

STATE OF NEW JERSEY

REPORT

OF THE

Bureau of Shell Fisheries

For the year ending October 31st

1912

Embracing the Annual Reports of the State Oyster Commission, the
State Oyster Commission for the District of Ocean County, the
Oyster Commission for the District of Atlantic County,
the State Biologist of the State Agricultural Experiment Station, and the Commissioner of
the Shark River District.

SOMERVILLE, N J
THE UNIONIST-GAZETTE ASSOCIATION, STATE PRINTERS
1913

State Bureau of Shell Fisheries.

CHARLES R BACON, Chief Office, State House, Trenton

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Days of Meeting, first Saturday in each month

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Shark River District.

HENRY A BENNETT, Commissioner, Neptune City

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Report of the Bureau of Shell Fisheries.

The Honorable Woodrow Wilson, Governor

I have the honor to submit herewith the tenth annual report of the State Bureau of Shell Fisheries

A number of very important and interesting phases of the oyster and clam industry of our State require attention and we earnestly urge that so much of the time of yourself and the members of the Legislature as may be possible be directed to them

The report embraces the reports of the State Oyster Commission (Maurice River Cove and Delaware Bay), the State Oyster Commission for the district of Atlantic County and the State Oyster Commission for the district of Ocean County and the Superintendent of the Shark River district as well as the synopsis of the report of the Biologist of the State Agricultural Experiment Station You will observe from a perusal of these several reports that the matters of interest to our oyster growers and shippers are receiving the sincere and careful attention of the several commissions appointed under the laws of the State

One of the most serious matters with which the industry has to deal is the present attitude of the government as represented by certain members of the Board of Food and Drug Inspection of the Agricultural Department You will recall that in our last annual report we called attention to the fact that we had obtained from that Board a hearing upon the question of floating oysters which the Board had endeavored to prohibit

That hearing was held in the office of the Board in Washington, February 23rd, 1912, after arrangements had been made by this Bureau to present our case backed by the facts as we knew them

Dr Harvey W Wiley, then Chief Chemist of the Department, presided at the hearing and we were able to show that despite the Board's ruling, the process of floating as practiced in New Jersey was not an adulteration under the Federal Statute There were no scientific facts or authorities to support the contention

A committee of the Maurice River Cove Oystermen's Associa-

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tion and representing our shippers as a whole, together with the Chief of this Bureau and representatives of the State Board of Health were present at the hearing which was opened by Honorable John J. Gardner, representative from the Second District, who as an old oyster grower and shipper, was in position to present some of the features of the situation which required attention.

Mr. Gardner's statement to the Board was as follows —

"MR. CHAIRMAN —I have been asked by the oystermen, whose financial and industrial life is involved in this question, to present at least some facts they feel will be of weight in the protection of the industry in which they are engaged and the methods of conducting it, an industry which is older than the present Government. They have followed the avocation of their fathers through the generations, and they never heard it suggested, of course, until a comparatively recent date, that the floating of oysters resulted in an adulteration.

"The business in the State of New Jersey, instead of being anything like that suggested by the Census, seems to involve in Maurice River alone more than four millions of dollars, probably five, in the balance of the State doubtless two million of dollars. At any rate, I feel I am far within the real facts in stating that an annual business of seven millions of dollars is involved in the decision which this Board shall make, the occupation of thousands of men and the means of livelihood and maintenance of the families of many of those oystermen, and almost, if not entirely, the existence of a number of prosperous villages, with very happy homes heretofore, that, with the enforcement of this order might well be described by some passages of Goldsmith's *Deserted Village*.

"We are called here, not to pursue the points in the order in which your tentative order presents them, but first, as I put it, that the phrasing in Order No. 121 is difficult—perhaps the order uses the word 'impossible'—of interpretation. Permit me to say, Mr. Chairman, that whatever difficulties the Board may find in interpreting that phraseology, there has never been the slightest difficulty about it among the oystermen. When it was suggested in this building in a different form, however, than that in which it was put into the order, until now, they have understood it to be water of that saline content in which an oyster would grow to a splendid maturity, from the spat to the full three or five year old size. That is the water they understood that order to mean, and that was their interpretation, and to that interpretation there is not the slightest objection on the part of the oystermen of New Jersey. Perhaps I should say right here that at the place where oysters are floated, at Port Norris and Bivalve, the spat catches and grows to maturity, as fine an oyster as grows in the State of New Jersey or elsewhere. So that it is not bringing the oyster to water of the saline content less than that in which oysters will thrive from infancy to their age.

"If we had difficulty about interpreting the phraseology of 'less saline content,' it would be to find some standard of saline content to which the order of the Board might refer. There are no two minutes in a month, per-

haps, in which the water of a given point is of the same saline content. It freshens every hour of the ebb, it grows saltier every hour of the flood. It is freshest on the low water, it is saltiest on the high water, and without doubt the water out of Maurice River Cove, from which the oysters are taken, contains a less degree of salt content at low water than the water where they are floated contains at high water. I do not know whether it is necessary for the life of the oyster or not, I am not enough of a scientist, but I know of no place where the oyster grows except there is a change, and a material change, first to fresher, and then to saltier in every twelve hours of time, and, in fact, there is a change going on during every hour of the ebb and flow, and it seems to me, as a logical matter, on the surface, at least, if the taking of the oyster from Maurice River Cove, for instance, at the mouth of Maurice River, and floating it, is an adulteration, the oyster that is taken on the low water is adulterated, or else the oyster that is taken on the high water is deteriorated even though taken out of the place where they naturally grow, because there is a material difference in the saline content of the water at those two periods in the tide.

"Perhaps the saline content of the water at the identical place where these oysters are freshened, so-called, or floated, may be that best adapted to the growth of the oyster. Certain it is, and I repeat and wish to impress it, that in this immediate vicinity is an ancient oyster bed, right where they are floated, and nowhere that I know of does the spat take better or the oysters grow to a better maturity than right there. And yet I suppose if you take on the average of a saline content,—I do not know at what time of the tide you would get it—it is probably less in the mouth of the Maurice River, or other places where oysters are floated, than it is where they grow.

"I wish to impress upon this Board an idea that has been suggested to me, and that did not occur to me when here before, that the floating of oysters is necessary to the business in New Jersey, whether the oyster drank or not, whether it underwent any change, whether there was any question of adulteration whatever—that is to say, it is necessary to warehouse. When this ice breaks up, trains containing perhaps forty cars will leave Bivalve and Port Norris. They would not be brought in and loaded except the oysters were kept in stock. It is as necessary for that oyster business to have a warehouse or a storage place as it is for any factory or other business. The oyster must be stored in water, it can not be stored out on dry land. So that, independent of the question of adulteration, independent of the idea that the oysterman is seeking some advantage over the public by giving his product a fictitious appearance, independent of all that, it is an absolute necessity to the business that 75 per cent of it must be stored. If the oyster can not be put in warehouse or storage—call it by whatsoever name you please—on the float, but must be put out on the dock, then none can be taken in the latter part of the week to be kept over Sunday, none can be in storage to fill orders so that it becomes a more precarious, peddling business. So I want to impress that entirely separate from all questions of adulteration, the ability to keep the oyster in stock, in storage, is an absolute necessity to the business, as much as to any other thing carried on on the scale on which this is carried on there.

"Of course, we are not here to dispute—this is, I am not here to dis-

pute—the chemical conclusions of the Board. Nevertheless, I wish to say for the record that it is true that there is no population anywhere given more to one diet, if you please, than are the people of that part of Cumberland County—and the same is true all around the coast where oysters are grown to the consumption of oysters. They have eaten through the generations oysters prepared for the market in this precise way. If the Board would think it worth while to get the local statistics in Galloway and Egg Harbor townships in Atlantic County, and the oyster townships in Cumberland, and so on, I dare say the absence of epidemics, the general longevity of the people, and the robust manhood of the oysterman would at least justify a question-mark as to whether there could be anything deleterious in this oyster.

"There is not an oyster on the Atlantic Coast that grows in water of any fixed, any stable, saline content, nowhere where the tide ebbs and flows is there the same saline content in the water for any single successive hour following any other hour, nor through the period of any moon as compared with any other moon. So that the change is constant, the adulteration and recovery must be of constant daily occurrence if it exists. I cannot understand—perhaps the Board can—how the taking of an oyster from those conditions and putting it into water of a less saline content, where it grows from the spat to maturity, a finer specimen than any of those that grow out in the bay—the oyster that would grow on the bed of Maurice River, where these oysters are freshened, the oyster that would grow at Oyster Bed Point, at the mouth of Millington River, the oysters that grow at other places, better and finer—I do not understand how it could injuriously affect the oyster. Indeed, it was the desirability of the place for growing fine oysters that originally suggested the name of the place from which they were shipped. It was not an accident. People did not go to Bivalve and Maurice River, and they did not go to other places to float oysters, because they arbitrarily selected those places. Indeed, they were originally inconvenient. They went there because the oysters that grow there were the finest specimens that grow in all Delaware Bay, in the one case, and Great Bay in the other.

"In conclusion of my part of the discussion, Mr. Chairman, I wish to impress that, aside from the Pure Food and Drug authority of the Board in the protection and the safeguarding of this industry, it should not be stricken out in New Jersey as a part of a general system, because there is a sinner—mayhap a criminal—three hundred or five hundred miles off, we should not be taken to the guillotine. As to that business, as I have said, it is older than the Government. Never has there, to my knowledge, been any question about the origin of any disease or any epidemic or any other thing from the Maurice River oyster or the oyster along the New Jersey Coast. It is as natural as breathing, as a business proposition, that the oystermen, knowing where the oyster spat best takes, where the oyster best grows to maturity as the finest individual specimen, where it grows to command the best sale, where grows the thing that is proverbial to the consumer, should go to float his oysters there, if he floated them to improve the appearance, or he should establish there a depot, if it became necessary as a warehouse or a storage proposition.

"Mr. Charles R. Bacon, Chief of the Bureau of Shell Fisheries, of the State of New Jersey, is here representing the State, which, as he will impress

upon you, I think, has an immense interest in this subject, both financial and ethical, if you please, in so far as maintaining the cultivation, the floating, and the shipping of New Jersey oysters under the most perfect conditions are concerned."

The Chief of the Bureau made the following statement—

"MR. CHAIRMAN AND MEMBERS OF THE BOARD—As a representative of the State of New Jersey, I have found it incumbent upon me to enter a protest to the tentative order of the Board modifying and reaffirming Decision No. 110, and abrogating Decision No. 121, for the reasons that, while the question of pollution or contamination figured in the original order, our modification gave us the privilege of the transshipment of oysters if properly marked 'Floated'. With that decision of the Board we had no contention whatever. We were perfectly willing to abide by your ruling, believing that the consuming public had ample opportunity to judge for itself as to the healthfulness of that product. Of that question we have no doubt whatever. We have endeavored in every way possible to remove all suspicion of contamination and pollution from our oyster beds.

"I will call to your attention the fact that at our previous hearing, two years ago, we presented to you the chairman of that section of our State Board of Health, Mr. Chew, who told you of the enactment of laws, and much of the efforts of the State Board of Health to remove all suspicion from the streams and waters in which our oysters grow, and from those sections of the streams in which they are floated. Supplementing that hearing, we have since passed even more drastic laws, giving our State Board of Health even more thorough charge of the oyster industry and its cleaning up. We have pending in our legislature today, having passed the Senate and been favorably reported in the House, and will probably be passed next week, an even more stringent law, giving the Board authority to make more frequent and thorough inspections of the oyster grounds, by a bacteriologist. We expect that bill to go through and give us an additional appropriation of \$7,500 a year for the express purpose of removing suspicion of contamination from our product.

"The population of our State, especially in the district most deeply affected by this order, shows a strong disposition to abide by every ruling of this Board, in every respect, and with that feature of the order we have no contention whatever. We desire here today to make clear to your minds the fact that we desire to cooperate with you most heartily in that feature of your order, because we take the ground that under no circumstances can we permit the public to maintain a suspicion of our product. We realize it is the very life of our industry that all suspicion shall be removed, and that public confidence shall be restored in its healthfulness. I might tell you that statistics show—such as we have been able to obtain—and all our shippers will bear me out in the statement that since the tremendous agitation of the unhealthfulness of our product, the industry has fallen off fully 80 per cent in shipment, and we unquestionably lay it to the agitation against our product, and we feel it is an unjust, unfair and uncalled for discrimination against that product in which we have such faith, and we will endeavor here to present to you some of the scientists we are able to present, giving testimony

to the effect that the order against what you say is an adulteration is unfounded. We assume that the oyster in the process of fattening, or floating, as you may term it, takes in water, of course. But our contention is that it is not an adulteration within the meaning of the law, and that is the basis of our protest.

"So far as the question of pollution, or contamination, is concerned, we desire to say with renewed emphasis that we make no contention whatever. We are in hearty accord with you in every respect, and will abide by any order you may make in that regard. We are sincerely and honestly endeavoring to clean up every one of our streams in every section of the State with the cooperation of the authority vested in the State Board of Health, and we believe that if you give us reasonable and proper time, we will show you conclusively there is no further danger of pollution.

"That is our statement of the case, so far as the State is concerned."

Some discussion between Dr. Wiley and the Chief of the Bureau followed the presentation of the case and as a result Dr. Wiley agreed to remove from the hearing all matter pertaining to the question of pollution and contamination as the Chief insisted and confined it to the question of adulteration alone.

Our contention was that we were in complete and hearty accord with the Board of Food and Drugs Inspection so far as the pollution problem is concerned. We stated that our State Board of Health was using every possible effort and that the oystermen themselves were cooperating in the effort to remove all suspicion of contamination, and that the State Bureau of Shell Fisheries, representing the State, was exerting itself toward that end.

Laws had been enacted giving the State Board of Health more complete authority over the oyster industry and permitted them to pursue the question of pollution and remove it forever from association with the industry.

Following the agreement upon that question, Dr. Julius Nelson, Biologist of the Agricultural Experiment Station and regarded everywhere in the United States as one of the most eminent authorities on the biology of the oyster, was then presented to make his statement regarding the question of adulteration.

Prof. Nelson's statement was as follows:

"DR. WILEY AND GENTLEMEN OF THE BOARD. As a scientist I feel very much handicapped on this occasion for the following reasons. My researches have been confined mainly to the study of oyster propagation, and during the summer time, when they are not marketed, and in connection with the previous hearing, in May, 1910, what I presented was such laboratory evidence as I could get in a short time. When Decision No. 121 was promulgated I supposed the question had been satisfactorily settled, and I continued my researches in the lines where they had hitherto run. But if I had anticipated this hearing I should certainly have diverted from that course of study and have studied the question of the biology of the oyster in the field—a question which requires a great deal of study to get facts which are pertinent to this question.

"I have prepared rather independently of the other members here what

I wish to present, and if you find that there are some duplications in the statements, you will pardon me for their presence.

"In response to a request from the Chief of the Bureau of Shell Fisheries of the State of New Jersey, I beg to submit the following testimony and argument to the Board of Food and Drugs Inspection, against the order of this Board reaffirming Food Inspection Decision No. 110 in regard to the practice of floating oysters before marketing, in water of less saline content than that in which they were grown.

"We give our unqualified endorsement to that part of said Decision which pertains to the practice of marketing oysters from polluted water. We believe that if this principle were specifically extended to the 'floating' of oysters in polluted waters as in the Food Inspection Decision No. 121, the public health will be as well safeguarded at this point as it is when similar measures are enforced in respect to polluted waters on oyster beds.

"I do not know that I fully understand the language of Decision No. 110. I referred to a copy that was in a report by R. Frank Wood, of New York, and from a study of that it struck me that the question of the pollution of floated oysters was not properly touched there, that the question of the pollution of other oysters than floated oysters was primarily aimed at, and that there was not a proper statement there as to the question of the pollution of floated oysters.

"In respect to that part of Food Inspection Decision No. 110, which declares that oysters are considered to be adulterated under the Pure Food and Drugs Act, when they have been floated in water of less saline content than that in which they were grown, because a 'substance has been mixed with them so as to reduce, lower or injuriously affect their quality or strength,' we desire to dissent, provided that the substance so added is pure water, for the following reasons:

"(1) The addition of such water is required in the case of oysters that have been grown in salt, as distinguished from the brackish or semi-salt water, to render them palatable and salable. That oysters taken from beds of high salt content are considered unsalable, we quote from the Report for 1903 of the U. S. Fish Com. as follows: 'From Dr. Caswell Groves' 'Investigation for the Promotion of the Oyster Industry of North Carolina' Page 311.

"The lower parts of Newport and North Rivers are not adapted to oyster culture. Oysters grow there in abundance when supported above the mud, but there is too much uncertainty connected with the crop to justify practical planting operations. When the time comes to place the oysters on the market they are too often not in salable condition. This is traceable to the high density of the water of these portions of the rivers'.

"Also from the Bureau of Fisheries, Document No. 610, 1907, page 57 of H. F. Moore's 'survey of Oyster bottoms in Natagorda Bay, Texas,' as follows:

"Aside from the question of the very existence of the oyster the matter of density or salinity influence the flavor, stock taken from the fresher waters being insipid or even repugnant to many palates, while very salt water produces a briny flavor equally objectionable'.

"(2) Such water is taken by a living animal under nervous control and regulation as part of a metabolic or physiological process. We refer to the

brief submitted at the previous hearing on this matter in May, 1910, and refer specifically to page 212 of the report of the Biological Department of the New Jersey Agricultural Experiment Station for 1910, on page 212, where this point is summarized

"And in addition we beg to call your attention to the fact that each oyster has developed a certain space within or between the valves of its shell to accommodate its body. It does not absorb more water than will permit its closing its shell. On the other hand when shucked oysters are soaked in fresh water we are in danger of having this process carried to a greater extent

"And still further we beg to call attention to the fact that oysters on natural beds are finest where there is considerable variation in salinity, and that it is reasonable to believe that in their adjustments to this fluctuation they are more or less bloated which gives them the fat appearance so highly esteemed

"On these points we quote from the Bureau of Fisheries Document No 610, p 60, as follows 'The densities' (shown graphically) 'were sometimes fairly uniform for several days in succession, but frequently exhibited sudden and violent fluctuations'

"And from the U S F C Report for 1903, p 268

"The density of the water (on the Hardesty bed) is subject to great and rapid fluctuations. This bed has been mentioned because it is an example of a continuously successful one'

"And from Bulletin No 15 of the Gulf Biologic Station, p 15 of W H Gates' 'Notes on Oyster Culture in Louisiana' as follows

"An oyster marketed from brackish water lacks the saltiness and is often bloated, while one raised in salt water is small and lacks the tender qualities of the transplanted oyster'

"He is arguing there for the medium degree, which lies between the freshest oyster and the saltiest oyster

"Also from the salinity tables published in our own reports for 1906 to 1910. We found at Barnegat on the oyster beds variations that averaged within a single day, of five to six points in a thousand on the hydrometer scale, while the extremes for the summer were still greater. In case of freshets we have seen the salinity on these beds absolutely reduced to zero, and it took weeks to restore a normal salinity of at least 1010. In dry seasons the salinity rises as high as 1018

'(3) Oysters differ greatly in their composition, as may be learned from the published results of Dr Atwater's Analyses (See Report of Shell Fish Commission of New York for 1887, pages 66, 70, etc.) While the average percentage of nutrients' is nearly like that of milk, there is a variation of from 9 to 18 per cent. There is, of course, no guaranteed percentage of composition as is required in the case of milk. Oysters are judged as individuals, first of all from their appearance, and secondly from their tests. In these respects there is a vast variation even aside from floating, which latter tends to make the composition more uniform. But oysters are a luxury, not bought for the percentage of nutrients they contain

"That is a point emphasized by Dr Atwater in his discussion of floated oysters. Personally, I am not interested in this matter one way or the other,

because I rarely eat oysters myself—not because I do not like them, but because of the high cost of the nutrients that are in them (Laughter)

"(4) Oysters from salt water spoil more easily than when taken from fresher water. The testimony published in Dr Atwater's report above noted is full and clear on this point, and our brief previously submitted and summarized in our report for 1910, substantiates this point, as well as testimony published in the report of the Biological Department, New Jersey Agricultural Experiment Station, for 1890"

There it records several conferences I had with oystermen in the different parts of the country, and at Norfolk, Virginia. I met a man who volunteered at that time to state that if you wished to send oysters to Europe it was necessary to take the oysters from as high up the river as possible, and there were other men. I did not happen to bring that particular report with me, but I could read quite a number of cases in which independent testimony was given to that fact, of the power to keep the oysters that came from fresh water longer than those from salt water. This has nothing to do with floating, this is simply a question of oysters coming from fresh water keeping longer than oysters coming from salt water

Dr WILEY Have you any other testimony besides that of the Norfolk man, on that question?

Dr NELSON Yes, sir

Dr BIGELOW May I ask a question now with regard to that last statement?

Dr WILEY Certainly

Dr BIGELOW You state that the oysters keep better when shipped to Europe. Does that mean that the oysters are packed with ice above them, so that the drippings from the ice drip over the oysters?

Dr NELSON There is no statement by the man, of course, with regard to how they were sent, and in the case of those particular experiments I made, which simply were to determine the relative strength of an oyster treated the same way, I did not treat any oysters with ice at all. They were subjected to the ordinary temperature of the laboratory which averaged 70 degrees, I suppose very rarely rising above 70 degrees

"For this reason shucked oysters are washed quite as much as for the purpose of cleansing. It is claimed that if not so treated they will 'heat' I have that on the testimony of an oysterman, which is a matter I want to investigate. He claims that if you take salt oysters and put them in a bulk, in a very few minutes the temperature will begin to rise, and within an half hour or an hour the temperature will come up to 100 degrees from some sort of metabolic change in those oysters, which evidently could not be due to biological deterioration. It must be due to a metabolic change in the oyster itself

Dr WILEY Do you accept that as a scientific fact?

Dr NELSON Would you accept it? I simply state I would like to investigate it

Dr WILEY It is usually considered that salt is a preservative, instead of a deteriorator

Dr NELSON It is universally admitted by oystermen that salt water ferments much more quickly, it is not the oyster that spoils, but the water that spoils, and it spoils the oyster that way

Dr WILEY How can water spoil?

Dr NELSON By fermentation, by the multiplication of the bacteria, which probably multiply much faster on account of the saline contents being favorable to those species that are present

Dr WILEY I did not know that water could be fermented under any circumstances

Dr NELSON There is, of course, nutrient matter present in the liquor of the oyster

Dr WILEY It is not the water, it is something in the water

Dr NELSON Of course, it is a solution

"The incidental subtraction of sea salts is not a serious matter, as each person naturally salts his food to suit himself. If the danger from putrefaction and ptomain production is decreased by floating, the process is the opposite in kind from that which would injuriously reduce the strength or quality of this food"

If it can be shown it seems to me, that the freshening of the oyster tends to produce fewer spoiled oysters in the consumption, it is fairly to be considered on the side of benefiting the oyster, rather than of injuring it

"(5) The freshening of oysters is a cleansing process which cannot be done on floats on the beds, because they would be destroyed by storms. These floats would need to be in sheltered locations where the salinity would naturally be less than in the open water. The process is one of preparation of a food product for consumption, comparable to a degree with cleansing processes of other food stuffs. Flour, deprived of its bran, removes nutrients, but this is not considered as adulteration

"(6) The science of the cultivation of oysters is still in its empirical stage. Much scientific investigation remains to be done to learn just how to produce the most desirable product, and to make such product more certain. The chemical analysis of oysters should be made in relation to biological conditions. The State of New Jersey has provided by law for an observation service, weather influences on oyster growth, whose results will undoubtedly be valuable as a guide both to further scientific work and to practical oyster culture

"It is likely that the various methods of oyster floating are not the same, as the density of the water used varies from that in which oysters will grow to maturity, to that where oysters could not live beyond a week. Science must discover under what conditions floating should be done to give the best results. This decision of your Board prejudices the case

"(7) The definition of floating requires attention. Is it 'floating' to store oysters in bins for long periods where the water will come and cover them at each tide? Certainly this is a different procedure from the ordinary practice of floating

"And where oysters are transplanted from one bed to another, how long

should they lie before they may be marketed, in case the salinity on the new bed is less than on the old?

"And, furthermore, how is the salinity of an oyster bed to be determined when that salinity is a fluctuating quantity which may, at times, change oysters from fat to lean, and back again inside of a week?

"Captain Stevens, of Berkeley, Virginia, told me that that was frequently the case in Willoughby Bay, which is a branch of the Chesapeake. And I have asked myself this question, which is one I want to investigate. What is this change on the oyster beds, where the salinity probably changes in a way which would naturally float the oyster, and they pick up the oyster and say it is food? Is it not a floated oyster? Is there any more nutrient in that oyster which we pick out there and sell as a good, fat oyster, from these natural beds, than there is some days later when the water changes to salt and so shrinks the oyster that it looks lean? Chemical analysis has not been able in just that way to discover what is the exact change in composition of such an oyster"

Dr WILEY Dr Nelson, if you will pardon me for a moment, this Board is not considering what nature does to an oyster in the oyster bed, we are considering what the man who drops it does to it

Mr GARDNER May I interpose, Doctor, that if nature does precisely the thing that man does to it, and it is perfectly legitimate to ship it if nature does to it, why differentiate against the man, even in that case?

Dr WILEY I hardly think, with all due deference to you, Mr Gardner, that is the question before the Board this morning. But still, you may complete your statement, of course, Dr Nelson

Dr NELSON That was with reference to the investigation I wish could have been made, and, which I shall, in the future, when I have opportunity, make, with reference to that very point. As to taking oysters, for instance, out of the same lot and subjecting some of them to transplanting in water of a less saline content, and leaving others on their salt beds, and then taking them up an ytime afterwards, even long enough to actually eat the food in both places, and comparing and seeing whether they are actually gaining more nutrient material than on the new beds, or whether it is due to the floating process, I do not know, I simply say that ought to be investigated

"(8) We give the Board of Food and Drugs Inspection high honor for their noble purposes in behalf of the public health. We accord this honor when we suppose that the prohibition of floating has been based more on the basis of possible pollution than on the actual fact of osmosis of water into the tissues of a living animal. Is it not possible that this danger of infection through floating has been overrated in comparison with the danger of infection from oysters growing in polluted waters?

"Fresh or brackish waters polluted reach the oyster beds, and the effort to prevent the pollution of the latter will involve the effort to prevent the pollution of the former. The great number of creeks and streams that flow through the sandy pine barrens of New Jersey, whose drainage area is scarcely

inhabited, convey to the shore the purest natural water that the country affords

"I submit, in addition, the abstract that was published in my last published report of what was submitted at the previous hearing. If the reading of this is called for, I am perfectly willing to read it. If it should be objected to, I am willing to leave it out."

Dr WILEY What is that?

Dr NELSON It is the abstract in my last published report of the points that were presented at the previous hearing on this question, which I have published in my Experiment Station Report.

Dr WILEY An abstract of it?

Dr NELSON Yes.

Dr WILEY Does it refer to adulteration, or pollution?

Dr NELSON I think pollution is not mentioned, if I remember rightly.

Dr WILEY If it refers to the sole fact of adulteration to which we have now decided to confine this, you may read it.

Dr NELSON If I come across the word "Pollution" I will skip it. (Laughter)

"THE FLOATING OF OYSTERS"

Floating oysters for the market is widely prevalent in the North, particularly in New Jersey.

This practice consists of placing the oysters on partly submerged floats or rafts in water less salt than that on the oyster beds. The oysters are left on these floats, usually during the time of two to four changes of tide.

Oysters so placed, open the mouth of their shell, after lying quiet for a longer or shorter period, and then they breathe or "drink" (draw in) the water, as they do when feeding on their original beds.

Hence the process is also called "giving the oysters a drink."

The practice is also aptly termed "freshening" the oysters.

The reason for this practice is manifold: (1) the oysters clean the mud out that was in them when taken from the bed, (2) the flesh of the oyster swells so as to occupy nearly a fifth more volume, (3) the flesh becomes whiter and firmer, or turgid, (4) such oysters do not shrink so much, nor so rapidly after being shucked from the shell, as they do when not floated, (5) they do not so readily lose their liquor while in the shell, and so keep better in transport and storage, and not so many are partly dry when opened after being kept for a week or longer.

Of these various reasons, the second is the most important, and is responsible for the floating being often termed "fattening" the oysters.

As long ago as 1883, Professor Atwater showed by chemical analysis that this "fattening" process consisted simply in the absorption, by the oyster, of water, a process known to scientists as osmosis. Osmosis takes place by the attraction between the fresh water and the mineral salts in solution in the tissues of the oyster. Some of these salts come out and more water enters. The process would continue until the water in the tissues had the

same saline contents as the surrounding water. Swelling can only occur when oysters are placed in water fresher than that in which they have been for a considerable time. If oysters were transferred from brackish to saltier beds, the osmosis would also occur, but the oyster would gain in salt, and lose some of its water, and shrinkage would be the result.

Dr Atwater showed that no additional nutrient substance was incorporated into the tissues of the oyster, as the result of floating, and that when oysters are sold by volume, after shucking, the practice constituted an adulteration, and deception.

It was natural that the Board of Food and Drug Inspection should have issued decision 110 against the practice. May, 1910, was the date, after which the practice of selling in interstate commerce, oysters that had been floated in water of less saline content than that in which they were grown, would be considered a violation of the law.

Because this practice costs something it might be supposed that the oyster planters would welcome its abolition.

On the contrary they were seized with consternation, and declared that they could not sell the unfloated oyster, that the industry would be ruined, that a real calamity would fall on the various shore towns dependent on this industry.

Large delegations went to Washington in hearings before the Board, trying to have the decision rescinded or amended. After earnest requests had been made, both by representative oyster planters, and by the State Bureau of Shell Fisheries, the Biologist consented to investigate the matter experimentally, and to give expert testimony. The researches began March 9th, 1910, and continued for a month, the testimony was offered at Washington April 9th and briefs submitted then, and subsequently.

SUMMARY OF THE RESULTS

The following is an abstract of our findings.

The oysters studied in the experiments were treated as follows:

Each lot of oysters taken from the beds was required to be divided into two equal lots, one of which was floated, the suitable length of time, and then both parcels were shipped to us, enclosed in an outside container, the contents being dated, and otherwise labelled as to their character and history.

At intervals of a week or oftener, we received samples from Stiles and Co., of Tuckerton, secured under the direction of F. R. Austin. We also received samples from Mulford and Mulford, of Bivalve, under direction of F. E. Daniells, chemist and bacteriologist of the State Board of Health.

We desire herewith to acknowledge the courtesies extended by these gentlemen.

We granted at the outset the general correctness of the analyses by Dr Atwater, but we believed that such analyses are not a true statement of the matter, unless the percentages in each case are based on and referred to the total shell capacity.

It was not evident that sufficient care was used to do this, in his analyses, and moreover, some of the results were stated as percentages, in a manner to prejudice the case against the floated oyster. We admit that his

statements are more just when applied to shucked oysters sold in by bulk, a practice that is exceptional in New Jersey

From our work, twenty-five experiments were selected with positive results. The general trend of the evidence was favorable to the practice of floating.

We state simply the results without presenting the evidence in the following:

A "LIFE" PROCESS

(1) Numerous experiments showed that oysters regulate the amount and quality of the water they breathe. They refuse to open in perfectly fresh water, they open quickly in saline solutions of moderate strength, the oysters on floats wait for the incoming tide which brings up water more brackish than the nearly fresh water that comes down on the last of the ebb, and after securing a certain amount of the brackish water they remain shut for a considerable period. There are individual differences, among the oysters, as to their history, the particular degree of saltiness of the "floating" water, etc.

Part of this individuality is due to the fact that a number of the oysters have suffered, through handling, a slight breakage of the nib sufficient to let water through, in spite of the fact that the shell is shut.

It is sometimes the practice of planters to watch the oysters, and to permit "drinking" only for a few minutes, then they are removed and sacked. During the subsequent days, the fresh water that replaced the loose salt water in the outer chamber of the shell, is slowly absorbed by the flesh, and the desirable plumpness and whiteness secured, but of course in this case there is not time for the oyster to clean itself.

CLEANING

(2) When unfloats and floats oysters were placed in two per cent saline, the water in which the former were breathing, gradually became fouled with dirt worked out of the oysters, while that covering the latter remained clean. This is due to the fact that during floating, the oysters clean out the sediment that was accumulated on their gills. This sediment is especially abundant when the storms and winds stir up the mud or sand, then the oysters have to take in much that is not food, and which is not carried to the mouth and swallowed. When these accumulations are abundant the oyster saves itself from smothering by suddenly snapping its shell-valves shut, and so "spits" out the dirt with the ejected jet of water. This of course is practiced anywhere, but on the floats, the water is clear, and so the cleaning is permanent, and probably more efficient, due to the stimulus of the fresh water, which causes an increased secretion of slime that lifts the dirt.

When unfloats oysters were shucked in comparison with floats ones, and the two lots were left a few hours in their natural liquor, the former secreted liquor the more rapidly and also, considerable slime, in which the coarser part of the dirt became entangled. This slime became stringy, and the liquor turbid and repulsive, due to the dirt that was mixed with it.

In strong contrast, was the clean and appetizing appearance of the floats.

lot, here, at first, the liquor was rather small in amount, but as much as in the former case was finally pressed out, through contraction of the tissues. It seemed that the total slime in the two cases was finally approximately equal, though at the start, the floats lot seemed to be the more slimy.

IMPROVED COLOR

(3) The fluid that runs out of the flesh in the case of the salt oyster is quite clear, but becomes white on standing under certain conditions not determined, that which seeps out of the freshened oysters is white to start with. The unfloats oyster is more transparent, at least, when first opened, and always darker in color than the floats ones.

It seems as if the absorption of the fresher water, caused a precipitation of certain substances, ordinarily in solution in the saltier juices of the unfloats oyster, but this point has yet to be thoroughly investigated by us. Be that as it may, the whiter appearance of the floats oyster, accompanied by the increase in bulk, strongly suggests a true fattening process, so that oystermen are not to be blamed for erroneously calling it "fattening." The improved appearance of the floats stock goes far toward explaining the desire of dealers to handle floats in preference to unfloats oysters.

NOT DECEPTION

(4) On the oyster beds the individuals differ much at different times owing in part to the variation in the salinity, the oysters changing from a state of fatness to lean, and vice versa. But there are other factors that influence the condition of the oysters. Some are almost transparent and are bloated with salt water, which rapidly runs out of them after opening, and leaves only a shred of flesh. Such oysters are not improved by floating, for it is actual flesh that absorbs the water, on the float, and actual nutrient substance must be present in order to secure the best results. The floating is in a sense the revealing of the true fatness of the salt oyster. It cannot and does not transform a poor oyster into one that looks deceptively fat. The fine, fat-looking, floats oyster is actually a fat oyster and was of superior appearance even before floating.

CAUSES PLUMPNESS

(5) The water that has entered into the tissues is held more firmly than that which is held by capillary attraction in the gill tubes and other channels of the body, and this in turn is held more firmly than that which fills the space between the gills and the valves of the shell.

When oysters are opened or shucked, it is the last mentioned water that runs to waste, and when the oysters are put in the container, the abundant liquor in which they lie floating, represents first of all the capillary water. Water in the tissues comes out very much more gradually, partly as a result of contraction. In the case of oysters served on the half-shell this is also due to drying or evaporation. The water leaves the tissues with considerable slowness, so that it takes some time to desiccate an oyster.

On the other hand, when an oyster is cooked, even when it is immersed in water less salt than is the salinity of the flesh of the oyster, there is a great shrinkage, also gradual, for it takes about half an hour's boiling to reduce the bulk to its lowest terms. This is equal in both lots.

In all these cases, the salt oyster shrinks faster than does the freshened one. After the short period in which the oysters are exposed when served raw, or when cooked the proper length of time, the floated oyster has plumper appearance, and more water in the flesh, properly diluting the nutrients, so as to make it more tender, resembling in this, the crispness of celery that has been floated before serving.

LOSS OF SALT

(6) The main constituents of the liquor of oysters is of course the salines of the sea water in which the oyster has been growing. Analyses of this liquor shows the presence of only slight, and negligible quantities of nutrients, which are least (or almost nil) in the case of the first water, and greatest in case of the last water, that leaves the oyster. It depends also on the length of time the oyster has been out of water.

That the oyster loses nutrients in its native water, even when this changes from salt to brackish, is not a reasonable proposition, and therefore it is unlikely that there is an appreciable loss by floating, though analyses by Atwater showed traces of such loss. It was not shown that this was due to osmosis, it may have been due to the production of slime.

Of course we do not refer in the foregoing to the loss of salines. No attempt was made by Dr. Atwater to distinguish between the salines of the sea water loosely present, and the salines actually in the flesh. When oysters are floated, it is the water in the outer chamber that is first replaced by fresher water, and only gradually is there a reduction in the salines of the flesh.

Our analyses showed that even in thoroughly freshened oysters, there is still a large, though reduced percentage of salines.

FLAVOR

(7) The flavor of oysters is in a large degree, simply the flavor of the sea salts, and in our experiments we tested the matter of flavor with several persons. The general testimony was to the effect that the unfloats oysters had a richer flavor than did the floated ones, but that when salt was added to the latter, there was no appreciable difference in flavor.

