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THE SOFT-SHELLED CLAM FISHERY OF THE BAY OF FUNDY

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The Clam Fishery of the Bay of Fundy.

Introduction.

On the Canadian Atlantic coast there are three kinds of shellfish possessing distinct economic importance - namely, oysters (Ostrea), soft shell clams (Mya) and quahaugs (Venus). The soft-shell clam Mya arenaria has always played a dominant role in the shellfish industry of the Bay of Fundy. This fishery in the hands of proper cultural methods is capable of development to the extent that the annual catch can be more than doubled. Clams in this region are used for human consumption and as bait for fish (haddock, cod, etc.).

The favorability of the Fundy Area for the growth of clams and for the development of the fishery together with the opportunity and need for increasing this valuable natural resource has made a survey of the fishery and a knowledge of the distribution and quantity available for market, very pertinent at this time.

For his assistance in many ways during the course of this investigation, the writer is much indebted to Professor A. G. Huntsman, Director of the Atlantic Biological Station. Acknowledgement is made to all the fishery officers and clam fishermen who were interviewed by the writer for their kindly readiness to cooperate in every phase of this work. (The plates included here were made by Dr. V. D. Vladykov to whom the writer is very grateful.)

Names.

The soft-shelled clam possessed a very wide geographical distribution and consequently it is known by a variety of common names. Thos most commonly used in this Bay are "the clam", the squirt claim", the mud clam", "the common claim" "the sand clam" "the long-neck clam", "the soft shelled clam". In England, the names "Gaper clam", "Sand Gaper", "old maid" are employed. The account of the variety of common names used, some of which are restricted to certain localities, it has, for years, been the custom of students of animal and plant life to use a double Latin name for each species. That selected for the soft shell clam is Mya (name of Genus) Arenaria (name of Species). It is interesting to note that the generic name Mya is derived from an old Greek word meaning the name of a species of mussel and the specific name arenaria is a Latin word meaning "living in sand".

General Description of the Soft-Shell Clam and Related Forms.

Living in open sand beaches and in relatively small numbers are Hen clams (Mastra Solidissima) sometimes called "beach clams" or "dipper clams". Quahaugs (Venus musenaria) also called "hard clams" or "hard shelled clams" occur in the Canadian Atlantic coast but we have no record of their presence in the Fundy area. The quahaug shell is distinguished by its large size and weight, characteristic shape and by the presence of sharp ridges on its outer surface (see plate I) They are found low down on the shore (intertidal zone) but the commercial fishery in many places is carried on mostly at a level slightly below mean low water mark.

The Hen clam (Mastra Solidissima) is the largest clam on the Atlantic coast whence the common name "giant clam". In the

Fundy area its distribution is very limited being reported from the vicinity of Digby where it is called the "Hen clam" or "quahaug" and also in the vicinity of St. Andrews, N. B. With regard to appearance, the outside of the shell is covered with a thin, dirty brown, epidermal layer and this character together with its large size and characteristic shape (see plate I) serves to easily differentiate it from the other two genera (Mya and Venus). This form lives at a low level on exposed sand beaches and altho suitable for human consumption is only in this region used for bait on a small scale.

The soft-shelled clam Mya arenaria, the only abundant and widely distributed clam in the Fundy area and the one with which we are immediately concerned, is the shellfish that is found so commonly, living in the sand and mud in the intertidal zone. In appearance, it is commonly white altho often colored by the earth in which it lives, so that it has a rusty or black or bluish clay color. On account of the high percentage of mud present in many of the beaches of the Bay of Fundy, the shells are usually dark in color. The shell is light and brittle as compared with the two species mentioned above, oval in general outline and the end with the siphon (commonly called the "head" or "neck") more pointed than the anterior part (see plate I). A length of over five inches may be reached but however, the majority are smaller. Clams living in coarse gravel beaches often possess heavier and more irregularly shaped shells.

On removing one shell (valve) by cutting the strong muscles which serve to draw the valves together, it is seen that they are attached by a hinge possessing a black, hinge ligament

which is an elastic horny substance that causes the divergence of the valves when the muscles are relaxed. The inside of the shell is white and very smooth as compared with the outside layer which is interrupted by somewhat irregular lines produced during growth. The smooth inner layer is formed by a secretion from the very thin, translucent, membranous tissue called the mantle that lines the interior of the shell. Near the anterior end of the valve is the mark of attachment of the severed muscle (anterior adductor muscle) and near the opposite end half way between the hinge and the posterior end, that of the posterior adductor muscle while extending from one to the other is the mantle line indicating the seam along which the mantle muscle is attached to the shell. Below the posterior adductor muscle the mantle line has a broad deep indentation marking the place of attachment of the muscle of the siphon ("head" or "neck") Near the center of the hinge margin of the left valve, there is a strong broad cardinal tooth projecting perpendicularly inwards. This character is the main point of differentiation between the two valves. No other clam in the Atlantic coast possesses this tooth hence it serves as an easy character for identifying the species.

An examination of the soft parts after one valve has been removed reveals the presence at the posterior end of a black siphon (head) capable of expansion and contraction. This siphon extends to the ground surface (Plate 2) and possesses two canals thru which water is drawn passing in one and out the other. From the minute particles of life in the water, the clam derives its food. The prominent oval, white or light brown body called the visceral mass (commonly known as the stomach) contains various organs of digestion and reproduction. Before spawning takes place,

the visceral mass is unusually large being distented with eggs or sperms. These surround the digestive tract and are responsible for the plump appearance of the body of the clam. Small ducts convey the eggs or sperms, as the case may be to the sea water where fertilization may take place and embryonic life begin. Just behind the anterior adductor muscle there is a conspicuous dark colored gland, corresponding to the liver of higher animals, the function of which is to secrete digestive juices. Most every clammer is familiar with a translucent gelatinous rod buried in the visceral mass near the stomach. This rod - the "crystelline style" - frequently considered as a parasite of the clam, is, in reality, concerned with the digestive processes.

History of the Fishery.

The presence of scattered shell heeps about two feet deep and occupying several acres of surface on the coasts of N.S. and N.B. are evidence of the early use of this shellfish for food by the Indians. Soon after the arrival of the Pilgrims in Mass. (1620), clam digging was commenced and afforded a natural supply of food in times of want. During the succeeding 200 years, large numbers were dug solely for local human consumption and it was not until about 1875 that inland markets became an important factor in the industry in Mass. At this time, a firm foundation was laid for the development of the fishery. Earlier in the nineteenth century the demand for clams for bait assumed large proportions.

In the maritime provinces, however, the development of the industry was somewhat slower. Statistical records of clam catches in the Bay of Fundy go back as far as 1899 in which year

2,000 bbls. with a value of $12,000.00 were reported from Charlotte Co., N. B. No records from other parts of the Bay are given for this year. It is likely that clams were previously used in this region for home consumption and bait but apparently not in sufficient numbers to warrant their inclusion in official statistics. In 1892, out of a total of 1825 lbbs. dug, 625 were canned in Charlotte Co. There are no records of clams dug in N. S. during this year. However, in the following year 700 lbbs. were taken in Annapolis Co., and altho no records have been found of clams canned during 1892 in counties of the N. S. bordering on the Bay of Fundy there were 650 cans valued at .12¢ a piece put up in Lunenburg Co., N.S. In fact records of canning operations in Lunenburg Co., date back to 1889 in which year 5,000 cans were packed. (value $600.00).

