0	1.0	1.3	3	14	31	45	Do.
1006...	do.	7.0	2.04	0	2.0	2.0	0	28	48	76	Do.
1008...	do.	7.0	2.04	1.0	4.4	2.9	2	62	70	132	Do.
1025...	Mar. 26	6.0	2.21	1.5	2.3	2.3	1	33	58	89	Do.
1029...	do.	8.0	2.04	0	1.6	2.0	2	7	48	55	Do.
1034...	do.	7.5	2.04	0	1.5	2.9	1	7	70	77	Do.
1039...	do.	8.0	2.04	0	1.0	2.0	1	14	43	57	Do.
1118...	Apr. 6	6.0	2.21	0	1.9	2.3	1	12	56	68	Do.
1119...	do.	6.0	2.21	0	2.7	1.3	1	38	81	99	Do.
1209...	Apr. 8	7.0	2.04	0	1.5	1.5	0	5	45	50	Do.
972...	Mar. 25	8.5	2.04	0	0	1.0	0	0	24	24	Depleted.
978...	do.	8.0	2.04	1.5	1.5	1.0	5	21	24	45	Do.
1026...	Mar. 26	7.0	2.04	1.5	6.9	1.0	5	84	24	108	Do.
1109...	Apr. 6	7.5	2.04	0	2.0	0	5	28	0	28	Do.
1111...	do.	7.0	2.04	0	1.0	.5	1	14	12	26	Do.

25. MIDDLE BAR.

This roughly cordate-shaped bed is of recent growth and is situated on the boundary between Apalachicola Bay and St. Vincent Sound and midway between Green Point Flat and Silva Bar. It has a length of about 750 yards, an average width of 300 yards, and contains approximately 48 acres. The depth at mean low water on the bar and on the adjoining territory is from 4 to 5 feet. The bottom is hard sand with some mud.

The oysters were found dense throughout and in small to medium-sized clusters with sharp edges. They were of good shape and ranged in quality from watery to good. Some black shells, mussels, small barnacles, and a few dead oysters were noted. But very little tonging was being conducted on the bar during the survey.

The following tables show the general conditions of this bed:

OYSTER GROWTH ON MIDDLE BAR.

Character of oyster growth.	Area.	Oysters per acre.			Estimated content of oysters.
		Under 3 inches.	Over 3 inches.	Total.	
Dense.....	Acres. 48	Bushels. 49	Bushels. 396	Bushels. 445	Bushels. 21,360

DETAILS OF EXAMINATION OF MIDDLE BAR.

Station.	Date of examination.	Depth of water.	Area covered.	Oysters caught per square yard.			Shells per square yard.	Estimated quantity oysters per acre.			Character of oyster growth.
				Spat.	Culls.	Counts.		Seed.	Market.	Total.	
1097...	1915. Apr. 5	Feet. 6.0	Sq. yds. 2.21	0	3.6	11.8	3	Bush. 42	Bush. 314	Bush. 356	Dense.
1174...	Apr. 7	6.5	2.12	0	8.0	18.9	7	86	574	660	Do.
1177...	do.	6.5	2.12	0	1.9	9.9	2	20	301	321	Do.

26. SILVA BAR.

Formerly Silva and St. Vincent Bars constituted one continuous oyster reef without a distinct line of demarcation, but within the last two decades a decided severance occurred, so that the two are now separated by a stretch of barren bottoms of about one-fourth mile in extent. It appears that Silva Bar has, during this interval, moved westward about one-fourth mile.

This bar, oblong in shape, lies partly in Apalachicola Bay and partly in St. Vincent Sound and is about midway between Green and St. Vincent Points. It measures about three-fourths mile in length by 350 yards in width and has an approximate extent of 100 acres, 69 per cent of which supports very scattering growth of oysters. It lies on about the general level of the contiguous areas and has a depth at mean low water of 5 to 6 feet. The medium-hard bottom is composed of sand and mud.

The oysters are in small to large irregular clusters and shapely singles. At the time of the examination they were fat and in good condition, but were becoming milky. A number of mussels and small barnacles were taken while tonging. At one station near the southwest border, which has very scattering growth, black shells buried in mud and green algæ or sea lettuce were found. At this place the oysters were in only fair condition. Fishing was not carried on extensively on this bar during the survey.

The following tables exhibit the condition of this bed:

OYSTER GROWTH ON SILVA BAR.

Character of oyster growth.	Area.	Oysters per acre.			Estimated content of oysters.
		Under 3 inches.	Over 3 inches.	Total.	
Dense.....	Acres. 23	Bushels. 30	Bushels. 313	Bushels. 357	Bushels. 8,211
Scattering.....	8	60	188	198	1,584
Very scattering.....	69	13	57	70	4,830
Total.....	100				14,625

DETAILS OF EXAMINATION OF SILVA BAR.

Station.	Date of examination.	Depth of water.	Area covered.	Oysters caught per square yard.			Shells per square yard.	Estimated quantity oysters per acre.			Character of oyster growth.
				Spat.	Culls.	Counts.		Seed.	Market.	Total.	
	1915.	<i>Fect.</i>	<i>Sq. yds.</i>					<i>Bush.</i>	<i>Bush.</i>	<i>Bush.</i>	
1178...	Apr. 7	6.5	2.12	0	8.5	8.0	5	91	243	334	Dense.
1179...	do	7.0	2.04	0	0	0.3	1	0	233	233	Do.
1200...	Apr. 8	5.5	2.38	0	2.3	14.1	3	25	429	454	Do.
1107...	Apr. 0	6.5	2.12	0.9	4.2	5.7	2	60	138	198	Scattering.
1105...	do	6.0	2.21	0	0	2.3	0	12	56	68	Very scattering.
1108...	do	7.0	2.04	0	1.0	2.4	2	14	58	72	Do.

27. FISH HAWK BAR.

It very seldom happens that an oyster reef of any considerable extent remains unknown to the tongers and dealers in a region that is extensively fished. Such, however, was the case with this bar, which was found untouched in its natural condition. It has, apparently, developed on a favorable bottom since the survey made by the Bureau in 1895-96, as it was not mentioned or recorded on the chart of that report. On account of its good size and the excellent quality of the product, the bar is named in honor of the U. S. Fisheries steamer *Fish Hawk*, which was detailed for the survey of these waters and has long been associated with oyster investigations.

The bar, ovate in outline, is located in the extreme western limits of Apalachicola Bay, about 1 mile south of St. Vincent Point and 2 miles north-northeast of West Pass. It measures about five-eighths by one-fourth mile and has an approximate area of 90 acres. The depth at mean low water is 2 to 5 feet, and the elevation on the east and south borders is about 1 foot. The bottom is firm and composed of sand, mud, and scrap shells, and supports about 30 per cent each of dense and scattering growths, 14 per cent very scattering, and 23 per cent depleted bottoms.

Though of small size, the oysters are of good shape and occur as singles or in clusters of two or three. At the time of the investigation they were fat, of good flavor, salty, and in prime condition. It appears that they would serve admirably for shell or barrel stock. Disregarding the nearness to West Pass and the rather high salinity of the waters, no detrimental conditions other than three medium-sized drills and many very small barnacles were observed.

The character of the oyster growth, area, and details of examination of Fish Hawk Bar are given in the following tables:

OYSTER GROWTH ON FISH HAWK BAR.

Character of oyster growth.	Area.	Oysters per acre.			Estimated content of oysters.
		Under 3 inches.	Over 3 inches.	Total.	
	<i>Acres.</i>	<i>Bushels.</i>	<i>Bushels.</i>	<i>Bushels.</i>	<i>Bushels.</i>
Dense.....	29	272	248	520	15,080
Scattering.....	27	170	92	262	7,230
Very scattering.....	13	131	30	161	2,171
Depleted.....	21	141	12	153	3,213
Total.....	90				27,700

DETAILS OF EXAMINATION OF FISH HAWK BAR.

Station.	Date of examination.	Depth of water.	Area covered.	Oysters caught per square yard.			Shells per square yard.	Estimated quantity oysters per acre.			Character of oyster growth.
				Spat.	Culls.	Counts.		Seed.	Market.	Total.	
	1915.	<i>Fect.</i>	<i>Sq. yds.</i>					<i>Bush.</i>	<i>Bush.</i>	<i>Bush.</i>	
1075...	Mar. 27	5.0	2.55	0	25.9	13.7	9	231	332	563	Dense.
1087...	Apr. 5	5.5	2.38	0	20.9	15.5	4	239	375	614	Do.
1088...	do	6.0	2.21	0	42.1	8.6	6	375	208	583	Do.
1089...	do	5.5	2.38	0	32.4	8.4	2	288	203	491	Do.
1090...	do	8.0	2.21	0	36.0	8.1	5	320	196	522	Do.
1094...	do	8.0	2.21	0	19.5	7.2	2	173	174	347	Do.
1073...	Mar. 27	6.5	2.12	0	9.9	3.3	2	88	80	168	Scattering.
1074...	do	6.0	2.21	0	15.8	3.2	1	141	77	218	Do.
1086...	Apr. 5	5.0	2.55	0	38.0	5.5	0	338	133	471	Do.
1093...	do	8.5	2.12	0	15.5	3.3	2	138	80	218	Do.
1072...	Mar. 27	7.0	2.04	0	14.7	1.5	5	131	36	167	Very scattering.
1092...	Apr. 5	6.0	2.21	0	15.8	.5	5	141	12	153	Depleted.