In frequent cases, oysters are swallowed without chewing so that few people ever get the flavor of the flesh itself. They simply get the taste of the sea water and a whiff of the odor of the mud, on which the oyster grew, and this is supposed to be the specific flavor of an oyster.

MEDICINAL VALUE.

(8) Undoubtedly there is value in the sea salts both as nutrients and as stimulants, as regulatives, they have therapeutic value. But from this point of view, if any considerable number of oysters are eaten, the amount of these

salines taken, is in excess of the therapeutic demands, and possibly pernicious, rather than beneficial (at least when the oysters come from very salt water). We have found enough of these salines in freshened oysters to satisfy medicinal requirements.

When taken raw, the alternate eating of floated and unfloats oysters gave us at first, a sense of the superiority of the flavor of the unfloats oysters, but it did not take many of these oysters to cloy, and even to produce aversion, whereas we continued to eat the floated product with satisfaction. We also found it necessary to scrape off the mud from the salt oysters before they were fit to be served.

KEEPING QUALITIES

(9) When oysters have been removed from the water, they keep their shells shut for a considerable time, but, finally, they become tired, and they relax the muscle, and the shell opens, causing the loose liquor to run out, while air, containing the microbes of decay, enters instead. These, and perhaps also some of the microbes naturally present in the sea water, cause decay and weaken the oyster. It allows its shell to open more and more, though it still has the power to close the shell as shown by giving the shell a knock.

Meanwhile the gills dry up little by little. When floated and unfloats oysters are compared, there are strong points in favor of the former. Experiments show that the salt oysters open their shells very much oftener, and more individuals opened, than, in the case of the floated ones. Even when the floated oysters opened, there was little, or no liquor to spill, as the water had nearly all soaked into the flesh, causing it to swell and fill almost all the shell cavity. Consequently, these oysters did not dry out so soon as the unfloats ones, and were suitable for stew several days later than the date when the unfloats oysters became unfit. Thus, in storage and in transport, the floated oysters keep better. There it is no wonder, that dealers should prefer them.

TRADE CONVENIENCE

(10) Sometimes it is necessary for such causes as ice over the oyster beds, and slow demand from the dealers, to keep the oysters for a considerable period, stored in the oyster houses of the producer. It certainly is advantageous to give the thirsty, living, oysters a drink of new water, before sending them on their journey. This prolongs their life and health. This would of course be true, even if the floating were done in water as salt as that in which they had been raised. But as more water is taken when it is less salt, there is an added advantage to float in as fresh water as is practicable.

Besides, these oyster houses are situated in the sheltered harbors of the creeks, and could not be miles away, near the beds. So it is natural and convenient to have the floats near the store houses, and here the water is fresher than on the beds. The handling of oysters is not as simple as in the case of land crops. The sea is a treacherous monster, whose moods and whims must be obeyed. It would be utterly impracticable to have the floats on the oyster beds.

CONCLUSION

We have shown that the water added is not injurious to the oyster, and if pure, it cannot be injurious to man. We have shown, that it is a benefit to the oysters to float them just before sending to market, and therefore, also beneficial to the consumer. We have shown that the objections to floating are of little moment in themselves, therefore we think that floating should not be prohibited.

Our own opinion is strongly in favor of having both kinds of oysters freely offered in the market, so that consumers can suit their individual tastes. Undoubtedly, if there was a good demand for unfloatoed oysters, it would be met by the supply. There is no conspiracy on the part of the trade to force the floated oyster upon the people against their will. Certainly, in the case of oysters raised in brackish water, it is not usual to freshen for market, and these are probably preferable for all purposes in the unfloatoed condition. In the case of the salt oyster, there are certain ways of cooking, as when serving a stew for example, and in some of the other methods of cooking, in which probably, taking all things into consideration, the salt oyster would generally be preferred to the freshened product. Near the oyster beds, where they can be secured quickly, oysters are generally relished in this condition. There may come a time when the demand for the unfloatoed oyster will be so general, that the planter will think it a hardship to be asked to float his product.

We admit that our conclusions are based on a rather limited investigation, and that a more prolonged study of the questions may be desirable, but we think that what has been submitted is sufficient on which to act for the present emergency.

Mr GARDNER. Mr Chairman, if you will permit, it occurs to me perhaps I ought to put into the record something I never thought of putting in before, for the future use of this Board, if it cannot use it now, that it may not be entirely the saline content of the water that influences the condition of the oyster, but the different portions of the different salines may have much to do with it. For instance, I found upon investigation of this subject, without any scientific knowledge, what everybody knows, that all our natural oyster beds, so called, the seed beds, so called, are in a narrow area, and near the mouths of our rivers, indicating, demonstrating, that that is the place, between the fresher water above and the salt water below, where the oyster naturally took its first growth. That was the place of its origin, so far as our waters were concerned. They grew and died there before the white man came, at any rate, until the shells are so thick, and the spat takes to them so readily, that they become known as our natural beds. Thinking I might find out something about it, although not knowing anything about science, I took a tank, or platform, if you please, constructed up above the ground, 12 feet wide, 16 feet long, and 8 inches deep, rather pretentious, and pumped it repeatedly full of sea water, or water from the inlet, and evaporated it. Of course, pure salt is not the only saline content of the sea. For some reason oysters will not grow in the sea. Whether that is because of the presence of the pure salt, or because of the other contents of salt water, may, after all, be a question. For instance, in evaporating water in a tank under a summer

sun, at a given degree of saltiness—I forget what it is—the salt, that is, the salt of commerce, precipitates in crystals, and falls to the bottom. It takes the sun quite two good days to precipitate the coarse salts. So that when we speak of saline contents, pure salt is only one, and there are other saline contents in the sea. You know more about that than I do, and it is a question well worthy of consideration whether it is not the different proportions of those salts present about the mouths of the rivers, and the bays and waters of a given saline content, as you expressed it, rather than the aggregate quantity of them, that agrees or disagrees, improves or makes lean the oyster. It is a matter that, it seems to me, it would be well worth while to carefully investigate in connection with the experiments, and it may have a very important bearing on the question under consideration.

Mr BACON. Mr Chairman, if you will pardon me just a moment, I desire to call the attention of the Board to a fact alluded to by Dr Nelson in passing. Last year in our Legislature we obtained the passage of a law permitting the Bureau of Shell Fisheries, with the cooperation of the Biologist, to establish observation stations at various points near oyster bearing areas. We are now seeking an appropriation to establish those stations. We have all the paraphernalia necessary for one station, the microscope and all the necessary scientific instruments, and the data, blanks, etc. We propose to start those stations this coming spring and obtain all the valuable data we require of just such conditions as confront us now, and we hope before another year passes we will have some very valuable data that we can present to the Board.

Dr WILEY. I hope you will investigate, too, that problem Mr Gardner has just spoken of. That is most interesting.

Mr BACON. That will be a part of the observation. Our intention is to get the salinity of the water at the varying tides, the condition of the atmosphere, and of the tidal flows, and at various times, not go down today and come back six weeks from now and get another observation, but get them every day at various times of the day.

As a result of that hearing, the Board of Food and Drugs Inspection has never enforced the reaffirmed order No 110, and our shippers have proceeded as though it has not been promulgated. Despite that fact, however, officers of the government have seen fit to make seizures of some of our shipments, and in one case an indictment was found against M P Howlett, a very extensive shipper, by the Federal Grand Jury. His oysters were seized in the city of Washington as being in violation of the Pure Food Law, but the circumstances were such as to prevent Mr Howlett putting in a defense, and by advice of counsel he pleaded non vult contender. He was set free on payment of costs by the Court. It was very evident to all concerned that this seizure had been made under unfair circumstances in view of the fact that the oysters had been shipped from Maurice River many weeks, and that there were no means of telling under what conditions they had been kept before the seizure. More recently other seizures have been made and the matter is now under investigation and consideration.

The Oyster Growers and Shippers Association of North America has taken this matter up and ask the cooperation of this Bureau and of the National Association of Shell Fish Commissioners to obtain a fair and rea-

sonable attitude upon the part of the government regarding our products. We hope to have this matter satisfactorily adjusted in a short while.

The condition of affairs in Atlantic County is not altogether satisfactory. There is a feeling among a very large number of the oystermen that sufficient protection has not been afforded the holders of leased grounds, and in a number of instances the lease-holders have refused to renew their leases. The present Commissioners had gained the impression that it was not legal for them to appoint guards for the leased grounds. To remove that impression the Bureau asked the Attorney General's Department for an opinion, and after due investigation of the laws, this opinion was given by Nelson B. Gaskill, Assistant Attorney General:

"DEAR SIR: I am in receipt of your letter of August 20th, asking to be advised as to the power of the Atlantic County Oyster Commission to appoint and maintain guards for the police protection of the oyster bearing areas and propagating grounds of that district.

"In reply, I beg to direct your attention to the provisions of paragraph 238 of the act constituting the Atlantic County Oyster Commission, P. L. 1905, page 145. Among other provisions, the Commission is given the power 'to employ such surveyors, guards, and other employees as they may deem necessary, and to provide guard boats and a sufficient number of men to protect all oyster beds and grounds in the tidal waters in said county of Atlantic in this state.'

"By the first clause of this paragraph, it is made the duty of the Commission to enforce the provisions of this act. It would seem to me, therefore, that the Commission not only has the power, but it is their duty to provide such guard service.

"This, as well as all other state operations, is contingent upon the provisions by the Legislature of sufficient funds for the purpose. I observe, in the Annual Appropriation Act, Session of 1911, page 826, being the act which is in force for the fiscal year ending Oct. 31, 1912, the following: 'For patrol service, two thousand two hundred and eighty dollars.'

"I am at a loss to understand the purpose of this appropriation, if it is not intended to cover expenses incurred under the provisions of the statute to which I have referred. If I am correct in this assumption, within the limits of this appropriation, as I have stated above, it seems to me it is not only the power, but the duty, of the Atlantic County Oyster Commission to provide such guards as, in their judgment, are necessary.

"Yours very truly,

"(Signed) NELSON B. GASKILL,
"Asst. Attorney General"

Another class of the oystermen of Atlantic County is opposed most strenuously to the law of 1910, permitting the leasing of barren grounds for the planting of seed oysters. These men have shown their opposition in every possible way and have endeavored to secure the repeal of this law. The present Commissioners also look with some disfavor upon this law, and there seems at present some difficulty in securing proper safe-guards for the grounds set apart for leasing. We have maintained always that the State should per-

mit the leasing of grounds for the propagation of seed because such a very large area of available ground lies idle and unproductive. In the line of conservation of our natural resources this seems a tremendous waste of a possible asset. Those who oppose such leasing hold the theory that these grounds should be open to the public at all times and yet they face the certain fact that while thus open the grounds are stripped bare of everything showing any sign of life. So long as we are connected with the Shell Fish industry we shall use every possible effort on the enforcement of this wise law and will endeavor to extend its provisions to those other sections of the State which appear to require it.

Another phase of this situation in Atlantic County is recalled in this report as it has been referred to in previous reports, and that is the question of proposed change of season for taking seed oysters from Fall to Spring. As has been stated many times, the Fall season, opening October 1st, prevents the growth of spat which has caught in July and August sufficiently to permit its removal to the planting grounds. It is so small and weak, in fact, that a very small percentage of it survives the process of removal, whereas if the seasons were changed to Spring, as has been recommended, the opportunity for growth and development through all of the Fall and early Spring would make the seed so very much stronger that a much larger percentage would be saved. Some of our old oystermen have figured that the proportion that survives transplanting in the Fall is not more than 10 to 15 per cent, while it is estimated that fully 75 per cent would be saved by the Spring transplanting. The Commissioners for Atlantic County have in their report recommended this proposed change of season, and our own investigation upon this subject shows that many of those who previously opposed it now commend it. We suggest that at the coming session of the Legislature legislation be passed providing for this change.

The season in the Maurice River Cove district has been one of the best in years, and our oystermen are rejoicing in the very much needed change of conditions. For at least five years there has been a widespread loss among our shippers because of the underdevelopment of the planted oysters. For some seasons, not necessary here to recount, being biological questions, the planted oysters have gained such little growth and presented such poor appearance that there was no market for them. In the present season, however, the oystermen have rejoiced in the tremendous volume of growth gained by the oysters on the same grounds, and an area of prosperity has set in for them which is keenly appreciated. In a number of instances, great financial distress had been felt by our shippers because of the almost total failure of previous seasons and the situation was assuming an alarming aspect. It is estimated that this year the output will be more than twice as valuable than in any year in the past decade, and this will carry good cheer to many homes of our citizens in that section.

We respectfully refer again to the proposition for the consolidation under some form of all our Commissions having to do with the Shell Fish industry. In this recommendation, as has been previously stated, we do not suggest the elimination of the Commissions, because we regard it as absolutely essential to the welfare of the industry that agents of the State, by whatever title they may be designated, must be upon the grounds to give proper attention

to the industry. It would be manifestly impossible for any one man, with headquarters at the State Capitol, to give adequate attention to the details of the business. There are more than 75,000 acres of land under oyster cultivation, and the area should be at least doubled in the next few years, so that any proposition looking to the elimination of any of these Commissions would be very poor business, indeed. We do suggest, however, that a number of Commissioners might be reduced, that all the Commissions be consolidated as a State Board or Bureau, and in this manner much good might be accomplished. With that end in view, we have prepared a bill which we hope to have presented in the Legislature embodying the idea of a State Board or Bureau to have entire control of the industry. This will provide a saving of several thousands of dollars per annum and we trust that it will receive your careful consideration.

One of the most vital matters concerning our industry has reached a very satisfactory standing within the past year. Under the law of 1912 our State Board of Health is given very much greater authority over the industry. The Act provides that the Board and its bacteriologist shall make proper, periodical inspections of the oyster grounds, the waters, the shipping houses, and all other matters connected with the dredging and marketing of oysters. With an appropriation of \$5,000 the Board was also permitted to purchase a boat, or floating laboratory, to facilitate these inspections, and it was also authorized to formulate specific rules and regulations for the better conduct of the business in order that all suspicion of pollution or contamination should be removed from our product. Under an arrangement made by this Bureau a meeting of the oystermen from the Maurice River Cove district and the members of the State Board of Health was arranged at Port Norris, and very careful consideration was given to the drafting of such rules and regulations. After due consideration of the subject from all points of view, the Board adopted the following:

1 Oysters or clams which are taken from waters found upon inspection by the State Board of Health to be so polluted as to render the oysters taken therefrom or placed therein dangerous to health shall not be distributed or sold for use as food within the State of New Jersey.

2 The floating, laying out or storing of oysters intended for use as food will not be permitted in water of a less salt content than that in which oysters will naturally grow to maturity.

3 Oysters will not be permitted to remain on floats longer than twenty-four hours during the first fifteen days of September, nor more than thirty-six hours from September 15th to November 1st. During the other shipping months oysters will not be allowed to remain on floats longer than forty-eight hours, except by permission of the State Board of Health. Oysters will frequently cleanse themselves in one tide and therefore, the offering for sale, as food, of oysters that bear evidence of over-floating or soaking is prohibited.

4 Oysters that have been subjected to the floating process shall not be permitted to remain in scows, or wharves or in shipping houses before shipment longer than forty-eight hours, except in cold weather, and then only if they are properly protected from freezing.

5 All floats, scows, or other vessels, used for transportation of oysters,

or clams, shall at all times be kept clean and free from mud, refuse, or any decaying matter.

6 Oysters that have been subjected to the floating process when shipped must have the sacks, barrels or other containers so marked that the purchaser may know that they have been floated. This marking shall be in the following words: "This package contains Floated Oysters," and the type shall occupy a space of at least three-fourths of an inch in height. The marking must be so stamped or printed on the tags that it can be easily discernible. No sacks that have been used for the trans-shipment of oysters shall not be used again for that purpose until they have been thoroughly cleaned and sterilized. Wooden barrels or other containers must be clean and free from anything that might contaminate the oysters.

7 The practice of allowing oysters that have been dredged from the planting grounds to remain on the decks of schooners for a considerable time before sale results in their deterioration as a food product, therefore oysters shall not be carried on the decks of vessels after dredging longer than twenty-four hours in September, forty-eight hours in October, and one week in November.

8 Railroad cars in which oysters are shipped in sacks must be clean and free from anything that might endanger the purity or healthfulness of the product. All cars shall be subjected to proper inspection to see that they conform to this rule.

9 Oysters that are shucked may be washed in clean water before shipping and must be packed for shipment in containers in which ice shall be used, but the ice or the water therefrom must not be allowed to come in direct contact with the oysters.

10 Oyster and clam shippers will be required to keep their boats, wharves and shipping houses in a clean and sanitary condition at all times.

12 Owners of all vessels in which men work continuously for more than two hours and which are engaged in the handling of oysters or clams from the planting grounds or in the vicinity of floats upon which oysters are or may be laid out, must provide their vessels with suitable receptacles in which the excreta, both solid and liquid, of persons using such boats shall be received, and the contents of such receptacles shall be disposed of either by incineration or by burial in the grounds at points sufficiently removed from the banks of streams to prevent pollution of the waters thereof.

13 Oysters or clams that have remained in storage until the product has become weakened will be regarded as unfit for food and cannot be shipped.

The violation of any of these rules or regulations is punishable by a fine of \$100.00 as provided in Section 8 of Chapter 24 of the Laws of 1912. These rules shall become effective immediately, provided, however, that no penalties shall be collected for violation of rule 12 until after November 15th, 1912.

BUREAU OF SHELL FISHERIES

LEASES AND LICENSES

	No of Acres Leased	No of Licenses Issued
Atlantic County	939 59	
Delaware Bay and Maurice River Cove	27,405 10	286
Ocean County	3,081 00	
Raritan Bay	489 25	7
Shark River	216 00	
	<hr/>	<hr/>
	32,130 94	293

TOTAL RECEIPTS FROM LEASES, LICENSES, ETC

Atlantic County	\$1,807 00
Delaware Bay, Maurice River Cove and Raritan Bay	24,282 25
Ocean County	1,720 00
Shark River	236 00
	<hr/>
Total	\$28,045 25

RECAPITULATION

Total Acres Leased	32,130 94
Total Licenses Issued	293
Total Receipts	28,045 25

1912 APPROPRIATIONS

ATLANTIC COUNTY

Commissioners' Salaries	\$900 00
Superintendent's Salary	1,000 00
Patrol	2,280 00
Incidentals	300 00
Surveys	150 00
	<hr/>
	\$4,630 00

CUMBERLAND COUNTY

Salaries and Patrol	\$13,000 00
Protection of Natural Beds	4,000 00
Surveys and Maps	800 00
	<hr/>
	\$17,800 00
Supplemental	4,000 00

BUREAU OF SHELL FISHERIES

OCEAN COUNTY

Commissioners' Salaries	\$750 00
Superintendent's Salary	1,000 00
Patrol	1,000 00
Incidentals	450 00
Rent	50 00
	<hr/>
	\$3,250 00

SHARK RIVER

Commissioner's Salary	\$117 00
<i>Bureau of Shell Fisheries</i>	\$4,000 00
Salary of Chief	1,800 00
Incidentals	600 00
Salary of Stenographer and Clerk	600 00
	<hr/>
	\$3,000 00
Total	<hr/>
	\$32,797 00

Report of the Biologist

BY JULIUS NELSON, BIOLOGIST

Our studies of oyster propagation for a series of years had shown the great importance of a knowledge of the climate and other conditions that influence the life of oysters and shell fish in general. We concluded that it would be necessary to ascertain as exactly as possible the presence and operation of these factors at several points on our coast simultaneously, in order to explain some of the most important problems of oyster culture. But the Act of 1901, (revised in 1907) establishing experimental researches in oyster propagation, at one or more stations in the oyster producing areas of the state, did not provide funds sufficiently ample for the establishment and maintenance of several stations that should be in operation simultaneously, and so requiring an equal number of trained investigators.

It was to supplement this work that the energetic chief of the Bureau of Shell Fisheries, secured the passage of the act authorizing the establishment of an observation service to secure the desired data. This service was intended to cooperate with the research and experimental service already provided for under the auspices of the Agricultural Experiment Station, not only in that the observations secured at the stations of the Oyster Culture Laboratory should be included as part of such service for purposes of scientific study and comparison of data, but also in that the biologist who had charge of such laboratory should be director of the general work under the Bureau of Shell Fisheries.

Unfortunately, no appropriation was secured for this new extension provided by law, yet the value of the data to be secured by the inauguration of such a service was considered to be so great that we felt impelled to try the experiment of running as many stations simultaneously as the limited appropriation for the oyster work of the Experiment Station would allow. Ample authority was given under the law for such extension.

We therefore determined to choose and to train and to place observers at these stations, viz (1) Barnegat, (2) Mullica River, (3) Great Egg Harbor River.

The observers put in charge of these stations were, in addition to the biologist, the following men: Students at Rutgers College, viz, R W Searle, C R Martin, and T C Nelson. With the exception of Mr Nelson who had acted as laboratory assistant for several summers, these men were untrained for the special duties of these stations. The funds permitted of their service only for two months, which covers the most important part of the season of oyster propagation. The observers began work June 17th, and their commission therefore expired August 17th. They were trained under the supervision of the biologist at the Barnegat Station, during the last two weeks in June. At the close of this period Mr Searle was left in charge at Barnegat, while the biologist and Mr Martin went to Scullville on the Egg Harbor River, where a station was established and equipped and left in Mr Martin's charge.

The central station was located at Turtle Island in the Mullica River, near Great Bay. To this point the floating Laboratory boat, Cynthia, was towed, and here the labors of the biologist and his right hand assistant were principally confined.

This was not only absolutely a new field, but also differed radically from the conditions made familiar by several years work at Barnegat. These conditions were also many times more severe and trying than at Barnegat. The tides were six times greater, the water many times deeper, and correspondingly rougher, the distances far longer and the facilities for reaching markets and transportation stations were exceedingly small. Naturally we had to acquire a good deal of experience with these conditions before the best work could be done.

We also installed several new instruments for securing data of a more accurate character than had hitherto been possible. A rain gauge gave us accurate account of the precipitation. We installed a Draper self-recording thermometer, that not only gave us a continuous reading of the temperature of the air, but gave this for the outdoor air, all our previous figures having been given by the thermometer hanging in the laboratory. Most important of all, was the invention of a self-recording tide gauge, using the apparatus of the Draper thermometer, as part of this apparatus. In addition to these instruments, we made a fair start in the matter of getting a record of salinity and temperature of the water at the bottom as well as the surface, a work not so readily undertaken in the shallow waters at Barnegat. The Scullville region resembles the Mullica region, but on a smaller scale.

AIR CONDITIONS

Air conditions differed but little at these three stations, the Mullica River station being a trifle cooler than the other two stations, but as there was a large influx of water from the interior both at Scullville and Turtle Island, this did not affect the temperature of the great body of water to an appreciable extent. In fact, part of this difference is certainly to be ascribed to the different locations of the thermometer at these stations, after the installation of the recording thermometer. This had been started in the laboratory but the rocking of the boat stopped the pendulum of the clock work of the machine so that we had to move it outdoors onto the island.

The season in general had been quite favorable to the early and normal maturing of oysters, plenty of rain had fallen during the Spring months and the temperature had slowly risen, without the extremes, as well as the great fluctuations of previous seasons. Consequently at all stations the water had reached to seventy degrees Fahrenheit, or higher, by the middle of June, and the oysters were beginning to throw out their spawn by that date. Spawning was already in progress by the time the observers began their work at Barnegat, and matters developed so rapidly that the main spawning period was over by the time the other stations were in operation. The balance of the summer was cooler than usual and not favorable to repetition of the spawning process.

WATER CONDITIONS

The tide gauge at the several stations were marked on such a scale that the average movement of the tide for one hour registered one division of the gauge. At Barnegat the units were of one inch value, at Mullica and Scullville they were six inches.

At Barnegat the greatest tidal range was eleven inches, at the Mullica four feet, at Scullville six feet.

The salinities ranged from 1005 to 1018 at Barnegat with an average mean of 1015. At the Mullica the densities ranged from 1011 to 1020 with an average of 1016, while at Scullville the range was 1007 to 1021 with an average of 1014.

The temperature of the water at Barnegat ranged from 66 degrees to 88 degrees Fahrenheit, with an average of 75. At the Mullica the range was 66 degrees to 80 degrees, with an average of 72 degrees. At the Scullville the temperature ranged between 66 degrees and 85 degrees, and an average of 74 degrees. The greatest difference in salinity noted in any one day at Barnegat was 1005 at the laboratory, and 1017 half a mile below. This is also the range observed at the laboratory during the season. The greatest simultaneous difference between the surface and bottom in the Bay was two points only (1013, 1015), the denser water being at the bottom.

The greatest change in density observed within twenty-four hours was 9 points, observed at the laboratory. In general there was greater fluctuation in the earlier part of the season than later, this was to be ascribed to the distribution of rainfall, and also in accord with this explanation, the water averaged about 1016 at this time as against a little less than 1015 earlier.

At the Mullica station there was less variation in salinity, the extremes being 1010.5 and 1020. At the one point where most of the samples were taken the extremes were 1010.5 and 1019. At this point the greatest range in a twenty-four hour period was 1011.5 to 1015. The greatest simultaneous difference between surface and bottom was shown by the record 1015 to 1020, a difference of 5 points repeated several times. The average bottom sample was two points saltier than the surface. Rarely was the bottom fresher than the top and never by more than one point.

At Scullville the extremes in salinity ranged from 1007 to 1021. The greatest twenty-four range at any point being 6.5 points, and the greatest simultaneous difference between surface and bottom was 2 points, based on rather few cases. The variations in salinity were abnormally low, for all stations, owing to the steadiness in the weather conditions.

SPAWNING CONDITIONS

Oysters at Barnegat, and probably at the other stations, came into maturity early in June, and abundant spawn could be secured throughout that month. Oysters examined July 30th had completed spawning, and the fry conditions in the water proved that spawning had practically closed a week before that date. At Scullville, the conditions were almost identically the same, and at the Mullica the same was true so far as our meagre data showed. Here we transplanted some spawned oysters and found them coming into spawn again, early in August, which was thrown out before the middle of that month. The result suggests a line that invites further research.

FRY CONDITIONS

Under the conditions obtaining in our stations, it was far easier to keep track of the spawning activities of the oysters by filtration experiments than by securing adult oysters and examining them.

At Barnegat the main spawning period fell on the twenty-fifth of June as discovered on the twenty-sixth when we found the enormous number of four thousand newly hatched oyster fry per bucket of water. This exceeds all previous records. There was also a fair lot of medium and of large fry. At the temperature of the water, we calculated that a spatting climax would be due during the second week in July, and it came early in that week, "Setting everything full," as the oystermen expressed it, or "A great catch on everything all over." From that date there was a small amount of setting of spat resulted during July.

At Scullville the oysters were too poor in the Spring to fill up with spawn to any great extent, and the fry were consequently never very numerous at any time. On the 27th of June there was a sufficiently large number of medium and of large fry in the water to promise a small "set" of spat. These had set before the station was in running order, and after that date the spawning was very poor, the most fry being found on the 14th of August, about 150 per bucketful. From such a small number we could not expect any results that would show in our experiments.

There does not appear to be a sufficiently large number of oysters in that

region to provide an abundant set, although with very favorable conditions the cultch would in time, say a series of years, become the seat of young oysters in sufficient numbers to recall the original natural oyster beds.

The claim is made that the region has been depleted by "over fishing," that is, there has been too little regard paid to leaving both sufficient cultch and large oysters to furnish seed. A large oyster will furnish perhaps fifty million eggs, of which half may hatch into oysters. The destruction of these young is so enormous that only about a hundred thousand would become spat, and of these only a small portion would grow to maturity. But such figures are very misleading. The deeper the water the more numerous should be the spawners, because unless the water is fairly saturated with the spawn of the male oysters (which are about half of the number of adult ones) the eggs emitted by the females will stand only a small chance of being fertilized.

If the large oysters are taken and reliance is placed on the small ones to replenish the beds, it is plain that there must be many times more small oysters than of large ones to secure an equally favorable result, that is, assuming that the spawn from a young oyster is equally virile with that of an old oyster. A one year old oyster does not have the hundredth part as much spawn as a five year old oyster. Assuming it requires four adult oysters per square yard of bottom, it would require four hundred yearlings in the same space to furnish a satisfactory amount of seed for the next season.

In the Mullica, there is no lack of oysters, although they occupy limited areas. Only a small part of the bottom is utilized in this magnificent domain. The vast quantity of water in the region, however, dilutes the spawn so that we cannot hope to count as high numbers of fry as at Barnegat. Our highest county of fry was only 350 per bucket at the close of July, and again August 14th. There is every reason for believing that a higher number than this was present in the water before the date when we first succeeded in establishing ourselves there.

SPATTING RECORD

We have already mentioned the unrivaled set of spat that occurred at Barnegat immediately following the 8th of July. At this time we were fortunate enough to have placed into position, a number of tiles which had been made to our specifications, by the Ceramics Department of Rutgers College. These tiles had been treated in various ways, being surfaced, some with glaze and some unglazed, some coated with plaster and some with paint, some with mastre varnish and some with gelatin hardened with formalin, etc., etc. These tiles had been placed without result for two preceding seasons, upon the spatting grounds, but now they received a most magnificent set of spat evenly distributed, and so numerous we did not try to count them. The experiment showed that copper paint and the glaze make the poorest surfaces, while the natural surface or a plastered surface, are as good as the best oyster shell, and better than clam shells. This plaster is made of equal parts unslated lime, fine sand, cement, and Paris plaster. The plaster is useful only in coating unfavorable surfaces or when sets are to be

removed For experimental purposes the natural unglazed naked pottery is the best

At the Mullica station there was no set on our experimental cultch until about the end of the first week in August In the immediate neighborhood of our station there never was during the entire summer a set that could be called satisfactory in amount But there was on the whole in the Mullica, a "good" set, satisfactory to the planters The conditions for a good set were excellent and only the peculiar distribution of the fry by the currents was responsible for the fact, that we in our lack of experience with this new region, did not secure the best of the set Besides, we believe that the main set of the season occurred before our operation got under way There certainly was a set here, at about the same date as that of the main set at Barnegat

This experience leads us to remark in passing that it requires close attention to matters at each station, as well as several years experience there, before the opportunities offered can be properly utilized, and for this reason it requires a man of experience at each station to make the observations It seems likely that the main climaxes of spawning and of spatting will occur on so nearly the same dates for different regions, that a general overseer would be unable to direct the work of amateurs at stations lying a considerable distance apart But this is only one of the many difficulties that molest us in connection with such researches

THE FLOATING QUESTION

The "Floating" question was again opened by the Bureau of Chemistry, and once more we were summoned to present evidence This hearing came so soon after its announcement, that there was no time for extended additional researches We could mainly reaffirm our previous testimony and put it in a slightly better summarized form We had a clearer comprehension of the facts at issue

In the absence of full scientific researches on this subject, we do not wish to dwell further on the aspects of the case, except to say that it is of primary importance to distinguish floating as a legitimate and useful process in preparing oysters for market, from various other practices also called floating When the retailer opens oysters into a bowl containing fresh water, in order to increase the amount of "liquor," the flesh of the oyster is "floating" in such water, and certainly is "soaked" therein, and its juices partly extracted, especially its saline It is easy to see that such a process should not be confused with the "floating" practiced by planters, who remove their oysters from their beds and place them for less than 48 hours in water of "less saline content" than that in which they were growing If this water were fresh water, the oysters would refuse to "drink" They shut their shells Only when a water of such saline content as the oyster really tolerates, reaches the float, does it open and drink as much as it wishes As such water is fresher than that in the tissues of the oyster, there is consequent swelling, but this also is controlled by the oyster, for there has been provided by nature a certain excess of shell capacity to accommodate such increase in size, because on their natural beds, in tidal estuaries, oysters have from time immemorial, been subjected to alterations of salt and of brackish water

When the water becomes so fresh that the swelling of the oyster's flesh would exceed the available space in the shell the oyster closes as long as possible, and only when the freshet conditions are prolonged, is it compelled to open Then occurs the real loss of substance, which at length kills the oyster

It is up to investigators to determine the exact extent and limits of these adjustments Upon the results of such an investigation will be based the rules for the proper floating of oysters Even if floating be depended on rational grounds, it is evident that it can be subjected to abuses In most cases these abuses have not been practiced by planters, there is greater opportunity for such abuses to arise in connection with shucking, particularly in the retail trade But it is quite wrong to fail to distinguish the freshening process to which oysters may be subjected when in the shell from that when they have been "shucked"

We consider it also proper to distinguish the various processes to which oysters may be subjected while in the shell Floating properly applies only to cases of more or less of freshening in the shell for a period not to exceed two tides of active drinking, and hence should not be used as synonymous with the idea that floating implies *lying on a "float"* A float is not indispensable in the process Oysters that rest on floats for an indefinite period or are stored where water can reach them daily, are not being subjected to a time floating process, and hence should not be called "floated oysters" So far as our understanding of the facts goes, in reference to the alleged cases of typhoid transmission by oysters, the principle cases that have to my knowledge been proved, were not cases due to "floated oysters," although constantly so designated As we understand the case, the oysters charged with being responsible for the Goshen epidemic received their contamination while held in storage in contact with polluted water in a creek that empties into Jamaica Bay Yet these oysters are spoken of as oysters floated in Jamaica Bay, which expression carries three false implications, (1) they were floated, (2) in Jamaica Bay, (3) this process caused contamination All of which is false If oysters have at any time been properly floated, and are later subjected to exposure to water, except under conditions similar to those obtaining at the previous "floating," then they cease to be floated oysters, the new character given these oysters, by the additional manipulation to which they have been subjected, has destroyed the character conferred by the term floating process, and it becomes necessary to designate them by a term appropriate to their new condition It is of course quite possible to "float" an oyster more than once, but unless an oyster actually drinks, when on the float, it cannot be called a floated oyster however many times it is subjected to the process We hold that whenever an oyster drinks on one or two tides, in water of less saline content than that in the tissues of the oyster, then it is undergoing the process of "floating" The entire confusion arises by the use of the term "floating" (which has a lot of general meanings) for a process that is a combination of certain quite specific conditions resulting in a quite specific activity similar to that which takes place in nature under normal conditions These conditions may, even in nature, become abnormal and injurious to the welfare of the oyster It would be a strange mistake to fail to distinguish such abnormal conditions simply because

the oyster bed became fresher in both instances Everything hinges on the *extent* to which the influences operate

Those interested in the details of the data secured during the summer are referred to the report of the Biologist in the New Jersey Agricultural Experiment Station Report for 1912

Delaware Bay, Maurice River Cove and Raritan Bay Report.

TO THE BUREAU OF SHELL FISHERIES —In conformity with the rules and regulations of the Bureau, and pursuant to the several statutes on the subject, the undersigned, New Jersey State Oyster Commission, respectfully submit this our annual report for the fiscal year ending October 31, 1912

Inspections which have been made by us of the natural spawning grounds above the "southwest line" in Delaware Bay indicate that late in the summer there was an unusually heavy catch of spat on many of the well known beds The spat, however, are small in size and we believe that the material interests of all the oystermen engaged in the business in Delaware Bay would be best served by imposing some limitations upon the taking of this young growth in the Spring of 1913 This may be done by restricting the quantity which each boat may lawfully take during the season, or by shortening the planting season for 1913, or by closing the bay entirely for the year This is a matter which we respectfully recommend for consideration, and for action after due investigation of all the facts

In the same connection we also beg leave to direct attention to the fact that many thousands of bushels of undersized oysters are annually taken out of the waters of this State and planted or sold for planting in other states, and of course on lands from which this State derives no revenue All other states of the Atlantic Seaboard where there is due and proper regulation of the oyster industry, have what is known as a "size law," whereby it is made unlawful to remove from such states any oysters for planting purposes, which measure less than two and one-half inches from hinge to mouth

A similar law in New Jersey would be productive of much additional revenue to the State, and prevent the depletion of our natural beds for the benefit of those who now contribute little or nothing towards the support and maintenance of the wise protective system which is enjoyed by all

You will observe that our revenue from boat licenses is somewhat less than last year The primary cause of this decrease is the inability to secure sufficient labor to adequately man the boats during the planting season

The law now prohibits the employment of any person on our boats during the planting season, unless such person is an actual inhabitant of this State and has been such for the preceding six months The agricultural and industrial interests of South Jersey have so greatly increased in recent years, and our resident labor is so generally employed in permanent positions and at satisfactory wages, that we find a growing and urgent need for outside help during the few weeks of the planting season each Spring The need for such help is greater now than heretofore, because a rigid enforcement of the rough cull law requires the carrying of double crews While we fully realize

conviction that industrial conditions require corresponding changes in the that the "Seventh Section" is a time-honored statute, we cannot escape the law, and we, therefore, recommend that at least some modification of the present law be made

The Legislature at its last session appropriated the sum of \$4,000 00 for sub-
stitutions and repairs to steam watch boat "Cypher"
stitution of gasoline motive power for steam, and necessary incidental altera-

Upon examination of the "Cypher" by a competent engineer, it was found

that she was not suitably constructed for the installation of a gasoline engine of the necessary horse power We used about one-fourth of the appropriation in making repairs to the boiler, hull and other works of the boat, and the balance reverted to the State Treasury We are convinced, however, that these repairs will do no more than make the boat serviceable for a few months, and we deem it necessary that a new and heavier boat be procured for police purposes in the waters of Delaware Bay and Maurice River Cove We ask your cooperation and aid to this end

The oystermen of Cumberland County are working in entire harmony with the State Board of Health in its efforts to insure the purity and wholesomeness of oysters grown in this territory That the public appreciates what has been done in this behalf and is convinced of its efficiency, is demonstrated by the unprecedented demand this Fall for "Maurice River Coves" They have never been better, and many thousands of sacks are being shipped daily

We beg leave to refer to the annexed report of our Superintendent for detailed statement of our receipts Moneys expended under our supervision are shown in the report of the State Comptroller

Respectfully submitted,

EDMUND STITES, JR.,
OGDEN GANDY,
WALTER C RIGGIN,
ADDINGTON B CAMPBELL,
State Oyster Commission

Superintendent's Report.