During the early part of this century a large percentage of clams dug were sold to the fresh market or used for bait. The trend during the years 1920-30 has been towards an increase in the number canned. However, as is shown in detail later, the loss of the U.S. market due to the enactment of the Smoot-Hawley Tariff in June 1930, resulted immediately in a reduction of canning operations to the extent that the output of all clam factories has been materially reduced many having ceased operations.

Charlotte Co., N.B.;-

Charlotte Co. is an always has been the center of the clam fishery of the Bay of Fundy. As early as 1889 statistics show that 2000 bbls were dug. These were used for bait and home consumption. It is very likely that digging operations were in progress at a much earlier date. Our first record of clams being canned in this district is in 1891 when, according to the statistics, 30,000 cans valued at $1500. were packed. Records of shelled (shucked) clams

being marketed date back to 1894.

During the period 1905-20, large numbers were dug and exported to the fresh market in Boston, Mass. Also a considerable number were used locally for bait. It is of interest to note that the N. S. fishermen during the early years of the century came to Charlotte Co. to get clams for bait for cod fishing on the banks of Newfoundland. As early as 1901 these are records of quantities of clams being shipped inland to hotels and shops in N. B. Considerable impetus was given to the clam fishery in this district in about 1889, as a result of the formation of laws restricting the period for clam fishing in the Unites States. From that date on large quantities have been marketed in Boston. There was a market increase in the industry during the early period from 1889-1904. The prices obtained for the fresh clams in the shell are somewhat erratic. For example in 1898, they brot. $7.00 per bbl. as compared with one dollar during the following year. Figure 4 gives a comparison of the percentage canned during the first 6 years of the century with the number during period 1925-30 and figure 3 illustrates the increase in number canned during period 1925-30 as compared with period 1900-1905. It is noted that until 1930 there was a fairly steady increase in the total number dug. Furthermore, the increase in percentage canned is very pronounced. (A comparison of the number canned during the years 1929, 1930 and 1931 and 1932 demonstrates clearly the effect on the canning business of the loss of the American market) The decline in the canning industry during 1930-32 is obviously due to loss of the American market (see table II).

Digby and Annapolis Counties.-

No records are included in the statistics of clams dug in the counties of Nova Scotia bordering in the Bay of Fundy until

1893 when 700 lbbs. were reported from Annapolis Co. There are, however, records of clams being canned in other parts of the province as early as 1889. It is likely that clams were dug for home consumption and bait in small quantities for a number of years previous to 1893. The number dug in this district was relatively small during the period 1894-1904. The earliest record of clams being canned in this district is in 1910 when 150 cases valued at $750.00 from Digby Co. were reported. Figure 6 shows that on an average the total figures for Digby Co. can about double those for Annapolis. In 1929 there were 3 factories in those two counties which packed clams at some time during the year. In 1931 there was only one and the output was small in comparison with the previous year.

Fresh clams are shipped to the Boston market which in 1931 was especially good as is evidenced by the fact that during the four months June- Sept. 9,347 bbls. valued at $18,694 were shipped from the district "Digby east". It appears that the trend of the industry over a period of years is determined not by the supply but rather by the market and the interest and need of the people for developing the fishery.

Colchester and Cumberland Counties;-

The statistical records of clams dug at the head of the Bay of Fundy date back to 1899. The beaches that have been dug over are near Parrsboro, Five Is., Little Bass River and Highland Village. However, the fishery has never been sufficiently developed to be of commercial importance. The quantities dug here are insignificant in comparison with the number handled in the district near the mouth of the Bay (see figure 6). Until the last 3 years

the few barrels of clams obtained were used entirely for home consumption. In 1929 three small factories were started and 160 cases packed in 1929 and in 1930 469 cases were packed. However, the factories operated only part of the year due to loss of the American market.

As is evident from figure 6, not sufficient clams are dug in other counties bordering on the Bay of Fundy to warrant consideration here.

The Relative Importance of the Fundy Area Clam Fishery.

The clam fishery of the Fundy area which as is shown above centers in a relatively restricted area near the mouth of the Bay, exhibits elements of concentration in two respects, firstly, with regard to species present, and secondly concerning ratio of productivity to area suitable for growth.

The clam fishery of the Fundy Area is confined only to one commercial species namely Mya Arenaria whereas on other parts of the Canadian Atlantic coast such as the Quebec coast quahaugs Venus mercenaria are present in considerable quantities. The same situation exists in B. C. where the soft shelled clam Mya arenaria is only one of several commercial forms. In the statistics all clams are recorded under the one heading "clams and quahaugs" hence the figures are of comparative value only in studying the general commercial clam industry of the various maritime provinces of Canada and do not permit a concrete comparison of the data concerning the soft-shelled clams in Fundy Area with those in any other district. This fact should be kept in mind during a study of figure 1. That the clam fishery in the Fundy Area constitutes a very significant part of the total shellfish resources for Canada is suggested by

figures 1 and 2. These graphs are based on yearly average figures for the 6 year period 1925-30 and demonstrate in a relative way the Fundy area clam fishery as compared with that of other parts of Canada. (It is to be noted that in this connection we are using the term clam in the general sense and not referring specifically to Mya arenaria). The quantity dug in the Fundy Area exceeds that in B. C. and constitutes over one half the total for the whole Canadian Atlantic coast. It is shown in figure 2 that the marketed value of the clams dug in B. C. during same period is somewhat higher than in the Bay of Fundy in spite of the smaller numbers. This may be explained by the fact that about 85% were canned in B.C. whereas only about 70% in the Fundy area. Of the total number dug in Canada during the period 1925-30, about 74% were canned.

In figure 3, there is presented a comparison of the yearly average quantity dug and also canned during the periods 1900-1905 and 1925-30, In Charlotte, Digby and Annapolis Cos. From this figure it is evident.- (1) that with the exception of Annapolis County, there has been a slight decrease in the total number dug. (2) That the clam fishery of the Fundy Area centers at the mouth of the Bay and mainly in the N. B. side.

(3) That there has been a marked increase in the clam canning industry of the Fundy Area since the early part of the century. During the period, the period 1900-05, of the total quantity dug 14% were canned whereas during the latter period the number had increased to about 70%.

From figure 4, we get a picture of the yearly trend of the canning industry during the periods 1900-05 and 1925-30, in the counties at the mouth of the Bay where practically all the canning is done. The figure shows (1) that during the period

1900-05 the clam canning industry of the Fundy Area was restricted to Charlotte Co. N. B. (2) that the canning industry has undergone great expansion during recent years until in 1930 when it experienced an abrupt decline due, we believe to lack of market principally caused by the U.S. tariff regulations that became effective in 1930. This decline has been even more pronounced in 1931, the output in all cases being materially reduced and several factories have been closed.

A second element of concentration has been revealed in a study of the population of the several commercial beaches of the Bay of Fundy. In general clams are regularly distributed in varying degrees of abundance depending on amount of digging and environmental conditions, on all the beaches of the Bay where soil conditions are favorable for growth. This presents a sharp contrast to what we know concerning facts of distribution of the soft shelled clam on the Pa. coast. Two essentially similar beaches not far apart may differ in that while one possesses soft-shelled clams in large numbers on the other, they are entirely absent.