28. PATCH NEAR FISH HAWK BAR.

There is a small dense patch of recent growth situated about one-fourth mile northeast of Fish Hawk Bar. It is nearly circular in outline, having a diameter slightly over 200 yards and an area of 9 acres. The patch has a depth at mean low water of 5 feet and an elevation from a few inches to about 1 foot. The bottom is firm mud and sand. The oysters are in small clusters and of good shape, although some scissor-bills were taken at a tonging station. An examination showed an average of about 168 bushels of seed and 373 bushels of market oysters per acre.

29. PATCH OFF SHEEPHEAD BAYOU (ST. VINCENT SOUND).

A small, very scattering patch of 6 acres is situated along the northeast shore of St. Vincent Island, about midway between Paradise and St. Vincent Points. Depth of water is 2 feet; bottom is of sand. The oysters are large and occur in scattering clusters, more or less covered with sea lettuce and green algæ. Some were partly buried in the sand. At the time of the survey they were fat and milky. Many small mussels and a few barnacles were taken. An examina-

tion of the patch showed an average of 6 bushels of seed and 55 bushels of market oysters per acre and a total of 366 bushels for the entire area.

30. PARADISE POINT BAR.

This somewhat rectangular-shaped bar of 74 acres is situated in the southeast section of St. Vincent Sound; off Paradise Point. Near the center a dense oval area of 11 acres is found, which is completely surrounded by a broad skirting of depleted bottoms of 63 acres. The depth ranges from 4½ to 6 feet at mean low water. The bottom, principally of sand with some mud, is hard and has but little elevation.

The oysters are of good size and in small scattering bunches. When this part of the sound was surveyed the oysters were fat and becoming milky. The oysters are usually taken by nipping. Many mussels and some barnacles were noted.

The following tables give the results obtained on this bar:

OYSTER GROWTH ON PARADISE POINT BAR.

Character of oyster growth.	Area.	Oysters per acre.			Estimated content of oysters.
		Under 3 inches.	Over 3 inches.	Total.	
	Acres.	Bushels.	Bushels.	Bushels.	Bushels.
Dense.....	11	191	158	349	3,839
Depleted.....	63	2	9	11	693
Total.....	74				4,532

DETAILS OF EXAMINATION OF PARADISE POINT BAR.

Station.	Date of examination.	Depth of water.	Area covered.	Oysters caught per square yard.			Shells per square yard.	Estimated quantity oysters per acre.			Character of oyster growth.
				Spat.	Culls.	Counts.		Seed.	Market.	Total.	
		Feet.	Sq. yds.					Bush.	Bush.	Bush.	
1152....	1915. Apr. 7	5.5	2.33	0	0	5.0	1	0	152	152	Dense.
1213....	Apr. 8	6.0	2.21		35.7	5.4	16	383	164	547	Do.
1149....	Apr. 7	7.0	2.04	0	.5	1.0	1	5	30	35	Depleted.
1173....	do.	5.5	2.38	0	.4	.8	0	4	24	28	Do.
1151....	do.	5.0					1				Do.
1212....	Apr. 8	6.5	(a)				0				Do.
1214....	do.	6.0					1				Do.
1216....	do.	6.5					1				Do.

^a Hard mud.

31. PARADISE FLAT AND ADJACENT LUMP.

This very irregular flat is located off the north shore of St. Vincent Island and slightly east of the center of the sound. It has a length in a northeast-southwest direction of about 1 mile, an average width of 800 yards, and, including the small lump to the northeast, contains an approximate area of 299 acres. Depth of water is 2 to 4½ feet at mean low tide. The elevation, particularly along the northern limits, varies from a few inches to about 1 foot. The bottom is sand or sand

and mud with occasional buried shells. The bar exhibits all phases of oyster growth from dense areas to depleted bottoms, these two alone embracing about 30 per cent each of the entire bed, while the scattering growth includes about 21 per cent and the very scattering about 17 per cent.

The oysters are large, heavy shelled, of good shape, and occur in small to large clusters. When examined they were fat, in good condition, but becoming milky. Many mussels, some barnacles, and considerable sea lettuce were observed. The oysters are usually taken by nipping or hogging.

Two small patches of very scattering growth southwest of this bed were outlined but were not examined in detail. They are shown on the chart.

The following tables show the character and details of examination of the flat and adjacent lump:

OYSTER GROWTH ON PARADISE FLAT AND ADJACENT LUMP.

Character of oyster growth.	Area.	Oysters per acre.			Estimated content of oysters.
		Under 3 inches.	Over 3 inches.	Total.	
	Acres.	Bushels.	Bushels.	Bushels.	Bushels.
Dense.....	93	28	337	365	33,945
Scattering.....	63	9	101	110	6,930
Very scattering.....	53	9	37	46	2,438
Depleted.....	90	2	0	2	180
Total.....	299				43,493

DETAILS OF EXAMINATION OF PARADISE FLAT AND ADJACENT LUMP.

Station.	Date of examination.	Depth of water.	Area covered.	Oysters caught per square yard.			Shells per square yard.	Estimated quantity oysters per acre.			Character of oyster growth.
				Spat.	Culls.	Counts.		Seed.	Market.	Total.	
		Feet.	Sq. yds.					Bush.	Bush.	Bush.	
1181....	1915. Apr. 8	6.0	2.21	0	1.8	6.8	2	19	207	226	Dense.
1185....	do.	5.0	2.55	0	1.6	6.0	3	17	180	197	Do.
1195....	do.	6.5	2.12	0	.5	15.1	4	5	495	500	Do.
1197....	do.	5.0	2.55	0	0	5.5	1	0	167	167	Do.
1198....	do.	5.0	2.55	0	1.1	5.5	1	12	167	179	Do.
1203....	do.	5.0	2.55	0	2.7	5.9	3	29	180	209	Do.
1206....	Apr. 14	4.0	3.05	0	2.9	8.2	5	31	249	280	Do.
1300....	do.	5.0	2.55	0	.8	10.9	1	9	332	341	Do.
1301....	do.	6.5	2.12	0	15.1	39.2	10	162	1,102	1,354	Do.
1302....	do.	4.5	2.80	0	0	6.5	0	0	193	193	Do.
1190....	Apr. 8	6.0	2.21	0	.5	2.7	1	6	82	87	Scattering.
1196....	do.	5.5	2.38	0	.5	2.8	5	5	85	90	Do.
1201....	do.	3.5	3.35	0	0	2.9	1	0	88	88	Do.
1294....	Apr. 14	3.5	3.35	0	.3	3.6	1	3	110	113	Do.
1297....	do.	5.0	2.55	0	2.4	4.3	39	26	131	157	Do.
1299....	do.	4.5	2.80	0	1.1	3.6	1	12	110	122	Do.
1182....	Apr. 8	6.5	2.12	0	0	.9	0	0	27	27	Very scattering.
1189....	do.	4.0	3.05	0	.3	1.3	1	3	40	43	Do.
1188....	do.	4.0	3.05	0	3.6	1.9	11	38	68	96	Do.
1199....	do.	4.5	2.80	0	0	1.1	0	0	33	33	Do.
1295....	Apr. 14	3.5	3.35	0	.6	.9	2	6	27	33	Do.
1200....	Apr. 8	4.0	3.05	0	.3	0	2	3	0	3	Depleted.
1202....	do.	4.0	3.05	0	0	0	0	0	0	0	Do.

^a Scrap shells.

32. HOPPE FLAT.

This body of oysters, forming a broad skirting along the north shore of St. Vincent Sound, begins near Signal Hoppe and extends westward for about 1½ miles. Its breadth is about 400 yards, and, exclusive of the private claim located within the eastern limits, contains about 151 acres. Depth of water is from 1 to 4 feet, with inshore parts becoming dry or awash at low tide. The bottom is firm and composed of sand, mud, and scraps. A few buried shells were observed in the central section of the bar. The elevation on the outer border is about 1 foot. Both the east and west ends of the bed, comprising about 110 acres, bear scattering growths of oysters; the central portion of 32 acres, very scattering; and the tongue or projection, an area of 9 acres, dense growth.

The oysters are large, occur usually in small clusters, and were found fat and in good condition, but milky. Many mussels, some barnacles, and considerable sea lettuce were taken, especially on the scattering growth.

The following tables point out the character of oyster growth and examination of this bed:

OYSTER GROWTH ON HOPPE FLAT.

Character of oyster growth.	Area.	Oysters per acre.			Estimated content of oysters.
		Under 3 inches.	Over 3 inches.	Total.	
Dense.....	Acres. 9	Bushels. 171	Bushels. 790	Bushels. 961	Bushels. 8,649
Scattering.....	110	22	117	139	15,290
Very scattering.....	32	11	67	78	2,400
Total.....	151				26,435

DETAILS OF EXAMINATION OF HOPPE FLAT.

Station.	Date of examination.	Depth of water.	Area covered.	Oysters caught per square yard.			Shells per square yard.	Estimated quantity oysters per acre.			Character of oyster growth.
				Spat.	Culls.	Counts.		Seed.	Market.	Total.	
	1915.	Fect.	Sq. yds.					Bush.	Bush.	Bush.	
1237...	Apr. 12	2.0	4.50	0	16.0	26.0	0	171	790	961	Dense.
1216...	do.	3.5	3.35	0	2.7	4.8	3	39	145	185	Scattering.
1232...	do.	4.5	2.80	0	.7	4.0	6	7	121	128	Do.
1233...	do.	2.0	4.50	0	2.0	3.1	2	31	94	125	Do.
1236...	do.	4.5	2.80	0	1.1	3.6	3	12	109	121	Do.
1231...	do.	4.5	2.80	0	1.0	2.2	5	11	67	78	Very scattering.