GENTLEMEN —I herewith submit to you my annual statement of receipts from all sources for the fiscal year ending October 31, 1912

From licenses issued to vessels in Delaware Bay	\$8,670 00
" leases issued for oyster grounds in Maurice River Cove	14,072 00
" survey fee for oyster grounds in Maurice River Cove	935 00
" sale of maps of oyster grounds in Maurice River Cove	8 00
" licenses issued to vessels in Raritan Bay	108 00
" leases issued for oyster grounds in Raritan Bay	489 25
	<hr/>
	\$24,282 25

Annexed hereto and made a part hereof, you will find schedule in alphabetical form, showing the name and post office address of the master or owner of all boats or vessels licensed to catch, plant and grow oysters in Delaware River, Delaware Bay, Maurice River Cove and Raritan Bay, in the State of New Jersey, including the tonnage, license number and license fee of such licensed boat or vessels In like form the name and post office address of all lessees of oyster lands lying under the waters of Delaware Bay, Maurice River Cove and Raritan Bay in the said State of New Jersey, also designating the lessee or lessees, lease number, ground number, section letter, total acreage and rentals

Respectfully submitted,

A T BACON,
Superintendent

Nov 1, 1912

Report of the State Oyster Commission, District of Ocean County.

TO THE BUREAU OF SHELL FISHERIES —Pursuant to the provisions of the act of April 14, 1903, (P L 1903, p 709), the undersigned New Jersey Oyster Commission for the district of Ocean County, make this our annual report for the fiscal year ending October 31, 1912.

In submitting our report we beg leave to call your attention to the recommendation of Superintendent Mott, also to recommendations made by the former Commissioners and Superintendent Horner

We are sorry to be obliged to report that the oyster business of this district seems to be on the decline, and unless there is some way provided whereby a cheaper supply of seed oysters can be obtained we fear the present conditions will continue as we cannot compete with those who have a plentiful supply of seed oysters at home near their planting grounds so that they can obtain a supply much cheaper

We do, therefore, earnestly request you to use your earnest efforts to secure legislation that will give us relief which can be obtained either by the State making an appropriation to shell the barren grounds or by leasing the same to individuals for the propagation of seed oysters, and should it be necessary we will gladly cooperate with you at any time in an effort to bring about this result

The laws governing the shell fish industry of this district have been fairly well observed

The catch of spat in the Mullica River and in Barnegat Bay is very satisfactory, and the plants that were taken from the natural oyster beds at the opening of the season were of fine quality, but owing to the fact that the spat were carried away during the open season of 1911 the quantity was very limited

We refer you to the annexed report of our Superintendent for a statement of our receipts and for moneys expended under our supervision, we refer you to the report of the State Comptroller

Respectfully submitted,

(Signed) GEO W HOLLINSWORTH,
PHILIP R SPRAGUE,
FRANK V FRAZIER,

Commissioners

Superintendent's Report for the District of Ocean County.

GENTLEMEN —I herewith submit to you my report for the fiscal year ending October 31, 1912

And beg leave to call your attention to some matters that I believe will benefit the oyster industry

Having been an advocate of closing the season for gathering seed oysters until Spring for a number of years, I am pleased to be able to report to you that a large majority of the oyster planters and baymen have expressed themselves favorable to this change I believe this change would save at least seventy-five per cent of the seed that are now taken from our natural seed producing grounds at a time when conditions are unfavorable to its removal

I would also call your attention to the inadequate patrol service, and state that a number of the oyster planters in the vicinity of Graveling Point have expressed a willingness to pay a rental of two dollars and fifty cents an acre provided they can have a watchman kept on duty all the time and paid a sufficient salary so that he can devote all his time to patrol duty I would therefore recommend that this matter be given prompt attention, and that a rental be charged according to the value of the grounds leased instead of a uniform price for good and bad as is now the custom

The law under which we are now operating makes a minimum rental of fifty cents and a maximum of three dollars per acre for grounds leased, but in case of the minimum being charged for the first ten acres that the lessee must pay one dollar per acre for each additional acre or fraction thereof I find that this feature of the law has been ignored, and that the minimum rental of fifty cents per acre has been charged for all grounds leased above two acres I would therefore recommend that the method of leasing be made to conform to the law, or that the Legislature be urged to make the law conform to the method of leasing

As the law requires that when applications are made for leases and the same are granted, that the lands leased shall be surveyed and the metes and bounds thereof ascertained, and as this section of the law has not been complied with because there were no funds available for that purpose, and in consequence of this fact the new grounds leased for the last two years have not been surveyed, it has confused the work seriously I trust that you will urge upon those in authority the necessity of making an appropriation sufficient to carry out this provision of the law

I also recommend that the lessee be required to place and maintain a suitable marker with the number of the lot thereon on the northwesterly corner of each lot leased

I believe the Commission should have the power to change the lines between the grounds set apart for oyster cultivation and the public clam grounds as conditions may change, so that the grounds may better suit the changed conditions

Believing that the displaying of a signal light or lights at the several Patrol Stations at night would be a great benefit to the baymen and to the watchmen themselves as a guide, I earnestly recommend that such signal lights be kept lighted and displayed by the watchmen every night while on duty, and that provision be made to procure and maintain the same

There being an expressed doubt in the minds of some persons who are inclined to take advantage of any technical point of law to trespass as to whether there is a law to prevent the treading or wading out of clams on leased grounds, and while I believe that the act of 1886 covers this point, I think it advisable to have the point made perfectly clear by amendment of the act of 1902

I am very sorry to find that the receipts for rentals are on the decrease I find the receipts for 1910 were \$2,367 00, for the year 1911 they were \$2,221 25, and for the year just closed they have dropped to \$1,720 00 I find for the first six months of this year receipts show a decrease of \$230 00, as compared with a corresponding period of 1911, and for the six months since my appointment they show a decrease of \$194 25 as compared with a corresponding period of 1911 I believe this is due to the fact that the price of seed oysters brought from other states has been so high that the business has, to a certain extent, become unprofitable, and that if some method of raising a cheaper supply of natural seed devised the acreage and revenue will be increased, and I trust that this may be brought about by legislative enactment, as recommended in former reports by the Commission and former Superintendent Horner

Annexed hereto and made a part hereof you will find schedules in alphabetical form, showing the names and post-office address of all lessees of oyster lands lying under the waters of Ocean County and the acreage leased to each

The following is a correct statement of moneys received by me, and as I find the records and receipts of my predecessor during the fiscal year ending October 31, 1912

For oyster ground rentals	\$1,720
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Respectfully submitted,

(Signed) GEO A MOTT
Superintendent

November 1, 1912

Report of the State Oyster Commission, for the District of Atlantic County.

TO THE BUREAU OF SHELL FISHERIES —The State Oyster Commission for the District of Atlantic County, herewith respectfully submit their annual report for the year ending October 31, 1912

The general conditions of the oyster industry in this district appear to have been very satisfactory during the past year The planted oysters have been in the best condition in years The demand for good oysters has made it a profitable year for both the planters and shippers

At the opening of the natural seed oyster season on October 1st, the Commissioners were on the natural seed beds of the Mullica River and Great Egg Harbor River in order to have personal observation of the work and operations of the tongers In the Mullica River the catch was exceedingly good, the plants being strong and well developed But the catch was not so large as it has been in previous years, because some parts of that river are badly in need of shelling In the Great Egg Harbor River there was very little catch Some claim it is on account of the dry season, which may be the reason

The Commissioners and guards paid especial attention to see that the cull law was enforced on the natural seed beds We are pleased to report having had very little trouble, as the tongers are realizing the necessity of leaving the shells upon the bottom to insure a catch in future They have given up hope of the State's ever appropriating money for shells any more

We wish to call your attention to an old matter which has been brought up from time to time in the past That is the changing of the opening of the natural seed beds We would recommend that the law be changed to open them on April 1st and close them May 21st A change which we think would be for the betterment of the industry Under the present law the young oysters are taken from the natural seed beds to the planting grounds before they are developed enough to take care of themselves, especially with the winter coming on The result is that about eighty per cent of them die Whereas, if they were allowed to stay on the natural beds until the Spring they would be well developed and strong, and most of them would survive This change was suggested in this district a couple of years ago, and it was found to have considerable opposition from a certain class of baymen That opposition is practically dead now, and about all of those who were opposed to it at that time favor it at present So we think that we will have very little difficulty having the act changed this coming Winter

We are having some trouble with certain persons who are planting grounds without leases We expect to bring the attention of the Grand Jury to this matter and try to get convictions We think it a matter of vital

importance for the betterment of the oyster industry that all concerned should respect and obey the laws as enacted, and we intend to enforce them to the letter

We also wish to call your attention to the use of patent tongs and rakes in the deep water parts of the natural seed beds. We consider their use very harmful to the industry, they dig up the bottom to such an extent that it leaves the bottom barren of shell, leaving nothing for the spat to catch on in future years.

Enclosed herewith you will find a list of lessees of oyster grounds for the year

The following shows the expenditures as approved by the Commission for the year ending October 31, 1912

For patrol service	\$1,025 93
For surveys of planting grounds	149 49
For incidentals	298 87
For repairs to guard boat	100 00
	<hr/>
	\$1,574 29

The oyster superintendent has collected the following moneys during the year ending October 31, 1912 \$1,807 00
Respectfully submitted,

C P HAMMELL,
D F CAVILEER,
WM BABCOCK,
Commissioners

Superintendent's Report, Atlantic County.

GENTLEMEN —I herewith submit to you my annual statement of receipts from all sources for the fiscal year ending October 31, 1912

From ground rentals	\$1,801 00
From other sources	6 00
	<hr/>
Total	\$1,807 00

All matter concerning leases, etc, will be found in the Commissioner's report

Respectfully submitted,

SAMUEL W GIBERSON,
Supt Atlantic County

Shark River District.

Report of the Oyster and Clam Commission of the District of Shark River, in the County of Monmouth, for the year ending October 1, 1912, pursuant to Chapter 14 of the Laws of 1905, entitled "An act for the regulation, protection and control of the planting, cultivating and the gathering or taking of oysters and clams on lands covered with water in Shark River, in the County of Monmouth," approved March 7, 1905

Receipts from oyster bed leases \$236 00

DISBURSEMENTS

April 1, 30 two-cent stamps	\$ 60
July 2, To Henry Flemming for staking out oyster lines	1 00
July 3, 15 two-cent stamps	30
Sept 4, 30 two-cent stamps	60
	<hr/>
	\$2 50
	<hr/>
	\$233 50

State of New Jersey, |
 |
County of Monmouth, |

Henry A Bennett, of full age, being duly sworn according to law, upon his oath saith, that he is the oyster and clam commissioner named in the foregoing report, that the same is a true and correct account of his receipts and disbursements for the year ending October 1, 1912, to the best of his knowledge and belief, for the said Shark River Oyster and Clam District

HENRY A BENNETT

Sworn and subscribed before me this 11th day of October, A D 1912
LEON R TAYLOR,
Attorney at Law of New Jersey

Sanitation of Oysters.

Facts to be Considered in the Determination of the Sanitary Quality of Oysters.

Paper Read by Prof Frederic P Gorham, of Brown University, Before the Convention of the National Association of Shell Fish Commissioners, at Boston, Mass

The question of the sanitary quality of oysters has been brought to the attention of the various Shellfish Commissions and Boards of Health of the oyster-growing states more and more frequently in the past few years, and will continue to be a subject for discussion for some time to come. It will, therefore, be well for those concerned to post themselves as far as possible upon this subject, so that whatever decisions or regulations they are called upon to make may be fair and reasonable, and based upon sound, scientific principles. With this in mind I wish to try to give you some of the conclusions at which I have arrived after a rather extensive and thorough study of this matter in Rhode Island waters.

We can divide the facts to be considered, first into those determined by the direct analysis of the oysters themselves, and second those derived from a study of the conditions that surround the oysters, or what is usually termed the sanitary survey.

- I The interpretation of oyster analyses
 - a Size of sample necessary

According to the report of the Committee of the Laboratory Section of the American Public Health Association upon Standard Methods of Shellfish Analysis a given lot of oysters must stand or fall upon the results obtained by an analysis of five oysters.

In the thousands of analyses which we have made in Rhode Island during the past three years, we have been again and again impressed with the diversity of results which we get in different oysters from the same lot. With the idea of testing the question of whether the analysis of five oysters would give us a fair idea of the quality of oysters from a given locality we have taken during this present Spring three lots of one hundred and twenty-five oysters each from three different beds in Narragansett Bay divided each lot into 25 samples of five oysters, and carried through the analyses of these different samples. The results of these experiments have not yet been fully tabulated, but we are ready to draw the conclusion that if a locality is badly polluted, all of the samples of five oysters will agree, or if the bed is

practically free from pollution, all of the samples will agree. And this is as we should expect, but if the bed is intermediate in character, one sample of five oysters is about as likely to be bad as good, so that in just those cases where we are especially desirous of getting accurate results our sample of five oysters will not give us a fair idea of the actual conditions. Just how large a sample must be taken in such cases to enable us to get a fair estimate we are as yet unable to say, but certainly it is unsafe to draw any conclusions from an analysis of only five oysters from any questionable locality.

b Character of bottom

Again in those cases where a given oyster bed is of varied character, perhaps part muddy bottom and part hard bottom, part deep water and part shallow water, it is unsafe to draw conclusions from the examination of oysters from one kind of bottom as to the conditions on the other. We have many times found that those oysters which are in the deeper waters of channels or in muddy holes show considerable pollution, while those on the hard bottom and shallow flats, where sediment does not collect, are clean and free from contamination. The polluting sewage materials entering an arm of the sea seem to follow the channels for considerable distances, while the flats on either side may be reasonably free from such pollution.

c Season of the year

Perhaps the most interesting and important observation which we have had the opportunity of making, is in regard to the seasonal variation in the bacterial content of oysters.

It appears that oysters which in the warm weather show the presence of sewage bacteria in large numbers, during the cold weather of December and January begin to clear up. The sewage and other organisms are gradually eliminated, until they all practically disappear, and this applies to oysters in water which is badly polluted, indeed to oysters in the immediate vicinity of large sewers. It would obviously be unfair then, to try to determine the quality of oysters in a given locality without taking into consideration the season of the year during which the analyses were made.

2 The interpretation of a sanitary survey

By a sanitary survey we mean a study of a given locality to determine the sources from which polluting materials may come, and the distribution of these materials in the water. This means first, a thorough study of the streams entering the sea in the neighborhood of oyster layings to determine the amount and extent to which they carry sewage, the relation of tides and winds, channels and flats in the distribution of those polluting materials to the oyster beds, the location of local sources of pollution, such as sewers and private drains, and the determination of the importance of the distribution of wastes from passing boats. All of these must be considered in the light of the amount of dilution to which these wastes are subject. These conditions

can only be determined by actual inspection followed by extensive and frequently long continued chemical and bacteriological analyses of the waters to cover all possible conditions of winds, tides and seasons.

In cases where it is possible the analyses of considerable numbers of oysters taken from different parts of a given locality will give a better idea of the actual conditions than analyses of the water or of the bottom. Since the oyster is estimated to filter from eight to ten gallons of water per day through its gills, so that the analyses of the contents of the oyster will give a composite sample of the water for a considerable time previous, while the analyses of the water or mud gives but the actual condition at the time the sample is taken. But it must always be remembered that in the winter the oyster is dormant and the polluting organisms may disappear from its body, while the water outside may still be heavily polluted.

I am inclined to think that the danger from eating polluted oysters has been overestimated, or rather that the danger from eating oysters *grown* in polluted water has been overestimated. I feel sure that there is hardly a place where oysters will grow to a marketable condition that is so badly or directly polluted as to make the oysters dangerous or capable of carrying disease. The dangerous pollution of oysters is that which occurs when they are floated or fattened in water directly polluted, just previous to marketing. If all oysters are marketed only from the beds on which they are grown, I feel sure that there can be no possible danger from disease.

But whether or not we wish to eat oysters from polluted waters, whether dangerous or not, is another question, not a sanitary but an esthetic question. The only solution for this question, it seems to me, is to make an arbitrary rule based not on the result of the analyses of the oysters, as these would vary at different seasons of the year, but based on the absolute distance from sewer outlets or other sources of pollution. These limits must be determined in each case, after a careful study of the local conditions or winds, tides, currents, and the dilution of the contaminating materials.

3 Conclusions

From a consideration of all these facts, it seems to me that it would be obviously unfair to base any regulations upon the results of analyses of oysters unless such analyses cover a considerable number of samples from the different localities concerned and are continued throughout at least one year. That, in order to prevent the spread of disease by means of oysters, all that is necessary is to prohibit the holding of oysters in polluted water just previous to sale, as the beds on which oysters are grown are probably seldom, if ever, subject to disease infection. To protect the public against filthy food it would seem best to prohibit the taking of oysters from beds grossly polluted by sewage materials, whether dangerous or not. This can only be done by making arbitrary limits around discharging streams or sewers, such limits to be determined by a careful study of local conditions, within which it shall be unlawful to take oysters for food, and finally, in all these matters conclusions in regard to other shellfish must not be drawn from the conditions determined in oysters.

Relation of Scientific Research to Oyster Culture.

Paper Prepared and Read by Julius Nelson, Biologist of the New Jersey Agricultural Station, at the Recent Boston Shellfish Convention

There is a real distinction between a "fishery" and "fish culture" The moment any efforts are directed toward the control of or utilization of natural forces of growth or of propagation, there is introduced a new element which necessitates scientific research We may distinguish three grades of such research

1 The results of the practical experience of the cultivator, so far as they tend toward progress in the industry, are the outcome of experiments and observations sufficiently accurate to be properly designated as "scientific" Therefore I desire to include, without reservation, under the term "scientific research" the accumulated experience of practical men engaged in any industry

2 The gathering of statistics not only of production and shipments, but also of the climatological influences or of *all* environmental influences that in any degree may be supposed to influence growth and propagation of shellfish This includes statistics of the variations in salinity of the waters covering shellfish beds, and of variations in the kind and quantity of the shellfish food The need of such data is fully as great for the use of the scientist in helping him in solving his problems as for the planter in selecting new beds or in the transplanting of seed or the planting of cultch

3 Finally, we have the more technical observations and experiments conducted by those who are expert in the use of scientific apparatus and methods This is what is generally meant when we use the term "scientific research"

It is only when data obtained by this sort of research has accumulated in sufficient degree to constitute a definite, "science," whose principles can be applied to the exigencies of practical work that scientific research becomes distinctly valuable to the practical man Under such conditions the practise of an industry becomes modified in the direction of greater efficiency, and the individual can bring to the scientist his special questions and difficulties with the assurance of receiving definite help Before science has reached this stage, the practical man who applies for aid from science will meet with disappointment until he will discredit the value of science for the practical purposes of life

We have at the present day very definite aid given to the land agriculturist when he asks advice from the experts in regard to the best way of combating insect pests, but such aid could not be given a few years ago So with many other agricultural questions This desirable advance has been due almost entirely to the fact that there was established a system of cooperative researches by the agricultural students of the national government cooperating with half a hundred State experimnt stations, at which several hundred expert workers for a quarter of a century have been seeking arduously to discover the principles that underlie efficient agriculture No longer

does the farmer sneer at science He depends on it for advice at every turn

In oyster and shellfish culture, scientific research by the U S Bureau of Fisheries, and of many of the states, has undoubtedly done splendid work, and this work is at present of a character both in scope and quality never before excelled But so much remains to be done, there are so many unknown factors to be elucidated, that shellfish culturists cannot for some time to come expect to receive the same help as is now received by land farmers There are a number of reasons why scientific shellfish culture has lagged in its progress behind agriculture, among which the most prominent are the inherent difficulties surrounding the biological study of these phenomena

Take oysters for example They live under water which is rarely transparent enough to permit of direct observation of these creatures while they are living their normal life, and when they are handled they shut themselves up within their shell To get at the living occupants the student practically has to sacrifice their life Even could these difficulties be overcome the life of the oyster is so simple and its eggs and larvae so small that such manipulation is needed to secure a primary observation

Suppose we wish to study mosquito larvae, we have simply to look at the pools and we can see with naked eye just how the wrigglers are distributed, just where they are, and we can see them dive when disturbed But to observe oyster fry we have to dip up water of the open sea at random, concentrate it by filtration, and examine the residue laboriously with a microscope of high power In the one case the first step in observation requires minutes—in the second case we do hours of work of a simply preliminary character Then again, in a chemical problem, we have our materials and the conditions for the experiments always ready at hand In the case of oysters we find the main lot of them gradually maturing their eggs, and on a particular date, not so predictable as an eclipse, the spawning takes place out of sight, and in a few hours the young have been scattered in the waves and tidal currents A few days inter, at some unknown place, the few survivors settle upon the cultch during the lapse of a few hours, and, after a few days, first give evidence by their assumption of visible size that the biological event has passed, perhaps not to be repeated for another year

Such biological work resembles that of the astronomer who investigates eclipses and comets It takes years of work to accomplish relatively as much as a chemist can do in a week When an investigator takes hold of a biological problem new problems arise from time to time, ever branching out I am sure I could give a hundred investigators in oyster biology each a special problem that would require years of research to solve "The fields are ripe for the harvest, but the laborers are few" Yet this is not all The results of scientific research not only require confirmation by repetition of the experiments by any one investigator, but it is almost imperative that several different workers come to mutually harmonious agreement in their conclusions by working at the same problem

Scientific workers in their professional courtesy toward one another too frequently fear to encroach upon the fields already occupied by other workers The consequence is we have a lot of conclusions that rest on the authority of practically one worker We have no certainty under such conditions

Only as several scientists study the same problem can really satisfactory progress be made "The more the merrier" Each worker has his own special method of approach The combination of the different minds stimulates thought and suggests new fruitful methods We need a large force of men studying shellfish culture just as we have in agriculture Aside from the general benefits that will accrue from an extension of shellfish research, we may indicate special lines of research, the solution of whose problems must be considered as the ideal goal of present studies

The study of oyster parasites Here we have already achieved great results of benefit to oyster culture Of course the immediate effects of the discovery of the possibility of the transmission of typhoid disease by means of shellfish have increased the difficulties of the culturist of shellfish But the same science which has made this discovery is bound to continue investigation, and to learn how best to avoid such contamination, or how to purify the shellfish for market after such contamination

My own studies have been along the line of artificial propagation Here the ideal is to imitate in oyster culture the general methods obtaining in fish propagation We look forward to the time when we can have oyster hatcheries That day lies still in the dim future We need to discover many principles yet in regard to the life, food, habits, etc., of oyster fry, to say nothing of the effects of the surroundings on the ripening of the spawn in the parent oysters, before this ideal can be realized

The matter of securing a set on cultch I have found that I can, by examination of the water, predict with approximate accuracy the date when a set is to take place This is already a fact of economic importance, because if cultch can be put overboard within a week before this date, they are likely to receive a better catch of "spat" than if they lie sufficiently long to be coated with a deposit of slime It is also evident that if cultch cannot be planted until after this date much expense will be saved in knowing it is too late There are other questions of importance in this line of research I have found that two shells which looked nearly equally good as cultch differed markedly in their power to attract spat What is the determining factor in the choice of the spat of the point of their fixation? It is also of importance to learn whether the little black snails that browse over the shells eat the newly-attached spat or not

The utilizing of the salt marshes for oyster breeding canals, according to the plans of Dr J A Ryder Here, too, much study is needed to learn just the conditions needed to make this venture successful Certainly, if one simply followed the directions given by Dr Ryder, there would never be any result of economic importance

Then there is the breeding of oysters just as new races of plants and animals are being bred This is a subject of tremendous importance, but its realization is still farther in the future than the problems whose solution must precede in order to make this desirable result possible

Finally, there are the special questions that arise in the experience of each planter, and which we invite them to lay before the scientists for study and attempt of solution, even though at present they may be mysteries—unanswerable questions We need these questions, they will greatly help scientific oyster research

In conclusion I want to encourage every advance toward a closer cooperation of study and research among all the various workers under the special State appropriations, and under the auspices of the National Bureau of Shellfisheries I hope the day is not many years distant when there shall be as perfect an organization of the shellfish students as now obtains among the members of the staffs of the various agricultural experiment stations

Large Income From Clams if Properly Attended to by Culturists.

Paper Read by Dr David L Belding, Biologist of the Massachusetts Department of Fisheries and Game, Before the Fourth Annual Convention of the National Association of Shellfish Commissioners in Boston, Mass

The development of a shellfish industry passes through two stages, an early free fishing and a later cultural period In many states the oyster fishery has passed the transitional stage through the cultural methods inaugurated by such men as meet here today Nature has been "beaten at her own game," and in the place where one oyster formerly grew many times that number are raised through the intelligent cooperation of man The purpose of this paper is to call your attention to another shellfish industry, of vast importance to Massachusetts, which is now in the transitional stage and from a free fishery to a permanent industry I refer to the quahaug or hard shelled clam—the popular little-neck

Even in this age of progress there is still that conservative element, I presume in other states as well as Massachusetts, which fondly cherishes the antiquated idea of free fishing and would rather see a shellfish industry exterminated than have it placed on a cultural basis This problem now faces the quahaug fishery of Massachusetts, an industry slowly but surely declining under the present methods of free fishing Acres of flats formerly productive, now barren, which nevertheless are capable of producing thousands of bushels of quahaugs and clams, if properly cultivated, and no adequate laws giving a fisherman the protection and the right to plant and grow shellfish, owing to the ill-advised adherence of many shore towns to the antiquated doctrine of free fishing

Experiments have demonstrated with convincing force the *only* method of permanently increasing the natural supply, which can be applied on a large scale, is artificial culture or quahaug farming The quahaug grows with sufficient rapidity to warrant large returns from small capital Many acres of unproductive flats can be turned into valuable quahaug gardens, and many men given employment by the institution, under proper legal regulations, of a system of individual leases for the planting of quahaugs Aside from its remunerative possibilities, such a system is the only means so far devised for permanently checking the decline of the natural beds The quahaug, scientifically designated as *Venus mercenaria*, from the use of the shell by the Indians as "black wampum," is called, south of Massachusetts, the "hard clam," while the young are known commercially as "little necks" It is truly

an American form, chiefly confined to the Atlantic coast from the Gulf of St Lawrence to the Gulf of Mexico. Its natural habitat is on the sandy and muddy flats just below low water mark, although occasionally occurring between the tide lines. The animal, protected by a heavy shell, possesses well developed digestive, nervous, blood and excretory systems. The spawning and early life history are strikingly similar to the well-known oyster, differing only during the attachment stage, when the free swimming embryo, from six to ten days old, according to the temperature, settles to the bottom and attaches itself by a splendor anchor thread, the byssus, instead of the calcareous fixation of the oyster spat.

From a commercial viewpoint the most important questions are the length of time necessary for the production of a marketable quahaug, and what natural conditions are favorable for its best development. By correctly solving these problems, practical methods of artificial culture and propagation to replenish the barren flats and to check the decline of the natural supply, can be intelligently applied, and valuable information furnished to prospective quahaug culturists. In this way growth experiments pave the way for intelligent application of cultural methods.

The quahaug differs from the higher animals in that its growth appears to be directly proportional to the amount of food consumed. Its automatic feeding apparatus is constantly at work whenever the animal is taking water through the extended siphons. The food of the quahaug, as of all lamellibrand mollusks, consists principally of diatoms—minute plant forms which are found in all waters in varying abundance, the lighter and smaller forms being more numerous near the surface. These little plants, which vary greatly in form and size, are constantly reproducing on the bottom soils, especially when the water is warm. Small crustacean, larvae of mollusks and crustaceans, protozoa, rotifers, bacteria, etc., constitute a part of the quahaug food, the quantity depending on the locality and the season. These organisms are carried with the water into the mantle chamber of the quahaug, strained out by the ciliated gills, and carried to the mouth in definite ciliated channels. The food problem is of extreme importance to the culturist, as it determines not only the growth but also the quality of the product.

The older and larger a quahaug becomes the more slowly it grows. A quahaug three-fourths of an inch in size shows the greatest capacity for growth, and above this size the yearly growth for the larger quahaugs steadily diminishes. It is possible to give approximately close figures for the age of any quahaug up to $3\frac{3}{4}$ inches in length, as under favorable growing conditions over 2 inches (the "little neck" size) can be obtained in $2\frac{1}{2}$ years, 3 inches in $4\frac{1}{2}$ years, and $3\frac{3}{4}$ inches in $10\frac{1}{2}$ years. In localities of very slow growth, it would take a quahaug 40 years to obtain the size of $3\frac{3}{4}$ inches, but in this case the quahaugs would show blunting before they reached this size. "Blunts" are quahaugs with the shells thickened at the edges a sign of retrogressive growth typical of old age.

The quahaug increases in size only during the summer months, no shell formation taking place during the cold weather. In Massachusetts growth begins about May 1, when the temperature of the water has reached 40 degrees F, and ceases during November, when the temperature has fallen below 45 degrees. The decrease in the microscopic food forms (diatoms)

in the water about December 1, is not sufficient to explain the cessation of growth, which is due rather to the inactivity or sluggishness of the quahaug during the cold weather.

There is no more convincing illustration of the influence of environment upon the life of the quahaug than the effect of the surrounding conditions upon its growth. Chief among these natural agents may be enumerated current, tide, soil, depth and salinity of the water, arranged in order of individual importance, yet so closely interwoven that their separate actions cannot always be clearly demonstrated. Their various combinations form a favorable or unfavorable environment for the growth of the quahaug, and govern largely the rapidity of its development. A discussion of these conditions involves separate treatment, but there are few, if any, instances where the pure uncomplicated action of a single natural condition can be obtained. The most essential condition for shellfish growth is a good current, not necessarily an exceedingly swift flow, but rather a fair circulation of water.

Current performs a threefold service. It determines the supply of food for the body and lime for the shell, it governs the supply of oxygen for the gills, and it acts as a sanitary agent.

The growth of the quahaug is directly proportional to the amount of food, and the animal situated in a current naturally receives a greater supply than one in still water. For all practical purposes current means FOOD, and, within limits, increase in current indicates increase in the amount of food. The amount consumed likewise depends upon the quantity in the water, the feeding power or capacity of the quahaug, and the absence of silt or other material in the water, which would interfere with the mechanical feeding process of the animal. In a similar way, current aids shell formation by increasing the supply of available lime salts. Intimately associated with its value as a food carrier is the no less important service of affording a good supply of oxygen.

The quahaug, like man, needs a definite amount of oxygen to perform the normal functions of life—to transform food into body tissues and energy. Current supplies fresh oxygen, and a quahaug with a good circulation of water is able to assimilate more food and grow faster than one in the still water. The work of sanitary agent is performed by carrying away all water. The work of sanitary agent is performed by carrying away all products of decomposition, thus preventing contamination in thickly planted beds. From the standpoint of the culturist, circulation of water is most important, and in choosing a grant selection should be based upon the current.

In considering the unsatisfactory conditions in the quahaug industry, no one cause can be designated as having brought about the present decline, but rather it has been the result of several factors. The usual type of reform attempted by the shore towns has been restrictive legislation which is aimed in an illogical and ineffectual manner to check the exploitation of the natural beds rather than provide methods of increasing the supply. Restrictive legislation, unless accompanied by constructive, is never truly protective. Under the present system of free fishing no constructive legislation can be applied, as there is no incentive for individual effort, since the fishermen who advocate cultural methods and conservation of the natural resources are powerless through the indifference of others, and consequently are forced,

against their will, to join the campaign of spoliation under the argument that they may as well get their share as long as the supply lasts.

The true remedy is found in legislation, now pending, which will permit the application of cultural methods, and is based upon a system of grants held and operated by individuals. It is not a theory evolved on the spur of the moment, but is the outgrowth of several years of careful study of the prevailing conditions along our coast. It is a system based on the results of successful experiments, and has been placed on a practical, commercial basis with the oyster, both abroad and in the United States. It will save the declining industry by lessening the drain on the natural beds and by meeting the increasing demands of the market. It will increase the supply to more adequately meet the demands of the market. It will furnish more remunerative and steady work for the fishermen, and it will be a benefit to the coast communities where the shellfish industry furnishes the main income of the inhabitants.

In the light of our present knowledge, the system which holds sway over the agricultural districts of our country is equally desirable for our extensive shore areas. Under a system of quahaug culture where only part of the flats are leased, the available territory of our coast would be dotted with small areas under artificial cultivation, strikingly similar in arrangement to a tract of agricultural country, where fertile gardens are interspersed with stretches of meadow and pasture land.

The planter should have two main ideas in mind in choosing the location of his grant, facilities for work and marketing and productive capacity. The ideal grant combines the two, where the work is easy and the growth rapid, while a nearby market furnishes high prices. Unfortunately, such delightful combinations are few, and the culturist will have to choose a grant with such qualifications as he thinks best suited to his needs.

Facilities for work comprise three things. The accessibility of the grant to the home of the culturist, the depth of water over the bed and the firmness of the bottom, as raking in shallow water is easier, marketing facilities. The most important factor in the selection of the ground is its productive capacity. The prime requisite of a grant is a rapid rate of growth, which, for a grant situated below mean low water mark, depends upon two conditions—the current or circulation of water and the nature of the soil. The growth of the quahaug essentially depends upon the circulation of water, as the current is the food carrier, and, therefore, within limits, the more current the more food. The nature of the soil affects the quahaug in two ways. If too shifting, it buries the quahaug or washes it beyond the border of the grant, and soils in which organic acids are present prove unsatisfactory for catching of seed and interfere to a slight extent with the growth by destroying the shell.

It is hardly necessary to suggest the danger to public health and the depreciation in the value of the marketed quahaugs when it is publicly known that the grant is situated in contaminated waters. For business reasons alone the planter should ascertain the purity of the water in the locality of his proposed grant, as in the future the public will demand the closure of all polluted waters and discountenance the sale of shellfish from such sources.

The rule for choosing a grant should be. Bottom of a mixture of mud

and sand (exact nature of soil not important), clear of thick eel grass, water the depth of three feet or more at low tide, a *good current*, and such facilities for work as best suit the particular planter.

The possibility for increasing the natural supply of clam seed by artificial means is a subject of importance to the quahaug planter, as the natural beds cannot, as in the case of the soft clam, furnish a sufficient quantity for an extensive industry. Two methods of obtaining seed are possible. These are. The artificial rearing of the fertilized egg through the larval stages to a size suitable for planting. In this way we protect the helpless larva from its enemies during the most critical period of his life, and reducing the great infant mortality, since under natural conditions not more than one out of 5,000,000 eggs reaches maturity.

From a commercial viewpoint, hatching experiments on a small scale have been discouraging. The chief cause of failure being due to the crowding of the larvae, whereas to give the young quahaugs a sufficient amount of space would so materially increase the expense of production as to prohibit hatching. Our experiments have shown that a small number can be raised in the laboratory—enough for the study of the early life history—but that when large numbers are tried the result is unsatisfactory.

The other possibility for increasing the natural supply is the collection of the quahaug seed from the water by some method such as that of taking spat as is used at the present time for the oyster. Experiments were made with spat collectors—small dry goods boxes, not more than 5 foot square each—partly filled with sand, suspended from a raft where a good circulation of water was obtained. Small quahaugs were caught in these small boxes, whereas to make such a method commercially important it would be necessary to obtain several hundred quahaugs to the square foot of surface. A better system would be, it seems, to develop the places naturally suited for the catching of seed by the building of gravel bars, and by artificially directing tidal currents, in other words, *make NATURE* supply the seed.

The grant needs little preparation for planting. After the bounds are marked, according to the regulations, thick eel grass, stones and other debris which would interfere with the raking, and enemies such as winkles, should be removed. The quahaugs should be scattered evenly from a boat by shovel such as the oyster planters use, or this can be done in any way most convenient for the clam digger. Ordinarily the quahaugs will burrow in the sand in a short time after they settle to the bottom. As their activity depends to a great extent on the temperature of the water, it will not be advisable to plant in cold weather, as quahaugs, instead of burrowing, will be exposed on the surface, where they are in danger of perishing.