The importance of the Bay of Fundy as a center of this fishery is very apparent. We believe that conditions in the water of this region are very favorable for the existence of the species, and that the productivity of many of the commercial beaches might be materially increased with small expenditure (e.g. Sissiboo Area).

Method of Handling Clams.

(a) Fresh-

There are two widely known methods of digging clams on the Atlantic coast - the "wit" employed when the flats are covered by tidal waters and the "dry" digging. Two men are required in the

process of "wet" digging. One man drags along in shallow water a "sea horse"- an enlarged clam hoe with prongs about 14 inches long and a strong wooden handle 4 feet in length - the handle of which possesses a belt attachment which is buckled around the clammer. The partner follows behind and gathers up the clams which the sea-horse plows out. This method is employed along the New England but not in the Fundy Area.

In "dry" digging the collection of clams is by means of a clam fork or clam hoe as it is frequently designated at the mouth of the Bay of Fundy where a major part of the commercial digging is done, clam forks of the type shown in Plate 3 are employed. The dimensions of these forks are as follows;

Used at St. Andrews.

(1) Length of handle 16 inches
" " tongs 10 "
Width of fork 6.5 "
Number of tongs 4

(2) Length of handle 16 inches
" " tongs 7 "
Width of Fork 8 "
Number of tongs 6

(3) Length of handle 15 inches
" " tongs 9.5 "
Width of tongs 1/3 inch.
" " fork 6 inches
Number of tongs 4

Used at Digby.-

(4) Length of handle 16 inches
" " tongs 9 "
Number of tongs 6

The length and set of the handle is a matter of choice with the individual clammer, some prefer a sharp acute angle other a right angle. At the head of the Bay of Fundy where little commercial digging is carried on, an ordinary potato fork is commonly used. In Alma, Albert Co., N. B. a fork of the description given below has been used - heavy wooden handle about four feet in length, single prong about eight inches long and two inch wide with a cross-piece of iron to facilitate pushing into the mud by means of the foot.

Commercial clammers commence digging when the tide is a little over one half ebb, depending on the slope of the shore and follow down with the tide and then back again so that there is a period of from four to six hours available for digging. The presence of numerous holes in the beach obviously serves as a good criterion for the selection of a place in which to dig. Sometimes the course of a small stream over the beach is changed since in the bed and along the banks of the stream there are often greater numbers than elsewhere.

In conveying the clams either directly to shore or to dories, wooden containers "creels" or "clam crates" (see plate) as they are called in the St. Andrews Region are used. These hold about 1/3 of a bushel. In this vicinity so called "clam baskets" made of ash by the Indians and having a capacity of 1/2 bushel are frequently employed. At Pocologan, N. B. "creels" are also termed "kibbons". In Digby Co., N. S. wire baskets called "washers" holding about 1/3 of a bushel an commonly used. These containers are all very suitable for washing the clams. In commercial digging dories are frequently employed. They are grounded on the beach during ebb tide loaded with clams, then floated on the flood tide and either rowed or towed by a motor boat to the point of destination.

St. Andrews, N. B. clams are sometimes placed in sacs on the beach and left there for several days until the desired quantity for shipment is secured. On the flats of the Sissiboo River, N.S. where large quantities are shipped fresh to the Boston market, the clams are dumped from the "washers" into barrels which are conveyed over the flats to shore on so called "stone drags" or "stone boats" each of which holds six to eight barrels, drawn by oxen. The barrels are covered with a bag which is held in position by a hoop. Those sent to the Boston market are transported to Yarmouth in auto trucks, then by boat to Boston so that they arrive within twenty-four hours after being dug. Fresh clams in the shell are shipped from St. Andrews, N. B. to Boston in barrels and in boxes (capacity 1/2 barrel, weight about 100 lbs). They are taken to Eastport, Me. where they are shipped on the regular boat leaving at 2;30 p.m. and arriving in Boston about 8;00 o'clock the following morning. In packing clams for shipment, they are carefully washed and ice is added following the addition of each bushel to the barrel. Care is taken to keep clams in a cool place and to pack in ice as soon as possible. When boxes are used, it is customary to cover the top with ice before nailing on the wooden cover. "Shocked" clams are sent to the American market from Digby, Annapolis and Charlotte Counties but not in large numbers. In "shocking" the valves (shells) are removed, the siphon (heads) are cut off, and after washing with salt water the clams are allowed to drain and then packed in a dry condition. At St. Andrews, N. B. altho one gallon cans are chiefly used, some are handled in two and five gallon tines. (see plate). At present, sugar barrels holding 20 one-gallon cans, and flour barrels which many contain 14 one-gallon tins are used for shipping purposes. Care is taken to surround the cans with ice especially

during the summer months. Shipments of shocked clams may leave St. Andrews at 4;10 p.m. by express and arrive in Boston at seven o'clock the following morning.

At Oak Bay, Charlotte Co., a few local residents supply the markets in St. Stephen and Calais with "shocked" clams. They also send a few to Montreal. In this district it is customary to wash and pack in fresh water using quart and pint jars for containers. Some, however, are drained and packed in dry conditon in tubs or candy pails covered with cheese cloth. Here for "shocking" purposes clams from 3 to 4 inches in length are preferred altho some smaller ones are used. Those sold in the shell are usually over two inches in length. At St. Andrews smaller clams (about 2-3 inches in length) are desired for "shocking" since they are usually served in a fried condition on beach stands and in hotels.

In the case of clams shipped in the shell to Boston few under two inches in length are included since there is a State regulation obliging the dealer to transplant all clams under two inches in length in event of their number exceeding 2 per cent of the total number.

At Lepreau, Charlotte Co., N. B. a few fresh clams in the shell are sent to St. John. "Shocked" clams are packed in wooden tubs varying in capacity from 1 to five gallons and transported in motor trucks.

Canned-

Probably no two canneries in the Fundy Area employ the same methods. Some possess superior machinery to others which obviates minor differences. However, the methods appear to be ostensibly the same in principle. Consequently, this account of methods employed in one typical factory is intended to provide the

reader only with a general concept of the process of canning clams from the time the fresh product is admitted to the factory until it is packed and ready for shipment. From dories clams are shoveled into "kibbons" (containers made of separated wooden slats connecting solid pieces of wood at each end) with a capacity of about one third of a bushel and after being washed in water beside the dory they are hoisted by means of block and tackle to second floor of factory. Here on admittance, a record is obtained of the quantity after which they are sent down a shoot to the floor below where they are again washed and placed into so called "Kibbons" to dry. (These receptacles are different from the kibbons referred to above being about three feet in length, two feet wide with wooden sides about four inches high and wire screen on the bottom).

The next step is to dump the clams from the "kibbons" into barrels, utmost care being exerted to avoid breaking the shells. These barrels have a steam pipe (1/4 inch) entering the bottom. Covers being placed on the barrels, the steam is turned on for twenty minutes after which the bullion is run off thru holes in the lower part of the side of the barrel and by means of a steam siphon conveyed to a barrel on the floor above from which it is piped to a container beside the sealing machine.