33. HOPPE OR TEN-MILE BAR.

This small dense area of 9 acres is situated near the center of St. Vincent Sound and lies equidistant from Paradise Flat and Bayou Bar on the south and Hoppe Flat on the north. At mean low water

it has a depth of about 3½ feet. The rather firm bed consists of blue mud and sand and is surrounded by a soft bottom. A station off the north end of the bar revealed a penetration of 11 feet with the testing pole.

The oysters are good shaped and in small clusters. At the time of the investigation they were fresh, fat, and milky. An examination of this bar showed about 24 bushels of oysters under 3 inches and 155 bushels of large ones per acre.

34. SUTERS LUMPS.

Situated between Bayou Bar and Hoppe Flat are three small lumps totaling 7 acres. Two have dense and the other very scattering growths of oysters. These patches were not examined in detail, but their location is indicated on the chart.

35. BAYOU BAR.

Beginning with a skirting of very scattering growth of oysters along the north shore of St. Vincent Island just east of the entrance to Big Bayou, this bar ranges northward for upward of a half mile, then bears to the east for about three-fourths mile in three tolerably well-defined arms. Its greatest width is approximately 500 yards, and its extent is about 177 acres. The depth of water at mean low tide is from 2 feet inshore to about 4 feet at the northern margin. The bed is only fairly well raised above the immediate floor and will hardly average 6 inches for its entire perimeter. The bottom is hard and consists principally of sand and mud with some scraps. The dense area lying to the eastward comprises about 60 per cent; scattering growth, in two small sections, 13 per cent; and very scattering, the connecting link between the main body and the island shore, about 26 per cent of the bar.

The oysters are very large and occur singly or in small clusters. When inspected they were fat, fresh, milky, and growing rapidly. Mussels, barnacles, and sea lettuce were found at nearly every station.

The acreage, character of growth, and details of examination are shown in the following tables:

OYSTER GROWTH ON BAYOU BAR.

Character of oyster growth.	Area.	Oysters per acre.			Estimated content of oysters.
		Under 3 inches.	Over 3 inches.	Total.	
Dense.....	Acres. 106	Bushels. 16	Bushels. 235	Bushels. 251	Bushels. 26,606
Scattering.....	24	7	94	101	2,424
Very scattering.....	47	0	73	73	3,431
Total.....	177				32,461

DETAILS OF EXAMINATION OF BAYOU BAR.

Station.	Date of examination.	Depth of water.	Area covered.	Oysters caught per square yard.			Shells per square yard.	Estimated quantity oysters per acre.			Character of oyster growth.
				Spat.	Culls.	Counts.		Seed.	Market.	Total.	
1220...	1915. Apr. 12	Feet. 4.5	Sq. yds. 2.80	0	1.5	0.5	4	Bush. 16	Bush. 289	Bush. 305	Dense.
1293...	Apr. 14	4.0	3.05	0	2.9	7.2	3	31	219	250	Do.
1303...	do.	4.5	2.80	0	0	6.5	6	0	198	198	Do.
1220...	Apr. 12	4.0	3.05	0	.7	3.3	4	7	100	107	Scattering.
1304...	Apr. 14	4.0	3.05	0	.7	2.9	1	7	88	95	Do.
1292...	do.	3.5	3.35	0	0	2.4	1	0	73	73	Very scattering.

That portion of the north shore of St. Vincent Island reaching from Big Bayou to St. Vincent Point, a distance of about 5 miles, has a firm bottom generally and usually clear and comparatively shallow water, with here and there scattering bunches of good oysters. When practicable, these grounds and adjacent bars are fished by nipping or by wading. It was stated that the work is often pursued by day in a flatboat or light-draft vessel, the product then taken to near-by oyster boats and culled at night; and also that under favorable conditions two men can gather from 12 to 15 barrels of oysters per day by these methods.

36. PATCHES OFF BIG BAYOU.

A small circular patch of dense growth of oysters is situated about three-fourths mile north of Big Bayou. This patch contains about 3 acres, the bottom is hard and fairly well raised above the neighboring grounds, and the depth is about 3 feet at mean low water. The oysters were good shaped, in small clusters, and were fat, fresh, and milky. An examination showed 10 bushels of seed and 228 bushels of marketable product per acre.

A small area about midway between the above patch and Big Bayou had a bottom composed of mud and dead shells; depth of water, about 4 feet.

A lump of limited extent and bearing very scattering growth is located about one-half mile west of the above area and 200 yards offshore; depth of water, 3 feet. No examination was made on this lump, but its position is indicated on the chart.

37. HALF MOON BAR.

This bed of 122 acres lies off the mainland or northern shore of St. Vincent Sound and 1 mile northwest of Bayou Bar. Its length in an east and west direction is about $1\frac{1}{2}$ miles, and its greatest width is about 400 yards; depth of water, 2 to $3\frac{1}{2}$ feet. The bottom varies from hard to medium, the eastern portion is largely sand, and the remainder is mud and sand. Some stations showed a slight deposit of yellow mud on top.

The oysters are, for the most part, large, deep, and occur in small clusters or as singles. The dense growth, comprising about 61 per cent of the total area, occupies the western portion of the bar. The scattering growth and depleted bottoms, of about 17 and 21 per cent, respectively, are found at the eastern section. At the time of the inspection the oysters were fat, fresh, and milky. Sea lettuce was observed at some stations.

The acreage, character of growth, and details of examination are shown in the following tables:

OYSTER GROWTH ON HALF MOON BAR.

Character of oyster growth.	Area.	Oysters per acre.			Estimated content of oysters.
		Under 3 inches.	Over 3 inches.	Total.	
Dense.....	Acres. 75	Bushels. 26	Bushels. 282	Bushels. 288	Bushels. 21,600
Scattering.....	21	7	109	116	2,436
Depleted.....	26	0	12	12	312
Total.....	122				24,348

DETAILS OF EXAMINATION OF HALF MOON BAR.

Station.	Date of examination.	Depth of water.	Area covered.	Oysters caught per square yard.			Shells per square yard.	Estimated quantity oysters per acre.			Character of oyster growth.
				Spat.	Culls.	Counts.		Seed.	Market.	Total.	
1250...	1915. Apr. 12	Feet. 5.5	Sq. yds. 2.38	0	2.1	6.3	4	Bush. 22	Bush. 192	Bush. 214	Dense.
1254...	do.	4.5	2.80	0	2.9	10.0	1	31	332	363	Do.
1251...	do.	5.0	2.55	0	0.8	3.9	0	9	118	127	Scattering.
1253...	do.	4.5	2.80	0	0.4	3.3	2	4	100	104	Do.
1252...	do.	4.5	2.80	0	0	.4	0	0	12	12	Depleted.

38. SHELL BANK BAR.

This long sinuous bar begins in the shallow water along the north shore of the sound near Signal Tree and extends south and south-east for about $1\frac{1}{2}$ miles. The greater part is very narrow, the crest or top of which consists of small bars dry or awash at low tide. The easternmost extremity broadens to a nearly circular outline with a breadth of about one-fourth mile. The entire area is about 129 acres. It is separated from Picoline Bar by a channel known locally as Big Gully, which has a depth of 26 to 29 feet. The hard, clean bottom is composed principally of sand, shell gravel, and shells, and depth of water ranges from a few inches to about 6 feet.

The oysters are large, of good shape, generally deep, and occur in small clusters or as singles. When examined they were fat and

milky. Very few mussels and barnacles were noted, although some of the older shells contained a number of the boring clam *Martesia*.

An average of five stations made on this bar gave the following results: 34 bushels of oysters under 3 inches and 358 bushels over 3 inches per acre. The bar has dense growth throughout.

DETAILS OF EXAMINATION OF SHELL BANK BAR.

Station.	Date of examination.	Depth of water.	Area covered.	Oysters caught per square yard.			Shells per square yard.	Estimated quantity oysters per acre.			Character of oyster growth.
				Spat.	Culls.	Counts.		Seed.	Market.	Total.	
	1915.	<i>Fect.</i>	<i>Sq. yds.</i>					<i>Bush.</i>	<i>Bush.</i>	<i>Bush.</i>	
1255...	Apr. 12	6.5	2.12	0	4.7	11.8	3	50	358	408	Dense.
1250...	do.....	7.5	2.04	0	2.4	5.4	19	26	164	190	Do.
1260...	do.....	5.0	2.55	0	4.8	18.4	11	46	559	605	Do.
1288...	Apr. 13	1.5	1.0	0	2.0	13.0	20	21	395	416	Do.
1306...	Apr. 14	6.5	2.12	0	2.4	10.4	14	25	316	341	Do.

39. PICOLINE BAR.

Picoline Bar is situated in the southwestern section of St. Vincent Sound, about 3 miles east of Indian Pass. No detailed examination was made on this bar, but its position is shown on the chart. It consists principally of shallow reefs extending northward from St. Vincent Island to the Big Gully. Both on the east and west it is delimited by private claims. The present limits are about one-half mile in length by 300 yards in width, having an approximate area of 48 acres. The margins along the northeast and northwest portions have a depth of about 4 feet and a hard bottom of sand and scrap shells, but no oysters. The top has dense growth. Formerly this bar was a bed of dead oysters.

40. CEDAR SHELL BANK BAR.

This consists of two shallow bars reaching southward from the mainland, about 2 miles east of Indian Pass. The western and upper third of the eastern extensions bear dense growth, consisting mostly of clusters of the shallow-bar type and generally of scrawny appearance. However, some singles are of fine shape.

A station made by wading on the lower end of the west reef revealed a hard bottom, with 14 small oysters, 21 from 3 to 4 inches in length, and 98 large ones, and 10 shells per square yard. Sea lettuce and a few mussels were observed. When examined the oysters were fat and milky.