The planter should have his grant divided into sections according to the size of the planted seed, which ought to be assigned in lots according to size and length of time before marketing. By dividing the ground into three or more parts, planted with quahaugs of different sizes, the clam culturist will have a rotation of crops, cleaning up and replanting one-third of his property each year. In this way the planter should be able to place a uniform size on the market each season and receive a proportionately better price for his goods, once he becomes known.

An acre of "little neck" quahaugs has a high market value. A conserva-

tive estimate of 10 per square foot gives an annual yield of 600 bushels of 2½ inch quahaugs per acre. This assumes that 120 bushels of 1¾ inch quahaugs were planted to the acre. The price paid for the same, at the high price of \$5 per bushel, would be \$600. The price received for the same, at \$3 per bushel, would be \$1,800, or \$3 for every \$1 invested. THIS IS A CONSERVATIVE ESTIMATE. Quahaugs could be planted two or three times as thick, seed might be purchased for less money, more money might be received for private shipments, and fast growth can be obtained. Practically the only labor necessary is gathering the quahaugs for market.

NOTE—When this paper was read the Great and General Court of Massachusetts had not passed the Senator Schofield bill permitting villages, towns and cities to lease clam flat lands for periods of years. The new law, in effect since the fourth annual convention of the National Association of Shellfish Commissioners in Boston, makes 10 years the minimum for all clam flat leases.

Co-operation Between States and National Shellfish Bodies

Paper Read by Dr. H. F. Moore, Assistant in Charge of Scientific Inquiry for the U. S. Bureau of Fisheries, before the Convention in Boston, Mass., of the National Association of Shellfish Commissioners.

In the course of my official duties, which have been directly concerned with shellfish, I have been impressed with the idea that this body could add vastly to its usefulness if it could bring about something more than a mere exchange of views—if it could promote some direct active co-operation between the several State commissions and between the States and the National Bureau of Fisheries. The Bureau always stands ready to co-operate to the full extent of its ability in any work which the interests of the fisheries require. It has so co-operated with a number of the State commissions, and in most cases has borne the heavier part of the burden because it was able to do so and because such co-operation was within the province for which it was created.

In many cases it has done more than merely co-operate. It has assumed the full technical and financial responsibility for carrying on work of a purely local interest for which the State itself properly might have made some provision. It has been the more willing to do this as it has the equipment, both of personnel and material, which it would be difficult, if not impossible, for the States to maintain, and which it would be economically indefensible for them to carry permanently. The national government has, for instance, several vessels which can be used in part for certain investigations, such as surveys, which require a considerable number of men for their prosecution and the establishment of elaborate laboratories and living quarters in isolated places in which the ordinary accommodations are lacking.

It also has at Woods Hole, Mass., and at Beaufort, N. C., laboratories

for the investigation of fishery problems, and it will soon have another on the gulf coast of Florida. These institutions are well equipped and provided with ample facilities for a considerable number of investigators. Provision is made for the supply of living material and the usual re-agents and glassware required for biological and a limited amount of chemical research. For a period during each year the bureau maintains at these laboratories from 25 to 35 scientific men and a number of assistants engaged in general fishery investigations. There are accommodations for additional workers not in the service of the bureau, and should any of the State commissions desire to carry on investigations on their own account and initiative their men will be welcomed and will be given every possible facility and assistance and co-operation.

However willing the Bureau of Fisheries may be to assist States in their great and important work of conserving and increasing their food supply through the improvement of methods and the betterment of the administration of the fisheries, there is some limit to its capacity in that respect. Its force is small compared with the demands made upon it, and it must use its personnel with judgment in order to secure the best results. It is always behind in its work and at present investigations already promised will fully occupy the available force for the next three years. In the conduct of the bureau's work the aim has been to avoid, if possible, duplication of the work being carried on by the States. For instance, for several years we have had many inquiries concerning the propagation of the quahaug, but knowing that the Massachusetts commission had this subject under investigation and feeling confidence in the high quality of their work, we have done nothing on this line and have devoted our energies to other fields.

Our results and publications are available to the people of the country at large, as appropriations under which they are carried on are national in character, but it is hardly justifiable to expect a State, whose taxation is local, to appropriate money for printing literature to be spread broadcast throughout the land. It would appear that cases such as that just cited present an opportunity for some species of co-operation which would make the results of such excellent work generally available without imposition or undue burden on the State.

It has occurred to me that the National Bureau of Fisheries might increase its usefulness by in some measure becoming a general clearing house for data and information relating to the shell fisheries. To some extent it already serves this function through the issuance of statistical, scientific and economic papers, and to a greater extent than perhaps any of you conceive, through its correspondence. We have daily calls from individuals and frequently from State authorities for data respecting the fisheries of their own and other communities. In many cases these inquiries can be answered from first-hand knowledge and our own records and publications, but frequently the information desired is of a character which should be furnished by the States, preferably in printed form. In some cases the inquirer has come to us only after he has found the information unavailable at home.

Most of the State commissions publish reports, some of which are excellent and furnish much information of value, while others are not so good. Some States publish nothing or else what they do publish is issued so sporadically as to be of little value, irrespective of its form and substance. The

character of the matter and the form in which it is presented, even in the good reports, are as varied as the States are numerous, and even in a given State both will vary from year to year to conform with the ideas of a succession of commissioners. Now the value of a report lies not alone in what it contains but also in the facility with which comparison may be instituted between its contents and the contents of other reports. Many of you have had experience in matters relating to fisheries legislation and you know the sort of questions which arise when such matters are under discussion.

In order to gauge the full necessity and probable effect of the proposition before you and to compare that proposition with others, you often wish to know how the condition of the fishery today compares with what it was 10 or 15 years ago. It is essential that you should not only know the history of the fishery in your own State, but it is important that you should have access to the experience of others and be able to compare results in one State with those in the other. I ask those of you who have had experience if you can reach satisfactory conclusions from the data which are now available to you. I think not. In final analysis the deductions are generally inconclusive and open to doubt, and the facts are susceptible of several interpretations. You consult the statistics compiled by the Bureau of Fisheries subject to the inaccuracies inherent in all statistical work of this character. They are well enough as far as they go, but they are per force taken at intervals of from five to six years, and in that time a great change may take place.

In North Carolina, for instance, the oyster fishery attained a sudden climax between two of these statistical periods and as suddenly waned. The natural beds were almost obliterated, yet we have nothing but contradictory hearsay evidence of what really brought this about. If we knew the number of oystermen and boats operated in those intervening years we would have some measure of the dram to which those beds were subjected by the fisheries, and the facts would present an object lesson not only to North Carolina, but to other states as well. If North Carolina had had in those days, as she has now, a system of licensing, the facts would be available. This data would serve another purpose. It would assist the Bureau of Fisheries in making its statistical canvasses and would add to their accuracy.

Our agents endeavor to get into touch with every man engaged in the industry, either directly, through his employer, the person to whom he sells his catch, or, in case none of these be possible, through some neighbor who is familiar with his operations. This is an arduous undertaking in states like Connecticut, Maryland or Virginia, and the labor would be greatly reduced if in all cases the records were available for reference, though not necessarily published.

We have recently found that in one or two states there is a record not even of the men who are holding bottom under lease or other tenure.

Now my plea is this. That we get together and see what we can do for one another to the general betterment of the shellfish industries, and our knowledge concerning them. Let us endeavor to bring about, so far as may be consistent with local requirements and conditions, a greater uniformity in the form of our reports. Let us endeavor to make available to one another the knowledge which we acquire, each of us in our own sphere. On behalf of the Bureau of Fisheries, I can promise that it will endeavor to do its part,

and I can assure you that a call for assistance and cooperation will not go unheeded in Washington.

No Danger in Oysters Properly Shipped says Expert

Paper read by Dr. Herbert D. Pease, of the Lederle Laboratories of New York City, before the recent Oyster Convention in New Haven, Conn.

This oyster year of 1911-12 has been marked by real progress of the more hopeful variety than for the previous three years, which may almost be described as the lean years of the industry. In saying this I do not mean the troubles of the oyster growers and distributors are ended, but I do mean that a nearing to the end of ill-considered and ill-advised demagogic attacks upon the business is approaching. The oyster business is of growing development of great consideration and of co-operative improvement of the conditions under which it is to be conducted in the future.

The hopeful state of affairs has been brought about in large part by an increase in our knowledge of some fundamental principles regarding the life history of the oyster and the conditions under which it thrives and in the right places waxes fat and luscious. Credit must be given, however, to the controversies for the stimulus which led to the discovery and working out of scientific facts. Without these controversies there would have been no scientific work and no discoveries, and, therefore, but little, if any, real progress. Let this be a lesson to those who command the industry. If you would avoid controversy keep ahead of the game. It's the industry in which its great commanders have the most complete and comprehensive knowledge of all its aspects, and the single industry that can boldly defy attacks from without. When any outsider can tell you something of importance about your business that you do not know, you are open to attack, and if you do not bring about that man's co-operation with you or if he can gain by his superior knowledge by attacking, you need not be surprised if you feel the blow.

The keynote I wish to sound to the oyster industry is, help yourselves. Don't expect others to do the work for you.

First let us consider the status of that live topic—the bacterial standards of shell stock, that is, the so-called B. coli scores. Without much hesitation it can be said the old standard scores of "passable 23" and "condemned 32" are dead and have been buried with proper, although almost unheralded, obsequies. These standards were bound to pass away because they never should have existed. They were not created because they indicated any clean cut differentiation between good and bad oysters from the sanitary viewpoint, but to meet an official demand for some action.

However, their death does not mean that some standards would not be appropriate, but it is a warning that any created should have some sound principle as the basis of their existence. They must, at least, clearly differentiate between marked degrees of goodness or danger. Whether any standards will be necessary for the future should depend upon how well you, the members of the Oyster Growers' and Dealers' Association of North

America, and the commanders of this industry, have learned the lesson I am referring to, and on what you aim to do in the immediate future to make all standards unnecessary by yourselves controlling the whole situation.

The word "standard" smacks of officialdom and official supervision. It is the first cousin to the word "law," and who is there that does not recognize that all laws, if strictly enforced, work injustice to the just and honorable? When the oyster industry supports and conducts its own sanitary and scientific work, then sane and elastic rules can take the place of rigid mathematical standards applied by the strong arm of the law.

Twenty-three and 32 as oyster standards died because that eminent Dr Stiles found variations of scores all the way from 10 to 50 occurring irregularly on different days in single lots of oysters, each lot obtained from one source and at one time and all held in a refrigerator for about 30 days at a temperature of about 39 degs Fahr. At a meeting a worker in Prof Gorham's laboratory reported a similar series of results from oysters taken from one bed during a somewhat similar period and season. The variations in the scores were equally irregular. At times the scores were below 23 and on other days above 32. It was most interesting to point out that these tests had been made on stock that had been held at temperatures under 40 degs Fahr. Undoubtedly the stock in both instances was in a state of hibernation and inactivity, and the variations in these scores were therefore due to internal variations in individual oysters and not to differences in pollution from the outside.

As the problems involved in the discovery of the hibernation of oysters during the colder weather are assuming a most important aspect, it is appropriate for me, as the one who first applied the term "hibernation" to this condition and at the same time pointed out its probable sanitary importance, I should here review the evidences in support of the contention that oysters undergo a period of genuine hibernation during the colder months of the year.

A number of bacteriologists studying oysters prior to 1910 called attention to the fact that frequently when shell stock was taken from water grossly polluted with sewage they did not show any or but small numbers of colon bacilli. Much difficulty was experienced in explaining these occurrences. Later, when more regular and systematic examinations were undertaken, attention was called to the fact that the oysters from certain beds, which in the months of September and October showed high scores running up into the hundreds and thereby indicating they contained large numbers of colon bacilli, showed very low scores during the months of November, December, January and February. The change seemed to be almost an abrupt one, and upon further study this phenomenon appeared in samples coming from waters from places on the Atlantic coast line from Massachusetts to Virginia. Every bacteriologist who has since done any systematic work on shell oysters has obtained invariably these results. They are now beyond dispute.

This almost abrupt change in bacterial content requires explanation. The simplest conception is that these bacteria do not get into the oysters during the cold weather—certainly not in the numbers which have previously gained entrance. However, we frequently find some *B coli* present, and the question arises whether they are tenants or old survivors. Dr Stiles' work with oysters out of the water, in a refrigerator, showed that these colon bacilli can survive

in small but varying numbers. Therefore, we have every reason to believe they can survive in similar numbers when the stock is in the water. If, now, new tenants were being added to the survivors, we would expect larger scores than are found or, with the advent of the new, the old would disappear. As the *B coli* scores of the shell liquor in the months of September and October are much higher than those of the surrounding water, it was considered possible that in the cold season the oysters were inactive but not necessarily holding their shells tightly closed, and that therefore pollution in the water might still be on or in the oyster itself, that is, inside the shell when closed.

Another point has been demonstrated by investigations in my laboratory which show with reasonable definiteness that oysters, during hibernation, are in a profoundly different bacteriological state from oysters during the warmer months of the year. Late in the summer and early fall of 1911 examinations were made of oysters from two popular marketing grounds in separate States. The primary object of the investigation was to determine the relation of the *B coli* scores in the shell stock to those in the opened stock. It was found that opened and slightly washed stock showed very much larger numbers of *B coli* and much higher bacterial counts than those obtained by the examination of the stock in the shell. Experiments were conducted to determine whether this very large increase in the numbers of organisms, including *B coli*, following the opening and the washing of the stock was due to the breaking up of clumps of bacteria attached or enmeshed in the gill and other cavities of the oyster. Accordingly, oysters were opened and the shell liquor drained off and examined in the usual manner for shucked stock. The oysters themselves were then shaken up vigorously with tap water—and in some instances with saline solution of strength equal to that of the oyster liquor. After such shaking, examination of the washing liquids was made. It was found the real oyster liquor contained only the expected number of *B coli* and bacteria, whereas, the liquor artificially made by the shaking up of the stock showed very much larger numbers of both groups of bacteria. Later, during the hibernating season, these experiments were repeated seven times on stock from various marketing grounds. In no instance was this increase of numbers of bacteria to be noted after the artificial washing of hibernating stock.

The interpretation of these experimental findings is obvious. The bacteria in the oysters during the late summer and early fall are in large masses or clumps, and are enclosed or closely associated with the inner recesses of the gill and other body cavities, and upon the washing of the stock these masses are brought out and are broken up, and as a result very high scores and bacterial counts are then obtained. Whereas, in the winter season, during hibernation, these clumps or masses of bacteria are not present in the oyster and the washing of the stock produces little or no change in it from a bacteriological standpoint, if the operations are conducted in a cleanly manner.

The question arises, is the oyster's shell continuously closed, or open, or capable of being opened and closed during the colder period of the year. It is most important to answer this question as definitely as is possible, and the bacteriological tests do not give a sharp, well defined answer, although they indicate that the shells are closed. Last December during a visit to Welfleet, Mass., to look over the beds of that region, the following observations

were made. As you know, the tides of the Welfleet Bay are high, and the flat bottoms are largely hard sand, although the depths of the channels contain much marine vegetation. Some of the oyster beds are exposed at low tide. I was informed by a long observer of local conditions that in the winter season the oysters are almost completely covered by the sand, and that in dredging for them it is necessary to scrape the surface sand from them before they are picked up. In the summer the individual oysters or clumps of them lie free in slight depressions in the sand which appear to have been scooped out.

The importance of this observation lies in the fact that if the oysters could and did open their shells when in the sand, they would be very likely to contain sand, and yet my informant said the winter stock was if anything freer from sand than in the summer. Sand doubtless gains entrance to the oysters in summer, but the animal has water available wherewith to wash it out, but when buried in the sand such a washing process would be impossible.

It suggested itself, however, that the oyster might filter inward through the mantle sufficient water for drinking purposes, and yet be able to avoid taking in any matters in suspension, and it is conceivable that the oyster might even expel matters held in suspension but not take them in. However, other observations made by practical oystermen are against such a conception. A considerable number of the practical oystermen I have talked to as to whether oysters in the winter actually drink when placed in water of less salt content than the water in their natural beds, have replied they do not, while many others think they do. Many of the latter have stated that oysters so transferred to rather more brackish water can be enclosed in ice under such circumstances, and yet the bodies of the oysters will not be frozen when broken out and opened. This is readily explainable by the fact that the closed oyster has in its tissues water of a salt content greater than has the water surrounding the shell, and consequently has a lower freezing point. The fresher water will freeze outside of the oyster and will protect, to a considerable extent, the oyster inside in the saltier water.

The same practical oyster growers of long experience related instances where oysters taken out of such brackish water into the colder atmosphere would freeze solid, and that when the brackish water was thrown over them the water would freeze, but the oysters would then be found to have thawed out. Granting the correctness of this fact, we have considerable support for the conception that oysters brought in cold weather from a water of high saline content and placed in a fresher water do not drink, and thereby do not dilute the saltier water of their tissues.

The duration of the period of hibernation undoubtedly varies according to climatic conditions. From studies made by us it is controlled by the temperature of the water surrounding the stock. When that temperature reaches 45 to 40 degs Fahr on its downward course, the oyster closes up. When in the spring it reaches 40 to 45 degs Fahr the oyster opens, but from our tests, the bacteriological effect of the spring opening is more gradual than the closing in the fall. However, in the fall the oyster is in a most active condition. The food supply has been large and conditions have favored its activity. The lowering of the temperature of the water producing inactivity brings about an alteration of the oyster's life, and the effect is a sharp one.

In the spring the oyster emerges from a long sleep and opens up in a more or less weakened condition. It is even possible that while the oyster, drinking in the spring, takes early to a lively appetite, but is not developed until some time after the cessation of the true hibernation in April. When the time arrives that it becomes desirable to fix more closely the limits of cessation of hibernation in the spring, more elaborate studies than have yet been made must be undertaken.

The importance of the hibernation of oysters from a sanitary standpoint is very great. In effect, oysters while in the shell are for a large portion of the year protected from dangerous or gross sewage pollution. They are even protected from those slight accidental and apparently almost unavoidable pollutions which sometimes take place when foods are grown or handled by human beings. That such protection from even typhoid infection is absolutely afforded in some cases, at least, has been demonstrated recently.

Allowing for the period of incubation of typhoid fever in human beings of from ten days to three weeks, we can determine the complete onset of hibernation at not later than November 15, and the destruction of the power of infection in the oysters by at least November 22. Thus we have direct, definite and practically conclusive demonstration of the great sanitary protection which hibernation affords the whole oyster industry in northern waters.

Samples of oysters were received from places where considerable pollution was conceded to exist, and the mud found in the hinge cavity was tested for its B coli content. In two instances from entirely different locations the mud was shown not to be unreasonably contaminated, the scores being much less than those in the oysters in the non-hibernating period. But the interesting fact was developed that the B coli present were in large part atypical or attenuated in character, showing a long continued existence on their part under more or less unfavorable conditions. It is also worthy of note that if the oyster's shells are held tightly closed the original fall mud would remain in the cavity until removed by some force outside the oyster.

The practical significance of this work is to the effect that even if disease-producing bacteria happen to be present in the waters over such beds, they would not readily gain entrance to the mud in the hinge cavity, and if they did they would probably not survive longer in the hinge cavity than in the body of the hibernating oyster. I think it can be safely concluded that the hibernating oyster is not liable to any infection from the mud in the hinge cavity.

Now we must face the problem of controlling conditions during the months of September, October and early November, and also in the spring and summer months from the last of April onward. The latter series of months is an inactive one for the oyster industry, from a marketing standpoint, and is relatively unimportant. Nevertheless, the requirements of the early fall also apply to these summer conditions, so far as we now know, and those who desire to carry on a business in summer oysters should strictly observe them until we have further knowledge on the subject. First, it behooves the oyster grower to know the sanitary character of his beds, and he should market from those which are in the best sanitary condition during the early fall, and leave those of which he is not so sure until hibernation sets in. The small

planter may be affected, for his beds may all be in the regions characterized by an undesirable amount of contamination. However, such men should wait at least until the middle of November, and, better, December 1, before marketing, and then all danger of seizure of their goods will be over, and so far as we know all possibility of a menace to the consumers of their stock will be eliminated.

Oysters are demanded upon the market in September and October and must be produced, and who knows but what a summer business in oysters could not be conducted successfully by the modern methods of transportation under refrigeration, if the oysters could be as free from sanitary menaces as in the winter season. Personally, I would greatly prefer to eat oysters in the summer than the various types of small clams so frequently served during that season.

From what has already been stated, it can be seen that the question of floating during the hibernating period is quite unimportant from at least the sanitary viewpoint. It is also doubtless true that the practise of floating or drinking during the hibernating period accomplishes nothing in the way of reducing the saline content of the oyster liquor. Many oystermen have held with considerable strenuousness, that notwithstanding the arguments put forth concerning hibernation, the oyster actually becomes plumper and more vigorous appearing when placed in brackish water during the colder months of the year. This statement has been made so frequently it requires attention. While it is probably true the oyster does not take up additional water at such a period, it is entirely within the bounds of probability that chemical changes take place in the oyster during this period which would give it a more attractive appearance when opened. This change may be similar, but not identical, with the change which takes place when oysters are floated during the non-hibernating period of the year. The questions involved in the floating of stock during the non-hibernating period are therefore the important ones for our present consideration.

Concerning the matter of the sanitary condition of drinking grounds, there is no controversy. All agree absolutely that such grounds should be above suspicion. Here again it will always be the better part of wisdom for the oystermen to have their own information concerning the places used by them for this purpose.

The other important question involved in the floating of oysters during the non-hibernating season was thrashed out most thoroughly at a recent hearing held in Washington, D. C., at the request of the New Jersey oystermen before the Board of Food and Drug Inspection of the United States Department of Agriculture. It was my privilege to be present at this hearing as representative of this association. It was deemed inadvisable, however, to have me address the board concerning the subject of floating, for the reason an agreement had been entered into between the representatives of the New Jersey oystermen and the chairman of the board, that questions relating to pollution should not be discussed. However, your representative was present at the conference of the New Jersey oystermen and others held the evening prior to the hearing. At this conference a prolonged discussion took place concerning the plan of action of the oystermen at the hearing, and the plans

suggested by your representative were accepted and followed by those who the following day, presented the case for the New Jersey interests.

Nothing has been heard of the tentative decision since the hearing, and it is most unlikely that the point involved in the tentative decision will again be raised. As the matter now stands, oysters can be shipped in interstate commerce provided they are not floated in a water of a less saline content than that in which oysters will reach maturity. This is certainly a fair conclusion for both the public and the oystermen.

Enemy of the Oyster, the Drill, Investigated by U. S. Experts

Paper by Prof. H. F. Moore, of the Bureau of Fisheries, Read before the Oyster Growers' and Dealers' Association of North America

It is estimated the United States Government might do much more than it does toward the solution of the problems which confront the oyster grower and the oyster industry in general. I quite agree with that view, and I am sure Commissioner Bowers does, but I wish to state emphatically that under existing conditions the bureau cannot accomplish much more than it is doing, and to add, moreover, it is probably doing more than most of you are aware of.

We have available for all the scientific work which we have to carry on in the country at large only six men who must suffice for carrying on investigations over 4,600 miles of sea coast, to say nothing of the vast extent of the Great Lakes and interior waters. They must acquire and supply information concerning upwards of 100 valuable fishes and other marine animals, and investigate fish diseases and various obscure but disastrous epidemics at upwards of a hundred hatcheries producing more than 3,000,000,000 of fish and fry annually. In addition to our own hatchery troubles, the State and private interests look to us to extricate them from their difficulties, and we have constant calls to investigate cases of wholesale mortality among the fishes in fish-cultural stations and in public waters. In many cases these calls come after the damage has been done, and it is extremely difficult to determine which of the conditions that may no longer exist are responsible for the difficulty. I think you will perceive from this that the scientific force of the bureau has a busy time, and there is always enough work on hand to keep it fully occupied with current matters and to leave but little time to look for other troubles.

The bureau recognizes the paramount importance of the oyster fishery, and has been doing all that was possible with the limited means at command to further it. Recently, in addition to its cooperation in the elaborate survey of Maryland waters, it has conducted investigations of more or less magnitude on the oyster beds of Delaware, Virginia, North Carolina, Alabama, Mississippi, Louisiana and Texas. In most cases the work has been that of surveying the oyster bottoms to determine the condition and extent of the natural beds and the methods by which they can be preserved, and the loca-

tion of barren bottoms suitable for the establishment of oyster culture. The reports made as a result of this work have carried suggestions and recommendations as to the means of conserving what already exists and the development of resources hitherto neglected and latent.

It is on work of this character on which rests the present prosperity of the oyster industry of various parts of the country. In Louisiana, for instance, the oyster product has increased from fewer than 1,000,000, to upwards of 4,000,000 bushels per annum, largely as a result of the measures adopted in accordance with the bureau's recommendations. The survey in Maryland, on which the State and Federal Governments cooperated, stands out in the recent bitter fight in that State as the only feature on which friends and foes of oyster culture were united in praise. It is not too much to say that in the absence of that survey, which stood as a rock in a seething sea of turmoil and strife, the oyster planters of Maryland, weak in numbers, would not only have gained nothing but would have lost even that little of which they otherwise now are possessed.

The bureau has been engaged mainly in the effort to stimulate the protection of oysters in those regions in which the industry is backward, but it has not altogether neglected attention to matters of importance to the more progressive regions. Leaving out of consideration commercial difficulties, the practical problems which confront the oyster grower may be roughly classed under three heads:

The difficulty of securing a set of spat or a supply of seed

The protection of the growing oysters from their natural enemies

The fattening of the adult oysters for market

The bureau has done, and is doing, work along all of these lines, but I shall confine my attention to one investigation now under way, namely, a study of the drill or borer which annually causes a loss of many thousands of dollars in Long Island Sound alone. The objects of the investigation are three fold. To determine the possibility of eliminating the drill from oyster beds. To ascertain under what conditions the oyster is immune from the attacks of the drill. To devise methods of oyster culture that may reduce the mortality of oysters to a minimum.

It will be the endeavor of the bureau to apply all data obtained to practical oyster culture experiments with a view to raising oysters in a drill infested locality, with as low a percentage of mortality as possible. In order to proceed in this end, it is essential first to possess a complete knowledge of the life history of the oyster drill, especially concerning its spawning season, its methods of reproduction, rate of growth, food, method of attack, rate of travel, enemies, relation to salinity and temperature of water, depth, etc.

The oyster drill (*Eurosalpinx cinerea*) is a small, rough, dull colored shell, averaging one inch in length and found most abundantly on rocks, mussel and oyster beds and along the shores between the tide marks that have a firm or stiff muddy bottom. It is found along the entire Atlantic coast, but in greatest abundance north of New York City. It is not found to any extent in water deeper than eight fathoms, but occurs in abundance wherever oysters were located in salty waters. The sexes are separate but there are no external characteristics by which they may be distinguished. The eggs are deposited in small, yellow, urn-shaped capsules, possessing very short stalks and of a

parchment-like texture. These capsules are laid in clusters on the under surfaces of stones and shells, in crevices of rocks and other protected spots. The average number of capsules laid by one female is ten or twelve, and the number of young shelled snails that emerge from each capsule averages ten. The total number of young from one female per season is approximately 100. Spawning takes place only once a season, most abundantly between June 1 and August 1. The period of incubation, or the time elapsing from the laying of the capsules until the emergence of the first shelled young, averages about six weeks. The eggs contained in these small capsules develop very unevenly, and from the date of the emergence of the first drill from four days until four weeks are required to discharge all young snails, such period of time being dependent upon the prevailing temperature of the water.

No parental care is provided for the young snails after their emergence from the capsules, and they may often be observed clinging to the opened capsule. They vary greatly in color, some being white, others of a dark reddish tint. When first hatched the young snails average 1 mm, or 1-25 of an inch in length. The smallest specimens collected in the field at the commencement of the season measured 12½ mm, or one-half inch, and from all observations this length represents the growth of one year.

The food of the very young snails could not be determined other than the fact that they are cannibals, and upon emergence from the capsule they immediately commence to kill and feed upon one another. When a quantity of young drills were retained in a dish in the laboratory to observe the rate of growth, food, etc., the very smallest oyster spat and fragments of the meat of oysters and clams were apparently ignored and "cannibalism" continued. In one dish containing 100 recently hatched snails with food, 64 snails were found dead in less than one month, and these 64, when examined, were all found to bear well defined perforations in their shells. It appears the small drills attach themselves to the shells of larger ones and kill them, contrary to the usual habit of larger animals killing the smaller. Allowing, therefore, 50 per cent for mortality due to this cause and to other natural causes, the number of drills from one female that may attain a length of one-half inch at the end of one year is perhaps 50.

The largest drill collected on the New England coast was 1¾ inches long, approximately. The length of life has not been determined and the age of sexual maturity, or the period at which the drill first commences to spawn, is also doubtful. The drill becomes first injurious to shellfish during the first season, as is evidenced by the fact that they are able to successfully attack and kill one another immediately upon hatching, and by the fact that at various times small drills under one-half inch in length were observed drilling young oyster spat.

In order to determine the perception of food, experiments were conducted which resulted as follows. Thin-shelled forms of shellfish were invariably preferred to the thicker shelled forms, whenever the choice was offered between mussels (*Mytilus edulis*) and oysters, the mussel was preferred, whenever there was a choice between young oysters and old oysters, the young were invariably selected, of oysters of the same length and of different thickness of shell, the thinner-shelled forms were again chosen. In fact,

a large number of experiments demonstrated the ability of the oyster drill to select the thinner-shelled form with almost unerring accuracy

Whenever drills were attacking a thick-shelled form of oyster, and a thinner-shelled oyster bearing an attacking drill was placed in proximity, the drill on the thicker-shelled oyster would generally abandon its prey and proceed to partake of the thinner-shelled form. Again, whenever any opened shellfish was placed near drills attacking oysters, the drills would invariably forsake their prey to feed upon the exposed shellfish meat. In other words, the oyster drill appears to pursue a course of least resistance in the securing of food.

In order to determine the perception of food with or against currents, the rate of travel, etc., drills were placed in the regular fish-hatching troughs of the laboratory and supplied with food, the troughs or boxes first being carefully scrubbed and the bottoms divided into squares for the purpose of aiding observations. The rate of current in the boxes could be regulated by a stop cock. When oysters, mussels and other food were so placed that drills were compelled to travel against the current to secure food, it was found the time required to reach such food was always greater than the time required when the drills were traveling with the current. It was the natural assumption that the current would bring to the drills the odor of food, but all experiments conducted appeared to indicate that perception of food was keener when the current was in the opposite direction. The date of speed of travel averaged one inch per minute with the current.

In order to obtain the period of time required to perforate the shells of oysters of the various sizes and the varying thickness of shells, quantities of oysters were divided into lots of certain sizes and placed in boxes with drills. The time required to perforate oysters of $1\frac{1}{2}$ inches in length averaged two days, oysters of $2\frac{1}{2}$ inches averaged four days, oysters of $3\frac{1}{2}$ inches six days, and oysters of 4 inches and over, seven days. These periods of time were for oysters of average thickness of shell for their respective sizes. In order to determine such, the exact hour was noted whenever a drill was observed to fasten to the shell of an oyster and remain stationary. Drills were then removed from such oysters at various periods of time until a shell was found to be completely perforated. Experiments were repeated many times in order to obtain such data.

The location of the perforation was found to be distributed over the entire shell, the greater number of perforations occurring in the center of the shell, and in the vicinity of the large adductor muscle. It has been often claimed that the drill would perforate the shell in such manner as to strike the heart—as the adductor muscle is usually called. By actual examination this was found to be erroneous, for out of 377 shells that had been completely or incompletely drilled, only 15 per cent of the perforations were confined to the limits of the adductor muscle. The claim has also been made that the oyster drill always selected depressions or the thinnest portion of the shell for its attack. Out of 377 drilled shells only 22 per cent of the perforations were found to be in regions of noticeable depressions. Many shells were found to be completely perforated in the region of the hinge or beak, on the sides and even on prominences of the shell. It seems the oyster drill selects no

special locality for perforation, even though the majority of the perforations occur in the middle parts of the shell, which are generally of uniform thickness.

Whenever an oyster drill had sufficiently perforated a shell, it would always be content to feed through its proboscis thrust through the perforation, and often two drills would be found with their proboscides through one perforation. Whenever an oyster was killed by a drill and the shell of the oyster relaxed sufficiently to allow other drills to crawl within the opened valves and bury themselves in the dead meat of the oyster, the drill that was responsible for the killing would invariably continue to draw its nourishment through the small perforation.

The persistence of attack was demonstrated by several experiments, and one drill was found to be capable of killing at least five young oysters in succession without any perceptible loss of time between its attacks. In conclusion, it appears that the oyster drill becomes injurious immediately after hatching and attains a size sufficient to drill young oysters spat when such appear on cultch after July 1. No size of oysters are immune from its attacks. The oyster drill favors young oysters and will attack such in preference to the larger sizes when they can be obtained. It will not attack even young oysters if more readily attainable food is within reach. The oyster drill is found in abundance wherever oysters are located, regardless of salinity above a specific gravity of about 1.010. The drill travels with difficulty and reluctance on soft bottom. Drills on the deeper oyster beds have been introduced usually, if not always, with seed oysters and cultch.

Just What Oystermen Want State and National Governments to Do.

Paper Read by F. A. Beardsley, Oyster Expert, Before the Fourth Annual Convention of the Oyster Growers and Dealers Association of North America.

Four years ago the Federal Government began to take a hand in prescribing the conduct of the oyster business, began to look into sanitary conditions connected with the beds, the handling of stock and the methods of shipping, and in a general way to supervise the business. The Pure Food Department started out without much knowledge of the facts and issued orders without, it seems to me, giving the subject in hand sufficient investigation. They issued orders and made investigations afterwards.

The influence of this association, I believe, has been largely instrumental in compelling the department to go slow and has checkmated more than once, the enforcement of regulations that were ill-advised and ill-considered, and calculated, if enforced to the letter, to work great hardships on the industry. The attitude of the department at first seemed to be to condemn the methods in vogue without a hearing and to impose regulations that were not reasonable. The department undertook to abolish the floating of oysters without exception and ended up, after much opposition on the part of oystermen, who showed the fallacy of the Government's position, by amending the order so,

that except in polluted waters, oysters may be floated, if the water is of such a salt content as oysters will thrive in. This ruling is the safe and sane ruling and one in which all readily concur.

Department officials started out to establish a standard of purity in oysters without knowing themselves what that standard should be, and the department and the scientific men, generally, are still groping for a standard. The influence of this association has always been in the direction of improving conditions, and has been exerted in favor of the best methods, but has consistently and persistently insisted upon a fair deal, and, like the man from Missouri, has asked to be shown. In all the four years of agitation on the part of the Federal Government and with all the effort on the part of officials to prove something against the industry, nothing has been that the public is being supplied with a wholesome food.

True, the agitation has caused in the minds of the consuming public misgivings that have resulted in a curtailed demand, and while the price of everything else has advanced, the price of oysters remains as low or lower than before, as a result of these misgivings. But we believe we are now on the road to improvement in this respect, and we believe that, with the restoration of public confidence, there will be increased demand, followed by advance in price.

The nation and the States should so frame and enforce their laws that every acre of land adapted to the production of oysters and other shell fish should be so conserved that the best quality and the greatest quantity of seafood must be produced, and that not one acre could be destroyed by allowing sewage and waste to be discharged into our streams, and that leads me to discuss, in a general way, the best method to bring about this desired result.

Ever since man became civilized the principle of private ownership in land above high water mark has been recognized as the plan best suited to the development of the community. Under a savage and semi-barbarous condition of mankind land was held in common. Fishing and fowling were free and the more or less wild man lived on the bounty provided by nature and ecked out a more or less precarious living thus provided. Might made right, and the savage individual or tribe with the most brawn got the largest share. Under this system, as population increased, this bounty of fish and fowl, etc., was depleted and no effort was made to replenish the waste that was the result of primitive shortsightedness. With the advent of civilization, the intelligence of mankind universally came to the conclusion that the best interests of the greatest number would be conserved by having the title to land vested in private individuals, on the theory that individual ownership and private interest would prompt the effort to develop the land and replenish the waste.

This system, in the experience of mankind, has been demonstrated to work out for the greatest good for the greatest number. Above high water mark individuals have been encouraged to invest their money in the development and improvement of land, whether in the process of making two blades of grass to grow where only one grew before, or in the development of manufacturing industries or anything else that produced wealth or gave employment to labor. The attitude of all civilized government has been in the direction of fostering productive industry in every direction. Under this wise plan land has been improved, great industries have been developed, and a

great complex civilization has been sustained. Crops and stock of all kinds have been improved. Cotton and wheat, corn, oats, potatoes, fruits of all kinds have been improved in quality and multiplied in quantity. Governmental and State experimental stations have, at great expense, made experiments and demonstrations to enable individuals who would, to take advantage of the most scientific methods to improve their land and crops and stock.