After being thoroly steamed, clams are dumped from barrels to wooden boxes the capacity of each being about one-half a bushel. These are dumped on the table in an adjacent room where girls are employed to remove the shell. The fresh product is placed in pans with perforations in the bottom so as to permit washing in fresh water. These pans hold 6 1/2 lbs. Each girl on filling a pan, takes it to another table, weighs it and makes a record there of each pan filled since they are paid by the pan.

At another table, workers are employed to cut off the heads (siphons) after which the meat is placed in a cylindric shaped receptacle called a "creel" holding three six and one-half pound pans, placed in a large sink in a horizontal position. The sink contains enough luke warm fresh water to cover the "creel" which is rotated back and forth (never completely around) for the purpose of washing the content. From the "creel" the clam meat is dumped on flakes and allowed to dry then transported to a porcelain table top ready for placing in cans which are lined with special parchment paper and hold five to eight ounces according to the size used. The can is then filled with boiling hot bullion that has been strained thru several layers of cheese cloth which is placed over the end of the pipe thru which bullion flows from the barrel on the floor above.

The can is next placed on the revolving table, the paper lining that projects about a couple of inches above the can is tucked down flush with the top and the can is passed on thru the machine and automatically sealed. Several cases are placed on large galvanized pans thirty three inches square with five rows of holes so situated as to permit rapid circulation of steam in the retort where they are processed. Dry steam enters from the bottom of the chamber under a pressure of 15 lbs. (250° of heat). The period in the retort is about 20 minutes. After cooling the labels are placed on the cans by means of an automatic machine.

The cans are then ready for packing in cardboard cartons each holding twenty four and are ready for shipment. Formerly wooden boxes holding 48 tins were employed.

On the basis of observations made during the investigation, it is suggested that with regard to canning methods, the amount

etc. Par. 7 (typed). We also believe that the existence of a standard would be very desirable.

The Cost of Marketing Clams.

The prices paid for equipment, digging and handling obviously vary from one year to another. However, the figures given below which, unless otherwise stated, are for 1931, may be considered representative.

Clams in the Shell-

In Digby Co. N. S. clammers received $1.50 per bbl. for digging, each person being able to dig from two to four bbls per tide. The cost of the barrel is fifty cents and the truckage to Yarmouth fifty cents. The price received on the Boston market is about three and one half or four dollars per bbl. The freight charge on the boat from Yarmouth to Boston is $1.00 per bbl paid by the buyer.

At St. Andrews, N. B. the price paid for digging is $1.50 - $1.75 per bbl. and the freight charge from Eastport to Boston is $1.72 per bbl. which is paid by the dealer who pays about $3.00 for the clams. On account of the freight charge of $2.25 per cwt (one barrel of clams weighs about 200 lbs) shipment of fresh clams in the shell to Montreal are almost prohibited. The barrels used cost the shipper .60¢ apiece and the boxes (capacity 1/2 bbl.) are valued at .30¢ each).

"Shucked Clams-

The average cutter (a person who shucks clams) requires about five or six hours to do one barrel and receives .28 cents per gallon (6 gallons of "shucked" clams are obtained from one barrel of

fresh clams in the shell. The express charge to Boston is 23 cents per gallon (paid by the buyer) and the price received by the shipper about one dollar per gallon, and when sold on the market bring from 1.25 to 2.15. The express charge from St. Andrews to Montreal is .25 cents per gallon and the dealer pays $1.00 per gallon plus the express. The cost of the cans used is as follows - 1 gallon size 12 cents, 2 gallon size 20 cents and 5 gallon size 35 cents per can (see plate).

The cost of canning clams is about 7 cents per can or 3.36 per case (48 cans per case). A packer has estimated that it costs per can 2 cents for digging, 2 cents for the can, 2 cents for the labor and 1 cent for coal and labels. The price received by the packer is usually about 10 cents per can (4.80 per case).

The Use of Clams as Bait for Fish.

It has long been known that carnivorous fishes such as the cod are especially fond of clams. In fact it is not an unusual experience to find them in the stomach contents of these fish. Although at first only used for inshore fishing, clams at a later date were taken considerable distances to superior fishing grounds. Frequently, they were placed in wells in the vessels or kept cool with ice. In the early part of this century, vessels from Cape Cod. Gloucester, and Maine, which constituted the largest part of the fleet of the fleet on the "Banks" in the cod and mackerel fisheries having no wells carried their bait shelled, salted and packed in barrels. About twenty five years ago Nova Scotia "Bank" fishermen carried their bait (shell removed) in barrels. To each barrel was added two quarts of salt and one pint of molasses. The salt seems to kill certain bacteria in the body of the clam that would cause

decomposition. The reason for adding the molasses is to supplement the supply of sugar already present in the body, which in the presence of a minute plant (a saccharomycete) produce lastic and other acids during the process of fermentation. These acids, thus produced in certain concentrations, act as ordinary preservatives by preventing putrefaction of the body parts. After about a week holes are punched in the barrel to allow the liquid and foam caused by fermentation to escape. Clams treated in this way taste as if kept in vinegar and are very suitable for bait, it is said. While fresh clams will probably secure more fish yet salt clams seem to be relished by cod and there is a great saving of time - the men are always supplied with bait and do not need to waste valuable fishing time to look for bait, such as herring, squid, mackerel or capelin. Salt clams retain their flavor while fresh bait that has been packed in ice, speedily deteriorates when exposed to the atmosphere in warm weather. In the early part of the century reference was made to salt bait of two kinds - "full salting" when one bushel of salt is added to a barrel of clams, "slack salting" or "corning" when one half to two pecks of salt is used per barrel. It takes about five barrels of fresh clams (in the shell) to make one barrel of salted shelled clams.

The old style of mackerel fishing was to chop up clams and to sprinkle them overboard as "toll-bait" to attract the mackerel to the surface. Now, however, mackerel are caught in seines. Cod-fishing is conducted in two ways - by trawling or by hand-lining. In the 17th. 18th. and first half of the 19th. centuries it was customary to handline for cod from the decks of vessels. About the middle of the 19th. century, the practice of fishing with hand-lines from dories was introduced. During the

present century the use of trawls has become general altho handling is still practised. With the introduction of trawls, the quantity of clams used for bait has been greatly increased.

Clams are used most extensively in the spring and early summer when squid and herring are not available, altho at Digby and St. Andrews haddock fishermen bait their trawls almost entirely with clams. They prefer fairly large clams at least two inches in length so as to "fill up" the hook. Otherwise two or more must be used per hook. The haddock trawl (see plate) usually of six shots (300 fathoms) has about 450 hooks hence about two gallons of clams are required to bait one tub (six shots) of trawl. Thus a boat carrying ten tubs of trawl uses about one barrel of clams. In rebaiting a trawl altho the clams remain on some hooks in good condition, usually it is necessary to rebait the entire number.

To an experienced fisherman, the method of attaching bait, whether it be herring, squid, capelin or clam, to the hook is a matter of prime importance in influencing the quantity of the catch. In the case of the clam, the method of attaching it to the hook varies in the different districts of the Fundy Ares (Plate), pictures three ways in which the clam is attached. The one on the left shows the hook fastened to the clam thru the stomach (visceral mass), the other parts being allowed to hang freely in the water. This method is employed by some fishermen at Welchpool, Campobello Island, N. B. An advantage exists in the ease and rapidity with which a trawl containing about 450 hooks can be rebaited. There appears, however, a disadvantage in handling trawls baited in this manner and, furthermore, the chances for catching a fish after it is attracted by the bait are seemingly less favorable.