The lower two-thirds of the east reef supports scattering growth. A station near the center of this section, in a depth of 3 feet and on a medium-hard bottom, gave the following results: 0.3 culls, 3.6

counts, and 1 shell per square yard. On this part of the bar the oysters were mostly good-shaped singles; they were fat and milky. The bar contains about 48 acres.

REVIEW OF THE NATURAL OYSTER BEDS.

The entire water area surveyed, from signals Marsh and Spartan to Indian Pass, contains about 130 square miles. In this district there were found and definitely located about 40 productive oyster bars, having an extent of about 7,135 acres, or 11.1 square miles, or nearly one-twelfth of the area surveyed.

In St. George Sound the ratio of beds to the part surveyed is, approximately, 1 to 6; in Apalachicola Bay the ratio is about 1 to 19, and in St. Vincent Sound it is about 1 to 10. Of the three bodies of water it is therefore evident that St. George Sound is the most advantageously situated as far as acreage of oyster beds is concerned and Apalachicola Bay the least so.

In St. George Sound the beds are rather indiscriminately located, but the larger ones are found along the western margin. The best beds are Porter, East Hole, and parts of Platform Bars.

In Apalachicola Bay the major portion of the beds are crowded in the western limits, where excellent stock is found, and in St. Vincent Sound the beds are for the most part situated along the southeastern shore and central portions.

About two-thirds of the total area of oyster bottom is classed as dense growth, the remaining part is about equally divided among scattering, very scattering growths, and depleted bottoms. Dense growth occupies somewhat more than 80 per cent of the oyster area in St. George Sound and about 50 per cent each in Apalachicola Bay and St. Vincent Sound. Scattering growth covers approximately 5 per cent, 11 per cent, and 21 per cent in the three bodies of water, respectively, while the per cent of surface for very scattering is about 6, 23, and 13, and for depleted bottoms it is about 5, 14, and 17, respectively.

The chart which accompanies this report shows the location and character of the beds, and the following table classifies the growth for each of the larger beds and for groups of the smaller patches.

SUMMARIZED STATEMENT OF AREAS OF MARKET OYSTERS ON PUBLIC BEDS.

Name of bed.	Character of oyster growth.				Total.
	Dense.	Scatter- ing.	Very scat- tering.	Depleted.	
ST. GEORGE SOUND.					
	Acres.	Acres.	Acres.	Acres.	Acres.
1. Goose Island Bar.....	24		120		150
2. Silvia Bar.....	57	4	8		69
3. Drum Bar.....	81			30	111
4. Sand Flat.....	20	20			40
5. Pelican Bar.....	60	17	6	5	97
6. North Lump.....		5		5	10
7. Green Point Bar and adjacent patch.....		9	17	10	57
8. Platform Bar.....	21		5	2	339
9. Porter Bar.....	332		25	112	260
10. Peanut Patch.....	114	0			123
11. Cat Point Bar.....	123				794
12. Bulkhead and East Hole Bars.....	686	102		6	1,379
13. Patches east of Bulkhead and East Hole Bars.....	1,322	12	30	15	5
	5				
APALACHICOLA BAY.					
14. Pelican Bar.....	91		110	97	298
15. Patches between East Hole and Pelican Bars.....	38	5			43
16. East Lumps.....	168	4	24	28	224
17. Norman Bar.....	45				45
18. Thigpen Bar.....	4				4
19. West Lump and adjacent patch.....	75	11	5		91
20. Patch off New Inlet.....	5				5
21. Hagen Flat.....	54	8			62
22. Green Point Flat.....	170				170
23. Lumps between Hagen and Green Point Flats.....	22		3		25
24. St. Vincent Bar.....	585	218	391	220	1,414
25. Middle Bar.....	48				48
26. Silva Bar.....	23	8	69		100
27. Fish Hawk Bar.....	20	27	13	21	90
28. Patch near Fish Hawk Bar.....	9				9
ST. VINCENT SOUND.					
29. Patch off Sheephead Bayou.....			6		6
30. Paradise Point Bar.....	11			63	74
31. Paradise Flat and adjacent lump.....	93	63	53	90	299
32. Hoppe Flat.....	9	110	32		151
33. Hoppe or Ten-Mile Bar.....	9				9
34. Suters Lumps.....	5		2		7
35. Bayou Bar.....	100	24	47		177
36. Patches off Big Bayou.....	3				3
37. Half Moon Bar.....	75	21		26	122
38. Shell Bank Bar.....	129				129
39. Picoline Bar.....	48				48
40. Cedar Shell Bank Bar.....	39	9			48
Total.....	4,747	686	972	730	7,135

The following table shows the character of oyster growth and yield in standard United States bushels for the various bars. The classification, as is explained on page 11, is based on the relative abundance of oysters over 3 inches long, which is assumed to be the minimum size that could be used for market purposes. The smaller oysters, while recorded and elsewhere discussed, do not enter in any way into the classification. Neither does the term "dense" mean a continuous cover of massed oysters. It is used to express the condition where oysters in excess of 150 bushels per acre are found on the bottom, lying on the mud or sand, either as a continuous growth or in separated clusters.

It may be stated that, as a rule, only those oysters having a length of 4 inches or over were taken to market by the tongs; those under

that length were considered as culls. The unit of measure used by those engaged in the industry is the Florida tub, or so-called "bushel," which contains about 2.2 bushels. If based on these data—the Florida bushel and 4-inch oyster—the yield per acre and per bar would be materially less than that determined according to the classification and measurements mentioned above.

The table shows an average of 368 bushels of marketable oysters per acre for the entire area of oyster beds in the district and an average of about 525 bushels per acre for the dense growth. Exclusive, however, of Bulkhead and East Hole Bars, the average for the entire oyster area drops to 274 bushels.

SUMMARIZED CONTENT OF MARKET OYSTERS ON PUBLIC BEDS.

Name of bed.	Character of oyster growth.				Total.
	Dense.	Scatter- ing.	Very scat- tering.	Depleted.	
ST. GEORGE SOUND.					
	<i>Bushels.</i>	<i>Bushels.</i>	<i>Bushels.</i>	<i>Bushels.</i>	<i>Bushels.</i>
1. Goose Island Bar.....	8,592		7,308		15,900
2. Silvia Bar.....	19,209	416	536		20,161
3. Drum Bar.....	27,216			360	27,576
4. Sand Flat.....	4,620	2,300			6,920
5. Pelican Bar.....	31,257	2,210	276	105	33,848
6. North Lump.....		725			725
7. Green Point Bar and adjacent patch.....	4,074	1,188	1,139	200	6,601
8. Platform Bar.....	222,772		90		222,862
9. Porter Bar.....	28,272	1,026	1,175	2,800	33,273
10. Peanut Patch.....	67,281				67,281
11. Cat Point Bar.....	324,478	11,628		126	336,232
12. Bulkhead and East Hole Bars.....	1,048,058	1,344	1,500	195	1,046,187
13. Patches east of Bulkhead and East Hole Bars.....	1,440				1,440
APALACHICOLA BAY.					
14. Pelican Bar.....	53,053		5,720	291	59,064
15. Patches between East Hole and Pelican Bars.....	17,024	500			17,524
16. East Lumps.....	76,104	308	1,296		77,708
17. Norman Bar.....	23,220				23,220
18. Thigpen Bar.....	1,020				1,020
19. West Lump and adjacent patch.....	31,875	1,386	310		33,571
20. Patch off New Inlet.....	980				980
21. Hagen Flat.....	34,236	752			34,988
22. Green Point Flat.....	70,380				70,380
23. Lumps between Hagen and Green Point Flats.....	10,266		78		10,344
24. St. Vincent Bar.....	221,130	24,634	10,550	3,740	269,054
25. Middle Bar.....	19,008				19,008
26. Silva Bar.....	7,814	1,104	3,933		12,851
27. Fish Hawk Bar.....	7,192	2,484	468	252	10,396
28. Patch near Fish Hawk Bar.....	3,357				3,357
ST. VINCENT SOUND.					
29. Patch off Sheephead Bayou.....			330		330
30. Paradise Point Bar.....	1,738			567	2,305
31. Paradise Flat and adjacent lump.....	31,341	6,363	1,061		38,665
32. Hoppe Flat.....	7,110	12,870	2,144		22,124
33. Hoppe or Ten-Mile Bar.....	1,395				1,395
34. Suters lumps.....					
35. Bayou Bar.....	24,910	2,256	3,431		30,597
36. Patches off Big Bayou.....	684				684
37. Half Moon Bar.....	19,650	2,289		312	22,251
38. Shell Bank Bar.....	46,182				46,182
39. Picoline Bar.....					
40. Cedar Shell Bank Bar.....					
Total.....	2,491,468	75,783	51,335	8,948	2,627,534

a Detailed examination was not made over the entire bar.

With reference to quantity, the small oysters, or those under 3 inches long, are about one-fifth that of the market stock, but numerically they are about twice as numerous as the market stock.

SUMMARIZED CONTENT OF YOUNG OYSTERS ON PUBLIC BEDS.