All this has been and is believed to be good practice above high water mark, but when the line of high water mark is crossed and we come to deal with land under water a new or entirely different code of business ethics obtains. Below this magic line, except in isolated cases that will be hereafter spoken of, the policy of the states and nation is to exercise a paternal supervision over the lands under water, instead of granting to individuals titles to them, and then protecting said individuals in the exercise of rights of property. Below this magic line land has been held in common, the public has been allowed, on such small portions of it as produced anything of value, to help themselves, with such restrictions as have been from time to time placed upon them. The result has been depletion.

Oyster beds, once prolific, have been robbed of their value by removal of the cultch. To those natural oyster beds has happened the inevitable. Resort has been had to close seasons, cull laws, prohibiting the sale of oysters of less than a certain size. But these are really nothing but makeshifts and do not meet the situation, which should be to make the land produce the greatest quantity and the best quality. What is true of oysters is even more true of quahaugs and clams. If the present policy of common ownership in clam quahaug ground is continued, in another generation the only place you will find them will be in some museum of natural history. Of course, the final destruction may be staved off by State aid, but the State will soon tire of contributing to the holding up of an industry for the benefit of those few who get a precarious living out of it. Instead of resorting to these makeshifts to save the clams and quahaugs, let the states sell the lands on which they once grew to private parties and then protect the private individual in his right, and the development of the clam and quahaug industry, and the restocking of those depleted lands will be taken care of without expense to the State, and will result in a larger and cheaper supply of food and the employment of more labor than at present or in the past.

Some states, notably Connecticut, awoke to the situation and took pretty advanced ground in giving perpetual franchises to oyster lands, and, by a liberal policy toward the industry, have enabled it to develop. Of course, from time to time, even in Connecticut, there is an effort made to impose unreasonable taxations, but up to date the sane views have prevailed and the industry has responded and has grown from small beginnings to be one of the leading industries of the State. It would be well if all the states would pursue the same wise policy followed in Connecticut. From a selfish viewpoint, however, the growers in Connecticut do not want the other states, particularly the southern states, to adopt our policy, for it would bring about competition which would be hard for us to meet, but, if the development of the oyster business, the clam and quahaug business, if the making of two bushels of oysters, clams and quahaugs grow where one has grown before, if the conservation of resources by development, if the providing of a plentiful food

supply, if the greatest good for the greatest number is the object of government, then the same ownership of lands under water should obtain that obtains above high water mark, and the same protection to property below high water should be given as to that above high water.

Nor does the shortsightedness of government stop here. These areas which are capable of producing so much of wealth, such an enormous supply of delicious, wholesome food are permitted by the states to be devastated. Cities and towns, manufacturing plants and individuals, are allowed to dump their sewage into our streams, thus destroying valuable properties. When the question arises as to the remedy we do not hear of any action on the part of governments to stop the evil by compelling the offenders to abate the nuisance. Rather, we see governments and officials condemning the innocent victims of their offense.

Right here in this community the State lays a tax of from \$500 to \$1,000 an acre on oyster ground, the city of New Haven dumps her sewage into the harbor and destroys the property and then the city board of health condemns it to destruction. While we concede the right of boards of health to look after the public health, it would seem, in all fairness, that they should make an effort, at least, to abate the nuisance and compel offenders to cease doing those things that result in the destruction of property and threaten the public health. This is only one instance, but from Maine to Texas and up the Pacific Coast this destruction is going on, and the feeble cry of the health authorities is raised, not against the offenders, but against the victims of the offenses. How long, oh, Lord, how long must we wait until public sentiment will be so aroused against this infamy that boards of health and State and National governments will arise in their wrath and demand and enforce laws that will prevent mankind from befouling their own nests and destroying their own property? When that day shall come then our streams and bays and harbors and our sounds will be restored to their natural purity. Then, again, will the finny tribes people the deep. Then, again, will the nation's resources be restored and conserved.

Oh, ye shell fish commissions, make it your prime business to see that your state's resources are not destroyed and that the beautiful waters are restored to their natural purity. Then, indeed, will you have done a great work for your State and your generation. This is the gospel that should be preached from every pulpit and from every platform to the end that public sentiment may be aroused and a revolution and redemption may be brought about.

Instead of formulating complex legislation to circumscribe and restrict the development of the resources that lie beneath the waters, while cities and towns are destroying them by pollution, devote your energies toward the stopping of this waste. Restore the waters to their natural condition. Give to private enterprises a title that will warrant the expenditure of money and energy. Give enterprise the opportunity to develop latent wealth and to restore depleted resources and protect enterprise and investment, and there will be such an increase in the supply of food taken from beneath the waters as the world heretofore has not known. Restore the waters to their natural purity so that all mankind may know the healthfulness of seafood products.

and even the greatly increased supply will not be commensurate with the increased demand.

This is a National Association of Oyster Growers and Dealers, and as such it is our duty to bring this matter to the attention of the National Government. If the question of jurisdiction is raised I want to repeat what I said at Norfolk two years ago. The National government has jurisdiction over navigable streams, spends millions of money in improving rivers and harbors, maintains lighthouses and buoys, makes laws governing navigation and in general has charge of the navigable waters of the nation, it spends money in the propagation of finny fish, with which to stock these streams, and in general is supposed to be interested in the conservation of the nation's resources. This being so, there seems no logical reason why the Government should not prevent the destruction of these resources by sewage pollution, and certainly no reason why the National government should not prevent the filling up of channels, that are dug at the expense of the government, by the dumping of sewage into them. I believe it is the duty of the general government to pass and enforce laws which will forever prevent this practice, and I further believe, if a persistent effort is made by this association in this direction, that the result can be accomplished. To my mind it is the one greatest question confronting the oyster industry to-day and on the solution of it, in the only way that it can be solved, which is, the restriction of the waters to their natural purity and the consequent restoration of public confidence in the wholesomeness of the product, lies the future success or failure of the industry.

True, by going farther and farther away from the more thickly populated localities and giving special attention to the method of handling stock, the public is safeguarded and a wholesome supply of this food is furnished. Eternal vigilance on the part of shippers has greatly improved conditions. The consumers of the land can rest assured that reputable dealers will ship nothing but good stock, and that every sanitary precaution will be taken, but if the National and State governments would do their full duty and restore the waters to that condition of purity which nature left them in, there would be a very much increased demand.

But it will be urged that all these improvements will cost money and who is to furnish it? The honorable shellfish commissioners have lately been in session in Boston, Mass., and while I was unfortunately not able to hear the able addresses there delivered, I understand that one question which vexed the minds of the speakers and others was, by what means or methods could more direct revenue to the states be gotten out of the oyster business, and that leads me to discuss briefly the theory of taxation, and to ask whether or not that State is most progressive that turns the thumb-screws of taxation the hardest, whether that State is the wisest which exacts the largest toll from the industry, or whether the oyster business and oyster property should be treated and be asked to bear its just and equitable share of the public burden and no more. Whether or not this industry alone should be singled out for a tax on productivity or whether it is intended also to tax the crop of the farmer after taxing his land, and the product of the mill and factory after taxing the real estate and improvements.

What is the theory of taxation? Certain revenue is required to meet the demands of a complex civilization such as ourselves, to provide for the

common defense, the economical carrying on of government, the administration of justice, the protection of life and property, the safeguarding of the public health and providing for the thousand needs of civilized society. The nation derives her revenue by indirect methods, tariff, internal revenue, etc., the states by taxes on franchises or corporations of one sort and another, and by receiving a percentage of the taxes received by cities and towns on real estate and personal property. Having ascertained the amount required to care for the needs of the government economically administered, the tax is raised by equitable assessment on taxable property. The theory is that similar kinds of property should be treated alike and that all property should be taxed in proportion to and in accordance with its fair value, said value to be arrived at by knowledge of its fair selling value or by the selling price of similar property. In arriving at values the hazards of the business should be taken into consideration and the demands made by it for expenditure by the State in the way of police protection, schools and facilities, roads, sewage, lights, etc.

The question arises whether there is any way of arriving at the value of oyster lands. I say there is no trouble about it. A committee of practical oystermen can without doubt arrive at the value of oyster lands as readily as a committee of real estate men can arrive at the value of a piece of real estate. Oyster lands, or the equity in them, when under a lease have been the subject of barter and sale many times, and a buying and selling value has been arrived at between buyer and seller, so there is no question of the ability of the assessing power arriving at a fair estimate of value. That being the case, why should not oyster lands be the subject of a fair and equitable tax, based on a fair assessment, just the same as other property, and not be the subject of exploitation with a view of exacting toll in excess of a fair return, either by excessive leases, rents or by a tax on productivity?

Certainly it is not because the oyster lands require more police protection than other property, for with few exceptions it gets none. Nor is there any demand for expenditure for roads, lights, schools or sewage. No fair-minded oysterman desires in any way to shirk his full share of the public burden, but he does object to being singled out for special taxes and methods of taxation, and he does deplore the fact that every time a legislature is in session he must watch proceedings with most vigilant care lest something in the way of special legislation shall be introduced that will place extra burdens on the industry. There is no more reason why the oyster industry should be singled out for special legislation than the farming industry, and no more reason why it should pay any more or any different kind of tax than a manufacturing enterprise. Anything more than this is an injustice that should not be recommended by officials or imposed by states, and anything less than this would be to give to the industry special privileges that are not asked for.

All the industry asks is that the same laws of property shall obtain as regards oyster property as obtain in respect to all other property, that the same kind of taxation be enforced as in the case of other property, no more, no less, that reasonable standards of purity be established, so that there can be no question arising affecting our status with the Pure Food Department, that a universal effort be made by this association, by the State and by the nation to the end that the dumping of sewage into the waters shall cease, and

that the waters of the nation shall be restored to their natural condition of purity.

Canadian Oyster Farming.

FROM CONSUL FELIX S. S. JOHNSON, KINGSTON, ONTARIO

The proposed leasing by the Government of Prince Edward Island of oyster beds to individuals has been rendered possible only through concessions on the part of the Canadian authorities, as the decisions of the courts have left jurisdiction over these beds in a much divided state. The jurisdiction of the Province over the beds themselves has now been confirmed, but the Dominion still possesses extensive powers of regulation.

In the beds, as now proposed to be leased by the Prince Edward Island authorities, oyster "farming" will be organized systematically. The oyster farmers will sow "seed" and tend and watch it and later reap the crops. The process will hardly show as quick returns as does ordinary agriculture. It is estimated that the area of the oyster beds will be 100,000 to 300,000 acres. The leases are to run for 20 years, with the privilege of renewal. For the first five years the annual rental is to be \$1 per acre, for the second five years \$3 per acre, and for the last ten years \$5 per acre. On the basis of the minimum estimated acreage this would mean a revenue of \$7,000,000 for the 20 years.

In 1882 the total yield of oysters in the Dominion, wholly supplied by the three maritime Provinces, was 64,646 barrels. That year was the high-water mark of the industry. The low mark was reached in 1907, when the yield was only 27,299 barrels. In 1908 and 1909 the product went up to 35,027 barrels and 38,535 barrels, respectively, but in 1910 (the latest returns available) it fell off again to 29,727 barrels. Twenty years ago the fishermen were paid \$1.90 a barrel, of late they have been getting \$6 to \$10, with the higher figure becoming steadily more frequent.

In winter power dredgers can be seen dotting the ice over the oyster beds. Agriculturists consider the mud and oyster shells, with their large percentage of lime, valuable as a fertilizer, and every winter these machines cut the oyster beds to pieces and suffocate the oysters by the deposits of mud that settle down. The natural result of these methods was the present depletion.

Prince Edward Island, which is now leading in measures of "reoysteration," has suffered most from these wanton proceedings. In the palmy days of the trade the island gave Canada more than seven-eighths of the total yield, while for the last few years it has sunk below New Brunswick in output. In 1882 Prince Edward Island had 57,000 barrels of oysters, and in 1907 had only 9,672 barrels. New Brunswick touched its highest point from 1885 to 1890 with an average yield of about 21,000 barrels a year, its yield sank to 12,470 in 1903, but has since risen, being 19,340 in 1909. Nova Scotia's highest record was 4,318 barrels in 1891, in 1909 the yield was 1,716.

The only other oyster-producing Province is British Columbia, where the yield varies from 1,000 to 4,000 barrels, and just about holds its own. The

natural British Columbia oyster is smaller than those produced on the Atlantic

Oyster Production in United Kingdom.

FROM DEPUTY CONSUL GENERAL CARL R LOOP, LONDON

According to the official report on sea fisheries, there were 26,358,115 oysters landed in England and Wales during the year 1911. However, one of the largest oyster factors in London gives it as his opinion that these figures are far too low. He believes that as many as 40,000,000 oysters were taken from the Whitstable beds alone. The following is his estimate of the results of last year's oyster fishing: Coasts of Kent and Essex, 65,000,000, other parts of England and Wales, 50,000,000, Scotland, 3,000,000. This gives a total of 118,000,000 oysters landed last year, and the greater portion of them came from Kent and Essex, where the best "natives" are reared.

Even this number, large as it may seem, shows a serious falling off when compared with the fishing of 20 years ago. In those days as many as 160,000,000 oysters were landed in a single year. Owing to the occurrence of certain cases of poisoning through eating oysters from polluted beds, the oyster market slumped, and for many years it has been fighting to regain popularity. In this attempt it has been in a large measure successful, due largely to the stringent precautions which have been taken to insure the purity of the shell fish. The Fishmonger's Co has done good work in this connection by appointing inspectors to watch the oysters and to see that only sound ones are sent to market. In this manner public confidence has been regained. Last year the home consumption showed a large increase, and it is anticipated that a further advance will be made this year.

The popularity of the English oyster is not confined to Great Britain. A large and growing export trade is done, principally with Belgium and France. It is estimated that last year as many as 10,000,000 oysters were sent abroad, realizing approximately £50,000 (\$243,325). The greater portion of these was sent to Ostend. From this point they were distributed to many parts of the Continent, principally Germany and Russia. These countries demand the best quality, and consequently the highest priced oysters are invariably exported.

While this country exports oysters, it also imports them, mainly from the Netherlands. The import trade, however, is not large, and is confined mainly to the cheaper varieties. France sends a number, but considering that that country alone required last year as many as 800,000,000 oysters for itself, it is not surprising that there were not many left for export. The Netherlands is the only serious competitor, the brackish water in the creeks and estuaries of that country providing splendid fattening grounds. Last year Great Britain imported oysters from the Netherlands to the value of £63,150 (\$307,320).

At one time large quantities of oysters were imported from the United States, but whereas 15 years ago 2,000 barrels of American oysters were sold weekly in London for consumption, at present it is estimated that not more

than 100 barrels are sold per week. It is claimed that the main factor in destroying the American trade has been the cheapness of the English oyster. Last year the crop was particularly prolific, with the inevitable result that prices were considerably lowered. The retail price of oysters per dozen in London at present is given as follows: Best natives, 60 cents to \$1.08, other qualities, 36 to 60 cents, foreign, 36 to 60 cents.

European Oyster Industry and Trade.

FROM CHARGE D'AFFAIRES NORVAL RICHARDSON, AMERICAN LEGATION, COPENHAGEN, DENMARK

Oysters have been found in Danish waters for several hundred years on the northeast coast of Jutland, from the east mouth of Limfjord up to Skagen, but most plentifully in the vicinity of Frederikshavn. They were not, however, very large, very good, or very abundant. In 1825 the sea broke through the narrow neck of land which then separated Limfjord from the North Sea, and Limfjord, which was formerly nothing but an inland lake, with slightly brackish water, became a great lagoon, or inlet of the sea, with very salt water, communicating with the North Sea on the west and the Cattegat on the east.

This splendid breeding place was soon discovered and utilized by the large Atlantic oysters, which soon settled down in little colonies all over the bottom of the shallow "fjord," which in only a few places is more than 5 or 6 fathoms deep and affords the quiet sun-warmed waters preferred by oysters. Here they thrive better and multiply more rapidly than in any other European waters, though in the western half of the "fjord," the narrow part from Logstor to Hals, on the Cattegat, is not salt enough for oysters. Even if it were sufficiently salt, this part of the "fjord" is so full of seaweed that the oyster would not live there.

GOVERNMENT GIVES A MONOPOLY

As soon as the oysters began to be plentiful in Limfjord, promiscuous oyster fishing by the lessees was permitted, but it was soon found that too large a quantity was being caught, and that too many very young oysters were being taken, while the old ones were left to die. Therefore, in order to prevent the annihilation of this great national asset, which had come so fortuitously from the western seas, the Danish Government leased to a private company, the Limfjord Oyster Co., of Nykjøbing, the monopoly in oyster fishing in Limfjord for an annual remuneration to the State amounting to \$38,860, and on the following principal conditions:

1 The company is obliged to fish at least 3,000,000 oysters a year (if the amount caught were less, many would grow old and die), but under no circumstances more than 4,000,000.

2 No oysters may be sold unless they are at least 7 centimeters wide and 3 centimeters thick (centimeter=0.3937 inch), a Government gauge being provided to measure them.

3 Fishing is only permitted from September 1 to April 15

4 The fishing shall be what is called "rotary," that is to say, one-third of the whole territory where the oysters grow is to be fished clean at one time, only small oysters, under the aforesaid minimum size, being left, then this part of the territory is to be left alone for three years. The first ensuing year the fishing is evenly distributed over the whole of the other two-thirds of the territory, the second year, one of these two-thirds, and the third year the other one is fished clean, and so on.

5 The maximum wholesale price of oysters is to be \$3.75 per hundred. They are retailed in restaurants at 95 cents per dozen.

THE FISHING SEASON AND RESULTS

The bottom of the "fjord" consists in greater part of soft mud, and the fishing is principally carried on by drag dredges drawn by motor boats, diving only being resorted to in severe winters, when the ice is too thick for the motor boats to run. In the season, September 1, 1910, to April 15, 1911, about 3,500,000 oysters were caught. The Limfjord Oyster Co. has seven motor boats and employs 80 to 100 fishers, who are paid an annual salary and a premium for every hundred they catch.

The oyster season for 1911-1912 is finished, the total result fished being 3,900,000 oysters, 400,000 more than last season. This increase is explained by the discovery of a new bank, very rich in production, 14 days before the season was over. This bank gave 12,000 to 20,000 daily per boat. The company's net profits amounted to \$34,304.

Danish oyster production is largely for home consumption. In 1910 Denmark exported only 12,125 pounds of fresh oysters, 3,086 pounds going to Norway, 8,598 pounds to Sweden, and 441 pounds to other countries. The imports of oysters greatly exceed this. In the same year Denmark imported 28,000 pounds of fresh oysters, of which 11,900 pounds came from Germany, 14,100 from the Netherlands, 1,300 from the United States, and the remainder from other countries. The imports of salted oysters and clams and caviar amounted to 4,190 pounds.

Coppery Taste of European Oysters Preferred.

FROM CONSUL GENERAL FRANK H. MASON, PARIS, FRANCE

The experiment of importing American oysters into France has been tried several times, but, so far as I can ascertain, with not very brilliant success, as it is found that while most Americans prefer the American oysters, Europeans generally prefer those with the coppery taste, which is peculiar to most oysters of European origin.

All the principal hotels and restaurants in Paris serve shell oysters during

the season from September to April, but they all, so far as I know, purchase their supplies here from large dealers and do not individually import oysters.

The great item of expense for American oysters is, of course, the freight and the difficulty of getting them here always fresh and in good condition, for so many cases of ptomaine poisoning have occurred from eating stale oysters, or those grown in water vitiated by sewage, that consumers are very critical about shell fish which have come a long distance.

(A list of the leading wholesale oyster dealers of Paris, who handle French, English, Portuguese and Dutch oysters, may be had from the Bureau of Manufactures at Washington.)

Oysters not Popular in Austrian Capital.

FROM CONSUL GENERAL CHARLES DENBY, VIENNA, AUSTRIA

Oysters are offered for sale in several large Vienna restaurants, always in the shell, but they are not much in demand. They are seldom served in private houses or at banquets. The oyster usually found in the restaurants is the Whitstable oyster, sold on the half shell at 6 crowns (about \$1.20) per dozen. On the Adriatic coast of Austria, at Trieste and other cities, local oysters are peddled about the streets, but this variety seldom reaches Vienna.

There were imported into Austria-Hungary in 1910 20 tons of oysters, valued at about \$10,000. They came from Belgium, Germany and Holland. There is fast-freight transportation in Austria, performing all the functions of the express service in America. The refrigerator service on Austrian railways is at present not fully developed, and a service of refrigerator cars on a regular time-table does not exist.

British Isles Import Large Quantities.

COMPILED IN BUREAU OF MANUFACTURES

The following statistics of oyster imports into the United Kingdom for the comparative calendar years 1907, 1909 and 1911 show that the largest quantities are derived from the United States, but that they average in value less than 2¾ cents per pound, while imports of Dutch oysters average 17 to 18 cents per pound.

Countries	1907		1909		1911	
	Pounds	Value	Pounds	Value	Pounds	Value
United States	5,735,072	\$151,548	5,574,240	\$153,392	5,872,160	\$160,361
France	62,048	1,095	10,192	526	4,256	282
Netherlands	662,704	117,580	2,414,608	392,016	1,784,160	307,319
All other countries	9,632	1,007	6,496	681	272,720	6,673
Total	6,469,456	\$271,230	8,005,536	\$546,615	7,933,296	\$474,635

DELAWARE BAY AND MAURICE RIVER COVE OYSTER BED LEASES—Continued

NAME	ADDRESS	Lease No	Average	Amount	Date	Term	Section			
							A	B	C	D
Bateman & Bateman,	Cedarville,	32	124	\$62 00	6/20/12	1 Yr	219	110	271	
							580	493	615	
Bateman, Bateman & Blizzard, Bateman & Blizzard,	Murricetown, Port Norris,	22 27	14 212	7 00 +133 00	6/20/12 6/20/12	1 Yr 1 Yr	167	104		145 311
								158		481 475
Bateman & Bradford, Bateman & Burt,	Newport Cedarville,	25 28	18 232	9 00 116 00	6/20/12 6/20/12	1 Yr 1 Yr		242	220	360 403
									254	450 502
									273	502
									433	
Bateman & Crossley, Bateman & Dament,	Newport, Cedarville,	24 33	26 41	13 00 20 50	6/20/12 6/20/12	1 Yr 1 Yr				322 426
Bateman, Dament & Elmer,	Cedarville,	29	183	91 50	6/20/12	1 Yr	327 448	270 112	268 499	158
Bateman & Emelson,	Cedarville,	30	82	41 00	6/20/12	1 Yr	A	B	C	D
Bateman & Swing,	Cedarville,	31	94	47 00	6/20/12	1 Yr		32	420	30 83
									123	402 512
									362	270
Bateman & Turner, Bateman & Weiden,	Newport, Newport,	37 35	45 103	22 50 +54 00	6/20/12 6/20/12	1 Yr 1 Yr		251	180	136 321
									239	

DELAWARE BAY AND MAURICE RIVER COVE OYSTER BED LEASES—Continued

NAME	ADDRESS	Lease No	Average	Amount	Date	Term	Section			
							A	B	C	D
Bell, George C. Jr., Berry, Chas & Phipp,	Bivalve, Port Norris,	9 52	16 99	\$8 00 49 50	6/20/12 6/20/12	1 Yr 1 Yr	173	90	230	95
									370	407
Berry, Henry A.,	Port Norris,	56	79	39 50	6/20/12	1 Yr			369	414
Berry, H A & Walter J, Berry, Stultz,	Port Norris, Port Norris,	55 57	20 239	10 00 *117 00	6/20/12 6/20/12	1 Yr 1 Yr	176	213	371	509
									181	145
									218	431
									413	508
									542	
Berry, William H.,	Port Norris,	53	67	33 50	6/20/12	1 Yr	225		26	179
										210
										244
Berry & Newcomb, Berry & Sheppard, Bidwell, William Blackman, A J & Smith S.,	Port Norris, Port Norris, Bivalve, Port Norris,	54 350 38 41	18 20 14 257	9 00 10 00 *7 50 +133 50	6/20/12 6/20/12 6/20/12 6/20/12	1 Yr 1 Yr 1 Yr 1 Yr	283		156	94
									231	256
									79	446
									236	532
									105	532
Bloxson, Robert H., Bornhorst, August,	Port Norris Port Norris	46 42	37 100	18 50 *51 00	6/20/12 6/20/12	1 Yr 1 Yr	160	168	300	256
									403	241
Bowler, Charles,	Dividing Creek,	44	34	17 00	6/20/12	1 Yr	201		185	194
Bowler, Thomas,	Port Norris	43	41	20 50	6/20/12	1 Yr			363	524
Bowler & Bowker,	Dividing Creek,	45	49	24 50	6/20/12	1 Yr	78		184	425
Boyle, Charles R Boyle, James,	Millville, Millville,	59 58	14 26	7 00 13 00	6/20/12 6/20/12	1 Yr 1 Yr			30 57	280 310
									183	
Bradford, Alford C., Jr., Bradford, Chas B., Jr.,	Newport Newport,	18 19	20 10	10 00 5 00	6/20/12 6/20/12	1 Yr 1 Yr				

DELAWARE BAY AND MAURICE RIVER COVE OYSTER BED LEASES—Continued

NAME	ADDRESS	Lease No	Acres	Amount	Date	Term	Section			
Bradford, Charles L.,	Newport,	20	222	\$111 00	6/20/12	1 yr	A	B	C	D
							228		500	170
							298		434	420
Bradford Elwood,	Newport,	17	16	8 00	6/20/12	1 yr			134	451
Bradford Lemuel,	Newport,	15	125	*66 50	6/20/12	1 yr			432	489
									82	143
									71	295
									430	470
										87
										252
Bradford, Lucus E.,	Newport,	16	57	28 50	6/20/12	1 yr	172			
Bradford & Vannaman,	Newport,	21	31	15 50	6/20/12	1 yr			274	
									179	
Bradshaw, John P.	Bridgeton,	60	40	20 00	6/20/12	1 yr			410	429
Burnight, Stiles & Sixtes,	Newport,	47	33	16 50	6/20/12	1 yr			258	371
Brineshults & Mayhew,	Cedarville,	39	240	*128 50	6/20/12	1 yr			212	183
									76	29
									77	324
									154	455
									169	456
									458	421
Cann, Ellis L.,	Port Norris,	108	63	*32 50	6/20/12	1 yr	A	B	C	D
							301	85		96
										277
										461
Callahan, John R.,	Milville,	68	9	5 00	6/20/12	1 yr			187	
Campbell, A B & W A,	Newport,	77	20	10 00	6/20/12	1 yr			258	
	Port Norris,	72	74	37 00	6/20/12	1 yr			212	
									141	
									255	
									260	
Campbell, Clement L.,	Newport,	86	16	8 00	6/20/12	1 yr			70	90
Campbell, James, Jr.,	Mauricetown,	76	73	36 50	6/20/12	1 yr			132	328
									19	
									400	
									401	
									576	

DELAWARE BAY AND MAURICE RIVER COVE OYSTER BED LEASES—Continued

NAME	ADDRESS	Lease No	Acres	Amount	Date	Term	Section			
Campbell, James,	Newport,	79	121	\$60 50	6/20/12	1 yr	A	B	C	D
							195		328	154
									408	206
Campbell, James & A B,	Newport,	82	10	5 00	6/20/12	1 yr			492	153
Campbell, James & Wilson A,	Newport,	78	69	34 50	6/20/12	1 yr			284	51
									332	
									407	
Campbell, James, Wilson A, & Philip F,	Newport,	81	18	*10 00	6/20/12	1 yr			337	416
Campbell, Peter,	Newport,	85	198	*100 00	6/20/12	1 yr	235		293	130
									263	161
									568	286
									621	412
									11	327
Campbell, Sheppard,	Newport,	84	34	*18 00	6/20/12	1 yr			58	499
Campbell, Smith,	Dividing Creek,	74	18	5 00	6/20/12	1 yr			508	200
Campbell, Winfield A,	Port Norris,	73	13	6 50	6/20/12	1 yr			508	200
Campbell, Campbell, Campbell & Campbell,	Port Norris,	75	82	*45 50	6/20/12	1 yr			247	297
									200	219
									200	219
Campbell & Mints,	Dividing Creek,	80	28	14 00	6/20/12	1 yr			249	219
Campbell & Robbins,	Newport,	88	256	*129 00	6/20/12	1 yr			553	
									446	
									605	
Chance, Eli W,	Mauricetown,	96	95	47 50	6/20/12	1 yr	51	224	873	
							209			
							232			
							101			
							112			
Chance, Chance & Bacon,	Mauricetown,	97	10	5 00	6/20/12	1 yr			202	177
Chew, Bateman & Henry,	Port Norris	107	50	*26 00	6/20/12	1 yr	206			468
Chew, William V,	Port Norris,	106	10	5 00	6/20/12	1 yr				

BUREAU OF SHELL FISHERIES

DELAWARE BAY AND MAURICE RIVER COVE OYSTER BED LEASES—Continued

NAME	ADDRESS	Lease No	Acreage	Amount	Date	Term	Section			
							A	B	C	D
Clark, John & Howard,	Port Norris,	91	55	*\$25 00	6/20/12	1 yr	124		549	267
Clark, Joshua,	Port Norris,	93	25	12 50	6/20/12	1 yr	247		360	490
Clark, Clark & Clark,	Port Norris,	92	10	*3 00	6/20/12	1 yr				344
Clark, William W.,	Port Norris,	94	15	*6 00	6/20/12	1 yr		28		455
Cobb, Glendon, Hunt, Muel & Bunes	Bridgeton,	111	22	*10 00	6/20/12	1 yr		55		
Compton, Howard,	Leesburg,	114	31	15 50	6/20/12	1 yr		61		
Compton & Wilson,	Leesburg,	113	38	19 00	6/20/12	1 yr			614	258
Compton, Wilson & Harris,	Leesburg,	112	50	25 00	6/20/12	1 yr	89			
Conahay & Bornhorst,	Port Norris,	70	27	*22 00	6/20/12	1 yr		131		326
Conahay & Yates,	Port Norris,	69	44	22 00	6/20/12	1 yr		240	505	264
Cook, E J,	Port Norris,	71	212	106 00	6/20/12	1 yr		210	7	441
								211	205	484
								112	252	
								120	69	
								165	519	
								238	518	
										151
Cosier, Lucius E.,	Newport,	102	36	18 00	6/20/12	1 yr		278		71
Cosier, Peter C.,	Newport,	100	212	106 00	6/20/12	1 yr		260		110
								241		290
								569		
								604		70
Cosier, William W.,	Dividing Creek,	103	16	8 00	6/20/12	1 yr		480		72
Cosier, Cosier Ware & More	Newport,	101	19	9 50	6/20/12	1 yr		357		78
Cosier & Gates,	Newport,	99	22	11 00	6/20/12	1 yr		478		99
Cosier & Husted,	Newport,	98	28	14 00	6/20/12	1 yr		259		330
Covert & Lee,	Leesburg,	110	226	*114 00	6/20/12	1 yr	197	100		479
							100	312		480
							137	320		
							111	582		
							248			

DELAWARE BAY AND MAURICE RIVER COVE OYSTER BED LEASES—Continued

NAME	ADDRESS	Lease No	Average	Amount	Date	Term	Section			
							A	B	C	D
Cox, Champion H.,	Leesburg,	87	81	*\$41 00	6/20/12	1 yr			14	237
								132		
Cox, Jonathan & Lalburn	Leesburg,	89	29	14 50	6/20/12	1 yr		177		227
									83	471
Cox, Raymond,	Cedarville,	90	30	*16 00	6/20/12	1 yr				366
Cruise Benjamin B.,	Mauicetown,	105	166	83 00	6/20/12	1 yr	169		512	103
									94	335
									358	516
								608		
Cruise, David R.,	Dorchester,	104	15	7 50	6/20/12	1 yr	170			
Dalchly & Fagan,	Port Norris,	123	29	14 50	6/20/12	1 yr		146		253
Dodson, Thomas L.,	Heisterville,	122	53	26 50	6/20/12	1 yr		31		278
Donnelly & Donnelly,	Heisterville,	120	107	53 50	6/20/12	1 yr				
								208		
								158		
								165		
								164		
								284		
									380	
Donnelly, Lorenzo G.,	Heisterville,	121	32	16 00	6/20/12	1 yr				
Edmonds & Garrison,	Port Norris,	129	65	32 50	6/20/12	1 yr		69		207
Ernickson & Compton,	Leesburg,	115	125	64 50	6/20/12	1 yr		109	20	206
								253		417
Evans, Evans & Evans,	Millville,	128	15	7 50	6/20/12	1 yr				382
Evans, Evans & Evans,	Millville,	127	230	115 00	6/20/12	1 yr		273	195	32
								280	139	
Fagan, Raymond,	Port Norris,	139	75	*41 50	6/20/12	1 yr	201			440
Ferguson, Argus S.,	Leesburg,	136	57	*31 50	6/20/12	1 yr	18			307
							135			66
Fidler, Frank,	Dennisville,	131	23	11 50	6/20/12	1 yr	24			
Fisher, T D.,	Mauicetown,	140	5	5 00	6/20/12	1 yr	138			

DELAWARE BAY AND MAURICE RIVER COVE OYSTER BED LEASES—Continued

NAME	ADDRESS	Lease No	Average	Amount	Date	Term	Section			
							A	B	C	D
Fithin, Samuel P, Fithin & Munch,	Bridgeton, Bridgeton,	133	16	\$8 00	6/20/12	1 yr	153	75	86	150
		132	208	*150 50	6/20/12	1 yr			234	287
Flynn John,	Camden,	135	108	54 00	6/20/12	1 yr			118	518
									465	277
Foster, W Lunwood, Fowler, William E, Est,	Delmont, Port Norris,	134	21	10 50	6/20/12	1 yr	110	15	503	314
		137	210	*106 00	6/20/12	1 yr		178	514	486
Fowler & Morris, Gandy, Miles,	Port Norris, Dennisville,	138	13	6 50	6/20/12	1 yr			482	472
		144	217	*110 00	6/20/12	1 yr			503	188
Gandy & Van Gulder, Garetson Samuel H, Garrison, Daniel C,	Dennisville, Haleyville, Heslerville,	155	128	*69 50	6/20/12	1 yr	156		449	
		147	12	6 00	6/20/12	1 yr	32	204	263	173
Garrison, Frank L, Garrison, Joseph, Garrison, Joseph M,	Dividing Creek, Dividing Creek, Port Norris,	151	12	6 00	6/20/12	1 yr	106		282	174
		149	19	9 50	6/20/12	1 yr	206		462	283
Garrison, Walter C, Garrison & Bonham, Gaskill, George S,	Dividing Creek, Dividing Creek, Port Norris,	152	88	41 50	6/20/12	1 yr	162	162	279	422
		153	13	6 50	6/20/12	1 yr			464	104
		150	41	20 50	6/20/12	1 yr	280		292	292
		143	111	*67 00	6/20/12	1 yr	286		550	413

DELAWARE BAY AND MAURICE RIVER COVE OYSTER BED LEASES—Continued

NAME	ADDRESS	Lease No	Average	Amount	Date	Term	Section			
							A	B	C	D
Gaskill, John,	Newport,	148	254	*\$129 50	6/20/12	1 yr	52	267	444	184
							333		476	294
Green, Samuel, Green, Soerites,	Port Norris, Port Norris,	157	8	5 00	6/20/12	1 yr	223		592	488
		158	5	5 00	6/20/12	1 yr	155		611	
Hageman, Albert C,	Camden,	196	247	*120 00	6/20/12	1 yr	136	22	524	198
							161	99	88	81
Hager Sherman, Haley, Clarence,	Port Norris, Mauricetown,	165	58	29 00	6/20/12	1 yr	84	127	206	208
		161	48	24 00	6/20/12	1 yr		184		346
Haley, S Douglass, Hand, Constant W,	Mauricetown, Port Norris,	160	6	5 00	6/20/12	1 yr		8		
		184	241	*122 00	6/20/12	1 yr		156	310	35
Hand, Harrison, Hand & Berry, Benj,	Port Norris, Port Norris,	176	38	19 00	6/20/12	1 yr		22	524	198
		182	92	46 00	6/20/12	1 yr		99	88	81
Hand & Berry, W H, Hand, Berry & Berry, Hand & Campbell,	Port Norris, Port Norris, Port Norris,	180	17	8 50	6/20/12	1 yr		127	206	208
		181	159	79 50	6/20/12	1 yr		184		386
		183	364	*181 50	6/20/12	1 yr		156	498	498
								58	310	35
								116	474	176
								150	142	150
								193	456	456
								418	378	418
								118	213	374
								214	578	578
								122	488	488
								406	23	187
								257	368	168
								177	409	190
								299	491	261
								127	317	317
									428	428
									605	605
									370	370