The method shown on the right (plate) is employed

at St. Andrews, N. B. The hook is first put thru the stomach (visceral mass) then the clam held by the siphon, is twisted a couple of times and the sharp point of the hook allowed to penetrate one of the holes (canals) of the head (siphon) and pushed on far enough to prevent it from coming off. It is to be noticed that the black head is lowermost on the hook (see plate).

The type shown in the center of plate is illustrative of the method in common use at New Edinburgh, N.S. It is essentially similar to the one on the right in that the hook is put thru the stomach or "bag" as it is commonly termed in that locality, the clam twisted and the head (siphon) pushed on the hook thru the head but, in this case, far enough for the head to point upwards leaving a light colored muscular portion visible from below. Some fishermen are of the opinion that this light colored muscle is more attractive to the fish than the darker head (siphon).

At St. Andrews it is a common practise among bait-fishermen to swell their clams by allowing them to soak in fresh water for three or four hours previous to baiting their lines. Sometimes, they keep clams in sacs on the beach for several days until the desired numbers are obtained then they remove them in dories or dingies to larger boats or directly to the point of destination.

Localities-

The beaches which are extensively dug over for bait are usually located near the main fishing centers. However, sometimes fishermen travel a considerable distance for the purpose of securing bait. For example, there are records of 14 vessels and 131 men coming to Passamaquoddy Bay to secure clams in 1901. Practically all the beaches dug over for bait are located at the mouth of the Bay of Fundy-

Charlotte Co. on the N. B. side and Digby and Annapolis Counties in N. S. In Charlotte County, bait fishermen from Campobello and Deer Island go to Bacobec Bay, the mouth of the Digdeguash river and Chamcook Harbor for clams. They use clams in the spring chiefly during May for bait since for the fall fishing herring and squid are preferred except in the case of haddock. During May 1931 about 16 men from Campobello dug clams on a relatively large scale for use as bait. A few are dug in Northern Harbor, Deer Island and Harbor de Latre, Campobello Island.

In the district near Pocologan and the Letang river, Charlotte Co. where there are valuable clam areas, the number dug for bait is scarcely worthy of mention. The same situation prevails on the beaches at the head of the Bay. In Digby Co. the best flats are near New Edinburgh where about 75 lbs. per month are dug for bait during the spring and summer months.

The Distribution of Clams in the Bay of Fundy.

(a) Conditions Affecting Distribution -

On beaches favorable for clam growth the greatest number are to be found between the half tide level and the average low water mark. Sometimes they may be present above and below these limits depending on a variety of conditions. Every clam digger has observed that clams present high up on the flats are smaller than those at a relatively low level and usually more abundant. To explain these phenomena of distribution several factors must be considered. Generalizations are always dangerous and perhaps particularly so here since the predominance of one favorable condition may more than make up for certain conditions normally unfavorably for the existence of the species. Four Conditions are considered which influence the abundance and size of

clams on different levels of the same beach (1) the circulation of the water (2) kind of water (3) type of soil (4) animal and plant life present on the beach.

Circulation of the water -

A fairly good circulation of water over a clam beach is necessary because of the role it plays as (1) food carrier (2) oxygen bearer (3) lime furnisher (4) sanitary agent and (5) set producer.

(1) Food Carrier -

In determining the distribution of any animal food is known to play a very important part. This is particularly true in the case of the clam. Its nourishment is obtained from the microscopic life in the water which circulates thru its body being drawn in thru one canal of the head (inhalent siphon) and expelled thru the other (exhalent siphon). Beaches located near the entrance of rivers into salt water are thus particularly favorable for the growth of clams since here the waters are especially rich in food materials and the currents are likely to be swifter. With increase in current to a certain limit more food is taken in and the result is that growth is greater since in many lower animals growth is directly proportional to the amount of food consumed.

(2) Oxygen bearer -

Clams, like fish, obtain their supply of oxygen for breathing from the fluid environment, moving water being better aerated contains more dissolved oxygen which is necessary for the fundamental processes involved in transforming food into energy essential to the life of the organism. Clams kept under artificial conditions in the absence of current fail to feed normally even tho the water is rich in food materials. Thus, the role circulation plays as a food carrier and oxygen bearer is inseparable.

(3) Lime Producer-

A careful examination of the soft shell of the clam shows that it is rich in lime salts. These are obtained from the water and transformed thru bodily activity with a suitable form for shell secretion. Thus it is clear that a fairly good circulation is essential for optimum shell formation.

(4) Sanitary Agent.

The role played by currents in preventing contamination in thickly planted beds by carrying away products of decomposition is easily understood. The improvement of the sanitary environment by removing any deposits of silt, dead eel grass or organic matter from the surface is effected by good circulation.

(5) Set Producer-

For an understanding of the influence of currents in the distribution of young clams it is necessary to consider briefly the early stages in the life history of the species. Minute sperms and eggs from male and female clams respectively, are extruded into the water during the summer months. After they unite and fertilization is effected, a free swimming embryo soon develops which remains in the water for ten or fifteen days. At the end of this period the larva is unable to swim and where the current is slack affording less possibility of keeping afloat, the clam, on coming in contact with some suitable object for attachment, sets. It is a common observation that at the mouths of rivers or streams emptying into shallow water there are usually eddies thus accounting in part for the presence of good sets. Likewise, in coves around rocks and other irregularities in the shore outline, a large deposit of young clams is effected. Again, in some flats, i.e, those in the Sissiboo River, Digby Co., N. S. large numbers of small clams are closely packed together over a small area near the half tide level due in part to the type of circulation.

Kind of Water

In as much as the clam is dependent on the presence of water to accomplish breathing and on the materials in the water for food, a consideration of the kind of water bathing the delicate tissues of the organism is essential.

As we have mentioned above, the minute plants (diatoms) utilized by the clam for food are strained from the water which is drawn in thru the incurrent canal of the head (siphon) and passed out thru the excurrent canal. The abundance of plant life is largely controlled by the quantity of nitrogenous salts in the water hence those salts indirectly play an important role in the growth of the species. Lime salts which are present in the water and food are changed by bodily activity into a suitable form for shell secretion.

It is a common observation to find beaches which contain an excessive amount of silt and sediment. For example in the esturial waters at the head of the Bay of Fundy the water for a long distance from shore partakes of a brownish tinge due to soil conditions. An excess of sediment in the water interferes with the finding of the clam on account of the mechanical effect on the internal delicate tissues. Since clams are found in bays and coves and along the banks of rivers flowing into the sea, we might expect that the great changes in salinity encountered would prove disasterous. However the clam, unlike the oyster, which is seriously affected by slight changes in salinity, is able to grow in practically all degrees of salt content.

In as much as clams are found from Greenland south along the Atlantic coast to Virginia it is obvious that they can also withstand a wide range of temperature so this cannot be considered a vital factor in determining their distribution in the Fundy Area.