Name of bed.	Character of oyster growth.				Total.
	Dense.	Scatter- ing.	Very scatter- ing.	De- pleted.	
ST. GEORGE SOUND.					
	<i>Bushels.</i>	<i>Bushels.</i>	<i>Bushels.</i>	<i>Bushels.</i>	<i>Bushels.</i>
1. Goose Island Bar.....	2,760		3,024		5,784
2. Silvia Bar.....	7,752	600	32		8,444
3. Drum Bar.....	8,748			900	9,708
4. Sand Flat.....	1,540	1,540			3,080
5. Pelican Bar.....	6,693	1,802	180	95	8,770
6. North Lump.....		405		35	440
7. Green Point Bar and adjacent patch.....	2,226	216	357	210	3,009
8. Platform Bar.....	36,852				36,852
9. Porter Bar.....	10,716	477	300	3,024	14,517
10. Peanut Patch.....	17,220				17,220
11. Cat Point Bar.....	53,508	4,080		378	57,966
12. Bulkhead and East Hole Bars.....	158,040	600	1,170	195	160,701
13. Patches east of Bulkhead and East Hole Bars.....	545				545
APALACHICOLA BAY.					
14. Pelican Bar.....	10,556		6,380	970	17,906
15. Patches between East Hole and Pelican Bars.....	2,850	300			3,150
16. East Lumps.....	17,136	72	1,056		18,264
17. Norman Bar.....	2,745				2,745
18. Thilgpen Bar.....	324				324
19. West Lump and adjacent patch.....	5,325	319			5,644
20. Patch off New Inlet.....	175				175
21. Hagen Flat.....	5,346	200			5,546
22. Green Point Flat.....	17,850				17,850
23. Lumps between Hagen and Green Point Flats.....	1,232		18		1,250
24. St. Vincent Bar.....	39,780	5,886	6,256	6,380	58,302
25. Middle Bar.....	2,352				2,352
26. Silva Bar.....	897	480	897		2,274
27. Fish Hawk Bar.....	7,888	4,752	1,703	2,961	17,304
28. Patch near Fish Hawk Bar.....	1,512				1,512
ST. VINCENT SOUND.					
29. Patch off Sheephead Bayou.....			36		36
30. Paradise Point Bar.....	2,101			126	2,227
31. Paradise Flat and adjacent lump.....	2,604	567	477	180	3,828
32. Hoppe Flat.....	1,539	2,420	352		4,311
33. Hoppe or Ten-Mile Bar.....	210				210
34. Suters Lumps.....					
35. Bayou Bar.....	1,696	168			1,864
36. Patches off Big Bayou.....	30				30
37. Half Moon Bar.....	1,950	147			2,097
38. Shell Bank Bar.....	4,386				4,386
39. Picoline Bar.....					
40. Cedar Shell Bank Bar.....					
Total.....	437,600	25,187	22,238	15,514	500,629

^a Detailed examination was not made over the entire bar.

For some phase of the growth, from dense areas to depleted bottoms, small oysters were in numerical preponderance on only about 45 per cent of the beds. Of these the greater number were in St. George Sound. At the time of the survey spat for the season had not set, which, of course, would reduce the proportion of the young. On those beds, however, where large oysters predominated the small size were in sufficient numbers to perpetuate the beds under present conditions, unless depleted by physical accidents, such as storms,

freezes, or deposits of silt and sand, all of which have occurred on some bars during the history of the local fishery.

Among the beds which appear to be the least provided with young stock are Platform Bar and Peanut Patch in St. George Sound; Norman, West Lump, Hagen Flat, Green Point Flat, Middle, and Silva Bars in Apalachicola Bay, and the greater number of bars in St. Vincent Sound.

From the table it appears that the following beds are extending their productive areas by improvement of the very scattering growths and depleted bottoms: Drum, Pelican, Green Point, Porter, Cat Point, Bulkhead, and East Hole Bars in St. George Sound, and Pelican, St. Vincent, and Fish Hawk Bars in Apalachicola Bay.

NUMBER OF OYSTERS UNDER THREE INCHES LONG FOR EACH ONE OVER THAT LENGTH ON THE SEVERAL BEDS.

Name of bed.	Character of oyster growth.			
	Dense.	Scatter-ing.	Very scatter-ing.	De-pleted.
ST. GEORGE SOUND.				
1. Goose Island Bar.....	0.9		1.1	
2. Silvia Bar.....	1.1	2.9	.7	
3. Drum Bar.....	.9			7.5
4. Sand Flat.....	.9	1.8		
5. Pelican Bar.....	.6	2.3	1.8	8.3
6. North Lump.....		1.6		(^a) 2.8
7. Green Point Bar and adjacent patch.....	1.5	.5	1.8	
8. Platform Bar.....	1.3		(^b) 1.5	4.0
9. Porter Bar.....	1.3	1.7		
10. Peanut Patch.....	.8			8.9
11. Cat Point Bar.....	.5	1.2		3.0
12. Bulkhead and East Hole Bars.....	.4	1.6	3.1	
13. Patches east of Bulkhead and East Hole Bars.....	1.4			
APALACHICOLA BAY.				
14. Pelican Bar.....	.6		4.3	10.2
15. Patches between East Hole and Pelican Bars.....	.5	2.0		
16. East Lumps.....	.6	.7	2.2	
17. Norman Bar.....	.4			
18. Thilgpen Bar.....	.9			
19. West Lump and adjacent patch.....	.5	.6	(^b)	
20. Patch off New Inlet.....	.4			
21. Hagen Flat.....	.3	.7		
22. Green Point Flat.....	.6		.5	
23. Lumps between Hagen and Green Point Flats.....	.3	.5	.0	3.8
24. St. Vincent Bar.....	.3			
25. Middle Bar.....	.3			
26. Silva Bar.....	.3	.9	.4	
27. Fish Hawk Bar.....	3.0	5.2	9.8	31.6
28. Patch near Fish Hawk Bar.....	.9			
ST. VINCENT SOUND.				
29. Patch off Sheephead Bayou.....			.3	.5
30. Paradise Point Bar.....	3.4			(^a)
31. Paradise Flat and adjacent lump.....	.2	.2	.7	
32. Hoppe Flat.....	.6	.5	.5	
33. Hoppe or Ten-Mile Bar.....	.4			
34. Sufers Lumps ^a			(^b)	
35. Bayou Bar.....	.2	.2		
36. Patches off Big Bayou.....	.1			(^b)
37. Half Moon Bar.....	.3	.2		
38. Shell Bank Bar.....	.8			
39. Picoline Bar ^a				
40. Cedar Shell Bank Bar.....	.1	.1		

^a No large.

^b No small.

^c Detailed examination was not made over the entire bar.

BARREN BOTTOMS.

The area of barren bottoms—that is, those which are not naturally productive of oysters even in small quantities—vastly exceeds that of the natural beds, including in the latter those so-called depleted areas which bear practically nothing. These bottoms are barren, mainly because of one character in which they differ from the productive areas—namely, that they are devoid of shells or other objects lying on the surface. They consist of sand and mud of varying degrees of stability and consistency. Oysters, immediately after they develop from the egg, for a brief period swim or float freely in the water, settling to a fixed condition only after they reach a stage of considerable development.^a

It is not necessary to give more detail to this subject other than to say that at the time at which they are undergoing fixation the oysters are very minute, and a slight film of mud or slime is sufficient to stifle them. During the spawning season these little organisms are present in the water in untold myriads and are precipitated to the bottom in a continuous gentle drizzle of tiny specks. If they fall on an oyster bed they find firm supports on the shells and oysters, attach themselves and grow, but if they fall on the mud or bare sand they die.

The natural beds have been slowly developed on bottom similar to that which surrounds them solely because through some agency there originally lodged on the mud or sand some hard objects to which the young oysters could safely cling. Oysters developing there and their shells scattered about by the waves furnished additional places for fixation of new generations of young, with the result that the original growth extended in area and its bed became a compact mass of shells and fragments, beneath which can still be found by excavation or probing the original bottom differing in no essential particular from the adjacent barren areas.

All that is required by the barren bottom in order that it may become productive is that its surface should be supplied with hard objects or cultch, either through natural agencies or by the hand of man. The capacity of the bottom to sustain material deposited on it and to maintain it in proper condition to serve as cultch depends largely on its stability and consistency. Moving sands gradually cover objects deposited on their surface and soft mud permits them to sink. It is therefore of prime importance for the oyster culturist to have information concerning the character of the bottom, and it was one of the purposes of the survey to supply it.

The methods and the instrument employed have been described in the introductory part of this report, and the results attained are shown graphically on the chart.

^a For a more extended account see "Oysters and methods of oyster culture," by H. F. Moore, Bureau of Fisheries document no. 349, which may be obtained by application to the Bureau at Washington, D. C.

The symbols on the chart designating the character of the bottom do not show all of the places at which examinations were made, but only those which have been selected as representative of the general conditions obtaining in the vicinity. It may be assumed that between any two adjacent symbols of different significance the change in the character of the bottom is more or less gradual.

The large number of soundings and bottom testings made during the course of the survey furnish valuable data for the determination of the character of the floor of the entire district. About 119 square miles, or 91 per cent of the region, exclusive of the depleted grounds of or adjacent to the recognized oyster reefs, consist of unoystered areas.

Of the productive portion of St. George Sound the eastern half has for the most part a firm hard bottom suitable for the development of oyster beds. The depth of water in this section is about 9 feet at mean low level. In certain portions, however, as between Porter and Green Point Bars and for some distance to the eastward of the latter bar, the bottom varies in quality from very soft to stiff mud and is unfavorable for the planting of shells or other cultch. The western half of the sound, barring the shore line, has generally very soft bottoms. Between Porter and Cat Point Bars and south of Peanut Patch there are stretches having ooze. Hard or stiff mud bottoms are found east of Drum Bar, between Silvia and Porter Bars, and northeast of signal Bulkhead.

With the exception of the margins, the greater portion of Apalachicola Bay has many soft or ooze bottoms. At a station west of St. Vincent Bar the testing pole recorded a depth of 8 feet of mud. Good firm bottoms are found on a small area west of Cat Point Bar, an extended section (of which a part was a bed of dead shells when examined by the Bureau 20 years ago) west and northwest of Pelican Bar, a stretch off signal Scaffold, a portion south of Green Point, a stiff mud area east of St. Vincent Bar, and a series of small patches northeast of West Pass. Depth of water ranges from 5 to 10 feet.