BUREAU OF SHFLL FISHERIES

DELAWARE BAY AND MAURICE RIVER COVE OYSTER BED LEASES—Continued

NAME	ADDRESS	Lease No	Acreage	Amount	Date	Term	Section				
							A	B	C	D	
Hand & Harrington, Hand Joslin & Campbell, Hand & Newell, Hand & Randolph, Hammers, McClellan,	Port Norris, Newport, Leesburg, Port Norris, Newport,	178	50	\$25 00	6/20/12	1 Yr				494	
		179	15	7 50	6/20/12	1 Yr			386	418	
		171	18	9 00	6/20/12	1 Yr	276			531	16
		179	20	10 00	6/20/12	1 Yr				163	377
		187	39	19 50	6/20/12	1 Yr					
Harrington, Gerald,	Port Norris,	183	14	7 00	6/20/12	1 Yr		155	574	316	
Harris, John W, Jr., Harris, John W, East, Harris & Hiles, Hearn, Margaret,	Leesburg, Leesburg, Haleyville, Port Norris, Port Norris,	170	23	14 00	6/20/12	1 Yr	130	188			
		169	76	28 00	6/20/12	1 Yr	300	93			
		171	6	3 00	6/20/12	1 Yr			437	96	
		167	33	16 50	6/20/12	1 Yr			236		
		168	21	10 50	6/20/12	1 Yr			103		
Hearn & Co., Henitz, Harry E Henderson, George Henderson, Lafayette, Henderson Zadok, Henry & Buzby,	Port Norris, Millville, Millville, Leesburg Leesburg Port Norris,	199	23	11 50	6/20/12	1 Yr		26			
		163	4	5 00	6/20/12	1 Yr			81	375	
		164	108	54 00	6/20/12	1 Yr	152	64	245		
		230	12	5 50	6/20/12	1 Yr			121	144	449
		192	205	147 50	6/20/12	1 Yr			115	121	147
Hettinger, Henry A.,	Bridgeton,	191	100	50 00	6/20/12	1 Yr	260			203	
Hiles, George S & Claude,	Haleyville,	198	30	17 00	6/20/12	1 Yr			602	439	
Hinson, Harold E.,	Mauricetown,	174	48	*23 50	6/20/12	1 Yr	269			15	
Hinson William T.,	Mauricetown	173	13	6 50	6/20/12	1 Yr				380	

BUREAU OF SHELL FISHERIES

DELAWARE BAY AND MAURICE RIVER COVE OYSTER BED LEASES—Continued

NAME	ADDRESS	Lease No	Acreage	Amount	Date	Term	Section				
							A	B	C	D	
Hinson & Bateman,	Mauricetown,	172	368	\$184 00	6/20/12	1 Yr	292 180		305 294 267 431 520 97 98	131 119	
Hollinger, Harrison, Hollinger & Bradford, Hunter, Aaron S, Hunter & Hunter, Hunter, William C., Husted, Howard S, Husted & Husted,	Port Norris, Port Norris, Haleyville, Haleyville, Haleyville, Bridgeton, Newport,	194	64	32 00	6/20/12	1 Yr	207 302	218	63	106	
		195	10	5 00	6/20/12	1 Yr	204			319	
		189	27	13 50	6/20/12	1 Yr	206			235	
		190	35	17 50	6/20/12	1 Yr	151	265		155	18
		188	27	*14 00	6/20/12	1 Yr	205			108	165
Ingersoll Charles M, Ingersoll & Campbell, Jeffries, Robert, Jenkins, William Johnson, Charles F.,	Daviding Creek, Daviding Creek, Port Norris, Daviding Creek, Cedarville,	186	48	24 00	6/20/12	1 Yr			412	338	
		185	65	*34 50	6/20/12	1 Yr			491	464	
		203	13	6 50	6/20/12	1 Yr			481	465	
		204	9	5 00	6/20/12	1 Yr			532	397	
		207	38	19 00	6/20/12	1 Yr		244	151	260	396
Johnson, Charles W, Joshua Benjamin S.,	Newport, Newport,	210	69	*42 00	6/20/12	1 Yr	252		93	340	
		215	87	43 50	6/20/12	1 Yr			285	496	
									454	263	98

DELAWARE BAY AND MAURICE RIVER COVE OYSTER BED LEASES—Continued

NAME	ADDRESS	Lease No	Acreage	Amount	Date	Term	Section					
							A	B	C	D		
Joslin, Howard, Joslin & Joslin, Joslin, & Moncrief, Joslin, Moncrief, Mulford & Mulford	Newport Newport, Newport, Newport,	214	12	\$6 00	6/20/12	1 yr				D	362	
		213	37	18 50	6/20/12	1 yr				C	379	
		211	9	5 00	6/20/12	1 yr						171
		212	68	*39 00	6/20/12	1 yr	237					353
Ladow, Hammell, Ladow, Sylvanus A., Lake, David R.,	Bridgeton, Dividing Creek, Pleasantville,	238	8	5 00	6/20/12	1 yr					82	
		237	32	16 00	6/20/12	1 yr					11	
		234	19	9 50	6/20/12	1 yr					333	
Lake, John T.,	Port Norris,	232	167	83 50	6/20/12	1-yr.	174				148	
											114	
Lake, J Hammitt, Lake, Samuel C.,	Port Norris, Port Norris,	233	17	8 50	6/20/12	1 yr					164	
		236	124	*63 50	6/20/12	1 yr		92			423	
Lake, Little, Bateman & Bradford, Lee, Addie, Lee, Daniel, Lee, Frank, Lee, Harry M., Lee, Maurice R., Lee, Samuel,	Newport, Leesburg, Leesburg, Leesburg, Port Norris, Port Norris, Leesburg, Leesburg,	235	50	*22 50	6/20/12	1 yr		247			165	
		231	14	7 00	6/20/12	1 yr					507	
		229	9	5 00	6/20/12	1 yr					204	
		228	6	5 00	6/20/12	1 yr					599	
		226	108	*55 00	6/20/12	1 yr		192	35			595
		227	64	32 00	6/20/12	1 yr		182	234	143	144	372
Lalliston & Sharpless,	Leesburg,	225	65	32 50	6/20/12	1 yr		305	134	138	401	
		241	12	6 00	6/20/12	1 yr		60	220	16	262	

DELAWARE BAY AND MAURICE RIVER COVE OYSTER BED LEASES—Continued

NAME	ADDRESS	Lease No	Acreage	Amount	Date	Term	Section				
							A	B	C	D	
Lorer & Peterson, Lord & Trabbett, Lore, Addie, Lore, J. Flyer, Lore, Youvassa, Lore, Nathaniel J., Lore, R. T. & Son,	Cedarville, Heslerville, Newport, Newport, Millville, Dividing Creek, Camden,	242	17	\$8 50	6/20/12	1 yr					
		218	21	*11 50	6/20/12	1 yr					368
		223	81	40 50	6/20/12	1 yr					290
		224	13	6 50	6/20/12	1 yr					387
		221	28	14 00	6/20/12	1 yr					166
		222	6	5 00	6/20/12	1 yr					88
		220	185	*86 00	6/20/12	1 yr					
Lore, Lore & Lore,	Cedarville,	219	107	*59 50	6/20/12	1 yr					319
											128
McClann, Charles G.,	Dividing Creek,	263	43	21 50	6/20/12	1 yr					156
											152
McDaniels, Major & Howard, McDaniels, Major & John, McDaniels, Willard, Meerwald, Augustus J., Moore, E. S., Moore & Henry, Moore, Isaac, Moore & More,	Port Norris, Port Norris, Port Norris, Dennisville, Bridgeton, Fruiton Dividing Creek, Bridgeton,	260	25	12 50	6/20/12	1 yr					309
		261	13	6 50	6/20/12	1 yr					488
		262	14	7 00	6/20/12	1 yr					59
		258	159	79 50	6/20/12	1 yr					60
		251	30	15 00	6/20/12	1 yr					
Moore Oscar, More Robert	Port Norris, Bridgeton,	246	48	24 00	6/20/12	1 yr					444
		248	206	103 00	6/20/12	1 yr					67

BUREAU OF SHELL FISHERIES

DELAWARE BAY AND MAURICE RIVER COVE OYSTER BED LEASES—Continued

NAME	ADDRESS	Lease No	Acreage	Amount	Date	Term	Section			
							A	B	C	D
Peterson, George C,	Newport,	298	169	*\$87 00	6/20/12	1 yr	242	73	242	73
Peterson & Bateman,	Port Norris,	295	176	88 00	6/20/12	1 yr	107	188	107	188
Peterson & Moore, Peterson & Peterson,	Newport, Port Norris,	297 296	21 73	10 50 *33 00	6/20/12 6/20/12	1 yr 1 yr	163	351	242	73
Pettit, Charles, Pierce, William H, Pierce & Pennell,	Bivalve, Dorchester, Dorchester,	302 300 299	9 10 46	5 00 5 00 23 00	6/20/12 6/20/12 6/20/12	1 yr 1 yr 1 yr	163	351	188	201
Polhamus, Alfred & Oscar, Polhamus, William, Polhamus & Sharp,	Leesburg, Leesburg Vineland,	288 290 292	17 37 73	8 50 *17 00 *37 50	6/20/12 6/20/12 6/20/12	1 yr 1 yr 1 yr	282	382	204	269
Polhamus & Stowman,	Dorchester,	291	76	38 00	6/20/12	1 yr	255	103	190	85
Rahr, David, Randolph, Andrew, Randolph & Adams,	Bricksboro Port Norris, Leesburg,	324 322 323	89 31 25	19 50 15 50 *13 00	6/20/12 6/20/12 6/20/12	1 yr 1 yr 1 yr	211	78	533	533
Reed & Robbins,	Port Norris,	311	61	30 50	6/20/12	1 yr	203	C	212	385

BUREAU OF SHELL FISHERIES

DELAWARE BAY AND MAURICE RIVER COVE OYSTER BED LEASES—Continued

NAME	ADDRESS	Lease No	Acreage	Amount	Date	Term	Section			
							A	B	C	D
Riggin, Charles M, & Edward M, Riggin, Charles M, Riggin, Edward M,	Port Norris, Port Norris, Port Norris,	335 333 334	17 34 101	\$8 50 17 00 50 50	6/20/12 6/20/12 6/20/12	1 yr 1 yr 1 yr	221	193	572	403
Riggin, Riggan & Riggan, Riggin, Riggan, Riggan & Stites, Riggin, Walter C,	Port Norris, Port Norris, Port Norris,	330 329 331	80 72 82	40 00 *41 00 41 00	6/20/12 6/20/12 6/20/12	1 yr 1 yr 1 yr	191	573	573	46
Riggin, Walter C & Charles M, Robbins, Clarence M,	Port Norris, Port Norris,	332 308	41 115	20 50 57 50	6/20/12 6/20/12	1 yr 1 yr	117	82	394	61
Robbins Daniel T, Robbins, David, Jr,	Port Norris, Port Norris,	318 309	12 147	6 00 73 50	6/20/12 6/20/12	1 yr 1 yr	62	176	288	221
Robbins, David, Sr,	Port Norris	316	280	*139 50	6/20/12	1 yr	175	68	54	349
Robbins, Edward C,	Haleyville,	314	37	18 50	6/20/12	1 yr	74	54	62	406
Robbins, George,	Port Norris,	317	206	*101 00	6/20/12	1 yr	252	129	470	470

DELAWARE BAY AND MAURICE RIVER COVE OYSTER BED LEASES—Continued

NAME	ADDRESS	Lease No	Acreage	Amount	Date	Term	Section
Sheppard, Lewis F,	Cedarville,	352	258	*\$132 00	6/20/12	1 yr	A
							B
Sheppard & Sheppard,	Newport,	353	128	64 00	6/20/12	1 yr	C
							D
Sheppard, Ralph A, Sheppard, S Ware,	Bivalve, Newport,	348 356	9 18	5 00 9 00	6/20/12 6/20/12	1 yr 1 yr	B
							C
Sheppard, S Ware & Smith, Shropshire, Edward,	Newport, Haleyville,	355 363	23 95	11 50 *49 50	6/20/12 6/20/12	1 yr 1 yr	A
							B
Shull, Harry Est, Shull, John L,	Newport, Newport,	362 361	14 255	7 00 *119 50	6/20/12 6/20/12	1 yr 1 yr	A
							B
Shull, S Burton, Simms, Benj W, Est,	Bivalve, Cedarville,	380 359	6 83	5 00 *43 50	6/20/12 6/20/12	1 yr 1 yr	A
							B
Sumpkins, Thomas, Smith, Asa C & Seth S, Smith, Henry C, Smith & Sheppard,	Cedarville, Leesburg, Newport, Newport,	360 358 357 354	39 62 19 107	*22 00 31 00 *13 00 53 50	6/20/12 6/20/12 6/20/12 6/20/12	1 yr 1 yr 1 yr 1 yr	A
							B

DELAWARE BAY AND MAURICE RIVER COVE OYSTER BED LEASES—Continued

NAME	ADDRESS	Lease No	Average	Amount	Date	Term	Section
Socwell, Henry S, Socwell, Howard W,	Port Norris, Port Norris,	374 376	75 626	\$37 50 *331 50	6/20/12 6/20/12	1 yr 1 yr	A
							B
Socwell & Gaskill, Stites, Edmund, Jr,	Port Norris, Port Norris,	375 368	25 385	*13 00 *208 00	6/20/12 6/20/12	1 yr 1 yr	C
							D
Stites, E, Jr, & Garrison, F L, Stites, E, Jr, & Newcomb, Wm B,	Port Norris, Port Norris,	370 369	32 92	16 00 46 00	6/20/12 6/20/12	1 yr 1 yr	A
							B
Stites, Gilbert & John, Stites (Est.) & Stites, Stites (Est.), Stites & Newcomb,	Dragston, Newport, Newport,	367 372	18 167	*10 00 83 50	6/20/12 6/20/12	1 yr 1 yr	C
							D
Sutter, Wilham, Sutton, Joseph, Sutton, Wilham G, Swank, David,	Port Norris, Leesburg, Bridgeon, Bivalve,	339 365 364 411	20 13 70 9	10 00 6 50 35 00 5 00	6/20/12 6/20/12 6/20/12 6/20/12	1 yr 1 yr 1 yr 1 yr	A
							B

DELAWARE BAY AND MAURICE RIVER COVE OYSTER BED LEASES—Continued

NAME	ADDRESS	Lease No	Acreage	Amount	Date	Term	Section			
							A	B	C	D
Terry, George N, Terry & Terry, Terry & Veal,	Dividing Creek, Dividing Creek, Dividing Creek,	384	26	*\$12 00	6/20/12	1 Yr	261			117
		385	25	12 50	6/20/12	1 Yr		105	404	
		386	86	43 00	6/20/12	1 Yr		232		
		397	26	13 00	6/20/12	1 Yr			229	109
Tligham, Eva, Townsend, Mark,	Port Norris, Port Norris,	390	96	47 50	6/20/12	1 Yr			359	
		391	43	21 50	6/20/12	1 Yr		60	387	356
Townsend, Stacy, Tozour, Charles, Tozour & Foster, Turnel, James A., Jr.,	Leesburg, Delmont, Delmont, Newport,	392	6	5 00	6/20/12	1 Yr		216		
		393	35	17 50	6/20/12	1 Yr		133	545	
		387	88	*50 00	6/20/12	1 Yr		253	613	100
		389	57	*28 00	6/20/12	1 Yr				432
Turner, Leaming, Turner, May, Turpin & Collins,	Dividing Creek, Newport, Mauricetown	388	16	8 00	6/20/12	1 Yr				447
		396	12	6 00	6/20/12	1 Yr	194			452
Vail, William A., Jr., Van, Vliet, William, Veal, Moses Veal, William, Veal & Loper,	Dividing Creek, Newport, Dividing Creek, Dividing Creek, Dividing Creek,	400	9	5 00	6/20/12	1 Yr				123
		404	21	10 50	6/20/12	1 Yr				182
		401	18	9 00	6/20/12	1 Yr				350
		402	15	7 50	6/20/12	1 Yr				20
		403	437	*223 00	6/20/12	1 Yr				
										364

DELAWARE BAY AND MAURICE RIVER COVE OYSTER BED LEASES—Continued

NAME	ADDRESS	Lease No	Acreage	Amount	Date	Term	Section			
							A	B	C	D
Wallen, Wallen & Whitaker,	Fairton,	406	273	\$136 50	6/20/12	1 Yr				
Westcott & Trenchard,	Fairton,	407	168	*80 50	6/20/12	1 Yr				
Whalden, John H., Whalden, Somers H., Wilson, Ralph C., Windfohl, Arthur, Windfohr, Aithur,	Fairton, Mauricetown, Leesburg, Bivalve, Bivalve,	408	41	20 50	6/20/12	1 Yr				
Yates, G Chrsty,	Port Norris,	412	186	*99 00	6/20/12	1 Yr				
Yates, Lucas E.,	Port Norris,	413	201	*153 50	6/20/12	1 Yr				

DELAWARE BAY AND MAURICE RIVER COVE OYSTER BED LEASES—Continued

NAME	ADDRESS	Lease No	Acreage	Amount	Date	Term	Section			
							A	B	C	D
Yates, Hoffman & Robbins,	Port Norris,	416	212	\$106 00	6/20/12	1 yr	169	123	497	
							271	229	65	
Yates & Peterson,	Port Norris,	415	70	39 50	6/20/12	1 yr		235	467	
Yates, Yates & Peterson,	Port Norris	414	104	52 00	6/20/12	1 yr		109	494	
								124	149	
									217	
									308	
									307	

*Indicates a debit or credit owing to area being estimated 1911 to 1912

**Arrears of \$5.00 paid on rental of 1911 to 1912

Raritan Bay Oyster Bed Leases.

NAME	ADDRESS	No	Acreage	Amount	Date	Term
Hammer & Hammer,	Keyport,	2	42 1/4	42 25	June 20, 1912	1 year
Mason, John W,	Keyport,	5	17 3/4	17 75	June 20, 1912	1 year
Mason, Lorenzo G	Keyport,	6	35	35 00	June 20, 1912	1 year
Maurer, Wilham,	Keyport,	7	81 1/2	81 50	June 20, 1912	1 year
Post, Garrett E,	Keyport,	3	91 3/4	91 75	June 20, 1912	1 year
Wolley, Wilham,	Keyport,	4	163 1/2	163 50	June 20, 1913	1 year
Total				\$489 25		

Delaware Bay and Maurice River Cove Boat Licenses.

NAME	ADDRESS	No	Tonn	Date	Term	Amount
Abbott Abdon,	Port Norris,	244	18	April 30, 1912	1 year	\$27 00
Abbott, Abdon, Jr.,	Port Norris,	422	10	March 31, 1912	1 year	15 00
Adams, J Wesley,	Port Norris,	431	15	March 31, 1912	1 year	22 50
Allen, Edward H.,	Bivalve,	136	10	April 2, 1912	1 year	15 00
Anold, James,	Fairton,	450	33	March 25, 1912	1 year	49 50
Bailey, A T,	Port Norris,	332	21	April 1, 1912	1 year	31 50
Bailey, David,	Port Norris,	115	Under	April 1, 1912	1 year	10 00
Bailey, Lafayette	Dividing Creek,	138	16	April 1, 1912	1 year	24 00
Baker, Edward,	Haleyville	77	10	March 30, 1912	1 year	15 00
Bass, George	Port Norris,	101	7	April 1, 1912	1 year	10 50
Bass, John M	Newport,	198	Under	April 24, 1912	1 year	10 00
Bateman, B F,	Newport	160	34	April 1, 1912	1 year	51 00
Bateman, Elmer	Port Norris	156	30	April 4, 1912	1 year	45 00
Bateman, J Roberts	Mauricetown,	52	20	Jan 1, 1912	1 year	30 00
Bateman Moses,	Mauricetown,	31	16	March 31, 1912	1 year	24 00
Bell George C Jr,	Bivalve	75	26	March 31, 1912	1 year	39 00
Bell, John,	Newport,	119	15	March 31, 1912	1 year	22 50
Bell William	Leesburg,	501	13	April 1, 1912	1 year	19 50
Berry, Benjamin,	Port Norris,	81	26	March 31, 1912	1 year	39 00
Berry Henry A	Port Norris	357	14	April 5, 1912	1 year	21 00
Berry, John	Port Norris	82	32	April 30, 1912	1 year	48 00
Berry, Philip,	Port Norris,	195	23	March 31, 1912	1 year	34 50
Berry, Stultz	Port Norris,	5	32	March 30, 1912	1 year	48 00
Bidwell, William,	Bivalve,	286	10	April 1, 1912	1 year	15 00
Blackman, Smith S	Port Norris,	213	23	April 11, 1912	1 year	34 50
Blizzard George M	Cedarville,	562	10	April 26, 1912	1 year	15 00
Blizzard Hiram	Cedarville	429	8	April 30, 1912	1 year	12 00
Blizzard, Wm F	Port Norris,	106	27	April 1, 1912	1 year	40 50
Bornhorst, August,	Port Norris	185	15	March 31, 1912	1 year	22 50
Bornhorst, Henry,	Port Norris,	366	16	March 31, 1912	1 year	24 00
Bowker Charles	Dividing Creek	473	16	April 1, 1912	1 year	24 00
Bradford, Alford,	Newport,	7	10	April 1, 1912	1 year	15 00
Bradford Charles L,	Newport,	96	35	April 1, 1912	1 year	52 50
Bradford Lemuel,	Newport,	250	26	April 1, 1912	1 year	39 00
Bradford Lucius E,	Newport	37	27	Jan 1, 1912	1 year	40 50
Bradshaw, John P	Bridgeton,	111	41	April 2, 1912	1 year	61 50
Brandt Walter	Port Norris,	430	10	April 28, 1912	1 year	15 00
Brant Robert	Camden,	41	27	April 24, 1912	1 year	40 50
Brineshults John M	Cedarville,	42	43	Oct 5, 1912	1 year	64 50
Burnight George,	Newport	183	11	March 31, 1912	1 year	16 50
Burns Jacob	Dividing Creek	249	Under	April 20, 1912	1 year	10 00
Burt George	Cedarville	25	24	May 27, 1912	1 year	36 00
Cain Ellis L	Port Norris	180	16	March 31, 1912	1 year	24 00
Campbell Archie	Port Norris	110	19	March 24, 1912	1 year	28 50
Campbell Clement I,	Newport	34	30	March 22, 1912	1 year	45 00
Campbell Davton,	Port Norris	90	7	March 14, 1912	1 year	10 50
Campbell Peter	Newport	227	33	April 19, 1912	1 year	49 50
Campbell Philip F	Newport	479	16	March 31, 1912	1 year	24 00
Campbell Stetson,	Port Norris	426	26	April 5, 1912	1 year	39 00
Campbell Walter	Port Norris	240	27	April 2, 1912	1 year	40 50
Campbell Wilson A	Newport,	218	30	April 1, 1912	1 year	45 00
Carey James	Camden	176	29	April 4, 1912	1 year	43 50
Cartright Walter	Camden	73	9	April 27, 1912	1 year	13 50
Chance E W	Mauricetown	325	25	April 28, 1912	1 year	37 50
Chew William V	Port Norris	137	15	April 20, 1912	1 year	22 50
Clark John	Port Norris	262	12	Jan 1, 1912	1 year	18 00
Clark Joshua	Port Norris	384	12	Dec 18, 1912	1 year	10 50
Clark William W	Port Norris	117	7	April 28, 1912	1 year	12 00
Coff James	Port Norris	120	8	April 27, 1912	1 year	27 00
Conshay George R	Port Norris	43	18	April 12, 1912	1 year	13 50
Corson Dudley	Port Norris	168	9	April 11, 1912	1 year	22 50
Covert Charles A	Leesburg	411	15	April 2, 1912	1 year	21 00
Cox Champion H	Leesburg	427	14	April 1, 1912	1 year	27 00
Cox Talburn *	Leesburg	150	18	Sept 22, 1911	1 year	19 50
Cox Raymond	Cedarville	147	13	Sept 27, 1912	4/1/13	19 50
Crossley George B,	Newport	51	10	April 26, 1912	1 year	15 00

DELAWARE BAY AND MAURICE RIVER COVE BOAT

LICENSES—Continued

NAME	ADDRESS	No	Tonn	Date	Term	Amount
Cruise, Benjamin B,	Mauricetown,	191	27	April 1, 1912	1 year	\$40 50
Daniels, David B,	Bridgeton,	197	8	April 24, 1912	1 year	12 00
Davis, Eli,	Fairton,	130	32	April 9, 1912	1 year	48 00
Davis, William,	Camden	472	Under	April 1, 1912	1 year	10 00
Dument, William A,	Cedarville,	32	22	Sept 23, 1912	1 year	33 00
Dillahay, Robert,	Port Norris,	320	16	March 25, 1912	1 year	24 00
Dillahay, Samuel J,	Port Norris,	39	Under	March 31, 1912	1 year	10 00
Dillahay, William,	Port Norris,	238	Under	April 28, 1912	1 year	10 00
Donnelly, Lorenzo G,	Heislerville,	135	24	April 27, 1912	1 year	36 00
Eagen, John,	Camden,	559	48	April 26, 1912	1 year	72 00
Earl Lumms,	Port Norris,	62	21	Nov 22, 1911	1 year	31 50
Earl, Thomas,	Port Norris,	303	14	March 31, 1912	1 year	21 00
Eddy Jervis H	Port Norris,	219	21	April 25, 1912	1 year	31 50
Emerson, Horatio,	Cedarville,	268	11	April 27, 1912	1 year	16 50
Errickson, Samuel W	Leesburg,	49	32	April 2, 1912	1 year	57 00
Evans Edgar,	Milville,	337	32	April 1, 1912	1 year	48 00
Evans Norman,	Milville,	154	20	April 1, 1912	1 year	30 00
Evans Leo,	Leesburg	266	17	April 1, 1912	1 year	25 50
Ferguson, Leo,	Greenwich,	72	45	April 12, 1912	1 year	67 50
Ferns, John,	Leesburg,	19	19	April 13, 1912	1 year	28 50
Fidler, Charles L,	Dennisburg,	392	18	March 30, 1912	1 year	27 00
Fidler, Frank,	Port Norris,	70	14	April 1, 1912	1 year	21 00
Fisher, John,	Camden,	14	31	April 12, 1912	1 year	46 50
Flynn, John,	Newport,	382	Under	April 27, 1912	1 year	10 00
Foster, John,	Delmont,	281	13	April 1, 1912	1 year	19 50
Foster, W Linwood,	Dividing Creek,	128	Under	April 29, 1912	1 year	10 00
Gandy, Ephraim,	Cedarville,	88	28	April 1, 1912	1 year	42 00
Gandy, Miles,	Haleyville,	397	10	April 1, 1912	1 year	15 00
Garrretson Samuel H	Port Norris,	105	34	April 11, 1912	1 year	51 00
Garrison, Charles,	Heislerville,	285	Under	April 1, 1912	1 year	10 00
Garrison, Daniel C,	Dividing Creek,	358	26	March 31, 1912	1 year	39 00
Garrison, Frank L,	Dividing Creek,	235	10	April 1, 1912	1 year	15 00
Garrison, Joseph,	Dividing Creek,	273	8	April 29, 1912	1 year	12 00
Garrison, Walter C,	Dividing Creek,	300	35	Jan 1, 1912	1 year	49 50
Gaskill, Edward,	Port Norris,	161	42	April 15, 1912	1 year	63 00
Gaskill, Elcana,	Port Norris,	439	23	March 30, 1912	1 year	34 50
Gaskill, George S	Port Norris,	458	27	April 1, 1912	1 year	40 50
Gaskill Jesse P,	Port Norris,	406	16	April 1, 1912	1 year	24 00
Gates, Harry A,	Newport,	279	34	April 30, 1912	1 year	51 00
Gates, James,	Newport	341	25	April 6, 1912	1 year	37 50
Goff, Oliver,	Heislerville,	210	20	March 31, 1912	1 year	30 00
Green, Samuel,	Port Norris,	132	9	April 28, 1912	1 year	13 50
Green, Socrates,	Port Norris,	4	10	April 1, 1912	1 year	15 00
Hager, Sherman,	Port Norris,	44	47	April 21, 1912	1 year	70 50
Haley, Clarence	Mauricetown,	269	14	May 1, 1912	1 year	21 00
Hand Harrison,	Port Norris,	229	16	March 31, 1912	1 year	24 00
Hand Leonard C,	Port Norris,	16	35	Dec 16, 1912	1 year	52 50
Hand Smith	Mavs Landing,	257	11	May 16, 1912	1 year	16 50
Hanners, McClellan,	Newport	241	26	March 29, 1912	1 year	39 00
Hannon, Otto	Cedarville,	95	15	April 8, 1912	1 year	22 50
Harrington, Gerald,	Port Norris,	236	26	April 28, 1912	1 year	39 00
Hartzog, William	Dorchester,	63	14	March 31, 1912	1 year	21 00
Henderson, George,	Milville,	246	Under	April 30, 1912	1 year	10 00
Henderson, William,	Leesburg,	8	17	April 1, 1912	1 year	25 50
Hignut, Frank,	Port Norris,	79	31	April 1, 1912	1 year	46 50
Hillman, Charles,	Leesburg,	57	34	April 22, 1912	1 year	51 00
Hinson Arthur,	Mauricetown,	171	32	Sept 5, 1912	1 year	46 00
Hinson, William T,	Mauricetown,	403	15	March 31, 1912	1 year	22 50
Hoffman, Silas	Port Norris,	155	33	April 28, 1912	1 year	49 50
Hoffman William,	Leesburg,	1	36	Dec 9, 1912	1 year	54 00
Hollinger Harrison,	Port Norris,	335	23	May 1, 1912	1 year	34 50
Holmes Edward	Pierces	585	17	April 24, 1912	1 year	25 50
Howell, Forest G,	Milville	293	25	Jan 1, 1912	1 year	37 50
Hunter Aaron S,	Haleyville,	216	10	April 1, 1912	1 year	15 00

DELAWARE BAY AND MAURICE RIVER COVE BOAT
LICENSES—Continued

NAME	ADDRESS	No	Tonn	Date	Term	Amount
Hunter, William C.	Haleyville,	3	15	Sept 1, 1912	1 year	\$22 50
Husted, Quincy L.	Newport,	118	21	Sept 30, 1912	1 year	31 50
Husted, William H.	Newport,	133	18	April 1, 1912	1 year	27 00
Ingersoll, Charles M.	Dividing Creek,	280	13	March 18, 1912	1 year	19 50
Insley, Vaughn L.	Port Norris,	187	18	March 31, 1912	1 year	27 00
Jeffries, Robert,	Port Norris,	328	14	April 27, 1912	1 year	21 00
Jenkins, Samuel,	Dividing Creek,	301	Under	April 26, 1912	1 year	10 00
Jenkins, William,	Dividing Creek,	532	Under	April 30, 1912	1 year	10 00
Johnson, Charles F.	Cedarville,	71	18	Nov 1, 1912	1 year	27 00
Johnson, Charles W.	Newport,	349	14	March 24, 1912	1 year	21 00
Johnson, Frank,	Greenwich,	152	33	April 2, 1912	1 year	49 50
Johnson, George W.	Green Creek,	228	8	April 25, 1912	1 year	12 00
Joslin, Harrison,	Newport,	69	30	April 1, 1912	1 year	45 00
Joslin, Zephaniah,	Newport,	56	9	March 30, 1912	1 year	13 50
Joslin, Zephaniah, Jr.	Newport,	53	Under	April 3, 1912	1 year	10 00
Ladlow, Sylvanus A.	Dividing Creek,	365	8	March 15, 1912	1 year	12 00
Lake, John T.	Port Norris,	165	23	March 29, 1912	1 year	34 50
Lake, Samuel C.	Port Norris,	583	13	April 29, 1912	1 year	19 50
Land, William H.	Port Norris,	166	19	April 25, 1912	1 year	28 50
Leach, William,	Greenwich,	99	35	April 23, 1912	1 year	52 50
Lee Frank,	Leesburg,	258	10	March 31, 1912	1 year	15 00
Lee, Harry M.	Port Norris,	207	24	March 28, 1912	1 year	36 00
Lee, Maurice R.	Port Norris,	223	15	April 21, 1912	1 year	22 50
Lee, Samuel,	Leesburg,	267	12	March 27, 1912	1 year	18 00
Lee, Steelman R.	Leesburg,	221	33	Jan 1, 1912	1 year	49 50
Lee, Uriah S.	Leesburg,	344	14	April 8, 1912	1 year	21 00
Lilliston, Thomas O.	Dorchester,	239	31	April 1, 1912	1 year	46 50
Lodge, James,	Greenwich,	121	27	April 24, 1912	1 year	40 50
Loper, Bernah,	Dividing Creek,	21	35	Jan 2, 1912	1 year	52 50
Lord, Harry C.	Heislerville,	153	25	April 4, 1912	1 year	37 50
Lore Addie,	Newport,	174	40	April 23, 1912	1 year	60 00
Lore, Gilbert,	Newport,	297	14	March 31, 1912	1 year	21 00
Lore, U S Grant,	Cedarville,	18	40	Sept 5, 1912	1 year	60 00
Ludlam, Henry,	Mayville,	385	Under	May 4, 1912	1 year	10 00
McDaniels, Howard,	Leesburg,	354	13	April 1, 1912	1 year	19 50
McDaniels, John,	Port Norris,	588	21	April 29, 1912	1 year	31 50
Meerwald, A J	Dennisville,	204	27	April 30, 1912	1 year	40 50
Mints, Howard F.	Dividing Creek,	109	Under	April 20, 1912	1 year	10 00
Moffett, James,	Greenwich,	45	25	April 1, 1912	1 year	37 50
Moore, Hamilton,	Dividing Creek,	209	33	March 28, 1912	1 year	49 50
Moore, Isaac	Dividing Creek,	233	Under	April 26, 1912	1 year	10 00
Moore, Judson,	Port Norris,	265	8	March 25, 1912	1 year	12 00
Moore, Oscar,	Port Norris,	9	25	April 3, 1912	1 year	37 50
Moore, S Kelsey,	Fairton,	129	23	April 30, 1912	1 year	34 50
Moore, Thomas,	Bivalve,	17	40	March 18, 1912	1 year	60 00
Moore, William,	Cedarville,	175	7	May 9, 1912	1 year	10 50
Morris, James,	Port Norris,	400	16	March 29, 1912	1 year	24 00
Mulford, J Ralph,	Cedarville,	10	21	April 1, 1912	1 year	31 50
Newcomb, Adrian B.	Newport,	377	25	March 29, 1912	1 year	37 50
Newcomb, Americus,	Leesburg,	173	23	March 19, 1912	1 year	34 50
Newcomb, Daniel L.	Port Norris,	20	12	March 25, 1912	1 year	18 00
Newcomb, Edward,	Greenwich,	35	35	March 26, 1912	1 year	52 50
Newcomb, Geo. W C.	Newport,	306	34	Sept 17, 1912	1 year	49 50
Newcomb, Geo. M D.	Newport,	317	30	March 22, 1912	1 year	45 00
Newcomb, Lewis B.	Cedarville,	475	10	March 26, 1912	1 year	15 00
Newcomb, Theophilus,	Port Norris,	97	18	March 25, 1912	1 year	27 00
Newcomb, Wm B.	Newport,	26	43	April 2, 1912	1 year	64 50
Nickelson, Henry C.	Port Norris,	144	41	Feb 17, 1912	1 year	61 50
Nickerson, H E.	Port Norris,	376	11	March 31, 1912	1 year	16 50
Ogden, Columbus,	Cedarville,	116	20	April 4, 1912	1 year	30 00
O'Hara, Harry O.	Port Norris,	89	25	April 1, 1912	1 year	37 50
Orr, John H.	Dividing Creek,	92	27	April 20, 1912	1 year	40 50
Orr, Mark L.	Dividing Creek,	351	10	March 22, 1912	1 year	15 00
Pashley, Charles,	Dividing Creek,	64	15	March 22, 1912	1 year	22 50