Type of Soil

The fact that clams are found in so many different types of beaches suggests the minor part played by soil in limiting their distribution. Thus, on the shores of Passamoguoddy Bay, clams are found almost universally on beaches composed of mud, sand and gravel in varying proportions. Near Five Islands, N. S. they are embidded in a heavy clay soil so sticky that digging is accomplished only with extreme difficulty. The character of the soil affects the distribution in two ways (1) it partly controls the number of small clams that get firmly settled in the beach (2) it influences the process of feeding. Every clammer has noticed the small number or total absence of clams on beaches consisting of shifting sand or of any soft mud. The explanation is that the openings in the head (siphon) become filled with earth to the extent that the water containing food can no longer be taken in and consequently death results. The presence of much decaying matter in the soil is unfavorable for growth. A mixture of sand and mud in about equal proportions constitutes the best medium for clams.

Animal and Plant Life Present on the Beach.

There are several beaches in the Fundy area, the productivity of which is affected by the presence of eelgrass (Zostera sp) or mussel beds (Fig x).

Near Granberry Point, Campobello Island, there is a small clam flat with considerable eelgrass which appears to be partially responsible for the accumulation of a layer of silt that tends to smother the clams. In general, there is not sufficient present to prove a serious menace to the fishery. The growth of eelgrass over a flat is prevented by constant digging.

On a few flats such as those at Chamcook Harbor, N. B. there

is evidence of the gradual encroachment of mussel beds on the clam flats. These prove not only detrimental to the life of the clam but render digging operations more difficult. On the clam flats of the Sissiboo River, N. S. there are a few mussel beds but they are kept from increasing in size by the large amount of digging. Mussels favor the accumulation of silt and tend to lessen the food supply and render the soil unfavorable for shell formation.

(b) Distribution in the Bay of Fundy.

Generally speaking, it may be said that clams in varying degrees of abundance are present in all beaches of the Bay of Fundy Area where soil conditions are favorable for the existence of the species. Graph 6 indicates in a relative way the number dug in each county but it is not to be expected that this information is necessarily an indication of distribution.

On the basis of field observations, maps have been drawn showing in a general way the extent of the commercial clam beaches of Charlotte Co. and the type of soil present. Fig. 7 represents the several beaches in proportional size. Fig. gives a very general picture of the extent which clams are dug in the three main regions of Charlotte Co. as given in the statistical records. It is important to point out here that location is a factor controlling the amount of digging on certain beaches. Sometimes extremely productive beaches receive little attention from the clammer due to the difficulty in transfering the product to a point of shipment.

Graph 5 shows the approximate acerage of the commercial clam flats of the three general regions of Charlotte Co. The yearly average quantity of clams dug during the period 1925-30 from each region is indicated. On the basis of this chart and quantitative observations, made pm the several beaches concerned, it is apparent that some beaches have been overdug to the extent of

reducing their maximum yearly field and that others which are little developed can stand considerably more digging than has been carried on without any danger of depletion.

Market may be considered as one of the important causes of variation in the number of clams dug in the several counties. However, certain facts of distribution do coincide with graph 6, namely, that the fishery is centered around the mouth of the Bay (Charlotte, Digby and Annapolis Counties) and that the beaches at the head of the Bay dug over commercially are relatively small yet, as is shown later, certain flats in Colchester Co. are capable of supporting a larger fishery than has been carried on heretofore. (See map).

In the following paragraphs, there is presented information concerning distribution as well as general notes on the fishery in each center.

Charlotte Co., N. B.-

For the sake of convenience the clam flats of Charlotte Co. shall be considered in 3 districts (1) those present west of Back Bay including the flats bordering on Passamoquoddy Bay, and St.Croix river (2) those located at Campobello and Deer, Grand, Manan Islands, (3) those present between Back Bay and Point Lepreau (Graph 5.) Graph 7).

The following is a list of the commercial beaches in district No. 1.

Oak Bay
Chamcook Harbor
The St. Andrews Area
Bocabec Bay
Digedeguash Area
Clam Cove
Magauadavie Area.

Oak Bay-

As is indicated in Fig. the areas for commercial digging are centered around Dawn Island and extend southward down both sides

of the St. Croix River to Oak Point. Altogether, there are approximately 130 acres of which about 100 acres are around and above Dawn Island. Years ago large numbers were dug from this locality. In 1924-25 about fifteen men were engaged in digging from Sept. until the 15th. of April but at present not more than four or five men dig regularly so as a result the flats are in excellent condition for commercial digging, all sizes desirable for market being present in sufficient numbers to make digging profitable. In general, two size classes are used for the fresh market - (1) those ranging from 3-4 inches in length which are "shucked" (some 2-3 in. in size are used but not as a rule). (2) those 2-3 in. in length which are sold in the shell. Results of counts made on different parts of the beach, altho too few in number are suggestive of the following facts pertaining to size and abundance. (1) In numerous places near the half tide level large numbers of small clams (about 1000per meter square area) less than two inches in length are present closely packed together to the extent that normal growth inhibited and about 40 percent are dead. (2) At low levels sufficient numbers are present to constitute good commercial digging and about 45% are between 1½ - 2½ inches and about 30% over three inches in length. (3) In some large shallow tidepools, situated at a low level of the intertidal zone, clams ranging from 4 - 4½ inches in length are present in considerable numbers.

Conditions here are unusually favorable for digging in that the beach possesses a very gradual slope so that teams may be driven out on the flats for conveying the clams to shore and the soil consists of a fairly firm mixture of sand and mud very favorable for digging. During the winter of 1930-31, about 500 lbs. were dug in this region. They are mostly all "shucked" or sold in the shell in Calais, Me. or St. Stephen, N.B. During 1930, the price paid for digging was $2.50 per bbl. Previous

to 1929, a few men in vessels came to dig for bait each winter but definite figures concerning the number used for this purpose are not available.

Chamcook Area-

The clam flats in Chamcook Harbor suitable for commercial digging comprise an area of about sixteen acres. At the head of the harbor there is a flat of about seven acres which has been dug over most. The soil consists of sand and mud in the proportions of about 1 to 1. The mud here is quite black containing considerable decomposing material. There are a number of mussel beds present on certain parts of the beach that appear detrimental to the clam population. Along the northwest side of the harbor the coast is irregular in outline with projecting rock ledges between which there are small clam flats consisting of a mixture of sand and mud. Clams are smaller and less abundant here than at Oak Bay. This may be explained by the fact that here as well as at Digdeguash, Bocabec Bay, Maguadavic River and the St. Andrews area, extensive digging is carried on every winter. Near Chamcook Harbor and south of the Bar Road which connects Ministers Island and the mainland there is a flat consisting of over 30 acres very suitable for commercial digging. Here there are present large numbers of small clams. The scarcity of large ones is very definitely due to overdigging. The soil which is very suitable for digging consists of mud and sand.

St. Andrews Area.

There are over 30 acres of commercial clam flats in the St. Andrews Area. Due to their location near a clam factory, they are dug over extensively an average of about 400 lbs. per month being dug in 1930. The clams dug in this area average between 1½ and 2½ inches in length, few over three inches being obtained. From July 1st. to

Oct. 1st. 1931 about 1300 bbls. were shipped in the shell to Boston from the factory at St. Andrews and during the last three years about 5000 gal. of "shucked" clams.

There is a small flat near the St.Andrews wharf subject to pollution from the town sewer, consequently it is only dug over for bait. Clams are dug for bait during chiefly the months of May but as a rule the number is small since not over eight men are engaged. During the winter months a few are dug for home consumption, but the main market is in Boston where shipments are made quite regularly thruout the year. In 1931, a price of $1.50 per bbl was paid for digging.