The eastern half of St. Vincent Sound has rather soft bottoms, but the western division is hard, firm, and more or less covered with scrap shells.

The location of barren bottoms which appear to be suitable for the development and culture of oysters may be approximately determined by consulting the chart.

GENERAL PHYSICAL AND BIOLOGICAL CONDITIONS.

TIDES AND CURRENTS.

In order to reduce the great number of soundings made during the survey to approximate mean low-water level, four widely separated tide-gauge stations, consisting of plain staffs graduated in feet and

tenths, were established and maintained for all or part of the time. One station was located at Cat Point (East Point, Fla.) from January 16 to April 9; the second station was at Apalachicola, Fla., from January 21 to April 15; the third on St. Vincent Island near West Pass from March 23 to April 16; the fourth at the camps along the north shore of St. Vincent Sound from April 2 to 20. The readings were made hourly from 8 a. m. to 5 p. m., excepting at the Apalachicola station, which was read every hour, day and night, from its establishment until the last of February, then the same as for the other stations for the remainder of the period.

At the Cat Point station the highest tide recorded was on February 23, when the water stood at 5.8 feet on the gauge, and the lowest was on January 29, when it fell to 1 foot, a maximum range of 4.8 feet. At Apalachicola on the same dates there was a range of 4.1 feet, but on February 1, from 3 to 4 a. m., the water reached a height of 6.8 feet, and on February 8, from 5 to 6 a. m., it stood at 2.4 feet, making a range of 4.4 feet. The West Pass station showed a maximum range of 1.8 feet and the camp stations about 2 feet. The mean range of tide was 1.5 feet for all stations, except West Pass, which was 1 foot.

The daily ebb and flow of the tide, though often augmented by high winds, is sufficiently strong to afford satisfactory currents for transporting food and oxygen to the oysters.

SALINITY AND TEMPERATURE OF THE WATER.

The connections or entrances at the eastern end of St. George Sound, West and Indian Passes, afford ample means for the comingling of the waters from the Gulf of Mexico with the fresh water brought down by the Carrabelle, Apalachicola, St. Marks, and other affluents. Throughout the entire district surveyed there was a marked range in the degree of salinity, which varied from almost fresh water suitable for drinking purposes to that nearly equal to open-sea water. At times, especially during ebb tide, together with freshets and favorable winds, the salinity was greatly reduced in certain sections. Early in the survey it was noted that comparatively fresh muddy water from East Bay overlapped the heavier clear salt water and extended for some distance east or west of that bay, depending largely on the direction of the wind before becoming thoroughly mixed. In this way the oyster beds are supplied with food, as it appears to be carried for many miles. If the direction of the currents be eastward, Cat Point and Porter Bars may have food-bearing waters spreading over them for some time before Bulkhead and East Hole Bars.

The character and quality of the oyster, as well as the presence or absence of certain enemies, are governed largely by the amount of

salt in solution. This mollusk thrives best in brackish water, having a mean between fresh (specific gravity 1.000) and open-sea water (specific gravity about 1.025). Either extreme, if continued, is decidedly injurious, if not fatal. Waters of rather high salinity are more favorable for drills or conchs, while mussels thrive in waters of low salt content.

For the purpose of determining the general character of the waters, two separate but simultaneous series of observations of salinity and temperature were carefully made. From the *Fish Hawk* the work was performed by the quartermasters at 6 a. m., noon, and 6 p. m., daily throughout the survey.

The vessel was first anchored off Cat Point, remaining there until the latter part of February; then off Jetty Beacon for about one month; next, in southwestern part of Apalachicola Bay for about a week; and, finally, near the second anchorage until the completion of the survey. The biological party conducted the other series, which covered all parts of the region surveyed, including stations on the oyster bars and on unproductive grounds.

The water bottle, or apparatus used for collecting the samples, is so constructed that it secures a uniform amount of water in every case from the layer a few inches above the bottom of the sound, regardless of the depth. This instrument is illustrated and described in Volumetric studies of the food and feeding of oysters, by H. F. Moore (Bulletin Bureau of Fisheries, vol. xxviii, p. 1297-1308).

The following table furnishes a summary of the two series of observations. The boldface type shows the data and location of the *Fish Hawk*; the other type, that of the biological party.

SALINITY AND TEMPERATURE OBSERVATIONS IN ST. GEORGE SOUND, APALACHICOLA BAY, AND ST. VINCENT SOUND.

Locality.	Date.	Water temperature.			Specific gravity.		
		Maxi-mum.	Mini-mum.	Aver-ago.	Maxi-mum.	Mini-mum.	Aver-ago.
	1915.	°F.	°F.	°F.			
<i>Fish Hawk</i> , off Cat Point...	Jan. 12-15.....	59	48.2	58.2	1.0088	1.0026	1.0054
<i>Fish Hawk</i> , off Cat Point...	Jan. 16-23.....	60.8	51.3	56.7	1.0098	1.0066	1.0053
Eastern end of St. George Sound.	.....do.....	57.2	51.8	54.8	1.0190	1.0036	1.0113
<i>Fish Hawk</i> , off Cat Point...	Jan. 24-31.....	59	53.6	58	1.0097	1.0041	1.0062
Vicinity of Porter and Platform Bars.	.....do.....	55.4	51.3	54.4	1.0088	1.0019	1.0056
<i>Fish Hawk</i> , off Cat Point...	Feb. 1-5.....	60.8	53.6	59.4	1.0089	1.0014	1.0045
East of Cat Point and Bulkhead Bars.	.....do.....	60.8	53.6	56.3	1.0053	1.0004	1.0020
<i>Fish Hawk</i> , off Cat Point...	Feb. 6-10.....	60.8	53.6	56.9	1.0082	1.0010	1.0019
Vicinity of East Hole, Cat Point, and East Bay.	.....do.....	54.5	50	52.9	1.0062	1.0001	1.0025
<i>Fish Hawk</i> , off Cat Point...	Feb. 11-17.....	60.8	54.5	58.0	1.0095	1.0025	1.0053
Vicinity of Drum, Platform, and Cat Point Bars.	.....do.....	59.9	53.6	57.7	1.0139	1.0022	1.0070
<i>Fish Hawk</i> , off Cat Point...	Feb. 18-22.....	60.8	55.4	58	1.0220	1.0058	1.0158
Vicinity of Pelican Bar, and east part of Apalachicola Bay.	.....do.....	58.1	57.2	57.4	1.0218	1.0097	1.0172

SALINITY AND TEMPERATURE OBSERVATIONS IN ST. GEORGE SOUND, APALACHICOLA BAY, AND ST. VINCENT SOUND—Continued.

Locality.	Date.	Water temperature.			Specific gravity.		
		Maxi- mum.	Mini- mum.	Aver- age.	Maxi- mum.	Mini- mum.	Aver- age.
Fish Hawk, off Jetty Beacon.	1915.						
Eastern part of Apalachicola Bay.	Feb. 23-25.....	60.8	57.2	59.4	1.0220	1.0114	1.0176
.....do.....	.....do.....	59	56.3	57.5	1.0160	1.0117	1.0133
Fish Hawk, off Jetty Beacon.	Mar. 1-6.....	60.8	58.0	57	1.0158	1.0069	1.0119
Vicinity of Norman Bar, East Bay.	.....do.....	60.8	53.6	56.8	1.0152	1.0068	1.0097
Fish Hawk, off Jetty Beacon.	Mar. 7-15.....	57.2	51.8	54.7	1.0189	1.0077	1.0185
Vicinity of Apalachicola.	.....do.....	57.2	55.4	56.6	1.0177	1.0038	1.0082
Fish Hawk, off Jetty Beacon.	Mar. 16-22.....	60.8	58.6	57.2	1.0210	1.0119	1.0174
Central part of Apalachicola Bay.	.....do.....	57.2	55.4	56.6	1.0228	1.0177	1.0209
Fish Hawk, at Lower Anchorage.	Mar. 23-28.....	59	55.4	57	1.0242	1.0077	1.0183
Western part of Apalachicola Bay.	.....do.....	62.6	55.4	60.3	1.0246	1.0149	1.0208
Fish Hawk, off Jetty Beacon.	Mar. 20-Apr. 5.....	62.2	58.6	58.8	1.0198	1.0050	1.0120
Western part of Apalachicola Bay.	.....do.....	59	57.2	58.1	1.0156	1.0118	1.0137
Fish Hawk, off Jetty Beacon.	Apr. 6-11.....	68	58.6	59.4	1.0190	1.0109	1.0151
Eastern part of St. Vincent Sound.	.....do.....	64.4	60.8	62.7	1.0204	1.0087	1.0115
Fish Hawk, off Jetty Beacon.	Apr. 12-15.....	71.6	57.2	64.9	1.0188	1.0061	1.0121
Central and western part of St. Vincent Sound.	.....do.....	76.1	68	71	1.0219	1.0074	1.0102

The table shows that the average water temperature in Apalachicola Bay, as determined by the observations taken on the *Fish Hawk*, ranged from 53.2° F. in the middle of January to 64.9° F. in the middle of April, a gradual increase of 11.7° during the interval. Also, the lowest temperature observed was 48.2° F., off Cat Point in January, and the highest 76.1° F., in rather shallow water at the western borders of St. Vincent Sound during the middle of April, showing a change of 27.9°.

During the early part of February a very low salinity observation (1.0001) was made near the eastern limits of Apalachicola Bay, and during the latter part of March, in the western part of the same body of water, an observation revealed a high salt content (1.0246). As has been mentioned, these extremes continue for very short periods only. The general average salinity is satisfactory and within the limits of safety.