DELAWARE BAY AND MAURICE RIVER COVE BOAT
LICENSES—Continued

NAME	ADDRESS	No	Tonn	Date	Term	Amount
Pepper, Jacob,	Dividing Creek,	6	21	April 3, 1912	1 year	\$31 50
Perry, William,	Bivalve,	530	9	April 4, 1912	1 year	13 50
Peterson, Aaron,	Newport,	78	10	April 1, 1912	1 year	15 00
Peterson, Chas S.	Newport,	55	21	April 3, 1912	1 year	31 50
Peterson, George C.	Newport,	255	28	Sept 19, 1912	1 year	42 00
Peterson, James,	Port Norris,	318	21	April 3, 1912	1 year	31 50
Peterson, John C.	Greenwich,	200	40	April 3, 1912	1 year	60 00
Peterson, Wm B.	Port Norris,	316	25	Sept 15, 1912	1 year	37 50
Phillips, George D.	Port Norris,	194	26	April 23, 1912	1 year	39 00
Phillips, William,	Camden,	179	12	April 30, 1912	1 year	18 00
Pickering, George,	Camden,	298	36	March 19, 1912	1 year	54 00
Pierce, John,	Dorchester,	310	15	March 31, 1912	1 year	22 50
Pierce, William,**	Dorchester,	451	8	April 23, 1912	1 year	12 00
Polhamus, Alfred,	Leesburg,	189	Under	May 1, 1912	1 year	10 00
Polhamus, Benage,	Vineland,	131	14	April 29, 1912	1 year	21 00
Polhamus, Joseph G.	Vineland,	203	24	March 28, 1912	1 year	36 00
Polhamus, William,	Leesburg,	93	18	April 30, 1912	1 year	27 00
Rahr, David,	Bricksboro,	388	12	April 7, 1912	1 year	18 00
Randolph, Andrew,	Port Norris,	314	14	April 14, 1912	1 year	21 00
Randolph, George W.	Leesburg,	416	19	March 26, 1912	1 year	28 50
Read, John,	Port Norris,	167	14	April 1, 1912	1 year	21 00
Riggin, Charles M.	Port Norris,	251	18	April 1, 1912	1 year	27 00
Riggin, Edward M.	Port Norris,	394	14	April 2, 1912	1 year	21 00
Riggin, Walter C.	Port Norris,	2	33	April 1, 1912	1 year	49 50
Robbins, Clarence M.	Port Norris,	60	33	April 25, 1912	1 year	49 50
Robbins, David Jr.	Port Norris,	237	23	April 1, 1912	1 year	34 50
Robbins, David,	Port Norris,	172	35	March 28, 1912	1 year	52 50
Robbins, Edward C.	Haleyville,	125	16	April 7, 1912	1 year	24 00
Robbins, George,	Port Norris,	50	26	April 1, 1912	1 year	39 00
Robbins, Levi,	Port Norris,	345	18	April 8, 1912	1 year	27 00
Robbinson, Silas,	Dividing Creek,	58	13	March 31, 1912	1 year	19 50
Rocks, William,	Camden,	319	27	March 31, 1912	1 year	40 50
Rowley, L Bates,	Port Norris,	202	10	Ma ch 29, 1912	1 year	15 00
Sharp, Halleck,	Leesburg,	47	16	April 1, 1912	1 year	24 00
Sharp, John T.	Port Norris,	315	21	March 22, 1912	1 year	31 50
Sharp, John W.	Leesburg,	418	13	March 26, 1912	1 year	19 50
Sharp, Walter L.	Port Norris,	164	18	April 12, 1912	1 year	27 00
Sharp, Zadok C.	Leesburg,	181	45	Sept 24, 1912	4/30/13	67 50
Sharp, Zadok R.	Leesburg,	107	35	April 5, 1912	1 year	52 50
Sharpless, John P.	Millville,	468	21	March 30, 1912	1 year	31 50
Sharpless, Maurice,	Leesburg,	141	10	Dec 8, 1912	1 year	15 00
Sharpless, Maurice,	Leesburg,	139	10	April 13, 1912	1 year	15 00
Shaw, George,	Dorchester,	205	21	Sept 1, 1912	1 year	31 50
Shaw, Howard,	Leesburg,	143	21	April 17, 1912	1 year	31 50
Sheppard, Lewis F.	Cedarville,	23	32	Nov 13, 1912	1 year	48 00
Sheppard, S Ware,	Newport,	86	43	Oct 22, 1912	1 year	64 50
Shropshire, Edward,	Haleyville,	122	32	April 11, 1912	1 year	48 00
Shull, Howard,	Dividing Creek,	346	11	May 1, 1912	1 year	16 50
Shull, Roscoe,	Port Norris,	272	16	March 27, 1912	1 year	24 00
Simpkins, Thomas,	Cedarville,	127	14	March 27, 1912	1 year	21 00
Smith, Asa C.	Leesburg,	149	13	April 15, 1912	1 year	19 50
Smith, Henry C.	Newport,	215	33	March 22, 1912	1 year	49 50
Smith, Seth S.	Leesburg,	302	14	March 31, 1912	1 year	21 00
Sockwell, Horatio, Jr.	Port Norris,	199	24	April 1, 1912	1 year	36 00
Spencer, Elmer,	Newport,	290	Under	March 28, 1912	1 year	10 00
Spiker, George,***	Leesburg,	38	22	April 29, 1912	5 mo & 24 days	33 00
Spiker, George,	Leesburg,	38	22	Oct 23, 1912	1 year	33 00
Squarewood, Charles,	Buckshutem,	278	11	April 1, 1912	1 year	16 50
Stites, Gilbert,	Dragston,	214	12	April 1, 1912	1 year	18 00
Stites, Nathan,	Dorchester,	186	42	April 20, 1912	1 year	63 00
Sutter, Harry,	Port Norris,	281	10	April 30, 1912	1 year	15 00
Sutter, John,	Port Norris,	146	13	April 3, 1912	1 year	19 50
Sutter, William,	Port Norris,	330	15	April 30, 1912	1 year	22 50

DELAWARE BAY AND MAURICE RIVER COVE BOAT
 LICENSES—Continued

NAME	ADDRESS	No	Tonn	Date	Term	Amount
Sutton, Clarence M.	Bridgeton,	30	25	March 19, 1912	1 year	\$37 50
Sutton, Ernest H.	Bridgeton,	283	25	March 26, 1912	1 year	37 50
Sutton, Harry W.	Leesburg,	162	14	March 31, 1912	1 year	21 00
Swank, David,	Bivalve,	83	Under	April 10, 1912	1 year	10 00
Swing, Leonard R.	Furton,	15		April 18, 1912	1 year	36 00
Tarburton, Elmer,	Greenwich,	29	41	April 20, 1912	1 year	61 50
Taylor, D Osborne,	Port Norris,	264	Under	April 29, 1912	1 year	10 00
Terry, George N.	Dividing Creek,	76	22	Sept 6, 1912	1 year	33 00
Terry, William F.	Port Norris,	485	19	April 16, 1912	1 year	28 50
Townsend, Stacy,	Leesburg,	65	11	April 28, 1912	1 year	16 50
Tozour, Charles,	Delmont,	230	12	March 28, 1912	1 year	18 00
Turner, Charles,	Newport,	134	26	March 22, 1912	1 year	39 00
Turpin, Howard,	Haleyville,	391	12	March 28, 1912	1 year	18 00
Tweed, John	Greenwich,	94	45	March 25, 1912	1 year	67 50
Vail, Jeremiah,	Dividing Creek,	193	Under	April 23, 1912	1 year	10 00
Vail, William A.	Bridgeton,	224	27	April 21, 1912	1 year	40 50
Vail, William A., Jr.	Dividing Creek,	33	28	Oct 25, 1912	1 year	42 00
Van Vhet, William,	Newport,	436	10	April 1, 1912	1 year	15 00
Veal, William,	Dividing Creek,	12	21	Oct 16, 1912	1 year	31 50
Wallen, David,	Fairton,	340	20	March 30, 1912	1 year	30 00
Ward, John W.	Greenwich,	36	24	March 30, 1912	1 year	36 00
Warren, Harry,	Bridgeton,	100	43	Nov 21, 1912	1 year	64 50
Welden, William H.	Newport,	211	21	April 1, 1912	1 year	31 50
Westcott, George H.	Fairton,	145	18	April 1, 1912	1 year	27 00
Whilden, John H.	Fairton,	378	11	April 12, 1912	1 year	16 50
Whilden, Somers H.	Mauricetown,	40	31	March 28, 1912	1 year	46 50
Williams, Whitefield,	Heislerville,	48	17	April 29, 1912	1 year	25 50
Willng, Marian,	Port Norris,	114	10	April 1, 1912	1 year	15 00
Windfohr, Arthur,	Bivalve,	112	13	April 28, 1912	1 year	19 50

*Paid Dec 6, 1911

**Fee paid, but boat not used and fee returned

***Expires Oct 23, 1912

Raritan Bay Boat Licenses.

NAME	ADDRESS	No	Tonn	Date	Term	Amount
Hammer, James L.	Keyport,	6-7-8	Tong	July 18, 1912	1 year	\$15 00
Mason, John W.	Keyport,	20	Tong	July 18, 1912	1 year	5 00
Mason, Lorenzo G.	Keyport,	22	Tong	July 18, 1912	1 year	5 00
Maurer, William,	Keyport,	32-33-34	Tong	July 18, 1912	1 year	15 00
Maurer, William,	Keyport,	23	14	July 18, 1912	1 year	21 00
Wooley, William E.	Keyport,	41	18	July 18, 1912	1 year	27 00
Wooley, William E.	Keyport,	37-38-39-40	Tong	July 18, 1912	1 year	20 00

Oyster Bed Leases—Ocean County.

NAME	ADDRESS	No	Acreage	Amount	Date	Term
Abbott, John,	Port Republic,	84	11	\$5 50	Dec 31, 1911	1 year
Abbott, William,	Manahawkin,	707-745-750-751	20	11 00	Aug 1, 1912	1 year
Adams, Elmer,	Port Republic,	43	11	5 50	Dec 31, 1911	1 year
Adams, John,	New Gretna,	105	5	2 50	Dec 31, 1911	1 year
Allen, Arnold,	New Gretna,	134	4	2 00	Dec 31, 1911	1 year
Allen Charles A.,	New Gretna,	115-134	6	3 00	Dec 31, 1911	1 year
Allen, Charles H.,	New Gretna,	74 114-161-116½	15	7 50	Dec 31, 1911	1 year
Allen, Chester,	New Gretna,	143 144	4	2 00	Dec 31, 1911	1 year
Allen, Edward K.,	New Gretna,	67 68	4	2 75	Dec 31, 1911	1 year
Allen & Grey,	New Gretna,	11 12 72	7	3 50	Dec 31, 1911	1 year
Allen, John,	New Gretna,	33 34 69	6	3 00	Dec 31, 1911	1 year
Allen, Jos B, Sr.,	Tuckerton,	8 79	12	6 00	Dec 31, 1911	1 year
Allen, Jos B, Sr.,	Tuckerton,	8½-29½	2	3 00	Aug 1, 1912	1 year
Allen, Jos B, Jr.,	Philadelphia,	30	2	1 00	Dec 31, 1911	1 year
Allen, Samuel B.,	Tuckerton,	148	3	1 50	Aug 1, 1912	1 year
Allen, Thomas A.,	New Gretna,	27-37 81-90	9	4 50	Dec 31, 1911	1 year
Allen, Thomas J.,	Tuckerton,	13 14	5	2 50	Dec 31, 1911	1 year
Allen, Uriah S.,	New Gretna,	39	2	1 00	Dec 31, 1911	1 year
Allen, Walter S.,	Tuckerton,	76-X	4	2 00	Dec 31, 1911	1 year
Allen, W S & S B,	Tuckerton,	9-75-137-9½ 75½-475	18	9 00	Aug 1, 1912	1 year
Bailey, Samuel,	Toms River,	16	6	3 00	Dec 31, 1911	1 year
Bartlett, C P,	West Creek,	76	4	2 00	Dec 31, 1911	1 year
Bates, Henry,	Port Republic,	103	26	13 00	Dec 31, 1911	1 year
Bennett Josiah,	Tuckerton,	426	2	1 00	Dec 31, 1911	1 year
Berry, E M,	Tuckerton,	405 406	4	2 00	Aug 1, 1912	1 year
Birdsall, Jesse,	Barnegat,	20	2	1 00	Aug 1, 1912	1 year
Birdsall, John,	Barnegat,	X	2	1 00	Aug 1, 1912	1 year
Bogan, Annie E,	New Gretna,	120	5	2 75	Dec 31, 1911	1 year
Bogan, Richard S.,	Atlantic City,	113 122	10	5 00	Dec 31, 1911	1 year
Bowen, Por & Son,	Tuckerton,	419	3	1 50	Aug 1, 1912	1 year
Bowker, William,	Barnegat,	12	2	1 50	Aug 1, 1912	1 year
Brinley, Alex	Lanoka,	27	8	4 00	Aug 1, 1912	1 year
Brown, Ezra P.,	West Creek,	90 165-167-197 285 816	18	9 00	Dec 31, 1911	1 year
Brown, E P & H	Rulon,	350-X-X	15	7 50	Aug 1, 1912	1 year
Brown, James D.,	Tuckerton,	308	6	3 00	Aug 1, 1912	1 year
Brown, John W.,	Parkertown,	X	4	2 00	Aug 1, 1912	1 year
Brown, Markley,	Parkertown,	843	3	1 50	Aug 1, 1912	1 year
Brown, Markley,	Parkertown,	827-919	8	4 00	Aug 1, 1912	1 year
Brown, Walter P.,	Tuckerton,	334½	4	2 00	May 1, 1912	1 year
Brown, W P & H	Regan,	420	3	1 50	Dec 31, 1911	1 year
Burton Bros,	Tuckerton,	454 481-X	17	8 50	Aug 1, 1912	1 year
Cavleer, Fulmore,	Port Republic,	42	2	1 00	Dec 31, 1911	1 year
Cavleer, Gilbert,	Port Republic,	121	3	1 50	Dec 31, 1911	1 year
Chandler Alex,	Barnegat,	7	2	1 00	Aug 1, 1912	1 year
Chew, Benj W.,	New Gretna,	3-4-5 117	8	4 00	Dec 31, 1911	1 year
Chew, Wm H.,	New Gretna,	1	3	1 50	Aug 1, 1912	1 year
Cobb, Thomas,	West Creek,	160	3	1 50	Dec 31, 1911	1 year
Cobb, Thomas,	Cedar Run,	929	4	2 00	Aug 1, 1912	1 year
Conklin, Amariah,	Cedar Run,	34½	4	2 00	Dec 31, 1911	1 year
Conklin, Calvin,	Cedar Run,	12	2	1 00	Aug 1, 1912	1 year
Conklin, Lewis A.,	Cedar Run,	46 23 18½	11	5 50	Dec 31, 1911	1 year
Conklin, Nehemiah,	Cedar Run,	20	6	3 00	Dec 31, 1911	1 year
Conklin, Samuel B.,	Cedar Run,	22 22½	10	5 00	Dec 31, 1911	1 year
Cornelius, John,	Bayville,	X	3	3 00	Apr 1, 1912	2 years
Cowperthwaite, H.,	West Creek,	189-190-246	8	4 00	Dec 31, 1911	1 year
Cowperthwaite, J.,	Tuckerton	X	2	1 00	Aug 1, 1912	1 year
Cox, Charles,	Barnegat,	53	2	4 00	Aug 1, 1912	4 years
Cox, C H & N B,	West Creek,	105 129	4	2 00	Dec 31, 1911	1 year
Cox, George M.,	West Creek,	99 181-282	8	4 00	Dec 31, 1911	1 year

OYSTER BED LEASES—OCEAN COUNTY—Continued

NAME	ADDRESS	No	Acreage	Amount	Date	Term
Cox, Harry & Wm,	Tuckerton,	X 470 854-427-467	20	\$10 00	Aug 1, 1912	1 year
Cox, James,	Barnegat,	30	2	1 00	Aug 1, 1912	1 year
Cox, J O & Jonathan,	West Creek,	142	4	2 00	Dec 31, 1911	1 year
Cox, William E.,	West Creek,	79-128-166-176 178 812	17	8 50	Dec 31, 1911	1 year
Cranmer, Albert S.,	West Creek,	102	2	2 00	Dec 31, 1911	1 year
Cranmer, Amariah,	Cedar Run,	25	3	3 00	Dec 31, 1911	2 years
Cranmer, Amariah & Levi,	Cedar Run,	2	2	2 00	Dec 31, 1911	2 years
Cranmer, Arnold,	New Gretna,	25 78 71 139	9	4 50	Dec 31, 1911	1 year
Cranmer, Arnold,	New Gretna,	25½ 80½ 86½-129-174 331-336½ 474	46	23 00	Aug 1, 1912	1 year
Cranmer, Arnold & Errol,	New Gretna,	69½	2	1 00	Dec 31, 1911	1 year
Cranmer A G,	Cedar Run,	27 862	6	3 00	Dec 31, 1911	1 year
Cranmer, Benj R.,	Mayetta,	X	2	1 00	Aug 1, 1911	1 year
Cranmer Caleb S & Son,	New Gretna,	80 94 172	19	9 50	Dec 31, 1911	1 year
Cranmer, Daniel D.,	New Gretna,	133 138	13	6 50	Dec 31, 1911	1 year
Cranmer, F J, H O & I J,	Cedar Run,	1003	14	7 00	Feb 1, 1911	1 year
Cranmer, Geo A.,	Cedar Run,	16-32	5	2 50	Dec 31, 1911	1 year
Cranmer, Harvey G,	Cedar Run,	870	1	1 00	Aug 1, 1912	1 year
Cranmer, Howard,	Mayetta,	8	2	1 00	Aug 1, 1912	1 year
Cranmer, Irving J.,	Cedar Run,	866	1	1 50	Aug 1, 1912	1 year
Cranmer, Irving J.,	Cedar Run,	44	2	1 00	Dec 31, 1911	1 year
Cranmer, J A.,	Cedar Run,	3 31	2	2 50	Dec 31, 1911	1 year
Cranmer, James A.,	Staffordville,	208 221	13	6 50	Dec 31, 1911	1 year
Cranmer, James H.,	Manahawkin,	3	6	3 00	Aug 1, 1912	1 year
Cranmer, Jos T.,	Manahawkin,	709 727 733	9	4 50	Aug 1, 1912	1 year
Cranmer, Jos W.,	West Creek,	107 813 914	12	6 00	Dec 31, 1911	1 year
Cranmer, Levi,	Cedar Run,	33	4	2 00	Dec 31, 1911	1 year
Cranmer Lewis A.,	Cedar Run,	X 29	5	2 50	Dec 31, 1911	1 year
Cranmer, M L,	Mayetta,	X X-881	8	4 00	Aug 1, 1912	1 year
Cranmer, M L,	Mayetta,	41	12	6 00	Mar 1, 1912	1 year
Cranmer, M L,	Mayetta,	9 51 40½-876 878	36	18 00	Dec 31, 1911	1 year
Cranmer, Noah,	Manahawkin,	717-746	5	2 50	Aug 1, 1912	1 year
Cranmer, Oliver,	West Creek,	42 39½ 873	11	5 50	Dec 31, 1911	1 year
Cranmer O T & Cox, N B,	West Creek,	186	4	2 00	Dec 31, 1911	1 year
Cranmer, Oscar C.,	West Creek,	139 151	6	3 00	Dec 31, 1911	1 year
Cranmer, P H.,	Staffordville,	1	3	1 50	Aug 1, 1912	1 year
Cranmer, Rufus,	Manahawkin,	X 718-757	13	6 50	Aug 1, 1912	1 year
Cranmer, Samuel,	West Creek,	26	6	3 00	Dec 31, 1911	1 year
Cranmer, Samuel,	West Creek,	871	2	1 00	Aug 1, 1912	1 year
Cranmer Sam R.,	West Creek,	60	2	1 00	Dec 31, 1911	1 year
Cranmer, Samuel & Jos,	West Creek,	199	6	3 00	Dec 31, 1911	1 year
Cranmer, T Frank,	Cedar Run,	869	2	1 00	Aug 1, 1912	1 year
Cranmer T Frank & H G,	Cedar Run,	47	10	5 00	Aug 1, 1912	1 year
Cranmer, Thomas,	Cedar Run,	24	8	4 00	Dec 31, 1911	1 year
Cranmer Thos H,	Manahawkin,	X 465 726	24	12 00	Apr 1, 1912	1 year
Cranmer Thos H,	Manahawkin,	X-X-704-719 700 723 725-734 738 740	38	19 00	Aug 1, 1912	1 year
Cranmer Walter H,	Cedar Run,	10½-11	5	2 50	Dec 31, 1911	1 year
Cranmer, W E.,	Mayetta,	X	2	1 00	Aug 1, 1912	1 year
Cummings, Chas.,	Parkertown,	912	5	2 50	Aug 1, 1912	1 year
Cummings, Eugene,	Parkertown,	849 903	6	3 00	Aug 1, 1912	1 year
Cummings, Jos,	Parkertown,	800 801	15	7 50	Aug 1, 1912	1 year
Duhy, J W.,	Port Republic	X 23 28 29	16	8 00	Dec 31, 1911	1 year

OYSTER BED LEASES—OCEAN COUNTY—Continued

NAME	ADDRESS	No	Acceige	Amount	Date	Term
Driscoll, Enoch,	Tuckerton,	154	2	\$1 00	Aug 1, 1912	1 year
Driscoll, Harry,	Tuckerton,	404	2	1 00	Aug 1, 1912	1 year
Driscoll, Houston,	Tuckerton,	446	6	3 00	Aug 1, 1912	1 year
Driscoll, Ruben,	Tuckerton,	402 447	5	2 50	Aug 1, 1912	1 year
Driscoll Wm F.,	Tuckerton,	472	2	1 00	Aug 1, 1912	1 year
Eyres, Alfonso,	Barnegat,	X	2	1 00	Aug 1, 1912	1 year
Estlow, Sidoc,	Barnegat,	5 6	12	6 00	Aug 1, 1912	1 year
Everham, Benj.,	Toms River,	35	11	5 50	Dec 31, 1911	1 year
Falkenburg Bros.,	Tuckerton,	498½	5	2 50	Dec 31, 1911	1 year
Fennimore, Allen,	West Creek,	111-138	5	2 50	Aug 1, 1912	1 year
Fennimore, Allen,	West Creek,	53 54 200-65-88 502	21	10 50	Dec 31, 1911	1 year
Fennimore A & Cranmer O.,	West Creek,	120	2	1 00	Aug 1, 1912	1 year
Fiske, Horace & Lewis	Tuckerton,	126 385½	9	4 50	Aug 1, 1912	1 year
Frazier, Frank V.,	Tuckerton,	167	2	1 00	Dec 31, 1911	1 year
French, Lewis M.,	Atlantic City	127	7	3 50	Dec 31, 1911	1 year
Gale, Harvey E.,	Tuckerton	311 333-483	17	8 50	Aug 1, 1912	1 year
Gule William H.,	Tuckerton,	102 153	5	2 50	Dec 31, 1911	1 year
Garrison, Eugene,	Tuckerton,	332-X	8	4 00	Aug 1, 1912	1 year
Gaskill, Jesse,	New Gretna,	131	2	1 00	Dec 31, 1911	1 year
Gaskill, T J.,	New Gretna,	56-64-85	10	5 00	Dec 31, 1911	1 year
Gaskill, Wm F.,	Tuckerton,	346	6	3 00	Aug 1, 1912	1 year
Grant, Herschell,	Lanoka,	31	5	2 50	Apr 1, 1912	1 year
Grant, Jesse,	Lanoka,	28	10	5 00	Dec 31, 1911	1 year
Grant, Jesse,	Bayville,	20	13	6 50	Aug 1, 1912	1 year
Grant, Nelson	Lanoka,	33	6	3 00	Aug 1, 1912	1 year
Grant, S T,	Lanoka,	30	21	10 50	Aug 1, 1912	1 year
Grant, William H. Mis,	Lanoka,	1	11	5 50	May 1, 1912	1 year
Grant, Wm H.,	Lanoka,	2	11	5 50	May 1, 1912	1 year
Grey, John A.,	New Gretna,	17-130	5	2 50	Dec 31, 1911	1 year
Haywood, Frank,	Manahawkin,	1 2 708	12	6 00	Aug 1, 1912	1 year
Haywood, Jos P.,	West Creek,	83 292 814-	23	11 50	Aug 1, 1912	1 year
Haywood Jos P.,	West Creek,	837	10	5 00	Dec 31, 1911	1 year
Hendley Paiker C.,	Tuckerton,	173 179 204-414	6	3 00	Aug 1, 1912	1 year
Hewitt, Jesse	Port Republic,	78 452	2	1 00	Dec 31, 1911	1 year
Hewitt, Nelson,	Port Republic,	X	6	3 00	Aug 1, 1912	1 year
Hickman Wm.,	Port Republic,	44 184	6	3 00	Dec 31, 1911	1 year
Higbee, Samuel,	Port Republic,	X X	6	3 00	Dec 31, 1911	1 year
Higbee, Somers T.,	Leeds Point,	45	10	5 00	Dec 31, 1911	1 year
Higgins, Theodore,	Beverly	176	3	1 50	Aug 1, 1912	1 year
Hollingsworth, Geo W,	Barnegat,	476½	2	1 00		
Holmes, Edward I.	Foiked River,	2-7 10-22-27-36 41 46	72	36 00	Aug 1, 1912	1 year
Homan, Bertha,	West Creek,	X-X	8	4 00	Apr 1, 1912	1 year
Homan, B Frank,	Parkertown,	64	2	1 00	Aug 1, 1912	1 year
Homan, Frank,	West Creek,	X-822	7	3 50	Aug 1, 1912	1 year
Homan, F & Ruter, J W.,	West Creek,	58	2	1 00	Dec 31, 1911	1 year
Horner, Chas A.,	Parkertown,	X-821	16	8 00	Aug 1, 1912	1 year
Horner, Ephraim,	Manahawkin,	216½-851	5	2 50	Aug 1, 1912	1 year
Horner, Isaac	Manahawkin,	706 706½	12	6 00	Aug 1, 1912	1 year
Hunterly, Charles,	Port Republic,	801½-828 931	17	8 50	Aug 1, 1912	1 year
Inman, Clinton,	Barnegat,	1	5	2 50	Dec 31, 1911	1 year
Inman, Lewis,	Manahawkin,	28	4	2 00	Aug 1, 1912	1 year
Inman, Stephen,	Barnegat,	743	2	1 00	Aug 1, 1912	1 year
Ireland, Mithon,	Tuckerton,	11-38	4	2 00	Aug 1, 1912	1 year
Jeffrey, Howard,	Lanoka,	X	10	5 00	Aug 1, 1912	1 year
Johnson Sarah,	West Creek,	1	6	3 00	Aug 1, 1912	1 year
Jones, A H.,	West Creek,	193	8	4 00	Dec 31, 1911	1 year
Jones, A H.,	Tuckerton,	91-124-126-909	8	4 00	Dec 31, 1911	1 year

OYSTER BED LEASES—OCEAN COUNTY—Continued

NAME	ADDRESS	No	Acceige	Amount	Date	Term
Jones, A H.,	West Creek,	823-831	19	\$9 50	Aug 1, 1912	1 year
Jones, A J.,	West Creek,	89-122	4	2 00	Dec 31, 1911	1 year
Jones, J F.,	West Creek,	127-284-845	13	6 50	Dec 31, 1911	1 year
Jones, Jos, H.,	Tuckerton,	343-448	5	2 50	Aug 1, 1912	1 year
Jones, Sam A.,	Tuckerton,	398	3	1 50	Aug 31, 1911	1 year
Jones, Sam A.,	Tuckerton,	338-339-386	11	5 50	Aug 1, 1912	1 year
Kelly, C D,	West Creek,	134-170	4	2 00	Dec 31, 1911	1 year
Kelly, C D, & Schoch, Geo Y.,	West Creek,	163-463-X-137-143	46	23 00	Dec 31, 1911	1 year
Kelly, Eugene,	West Creek,	103-206	6	3 00	Dec 31, 1911	1 year
Kelly, Hugh F.,	West Creek,	212-500-820-87-132-188	14	7 00	Dec 31, 1911	1 year
Kelly, James E	West Creek,	86 93 289	10	5 00	Dec 31, 1911	1 year
Kelly, J Henry,	West Creek,	70	2	1 00	Dec 31, 1911	1 year
Kelly, James W.,	Tuckerton,	498½	6	3 00	Aug 1, 1912	1 year
Kelly, James W.,	Tuckerton,	436	6	3 00	Aug 1, 1912	1 year
Kelly, Lizzie, Mrs.,	West Creek,	241	2	1 00	Dec 31, 1911	1 year
Kelly, Mannas,	West Creek,	69	3	1 50	Dec 31, 1911	1 year
Kelly, Myles,	West Creek,	140	2	1 00	Dec 31, 1911	1 year
Kelly, Myles,	West Creek,	135	2	1 00	Dec 31, 1911	1 year
Kelly, N E.,	West Creek,	72 98-133 164-172	17	8 50	Dec 31, 1911	1 year
Kelly, N E.,	West Creek,	826 830-847-848	20	10 00	Aug 1, 1912	1 year
Kelly, Presgrove,	West Creek,	850	2	1 00	Aug 1, 1912	1 year
Kelly, T C.,	West Creek,	210 240 243	21	10 50	Dec 31, 1911	1 year
Kelly, T C.,	West Creek,	833-835-852-902-943	53	26 50	Aug 1, 1912	1 year
Kelly, T C & Son,	West Creek,	92-100-104-174-177-207-237 242 283	34	17 00	Dec 31, 1911	1 year
King, Elmer,	Beach Haven,	922	2	1 00	Aug 1, 1912	1 year
King, John	Barnegat,	4	3	1 50	Aug 1, 1912	1 year
Lamson, Joel W.,	Cedar Run,	5 28	5	2 50	Dec 31, 1911	1 year
Lamson, Jos A.,	Cedar Run,	30	5	2 50	Dec 31, 1911	1 year
Leeds, Rusley,	Leeds Point,	40	3	1 50	Dec 31, 1911	1 year
Leigh, A J., Mrs.,	West Creek,	202	2	1 00	Dec 31, 1911	1 year
Leigh, A J., Mrs.,	Manahawkin,	129½	2	1 00	Aug 1, 1912	1 year
Letts, Nathan,	Manahawkin,	729-730 731-748-749 756	28	14 00	Aug 1, 1912	1 year
Letts Pruden,	Manahawkin,	744 754 714-732	11	5 50	Aug 1, 1912	1 year
Lippincott, Frank,	Tuckerton,	480	2	1 00	Aug 1, 1912	1 year
Loveland, Benj.,	New Gretna,	183	2	1 00	Aug 1, 1912	1 year
Loveland, Benj.,	New Gretna,	52	5	2 50	Dec 31, 1911	1 year
Loveland, Jesse A.,	New Gretna,	120	5	2 50	Dec 31, 1911	1 year
Loveland, Jesse A.,	New Gretna,	141	6	3 00	Aug 1, 1912	1 year
Loveland, Jesse I.,	New Gretna,	92	3	1 50	Aug 1, 1912	1 year
Loveland, Towers,	New Gretna,	170	3	1 50	Aug 1, 1912	1 year
Luker, Stephen,	Tuckerton,	348	3	1 50	Aug 1, 1912	1 year
Marshall Solomon	Tuckerton,	429	10	5 00	Aug 1, 1912	1 year
Martin, Frank,	Manahawkin,	739 X	12	6 00	Aug 1, 1912	1 year
Martin, Humphrey,	Manahawkin,	711	3	1 50	Dec 31, 1911	1 year
Mathis, Alvin,	New Gretna,	73-82	4	2 00	Aug 1, 1912	1 year
Mathis, Caleb A.,	New Gretna,	165	5	2 50	Dec 31, 1911	1 year
Mathis, Caleb A.,	New Gretna,	180	5	2 50	Aug 1, 1912	1 year
Mathis, D E.,	New Gretna,	162	5	2 50	Dec 31, 1911	1 year
Mathis, D E.,	New Gretna,	91 34½	6	3 00	Aug 1, 1912	1 year
Mathis, Frank,	Leeds Point,	10-111-112	24	12 00	Dec 31, 1911	1 year
Mathis, Frank,	Leeds Point,	10½-111½	8	4 00	Aug 1, 1912	1 year
Mathis, Harry V.,	New Gretna,	6-58	9	4 50	Dec 31, 1911	1 year
Mathis, H C & Curtis,	New Gretna,	55	7	3 50	Dec 31, 1911	1 year
Mathis, John A.,	Tuckerton,	X 453	7	3 50	Aug 1, 1912	1 year
Mathis, John K.,	New Gretna,	X	2	1 00	Dec 31, 1911	1 year

OYSTER BED LEASES—OCEAN COUNTY—Continued

NAME	ADDRESS	No	Acreage	Amount	Date	Term
Mathis, Pitman E,	Atlantic City,	19	3	\$3 00	Dec 31, 1911	1 year
Mathis, Wm H,	New Gretna,	15-70	7	3 50	Dec 31 1911	1 year
Maxwell, George & Jos H,	Wading River,	182 54	6	3 00	Aug 1, 1912	1 year
McAnney, John,	New Gretna,	32-132	4	2 00	Dec 31, 1911	1 year
McDaniels, Wm R,	Tuckerton,	323½-486	8	4 00	Aug 1, 1912	1 year
Miller, Ensign,	West Creek,	80	2	1 00	Dec 31, 1911	1 year
Mills, John,	Barnegat,	62	6	3 00	Aug 1, 1912	1 year
Mott, Eldridge,	Tuckerton,	108	2	1 00	Aug 1, 1912	1 year
Mott, Joel,	Tuckerton,	108 109-110-123	9	4 50	Dec 31, 1911	1 year
Parker, Adelbert,	Parkertown,	826½-921	8	4 00	Aug 1, 1912	1 year
Parker, Chas H,	Parkertown,	466	2	1 00	Aug 1, 1912	1 year
Parker, Charles,	Parkertown,	387-493	10	5 00	Dec 31 1911	1 year
Parker, Hansell,	Parkertown,	916-227-841	12	6 00	Aug 1, 1912	1 year
Parker, Henry,	Parkertown,	X 841	6	3 00	Aug 1, 1912	1 year
Parker, Horrie,	Parkertown,	925	5	2 50	Aug 1, 1912	1 year
Parker, Jay C,	Parkertown,	X	3	1 50	June 1, 1912	1 year
Parker, John N,	Parkertown,	924	2	1 00	Aug 1, 1912	1 year
Parker, J W, & Bros,	Tuckerton,	X-X-X-318-321-325-327-328 329-428-492	70	35 00	Aug 1, 1912	1 year
Parker, J W, & Son,	Tuckerton,	803	6	3 00	Aug 1, 1912	1 year
Parker Norwood,	Parkertown,	913 927-928-X 811-911	24	12 00	Aug 1, 1912	1 year
Parker, Rudolph,	Parkertown,	804	3	1 50	Aug 1, 1912	1 year
Parker, Sam B,	Tuckerton,	X 341-395-396	26	13 00	Aug 1, 1912	1 year
Parker, Wm A,	Parkertown,	X	3	1 50	Aug 1, 1912	1 year
Paterson, C C,	Manahawkin,	702½	2	1 00	Aug 1, 1912	1 year
Paterson & Cobb,	Manahawkin,	37-45	8	4 00	Aug 1, 1912	1 year
Perrine, Ella,	Barnegat,	28½	2	1 00	Aug 1, 1912	1 year
Perrine, Samuel,	Barnegat,	X 31-32	6	3 00	Aug 1, 1912	1 year
Peterson, Wm,	Barnegat,	40	2	1 00	Aug 1, 1912	1 year
Pharo, Aaron W,	West Creek,	73-234	5	2 50	Aug 1, 1912	1 year
Pharo, Frank,	West Creek,	824	3	1 00	Aug 1, 1912	1 year
Pharo, Frank,	West Creek,	81 255	6	3 00	Aug 1, 1912	1 year
Pharo, J J,	Tuckerton,	455	8	4 00	Aug 1, 1912	1 year
Pharo, Watson L,	West Creek,	196 256 819	9	4 50	Aug 1, 1912	1 year
Philips Randolph,	Forked River,	X	10	5 00	Aug 1, 1912	1 year
Pitt, W W, Mrs,	Barnegat,	109 168	4	2 00	Aug 1, 1912	1 year
Potter, Edward F,	West Creek,	216	5	2 50	Aug 1, 1912	1 year
Price, Abram,	Parkertown,	815	11	5 50	Aug 1, 1912	1 year
Price, Clarence,	Parkertown,	809	4	2 00	Aug 1, 1912	1 year
Price, Mason,	Parkertown,	802	5	2 50	Aug 1, 1912	1 year
Price, Merritt,	Parkertown,	808	3	1 50	Aug 1, 1912	1 year
Pullen, Brazilla,	Tuckerton,	418 441-443-478	9	4 50	Apr 1, 1912	1 year
Pullen Brazilla,	Tuckerton,	X 340 417-479	17	8 50	Aug 1, 1912	1 year
Quinn, George,	Tuckerton,	X 393	5	2 50	Aug 1, 1912	1 year
Rider, A J & Sons,	Tuckerton,	X-X-412-422-424-451-465	25	12 50	Aug 1, 1912	1 year
Rider, Arthur T,	Beach Haven,	342	9	4 50	Aug 1, 1912	1 year
Ridgway, Edw B,	Barnegat,	45 20	5	2 50	Aug 1, 1912	1 year
Ridgway Oscar,	Barnegat,	1 3-13	11	5 50	Aug 1, 1912	1 year
Ridgway, Wm,	Barnegat,	8	2	1 00	Aug 1, 1912	1 year
Riley, Benjamin,	Tuckerton,	421	2	1 00	Aug 1, 1912	1 year
Ripley, John,	West Creek,	110 900	12	6 00	Aug 1, 1912	1 year
Robbins, Charles,	New Gretna,	35 36 65-86	12	6 00	Aug 1, 1912	1 year
Robbins L D,	New Gretna,	87 89 93-118	6	3 00	Aug 1, 1912	1 year