Bocabec Bay-

In this region there are about 30 acres available for commercial digging. The part of the intertidal belt suitable for digging consists of a narrow strip averaging about 30 yds in width and extending along both sides of the Bay. The soil consists of sand and mud but on account of the presence of large numbers of rocks the surface is very irregular and digging very difficult in many places. At the head of the Bay there is a small mud flat (area about 4 acres) that has been extensively dug over. Near the half tide level small clams are very abundant. Whereas lower down there is a scarcity of all sizes.

Quite a number of men from Deer and Campobello Island camp here in winter for the purpose of digging. During the winter of 1931 about 20 men dug regularly and an approximate average of 125 lbs. per week were shipped. A large percentage of the total number dug were marketed in Machais, Me. where they are canned. In 1931, the price per bbl. landed at the factory was only .85¢.

Digedeguash River

From (Fig.) it is shown that the area on the intertidal

belt suitable for commercial clamming consists of a narrow strip (averaging about 20 yds in width) extending along both shores of the Harbor, a total of about 12 acres. Sand and mud flats favorable for digging operations are decidedly scarce. The shore is irregular and rocky in outline and the area for digging in only exposed about 2 or 3 hours per tide. There are large numbers of small clams present and the scarcity of those over 3 inches in length is ascribed to over-digging.

At Hog Island, located near the mouth of the river there are about 3 acres of clam flats. There are a large number of small clams present at low levels together with a fairly large percentage over 2½ inches in length. On the basis of these observations, we believe that there is no danger of depletion in the near future.

Maguadavic River.-

Clams are present on both sides of the river near the mouth comprising an area of about 22 acres. The marketable sizes are rather small but were abundant.

Most of the shipments from this locality are sent to the factories at Back Bay and St. Andrews, very few being dug for bait.

Clam Cove-

Very little digging has been done here, altho there are over 30 acres of suitable flats consisting of sand and mud. The slope of the beach is very gradual and circulation is good. There are a large number of small clams from a little above the high tide level to mean low water mark and the abundance of clams of marketable size is sufficient to rank this beach as one of the best for its size in the Passamoquoddy Region.

Digby and Annapolis Counties-

The commercial clam fishery on the N. S. side of the Bay of Fundy is centered in Digby and Annapolis Counties. Since 1910 clams have been canned and used fresh for bait and home consumption. The following is a list of the more important centers of the commercial fishery together with an estimate of the number of acres suitable for clamming in each locality.

	Locality	Acreage.	
Digby Co.			
	Sissiboo River	280	High
	Smith Cove	75	
	Gilbert Cove	50	
	Joggins	40	
	Plympton	15	
Annapolis Co.			
	Clementsport	500	
	Upper Clements Deep Brook Thornis Cove	500	
	Total	1450	

The soil is very favorable for clamming consisting of a mixture of fine sand and mud in varying proportions on the different flat.

Clams are used for canning, bait and home consumption. There are about four factories in operation usually only during a few months of the year (Oct., Nov., Mar., and April chiefly) as a result of unfavorable marketing conditions. Haddock fishermen use clams thruout the entire summer for bait. In 1931, diggers received 1.20 per bbl. At this time, the greater number were shipped fresh in the shell to the Boston market. In the vicinity of Goat Island, where there are

extensive areas of excellent flats, local diggers market a few fresh clams in various towns thruout the Annapolis Valley. A small number are shucked and sold in Boston. In 1931, the price received for "shucked" clams was 1.25 per gallon and .60 per gallon paid for "shucking".

As indication of the trend of the fishery is given by the fact that a total of 11,211 bbls was dug during 1926, 1927 and 1928; 2466 bbls in 1929 and 12,690 bbls valued at $23,708. during June, July Aug. and Sept. 1931. Of the total dug during the summer of 1931, about 80% were reported from the district Digby East. As a result in certain localities such as the Bissiboo River depletion is immanent. Market conditions are considered mainly responsible for the fluctuations in the number dug.

Colchester County.-

Habitats favorable for clams are not numerous at the head of the Bay.of Fundy. The only beaches suitable for commercial clamming are located in Colchester Co. (See Fig.) Here a small fishery centers around Five Islands, Economy and New Islands. There are a few clams present on the beaches near Parrsboro and Advocate, N. S. but not in sufficient numbers to be considered commercially. In 1929, two small factories were in operation one located at Harrington River the other at Five Islands. Due to lack of market both factories closed during the early part of 1930. Altogether not over 400 lbs. were canned by both factories. These were sold principally in the N. S. market.

A small number of clams are dug for home consumption but practically none for bait. The price received by men who peddle clams from house to house is .50 cents per peck. Factory diggers received 1.25 per bbl. The fluctuation in the number dug is to a large

extend caused by changing conditions of employment.

The flats which have a very gradual slope consist of a layer of heavy red mud and sand six to ten inches in depth irregularly covered with a layer of soft brown mud 2 - 3 inches in depth. Below these layers, the soil consists of heavy impenetrateable clay consequently digging is difficult in most areas.

There is little variability in the size of the clams present. Approximately 80% range in length from 1½ - 2½ inches.

The small number of clams present in the area at the head of the Bay is principally due we believe to unfavorable soil conditions.

Clam Culture.

The need for cultural operations has already been evidenced in several clam flats of the Bay of Fundy. Counties (e.g. the Sissiboo River Area) have been overdug. On account of the slow rate of growth in these waters as compared with more southern localities (e.g. Massachusetts) the introduction of clam culture is desirable for an early return of normal conditions.

Extensive depleted areas have been restocked in the Cape Cod region and the possibilities of Clam Culture thoroly demonstrated.

The methods employed in restocking are simple and easy to practise. Seed clams (preferably less than 1½ inches in length) are sowed on the surface of the flat during flood tide so as to be exposed as short a period of time as possible. When covered by the tide, the small clams will rapidly burrow into the soil if in good condition and require no further attention. Some beaches require raking over to loosen up the surface and thereby facilitate burrowing, and prevent the "clumping" of the clams by the tide. If clams are sown on firm flats

exposed to wave action the flooding tide is likely to roll them in windows upon the beach before they have time to burrow. Hence, under these circumstances, it is customary to plant when the water is about three feet deep over the flat.

Essentially similar methods have been employed by the writer at the Sissiboo clam flat, N. S. and the experiments are still in progress. Thus far, our results for this area indicate that a very low percentage readily digs in and become permanently established. Apparently this is the major problem facing the commercial development of clam culture in the Bay, and one which warrants immediate solution. On most beaches in this region, seed clams are present in large numbers at the upper levels for transplantion to the lower depleted zones of the beach. Due in the main to lack of food, the early growth of the small clams at the upper levels is somewhat retarded. The effect of this retardation upon the subsequent growth of these clams which are transplanted to lower levels, where normal conditions of food exist, is as yet undeternined and awaits analysis.

In event of the necessity for shipping seed clams, packing in seaweed with a little ice has been found satisfactory.

Digging over an area of beach is of advantage to the clam population only when they are too thick to grow well. Otherwise it is injurious rather than advantageous as is frequently believed.