OYSTER ENEMIES.

From statements of dealers and tongs, as well as from observation, it appears that the oyster in this locality has no aggressive enemies. Physical conditions, however, are often decidedly injurious to certain bars or localities. Storms may cause a shifting of sand or mud over the beds and stifle the mollusk, freshets may deposit a layer of mud, droughts may reduce greatly the food supply, and freezing weather accompanied by a low tide may prove very harmful.

The following information is furnished respecting certain enemies which are common in other parts of the Gulf coast:

Drills or conchs.—So few drills were found on the oyster beds that no damage whatever was noted, and they may be regarded as a negligible quantity in these waters. The few that were taken were found, for the most part, in the western extremity of Apalachicola Bay, in the vicinity of West Pass, where the salinity naturally attains a high degree for a part of the time at least. Under the description of the various beds, mention is made of the places and number of drills taken. It is commonly supposed by oystermen that the drill secretes an acid by which it perforates the oyster shells by solution, but in reality the holes are made mechanically by means of a rasplike tongue, which is protruded from the mouth.

Mussels (Mytilus hamalus).—This species, which was found on the oyster bars, is distinct from the large edible sea mussel of the Atlantic coast and, also, the fresh-water mussel used for the manufacture of buttons and novelties. So far as is known, it has no present economic use, but doubtless it would make a good fertilizer. Although this mollusk is classed as an oyster enemy, it is not one in the sense of preying on this more valuable shellfish. It is injurious in that it eats the same kind of food as the oyster, and, therefore, lessens the food supply; and its more prolific growth enables it to cover the oyster, which interferes with its development, and eventually, may stifle or starve it.

Mussels were found in varying quantities on practically all of the oyster beds. They were found in rather larger numbers on the reefs in the vicinity of East Bay, where the salinity of the water is reduced by reason of the proximity of the large affluents, and, also, on the beds in the southeastern section of St. Vincent Sound. They were only fairly abundant on the eastern beds, and least so at the western ends of both Apalachicola Bay and St. Vincent Sound.

Drumfish (Pogonias cromis).—The black drum was not observed during the survey, nor was it learned that it had ever caused destruction of the oysters of this region. It is enumerated here in the list of enemies, because it may appear suddenly on any part of the coast and is reported to have destroyed oysters on the beds of Alabama. It destroys oysters by crushing them between the stout grinding teeth or bones with which its mouth is furnished.

Minor enemies and pests.—Among the minor but objectionable enemies observed during the survey may be mentioned the following: Barnacles, although generally small, were plentiful on some beds. They roughen the shells and crowd the oyster, but do comparatively little harm. The little clam *Martesia* was found more particularly in the larger and older shells, which were weakened by the boring, but

the inner cavity was seldom penetrated. At a few stations a coral growth was observed on the oysters. Marine algæ were noted growing luxuriantly on the clusters at a number of stations, usually near the inner limits of the beds.

SPAWNING.

The conditions of spawning probably do not differ from those generally obtaining on the Gulf coast, and it is therefore not necessary to discuss the subject at any length. It will suffice to repeat what has been said in a previous report.^a

The spawning of oysters consists, in brief, of the discharge of eggs from the female and spermatozoa from the male which meet and fuse in the surrounding water. The fertilized eggs develop into minute embryos, each furnished with a little brush of cilia or hairlike processes which vibrate in rhythm and propel it feebly through the water. After a time, varying with the temperature of the water, the embryos develop a tiny shell, which by its weight eventually precipitates them to the bottom, where, if they fall upon a suitable, clean, firm, support, they attach and grow into spat, but if not they speedily die. As their own powers of locomotion are inconsiderable, the wide distribution of the young oysters in their swimming stage is dependent upon the currents.

Oysters in the spawning condition are of a peculiar creamy color, with branching lines traced over the surfaces of the body. When they are cut the ripe genital products at once exude from the wound, but if the shell be opened carefully and a gentle pressure exerted upon the body they will be discharged from a definite opening lying below the muscle (usually called by the oystermen the "eye" or "heart") which extends between the two valves. This is the pore from which they flow in the normal process. Ripe oysters in the language of the oystermen are aptly described as "milky."

Spawning takes place, in the main, during spring and summer, in any given region, extending over a period of some months, depending upon the latitude and the climate. On the Gulf coast I have found during almost every month oysters which were apparently ripe, and from which there were obtained eggs which readily separated in the water and had every appearance of maturity. Whether such eggs would be extruded during the winter under natural conditions is doubtful, and if they were it is practically certain that they would not develop, as the experience of all investigators has shown that development is inhibited if the temperature of the water drops materially below 70°.

The oysters were first observed in "milk" in Apalachicola Bay on March 15, but owing to a decided fall in temperature the development

of this condition was greatly retarded or ceased entirely for a period of about three weeks. By the middle of April, however, just as the survey was nearing completion, the oysters were becoming milky throughout the district. The stock was generally strong and vigorous and had every indication of a satisfactory productivity.

On the various reefs there were noted from time to time a number of spat, but they appeared to be those that failed for some reason to mature or develop properly the preceding year. These are usually called "runt oysters."

A freshet during the early spawning season may, in consequence of a deposit of mud and silt, have a serious effect on the spat as well as on the maternal oyster.

OYSTER CULTURE.

Although the State provides suitable regulations for leasing barren grounds for the purpose of oyster culture, the industry is carried on to a very limited extent by private enterprise. At the time of the survey there were but three claims, all situated in St. Vincent Sound, and having an area of 113.5 acres.

During the spring of 1914 the State planted several thousand barrels of oyster shells on the principal public bars from Green Point and Porter Bars in St. George Sound to Paradise Flat in St. Vincent Sound.

From the good average quality of the stock and the thickness and solidity of the shells, it appears that the waters furnish food and lime in quantities sufficient for the growth and development of the oysters, and also that a larger acreage could be maintained profitably without impairing or vitiating the public beds.

There have been pointed out under the discussion of barren bottoms different areas having good firm bottoms, apparently suitable for the establishment of safe and remunerative oyster beds. The western limit of St. Vincent Sound has a hard bottom generally and but few oysters. This latter condition may be due in part to the reduced width of the sound, its exposure to storms, and occasional strong currents, but probably to the high salinity of the water for periods longer than the oysters can endure with the best results. Before the planting of beds at places tentatively selected, it may be advisable to study the course of the currents, the action of storms on the bottoms, and the deposit of silt.

Bulkhead Bar, although it does not bear a very good grade of material, could be made to produce a much better quality of oysters, provided the beds were judiciously cultivated. As it now stands, it is too densely populated to yield stock that will command prices commensurate with the time and labor necessary to place it on the market.

^a Moore, H.F.: Oyster bottoms in Matagorda Bay. Bureau of Fisheries document no. 610, 1905.

RÉSUMÉ, CONCLUSIONS, AND RECOMMENDATIONS.

Following is a summary of the results of the survey, with the conclusions and recommendations based on them:

1. The survey covered the western portion of St. George Sound and all of Apalachicola Bay and St. Vincent Sound; approximate area, 130 square miles.

2. The area of the oyster beds is 7,135 acres, or 11.1 square miles, of which about two-thirds support dense growth.

3. It is estimated that during the season 1914-15 the contents of the beds were 2,627,534 bushels over 3 inches long and 500,629 bushels of smaller ones, based on the standard bushel, which is less than one-half the volume of the Florida oyster tub, or so-called "bushel."

4. Bulkhead and East Hole Bars taken together contain less than one-fifth of the total oyster area but nearly one-half of the oyster content. On Bulkhead Bar many of the denser stations revealed a crowded condition of closely clustered raccoon oysters.

5. The yield for the entire district for 1914-15 was about 40 per cent less than for the preceding season; due to the demand, for the supply was sufficient to meet a much larger requirement.

6. The oysters of these waters have no aggressive enemies, and no diseases were observed. Physical phenomena, however, have greatly damaged many of the bars.

7. St. Vincent Bar, which was showing sign of depletion, was closed during the latter half of the 1914-15 season by order of the State shellfish commissioner. Porter Bar, which has suffered depletion by storms, should be carefully guarded by the State authorities that it is not overfished; this also applies to the important bars in St. Vincent Sound.

8. About 91 per cent of the total area of the district is composed of barren bottoms, the greater part of which is unsuited for oyster beds. Several favorable regions for oyster culture have already been pointed out. It appears that the natural development of patches and new beds, such as the Fish Hawk Bar, as well as the recovery of old beds after having been depleted by storms, freshets, or freezes, show good conditions and possibilities for oyster culture.

9. The permanent triangulation points established by the United States Coast and Geodetic Survey, together with the few established by this Bureau, will be of great value and should be used in determining the exact location of future leased bottoms for oyster culture. A strict compliance with this recommendation will guarantee accuracy in the surveys, obviate disputes, and secure an honest and correct assessment of rentals.