OYSTER BED LEASES—OCEAN COUNTY—Continued

NAME	ADDRESS	No	Acreage	Amount	Date	Term
Rossell, Lewis G,	Tuckerton	X	2	\$1 00	Aug 1, 1912	1 year
Rulon, Harper,	West Creek,	75-159 201	7	3 50	Aug 1, 1912	1 year
Russell, Clarence,	Barnegat,	23	2	1 00	Aug 1, 1912	1 year
Russell, Holmes,	Barnegat,	34-37	4	2 00	Aug 1, 1912	1 year
Rutter & Haywood,	West Creek,	63 68 97 244	12	6 00	Dec 31, 1911	1 year
Rutter, John W,	West Creek,	841-59-232	8	4 00	Aug 1, 1912	1 year
Rutter, J W, & Kelley, J S,	West Creek,	169	3	1 50	Aug 1, 1912	1 year
Rutter, R F,	West Creek,	175 183-191-501-203	22	11 00	Dec 31, 1911	1 year
Rutter, T H,	Barnegat,	44	2	1 00	Dec 31, 1911	1 year
Salmons, Daniel,	West Creek,	147	3	1 50	Aug 1, 1912	1 year
Salmons, Edwin,	West Creek,	X	2	1 00	Aug 1, 1912	1 year
Salmons Joel J,	Staffordville,	54-454½	6	3 00	Aug 1, 1912	1 year
Sapp, H W,	Tuckerton,	X-309-394	17	8 50	Aug 1, 1912	1 year
Sapp, Joseph E,	Tuckerton,	489½	4	2 00	Dec 31, 1911	1 year
Sapp, Joseph E,	Tuckerton,	324-334-482-487-489	29	14 50	Aug 1, 1912	1 year
Sapp, Walter L & Co,	Tuckerton,	310 312-314-315-337-456-490	54	27 00	Aug 1, 1912	1 year
Sawyer, Joseph,	Tuckerton	323-356	26	13 00	Aug 1, 1912	1 year
Seaman, Clarence,	West Creek,	82-145-162-842	9	4 50	Dec 31, 1911	1 year
Seaman, Geo A,	West Creek,	84-144 156-239	24	12 00	Dec 31, 1911	1 year
Seaman, Josephus,	West Creek,	194	5	5 00	Aug 1, 1912	1 year
Seaman, W S,	West Creek,	67-96-187 301	10	5 00	Dec 31 1911	1 year
Sears, W N,	New Gretna,	47-146	14	14 00	Dec 31, 1911	2 years
Shinn, Alfred,	West Creek,	158	2	1 00	Dec 31, 1911	1 year
Shinn, Alfred,	West Creek,	74 114-214-224 233	18	9 00	Dec 31, 1911	1 year
Shinn, Edward L,	West Creek,	X-215-840-938	20	10 00	Aug 1, 1912	1 year
Shinn, Frank & Edward,	West Creek,	225	2	1 00	Dec 31, 1911	1 year
Shinn, Harry S,	West Creek,	148 161-209-220 222-229-906	25	12 50	Dec 31, 1911	1 year
Shinn, John A,	West Creek,	150 937	15	7 50	Aug 1, 1912	1 year
Shinn, John A,	West Creek,	117-118 154-218 231-228	24	12 00	Dec 31 1911	1 year
Shinn, Samuel E, & Sons,	West Creek,	219-230 235-245-839	14	7 00	Dec 31 1911	1 year
Shinn, Thomas,	West Creek,	125 238	4	2 00	Dec 31, 1911	1 year
Smith, Henry P,	Tuckerton,	445-477	5	2 50	Dec 31 1911	1 year
Smith, Joseph P,	Tuckerton,	344	4	2 00	Aug 1, 1912	1 year
Smith, Samuel J, & Sons,	Tuckerton,	345	8	4 00	Aug 1, 1912	1 year
Sooy, Daniel T,	New Gretna,	24-59	10	5 00	Dec 31 1911	1 year
Soper, Charles H,	Barnegat,	9-33-56	11	5 50	Aug 1, 1912	1 year
Soper, Philip,	Manahawkin,	742	5	2 50	Apr 1, 1912	1 year
Soper, Philip,	Manahawkin,	727½ 713 716	7	3 50	Aug 1, 1912	1 year
Speck, James H, & Bro,	Tuckerton,	20	110	55 00	Dec 31, 1911	1 year
Speck, James H,	Tuckerton,	119	7	3 50	Aug 1, 1912	1 year
Speck, William,	Tuckerton,	21	10	5 00	Dec 31, 1911	1 year
Speck, Wm H,	Tuckerton,	X	3	1 50	Dec 31, 1911	1 year
Sprague, Albert,	Tuckerton,	471	2	1 00	Aug 1, 1912	1 year
Sprague, Edwin B,	Staffordville,	40	2	1 00	Dec 31, 1911	1 year
Sprague, Edwin B,	Staffordville,	877-861	4	2 00	Aug 1, 1912	1 year
Sprague, Frank,	West Creek,	62-85	4	2 00	Dec 31, 1911	1 year
Sprague, Frank, & John,	West Creek,	78	2	1 00	Dec 31, 1911	1 year

OYSTER BED LEASES—OCEAN COUNTY—Continued

NAME	ADDRESS	No	Acreage	Amount	Date	Term
Sprague, Henry,	West Creek,	71	2	\$1 00	Dec 31, 1911	1 year
Sprague, Joel H.,	Beach Haven,	X-312½-457	10	5 00	Aug 1, 1912	1 year
Sprague, John F.,	West Creek,	180	2	1 00	Dec 31, 1911	1 year
Sprague, Lewis,	Tuckerton,	X-X 439	9	4 50	Aug 1, 1912	1 year
Sprague, Philip,	Tuckerton,	410 430-439-				
		X 498	25	12 50	Aug 1, 1912	1 year
Sprague, Philip A.,	Tuckerton,	X	2	1 00	Dec 31, 1911	1 year
Sprague, Philip R.,	West Creek,	101-131-182-				
		205 818	11	5 50	Aug 1, 1912	1 year
Sprague, Ruben,	West Creek,	77	2	1 00	Dec 31, 1911	1 year
Sprague, Samuel,	Barnegat,	39	1	0 00	Aug 1, 1912	1 year
Stiles, Edward,	Tuckerton,	388	12	6 00	Aug 1, 1912	1 year
Stiles, Elias,	Tuckerton,	336	11	5 50	Aug 1, 1912	1 year
Stiles, Ezra & Co.,	Tuckerton,	407 408 403-				
		X-X-X-335-				
		413 392-425-				
		855	33	16 50	Dec 31, 1911	1 year
Stiles, James,	Tuckerton,	415	2	1 00	Dec 31, 1911	1 year
Taylor, Georgianna						
Mrs.,	Bayville,	17	5	2 50	Aug 1, 1912	1 year
Taylor, Henry,	Cedar Run,	21	2	1 00	Aug 1, 1912	1 year
Truex, Geo C.,	Cedar Run,	863	4	2 00	Aug 1, 1912	1 year
Truex, Jos J.,	Mayetta,	865	2	1 00	Aug 1, 1912	1 year
Truex, J W.,	Cedar Run,	10 38½	6	3 00	Aug 1, 1912	1 year
White David M.,	Manahawkin,	6	4	2 00	Aug 1, 1912	1 year
Wilkins, Joseph J.,	Manahawkin,	752-753	58	29 00	Dec 31, 1911	1 year
Wilson, Amasa,	Port Republic,	X	2	1 00	Aug 1, 1912	1 year
Wilson, J H.,	Port Republic,	41	2	1 00	Aug 1, 1912	1 year

Oyster Bed Leases—Atlantic County.

NAME	ADDRESS	No	Acreage	Amount	Date	Term
Albertson, John C.,	Pleasantville,	21a	1 33	\$1 50	Sept 1, 1912	1 yr
Allen, Jos B., Jr.,	Atlantic City,	90a	7 44	7 50	Sept 1, 1912	1 yr
Allen, Samuel B.,	New Gretna,	227a	1 75	1 75	Sept 1, 1912	1 yr
Babcock, Reuben L.,	Absecon,		10 00	10 00	Jan 1, 1912	1 yr
Boice, Abbie S.,	Absecon,	134b	4 00	4 00	Sept 1, 1912	1 yr
Boice, Harlan P.,	Absecon,	169a	7 50	7 50	Sept 1, 1912	1 yr
Boice, Harry B.,	Absecon,	14b	1 95	2 00	Sept 1, 1912	1 yr
Bowen, Bartine,	Leeds Point,	126b	3 89	4 00	Jan 1, 1912	1 yr
Bowen, J Clark,	Leeds Point,	152a	5 92	6 00	Sept 1, 1912	1 yr
Bowen, Samuel G.,	Pleasantville,	9b	1 08	1 25	Sept 1, 1912	1 yr
Bowen, Samuel G.,	Pleasantville,	23a	8 63	8 75	Sept 1, 1912	1 yr
Bowen, Somers L.,	Pleasantville,	24a	3 60	3 75	Sept 1, 1912	1 yr
Chew, Benjamin W.,	New Gretna,	196a	2 88	3 00	Sept 1, 1912	1 yr
Chew, Benjamin W.,	New Gretna,	25b	2 25	2 25	Sept 1, 1912	1 yr
Collins, Burris,	Pleasantville,	80a	3 78	4 00	Sept 1, 1912	1 yr
Collins, Harry R.,	Pleasantville,	30a	9 73	9 75	Sept 1, 1912	1 yr
Collins, Hugh,	Pleasantville,	47b	7 07	7 25	Sept 1, 1912	1 yr
Collins, Isaac,	Pleasantville,	28a	10 00	10 00	Sept 1, 1912	1 yr
Collins, John H.	Pleasantville,	29a	10 00	10 00	Sept 1, 1912	1 yr
Collins, Louisa	Smith's Landing,	31a	3 95	4 00	Sept 1, 1912	1 yr
Conover, Alfred,	Atlantic City,	92a	10 00	10 00	Sept 1, 1912	1 yr
Conover, Chester	Oceanville,	20b	1 00	1 00	June 1, 1912	1 yr
Conover, Emily F.,	Absecon,	42b	10 00	10 00	June 1, 1912	1 yr
Conover, Enoch	Oceanville,	162a	1 13	1 25	Sept 1, 1912	1 yr
Conover Gilbert,	Absecon,	154a	2 50	2 50	Sept 1, 1912	1 yr
Conover Harry,	Atlantic City,	22b	3 00	3 00	June 1, 1912	1 yr
Conover Harry B.	Absecon,	37b	2 00	2 00	Jan 1, 1912	1 yr
Conover, Harry B.,	Absecon,	11b	1 95	2 00	Sept 1, 1912	1 yr
Conover, Harry B.,	Absecon,	260a	1 20	1 25	Sept 1, 1912	1 yr
Conover, Howard,	Barnegat	46b	5 36	5 50	Sept 1, 1912	1 yr
Conover, Joel A.,	Atlantic City,	91a	10 00	10 00	Sept 1, 1912	1 yr
Conover, John F.,	Atlantic City,	96a	8 25	8 25	Sept 1, 1912	1 yr
Conover, Micajah H.,	Absecon,	165a	6 25	6 25	Sept 1, 1912	1 yr
Conover, Priscilla,	Absecon,	224a	7 21	7 25	Sept 1, 1912	1 yr
Conover, Priscilla,	Absecon,	228a	1 49	1 50	June 1, 1912	1 yr
Conover, Roland,	Oceanville,	128a	1 50	1 50	Sept 1, 1912	1 yr
Conover William	Atlantic City,	93a	8 00	8 00	Sept 1, 1912	1 yr
Conover, Willis R.,	Oceanville,	153a	3 14	3 25	Sept 1, 1912	1 yr
Conover, Zeph S.,	Atlantic City,	19a	7 00	7 00	Sept 1, 1912	1 yr
Cranmer, Albert F.,	Atlantic City,	129a	1 03	1 25	Sept 1, 1912	1 yr
Cranmer, Albert F.,	Atlantic City,	190a	1 97	2 00	Sept 1, 1912	1 yr
Cranmer, Arnold,	New Gretna,	136b	1 45	1 50	Sept 1, 1912	1 yr
Cranmer, Arnold & Co.	New Gretna,	40b	65	1 00	Mar 1, 1912	1 yr
Cranmer, Arnold & Ca-						
leb	New Gretna,	189a	53	1 00	Sept 1, 1912	1 yr
Cranmer John T.,	New Gretna,	243a	1 53	1 75	Sept 1, 1912	1 yr
Darby John A.	New Gretna,	188a	2 09	2 25	Sept 1, 1912	1 yr
Dennis, Burris F.,	Scullville,	32a	6 25	6 25	Sept 1, 1912	1 yr
Dennis Chas B.	Scullville,	33a	94	1 00	Sept 1, 1912	1 yr
Dennis Chas & Henry,	Scullville,	34a	2 40	2 50	Sept 1, 1912	1 yr
Dennis Henry B.	Scullville,	35a	2 57	2 75	Sept 1, 1912	1 yr
Doughty, B F.,	Atlantic City,	176a	47	1 00	Sept 1, 1912	1 yr
Doughty, Bertha I.,	Absecon,	51b	10 00	10 00	June 1, 1912	1 yr
Doughty, David,	Oceanville,	49b	4 00	4 00	Sept 1, 1912	1 yr
Doughty, David,	Oceanville,	195a	73	1 00	Sept 1, 1912	1 yr
Doughty Edward C.,	Oceanville,	182a	80	1 00	Sept 1, 1912	1 yr
Doughty Ezra,	Oceanville,	183a	1 79	2 00	Sept 1, 1912	1 yr
Fairbrothers Charles,	Pleasantville,	38a	4 25	4 25	Sept 1, 1912	1 yr
Fairbrothers Lewis	Pleasantville,	39a	5 00	5 00	Sept 1, 1912	1 yr
Garrison Dennis	Scullville,	181a	3 11	3 25	June 1, 1912	1 yr
Garwood Richard,	Pleasantville,	53b	2 00	2 00	Sept 1, 1912	1 yr
Gaskill Thos J.	New Gretna,	187a	1 35	1 50	Sept 1, 1912	1 yr
Giberson Richard,	Absecon,	118a	1 30	1 50	Sept 1, 1912	1 yr
Giberson, Samuel	Absecon,	71b	4 50	4 50	Sept 1, 1912	1 yr
Giberson, Samuel	Absecon,	115a	5 17	5 25	Sept 1, 1912	1 yr
Giberson, Thomas D.,	Leeds Point,	121a	3 68	3 75	Sept 1, 1912	1 yr

OYSTER BED LEASES—ATLANTIC COUNTY—Continued

NAME	ADDRESS	No	Acreage	Amount	Date	Term
Giberson, Thomas D,	Leeds Point,	219a	2 37	\$2 50	Sept 1, 1912	1 yr
Giberson, H A & Smith, D K,	Leeds Point,	213a	4 74	4 75	Sept 1, 1912	1 yr
Gillison, Alfred,	Atlantic City,	59b	1 30	1 50	Sept 1, 1912	1 yr
Hackney, Steven R,	Margate City,	60b	1 50	1 50	Sept 1, 1912	1 yr
Hammell, Chas P,	Absecon,	198a	9 84	10 00	Sept 1, 1912	1 yr
Hammell, Elnora M,	Absecon,	246b	4 05	4 25	Jan 1, 1912	1 yr
Hammell, Elnora M,	Absecon,	199a	3 07	3 25	Sept 1, 1912	1 yr
Hammell, William A,	Absecon,	178a	5 94	6 00	Sept 1, 1912	1 yr
Hand, William E,	Ventnor City,	61b	2 00	2 00	Sept 1, 1912	1 yr
Hewitt, Nelson,	Port Republic,	243a	1 61	1 75	Sept 1, 1912	1 yr
Highbee, Allen,	Leeds Point,	73b	44	1 00	Sept 1, 1912	1 yr
Highbee, Allen,	Leeds Point,	131a	1 67	1 75	Sept 1, 1912	1 yr
Highbee, James W,	Leeds Point,	155a	10 00	10 00	Sept 1, 1912	1 yr
Highbee, Job M,	Leeds Point,	130a	2 25	2 25	Sept 1, 1912	1 yr
Highbee, John G,	Leeds Point,	132a	10 00	10 00	Sept 1, 1912	1 yr
Highbee, Somers T,	Leeds Point,	74b	3 44	3 50	June 1, 1912	1 yr
Hilton, Hannah,	Pleasantville,	288a	1 81	2 00	June 1, 1912	1 yr
Hilton, John M,	Pleasantville,	41a	9 88	10 00	Sept 1, 1912	1 yr
Holdzkorn, Edward,	Brigantine,	98a	6 69	6 75	Sept 1, 1912	1 yr
Koldzkorn, John M,	Brigantine,	137b	3 00	3 00	Sept 1, 1912	1 yr
Holdzkorn, Samuel B,	Brigantine,	177a	3 06	3 25	Sept 1, 1912	1 yr
Holdzkorn, Wilham,	Brigantine,	124a	1 48	1 50	Sept 1, 1912	1 yr
Honer, Julius,	Oceanville,	226a	1 30	1 50	Sept 1, 1912	1 yr
Horton, Charles M,	Pleasantville,	44a	7 12	7 25	Sept 1, 1912	1 yr
Horton, Charles M,	Pleasantville,	68b	1 60	1 75	Sept 1, 1912	1 yr
Horton, Edward,	Pleasantville,	43a	1 11	1 25	Sept 1, 1912	1 yr
Horton, Edward,	Pleasantville,	62b	1 00	1 00	Sept 1, 1912	1 yr
Horton, Howard,	Pleasantville,	45a	1 92	2 00	Sept 1, 1912	1 yr
Horton, Howard,	Pleasantville,	65b	2 34	2 50	Sept 1, 1912	1 yr
Horton, Peter,	Pleasantville,	72b	6 44	6 50	Sept 1, 1912	1 yr
Horton, Willis,	Pleasantville,	48a	1 16	1 25	Sept 1, 1912	1 yr
Ingersoll, J B & Chas,	English Creek,	242a	5 04	5 25	Sept 1, 1912	1 yr
Jacobson, Charles,	Oceanville,	139a	1 10	1 25	Sept 1, 1912	1 yr
Jeffries, Morris,	Atlantic City,	191a	2 64	2 75	Sept 1, 1912	1 yr
Lafferty, Walter,	Pleasantville,	53a	6 83	7 00	Sept 1, 1912	1 yr
Lake, Albert P,	Pleasantville,	50a	5 72	5 75	Sept 1, 1912	1 yr
Lake, Henry,	Pleasantville,	52a	2 85	3 00	Sept 1, 1912	1 yr
Lake, Henry,	Pleasantville,	54b	1 25	1 25	Sept 1, 1912	1 yr
Lee, Franklin,	Scullville,	263a	1 54	1 75	June 1, 1912	1 yr
Leeds & Blackman,	Oceanville,	197a	3 51	3 75	Sept 1, 1912	1 yr
Leeds & Blackman,	Oceanville,	75b	4 00	4 00	June 1, 1912	1 yr
Leeds, Charles A,	Leeds Point,	141a	3 13	3 25	Sept 1, 1912	1 yr
Leeds, Edward,	Oceanville,	172a	3 39	3 50	Sept 1, 1912	1 yr
Leeds, Warren C N,	Brigantine,	123a	4 93	5 00	Sept 1, 1912	1 yr
Leeds, Wilmer,	Oceanville,	81b	2 00	2 00	June 1, 1912	1 yr
Le Menyon, Ph,	New Gretna,	256a	4 36	4 50	Sept 1, 1912	1 yr
Loudenslager, Wm B,	Ventnor City,	211a	2 70	2 75	Sept 1, 1912	1 yr
Loveland, Benj F,	New Gretna,	142a	3 75	3 75	Jan 1, 1912	1 yr
Mathews, D L,	Oceanville,	171a	5 07	5 25	Sept 1, 1912	1 yr
Mathis, Alvin L,	New Gretna,	144a	1 57	1 75	Sept 1, 1912	1 yr
Mathis, Caleb,	Pleasantville,	82b	2 00	2 00	Sept 1, 1912	1 yr
Mathis, Caleb B, Jr,	Pleasantville,	85a	3 41	3 50	Sept 1, 1912	1 yr
Mathis, Caleb B, Jr,	Pleasantville,	248a	5 62	5 75	Sept 1, 1912	1 yr
Mathis, Edward D,	New Gretna,	145a	2 13	2 25	Sept 1, 1912	1 yr
Mathis, Gilbert,	Pleasantville,	58a	9 82	10 00	Sept 1, 1912	1 yr
Mathis, John F,	Pleasantville,	83b	25	1 00	Sept 1, 1912	1 yr
Mathis, Pitman E,	New Gretna,	146a	1 03	1 25	Sept 1, 1912	1 yr
Mathis, William H,	Pleasantville,	56a	10 00	10 00	Sept 1, 1912	1 yr
McKeague, H Seymour,	Scullville,	12a	1 44	1 50	Sept 1, 1912	1 yr
Mitchell, William,	Pleasantville,	55a	4 42	4 50	Sept 1, 1912	1 yr
Powers, Elwood M,	Lunwood,	15a	1 88	2 00	Sept 1, 1912	1 yr
Powers, Elwood M,	Lunwood,	16b	3 00	3 00	Sept 1, 1912	1 yr
Price Job C,	Brigantine,	99a	1 51	1 75	Sept 1, 1912	1 yr
Reed, Bodine C,	Oceanville,	111a	2 63	2 75	Sept 1, 1912	1 yr
Reed, Willis W	Oceanville,	107a	1 59	1 75	Sept 1, 1912	1 yr

OYSTER BED LEASES—ATLANTIC COUNTY—Continued

NAME	ADDRESS	No	Acreage	Amount	Date	Term
Riley, Samuel C,	Pleasantville,	247b	5 00	\$5 00	Sept 1, 1912	1 yr
Risley, Ephraim,	Pleasantville,	64a	4 88	5 00	Sept 1, 1912	1 yr
Risley, Harry C,	Pleasantville,	71a	7 85	8 00	Sept 1, 1912	1 yr
Risley, Herman & Cur- tis,	Pleasantville,	63a	9 20	9 25	Sept 1, 1912	1 yr
Risley, Job C,	Pleasantville,	67a	3 80	4 00	Sept 1, 1912	1 yr
Risley, Obediah,	Pleasantville,	69a	4 91	5 00	Sept 1, 1912	1 yr
Risley, Richard I,	Pleasantville,	66a	8 13	8 25	Sept 1, 1912	1 yr
Robbins, L D,	New Gretna,	148a	1 06	1 25	Sept 1, 1912	1 yr
Robinson, David S,	Scullville,	13a	2 00	2 00	June 1, 1912	1 yr
Scott, Robert M,	Leeds Point,	159a	10 00	10 00	Jan 1, 1912	1 yr
Scull, Alfred S,	Lunwood,	89a	1 07	1 25	Sept 1, 1912	1 yr
Scull, Elijah,	Scullville,	10a	6 43	6 50	Sept 1, 1912	1 yr
Scull, John B,	Lunwood,	200a	2 00	2 00	Sept 1, 1912	1 yr
Scull, M V B,	Atlantic City,	151a	3 00	3 00	Sept 1, 1912	1 yr
Scull, Thos B,	Leeds Point,	158a	3 49	3 50	Sept 1, 1912	1 yr
Severn, Joseph,	Brigantine,	92	1 00	1 00	June 1, 1912	1 yr
Showell, Alfred,	Absecon,	114a	1 00	1 00	June 1, 1912	1 yr
Smith, Aaron R,	Scullville,	6a	6 38	6 50	Sept 1, 1912	1 yr
Smith, Abel W,	Scullville,	5a	8 94	9 00	Sept 1, 1912	1 yr
Smith, David T,	Scullville,	4a	6 12	6 25	Sept 1, 1912	1 yr
Smith, Edwin,	Oceanville,	184a	57	3 25	Sept 1, 1912	1 yr
Smith, Japhet S,	Scullville,	239a	3 18	3 25	Sept 1, 1912	1 yr
Smith, J Frank,	Brigantine,	186a	1 18	1 25	Sept 1, 1912	1 yr
Smith, Theodore,	Scullville,	1a	8 18	8 25	Sept 1, 1912	1 yr
Smith, Wilham J,	Oceanville,	185a	3 98	4 00	Sept 1, 1912	1 yr
Somers, Bodine C,	Oceanville,	244a	2 00	2 00	Sept 1, 1912	1 yr
Somers, Bodine C,	Oceanville,	87b	70	1 00	June 1, 1912	1 yr
Somers, Boice,	Scullville,	8a	3 75	3 75	Sept 1, 1912	1 yr
Somers, Emily S,	Lunwood,	86b	4 00	4 00	Sept 1, 1912	1 yr
Somers, Ezekiel,	Oceanville,	108a	4 29	4 50	Sept 1, 1912	1 yr
Somers, Harris,	Oceanville,	110a	1 66	1 75	Sept 1, 1912	1 yr
Somers, Harry C,	Oceanville,	109a	1 95	2 00	Sept 1, 1912	1 yr
Somers, Jackson,	Steelmanville,	7a	2 50	2 50	Sept 1, 1912	1 yr
Somers, James S,	Lunwood,	17a	5 57	6 00	Sept 1, 1912	1 yr
Somers, Leon,	Somers Point,	193a	8 71	8 75	Sept 1, 1912	1 yr
Somers, Mark S,	Oceanville,	113a	1 74	1 75	Sept 1, 1912	1 yr
Somers, Richard J,	Lunwood,	18a	9 86	10 00	Sept 1, 1912	1 yr
Sooy, Daniel T, Jr,	New Gretna,	252a	10 00	10 00	Sept 1, 1912	1 yr
Sooy, Elphra,	Pleasantville,	77a	10 00	10 00	Sept 1, 1912	1 yr
Sooy, E M, J E, & J M,	Pleasantville	262a	1 92	2 00	Sept 1, 1912	1 yr
Sooy, Leonard S, Dow, Robbins L,	New Gretna,	93b	2 12	2 25	Sept 1, 1912	1 yr
Sooy, Nancy,	Pleasantville,	78a	8 00	8 00	Sept 1, 1912	1 yr
Sooy, Samuel B,	Pleasantville,	76a	6 77	7 00	Sept 1, 1912	1 yr
Sooy, Samuel B,	Pleasantville,	95b	2 75	2 75	Sept 1, 1912	1 yr
Valent, George,	Pleasantville,	254a	2 77	3 00	Sept 1, 1912	1 yr
Webb, George,	Tuckerton,	97b	3 00	3 00	Sept 1, 1912	1 yr
Weber, E A,	Margate City,	105b	3 00	3 00	Sept 1, 1912	1 yr
Weber, E A,	Atlantic City,	101b	1 00	1 00	Sept 1, 1912	1 yr
Weber & Cavilleer,	Atlantic City,	107b	5 00	5 00	Sept 1, 1912	1 yr
Willets, Fred W,	Atlantic City,	120a	3 71	3 75	Sept 1, 1912	1 yr
Yates, Jesse,	Brigantine,	114	1 14	1 25	Sept 1, 1912	1 yr
York, Wilham,	Atlantic City, Smith's Landing,	245a 104b	4 23	4 25	Sept 1, 1912	1 yr

Propagating Oyster Bed Leases—Atlantic County.

NAME	ADDRESS	No	Acreage	Amount	Date	Term
Adams, Jas H.	Pleasantville,	75	5 00	\$15 00	Mar 1, 1912	1 year
Agents, S H M.	Newark,	61	4 54	14 25	Sept 1, 1912	1 year
Babcock, R L.	Absecon,	77	5 00	15 00	Mar 1, 1912	1 year
Bailey, Raemond M.	Atlantic City,	81	4 00	12 00	Sept 1, 1912	1 year
Barrett, L H.	Pleasantville,	66	2 00	6 00	Sept 1, 1912	1 year
Bessel, Frank J.	Atlantic City,	28	4 30	13 50	Sept 1, 1912	1 year
Bessesen, Wm R.	Atlantic City,	84	3 41	10 50	Mar 1, 1912	1 year
Bowen, Baker D.	Smithville,	60	5 00	15 00	Sept 1, 1912	1 year
Delaney, R E.	Atlantic City,	22	5 00	15 00	Sept 1, 1912	1 year
Dennis, Burris F.	Scullville,	3	5 00	15 00	Sept 1, 1912	1 year
Dennis, Chas B.	Scullville,	7	4 00	12 00	Sept 1, 1912	1 year
Dennis, Elizabeth B.	Scullville,	49	3 75	11 25	Sept 1, 1912	1 year
Dennis, Gorette	Scullville,	45	5 00	15 00	Sept 1, 1912	1 year
Dennis, Henry B.	Scullville,	9	4 45	13 50	Sept 1, 1912	1 year
Dennis, Wm B.	Steelmanville	5	5 00	15 00	Sept 1, 1912	1 year
Doughty, F F.	Absecon,	37	5 00	15 00	Sept 1, 1912	1 year
English, Walter	English Creek,	12	5 00	15 00	Sept 1, 1912	1 year
Goff, A W.	Atlantic City,	18	4 40	13 50	Sept 1, 1912	1 year
Hamilton, Thomas J.	Absecon,	78	5 00	15 00	Mar 1, 1912	1 year
Holdzkorn Edward,	Brigantine,	42	2 66	8 25	Sept 1, 1912	1 year
Holland Edward J.	Atlantic City,	10	5 00	15 00	Sept 1, 1912	1 year
Ingersoll John W.	Margate City,	30	5 00	15 00	Mar 1, 1912	1 year
Ireland, Samuel,	Pleasantville,	79	5 00	15 00	Mar 1, 1912	1 year
Jeffers, Andrew B.	Scullville,	27	4 00	13 50	Sept 1, 1912	1 year
Jeffers, Benjamin C.	Scullville,	11	4 00	12 00	Sept 1, 1912	1 year
Jeffers, George B.	Scullville,	6	4 50	13 50	Sept 1, 1912	1 year
Kuehne, Louis	Atlantic City,	21	5 00	15 00	Sept 1, 1912	1 year
Lashley, Clarence,	Scullville,	16	2 00	6 00	Sept 1, 1912	1 year
Lee George B.	Pleasantville,	76	5 00	15 00	Mar 1, 1912	1 year
Lee, Oliver A.	English Creek,	34	5 00	15 00	Sept 1, 1912	1 year
Mapel, Clara I.	Atlantic City,	68	4 88	15 00	Sept 1, 1912	1 year
Mapel, Newton J.	Atlantic City,	39	5 00	15 00	Sept 1, 1912	1 year
McElroy, Samuel W.	Atlantic City,	41	4 83	15 00	Sept 1, 1912	1 year
McGurk Michael,	Atlantic City,	73	5 00	15 00	Mar 1, 1912	1 year
McKeague, Hannah,	Scullville,	48	4 70	14 25	Sept 1, 1912	1 year
McKeague, Seymour,	Scullville,	82	1 75	6 00	Mar 1, 1912	1 year
Murtland Henry J.	Atlantic City,	56	3 19	9 75	Sept 1, 1912	1 year
Nelson, Alex H.	Atlantic City,	36	5 00	15 00	Sept 1, 1912	1 year
Postoll, W S.	Atlantic City,	67	5 00	15 00	Sept 1, 1912	1 year
Reed, Oris.	Atlantic City,	46	5 00	15 00	Sept 1, 1912	1 year
Robinson, Dave S.	Scullville,	29	2 00	6 00	Sept 1, 1912	1 year
Smith, Susan B.	Scullville,	88	3 50	10 50	Sept 1, 1912	1 year
Steelman, Frank,	Atlantic City,	72	4 00	12 00	Sept 1, 1912	1 year
Steelman, S S.	Atlantic City,	50	4 30	13 50	Sept 1, 1912	1 year
Tallman, Eugene,	Scullville,	1	3 00	9 00	Sept 1, 1912	1 year
Webb, Alice B.	Margate City,	62	3 00	9 00	Sept 1, 1912	1 year
Webb, George S.	Margate City,	2	4 16	12 75	Sept 1, 1912	1 year
Willetts, Fred W.	Brigantine,	38	5 00	15 00	Sept 1, 1912	1 year
Willetts, Jennie,	Brigantine,	85	3 00	9 00	Mar 1, 1912	1 year
Wilson, L R.	Absecon,	43	5 00	15 00	Sept 1, 1912	1 year

Oyster Bed Leases—Shark River.

NAME	ADDRESS	No	Acreage	Amount	Date	Term
Allgor, Benj E.	New Bedford	11				
Allgor, Devine,	Como,	125-126-137-138-133-134-135-124	1	\$1 25	1912	1 year
Allgor, Devine,	Como,	117-190	8	7 50	1912	1 year
Allgor, Devine,	Como,	109-110-118	2	3 00	1912	1 year
Allgor, Devine,	Como,	178	3	5 50	1912	1 year
Bennett, Charles M.	Asbury Park,	170-171-172	1	1 50	1912	1 year
Bennett, Charles M.	Asbury Park,	175-176-177	3	3 00	1912	1 year
Bennett, Charles M.	Asbury Park,	66 to 73-82-83-84	3	2 25	1912	1 year
Bennett, Charles M.	Asbury Park,	161-162-167-	11	5 50	1912	1 year
Bennett, Eden, Sr.	Avon,	168	4	3 00	1912	1 year
Bennett, Eden, Sr.	Avon,	30-31	1	3 00	1912	1 year
Bennett, Eden, Sr.	Avon,	27	2	3 00	1912	1 year
Bennett, Franklin E.	Avon,	21 to 24	1	3 00	1912	1 year
Bennett, Franklin E.	Avon,	4 5	4	12 00	1912	1 year
Bennett, Franklin E.	Avon,	47-48	2	6 00	1912	1 year
Bennett, Garrett,	Belmar,	131-132-139-140	2	1 00	1912	1 year
Bennett, Henry A.	Avon,	6-7	4	4 00	1912	1 year
Bennett, Henry A.	Avon,	160-169	2	6 00	1912	1 year
Bennett, Henry A.	Avon,	12	2	2 00	1912	1 year
Bennett, Henry A.	Avon,	18	1	3 00	1912	1 year
Beutell, E M.	Avon,	3	1	3 00	1912	1 year
Bowd, Willard & Co.	Bradley Beach,	113-114-127-128	1	3 00	1912	1 year
Brown, Harry,	Belmar,	7 8-16-17-29-30	4	5 00	1912	1 year
Campbell, Freeman,	New Bedford,	186-187-188-189	6	6 00	1912	1 year
Campbell Neil	Belmar,	181-182-183-184	4	5 50	1912	1 year
Finley, Joseph,	Bradley Beach,	29-32 to 36	4	6 00	1912	1 year
Flemming, Henry,	Avon,	13-19	6	6 00	1912	1 year
Flemming, Henry,	Avon,	1-2-3-21-22	2	4 00	1912	1 year
Flemming, Henry,	Avon,	74-75-80-81	5	4 00	1912	1 year
Gassan, Joseph R.	Belmar,	88-64-65	7	3 50	1912	1 year
Glashan, Harry,	Asbury Park,	34	1	2 00	1912	1 year
Green, H D.	Asbury Park,	79-80	2	1 00	1912	1 year
Rowland, Mrs Chas.	Belmar,	23-24-25-45 to 51	10	7 50	1912	1 year
Low, C L.	Asbury Park,	159	1	2 00	1912	1 year
Morris, Alex Sr	Asbury Park,	17	1	3 00	1912	1 year
Morris, William F.	Asbury Park,	14-15-16-20	4	12 00	1912	1 year
Morris, William F.	Asbury Park,	8-9-10-11	4	10 00	1912	1 year
Morris, William F.	Asbury Park,	46-57-68	3	2 00	1912	1 year
Newman, Wilson L.	Belmar,	136-4-5-154-155-156-153	7	6 50	1912	1 year
Newman, Wilson L.	Belmar,	115-116	2	4 00	1912	1 year
Newman, Wilson L.	Belmar,	111-112	2	4 00	1912	1 year
Newman, Wilson L.	Belmar,	145-152-157-158	4	3 00	1912	1 year
Newman, Wilson L.	Belmar,	163 to 166				
Newman, Wilson L.	Belmar,	141 to 144-				
Newman, Wilson L.	Belmar,	129-130-173-174	4	3 00	1912	1 year
Newman & Allgor,	Belmar,	6-9-10-13-14-15-18-19-20-26-27-28-31-32-86-87-87 to 44-52 to 63-76 to 79	12	10 00	1912	1 year

OYSTER BED LEASES—SHARK RIVER—*Continued*

NAME	ADDRESS	No	Acreage	Amount	Date	Term
Newman & Allgor,	Belmar,	119 121 122	2	\$3 75	1912	1 year
		123 180		1 50	1912	1 year
		58-59		1 00	1912	1 year
Palmer, John P.	Avon,	49-60	2	2 00	1912	1 year
Palmer, John P.	Avon,	37 38				
Tilton, William L.	New Bedford,	12 36	2	2 00	1912	1 year
Tucker, Edwin,	Avon,	1 2		2 00	1912	1 year
Wight James	Belmar,	35	3	3 00	1912	1 year
Wooley, E S V.	New Bedford	149 150 151		3 50	1912	1 year
Wooley, Hiram,	New Bedford	148	1	1 50	1912	1 year
Wooley, William H.	New Bedford	179		1 00	1912	1 year
Wooley, William H.	New Bedford	146-147	2	2 00	1912	1 year
Wooley, William H.	New Bedford	185		1 00	1912	1 year
VanNote, Frederick H.	Asbury Park,	25 26	2	3 25	1912	1 year