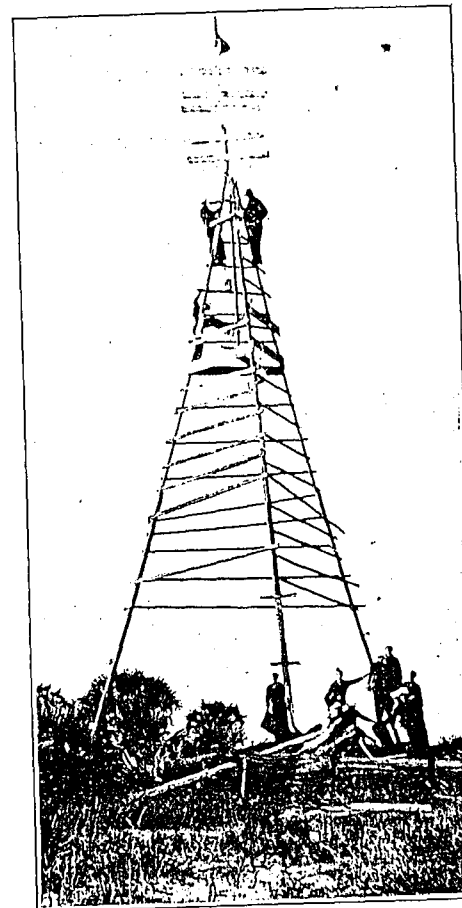


FIG. 1.—SIGNAL AT ST. VINCENT POINT.



FIG. 2.—BRASS DISK IN TOP OF CEMENT MONUMENTS.



FIG. 3.—OYSTER FROM PORTER BAR.
(Natural size.)



FIG. 4.—CLUSTER FROM CAT POINT BAR.
(Slightly reduced.)



FIG. 5.—CLUSTER FROM BULKHEAD AND EAST HOLE BARS.
(Five-sixth natural size.)

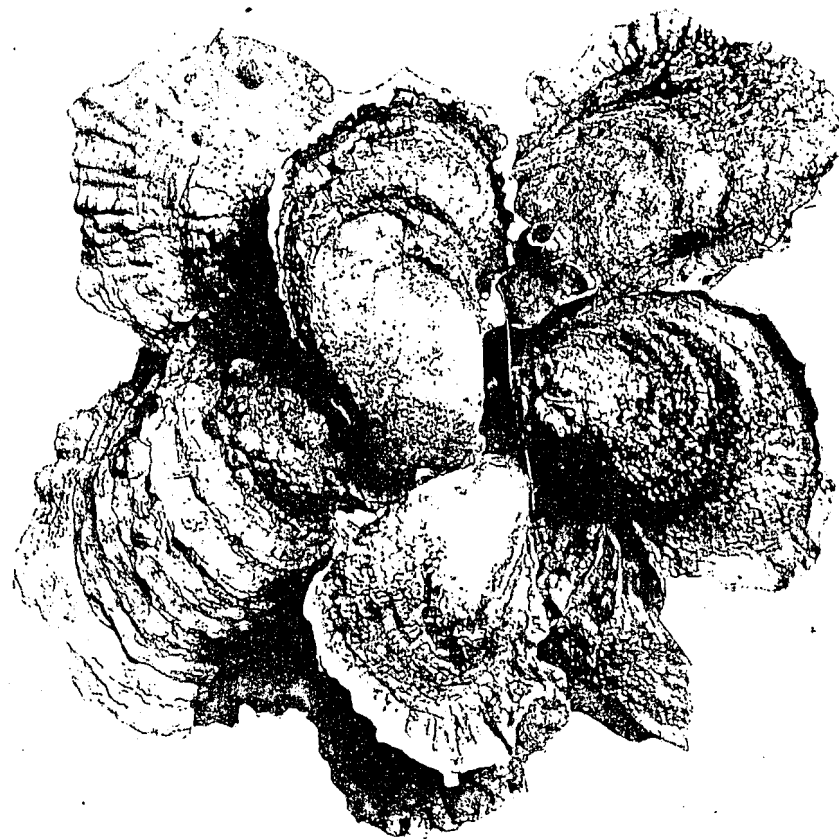


FIG. 6.—CLUSTER FROM ST. VINCENT BAR.
(Reduced $\frac{1}{2}$.)

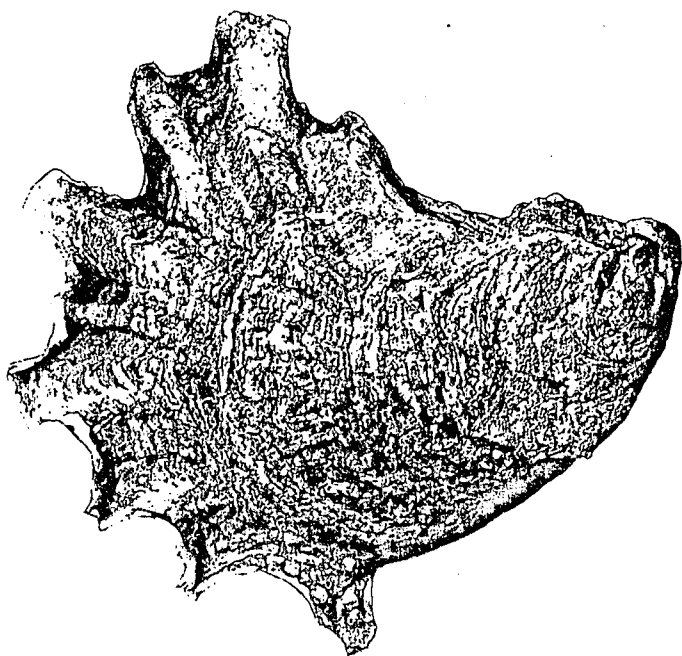
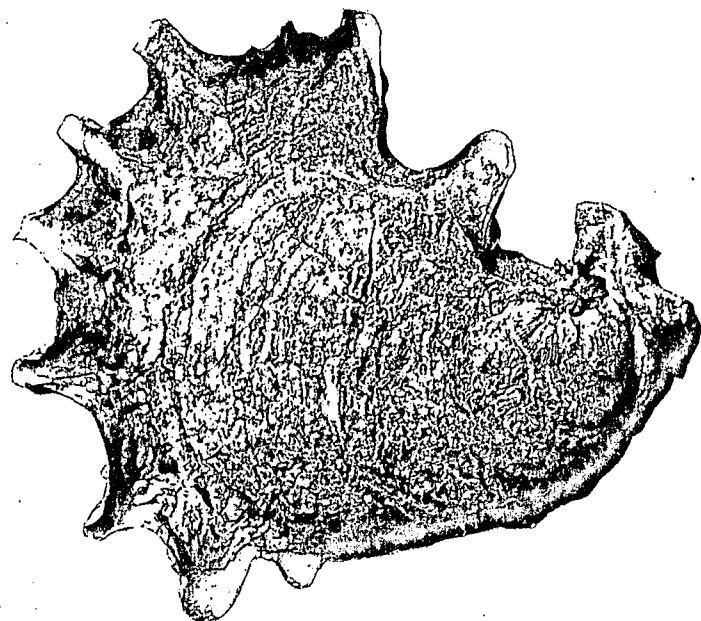


FIG. 7.—OYSTERS FROM FISH HAWK BAR.
(Slightly enlarged.)

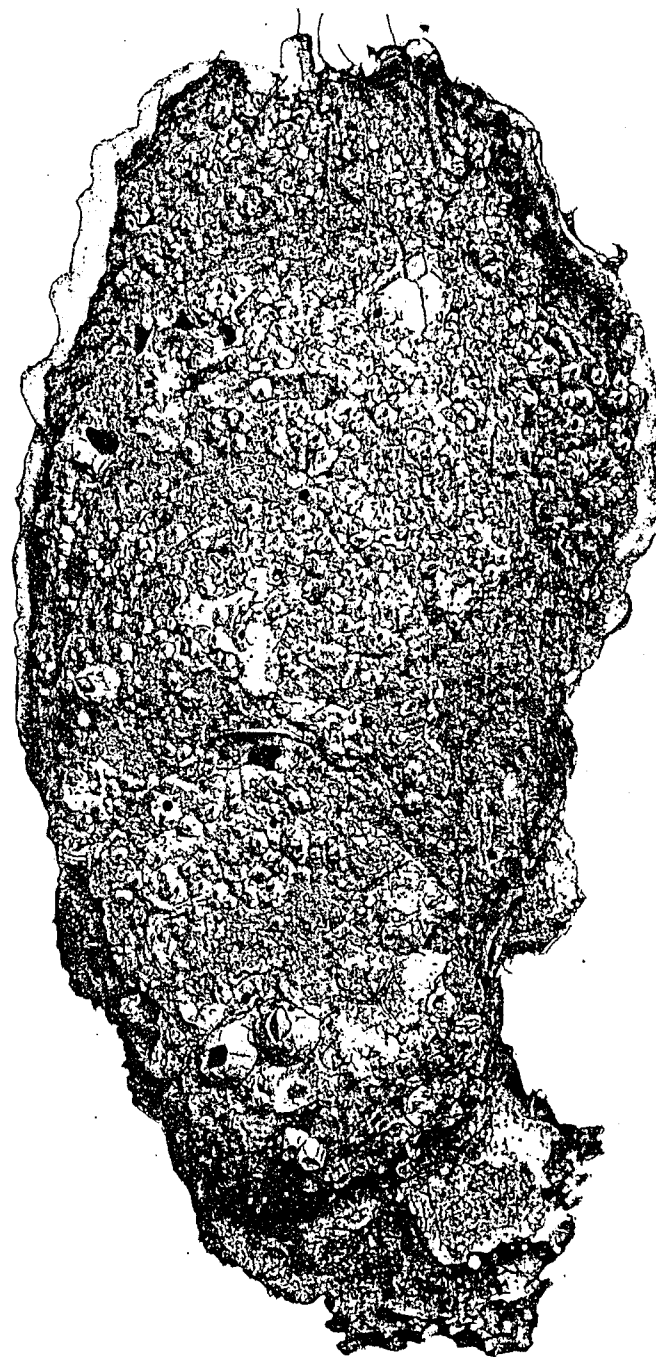


FIG. 8.—OYSTER FROM BIG BAYOU BAR.
(Natural size.)