Closed seasons should accompany clam planting as an economical means of increasing clam supply. Furthermore, it is highly desirable to set aside certain flats for brook grounds. On these flats, the protected clams will furnish spawn to seed the other flats.

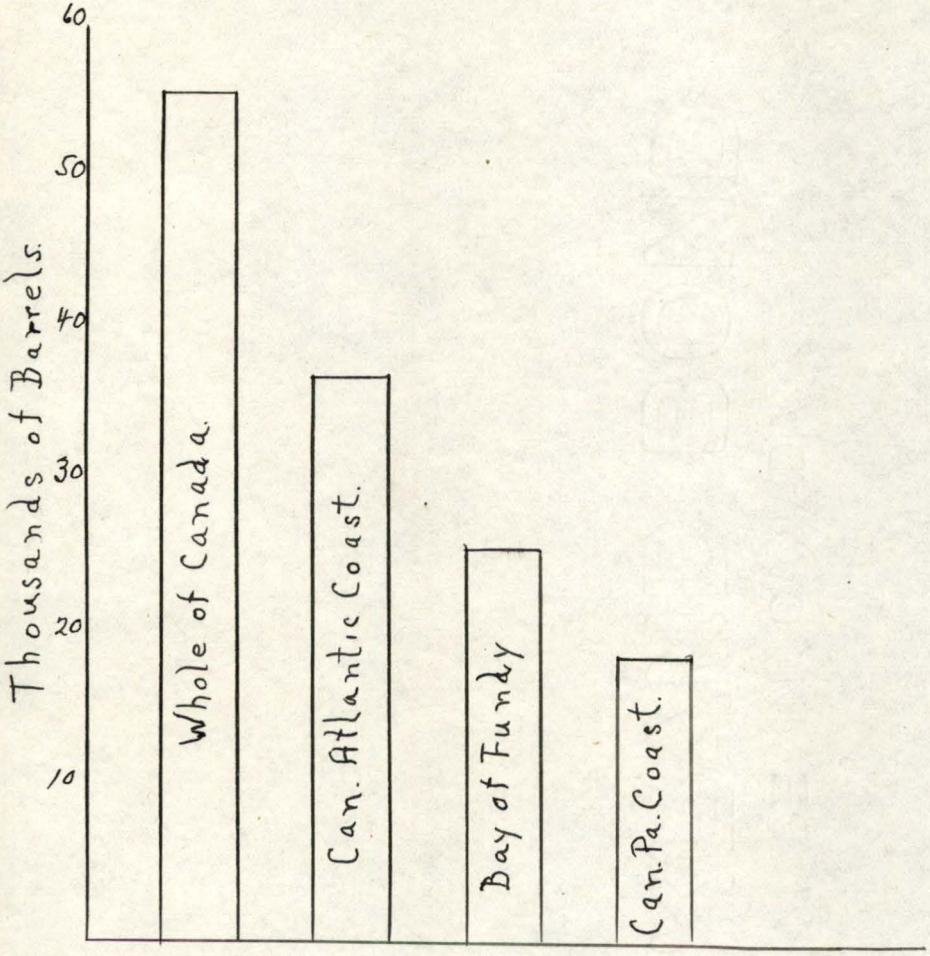
In some places, flats are leased by towns or by individuals for the purpose of clam farming, a not unprofitable occupation in many localities.

Should the fluctuations of the clam population of the various commercial beaches of the Fundy area be followed from year to year and cultural operations undertaken where the conditions warrant restocking, it is believed that this important fishery could be materially increased and operated on a sound economic basis.

Table 11.

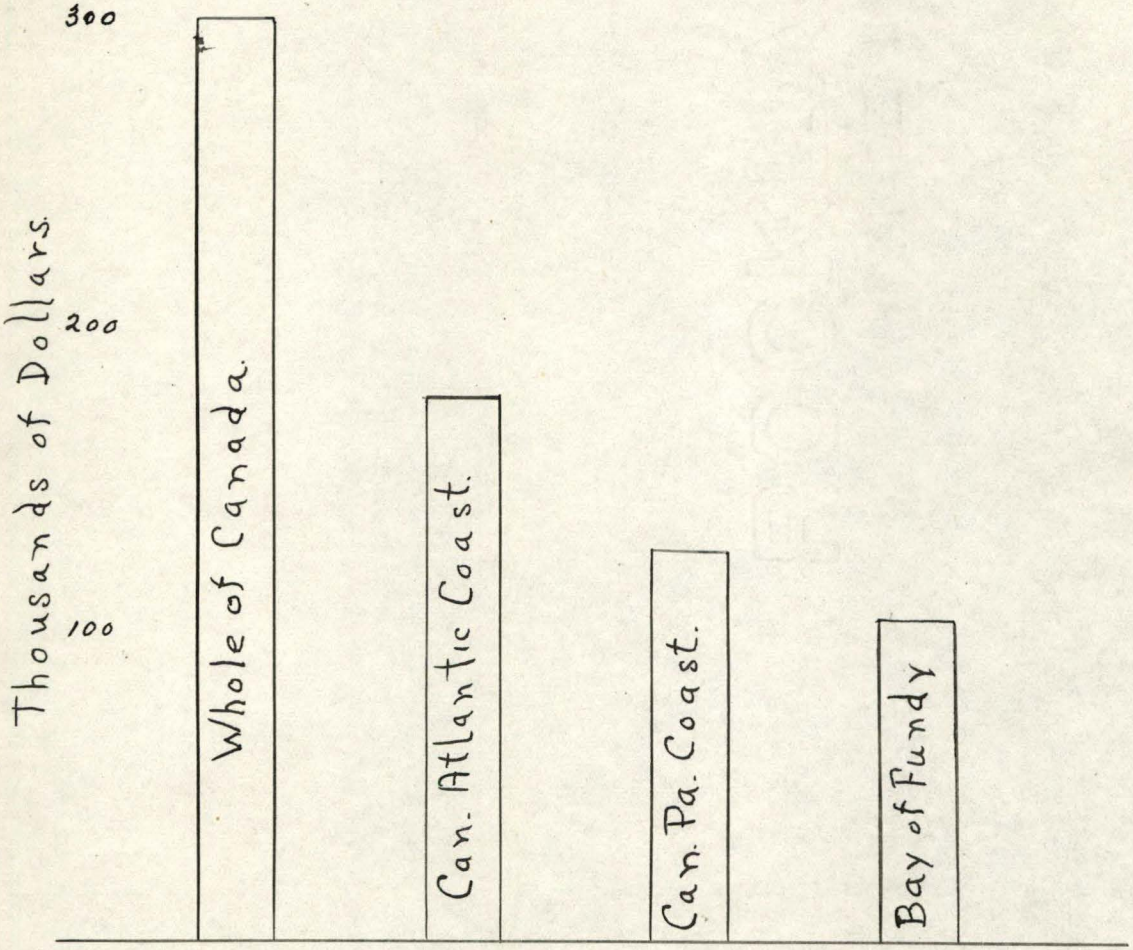
Charlotte Co.

Year	Total	Fresh	Canned
1925	11507	1586	9360
1926	17833	5980	11795
1927	24493	6696	17797
1928	23121	4779	18007
1929	22946	1216	22279
1930	16623	2249	13907
1931	[illegible]	5017 bbls	6489 cases
1932			

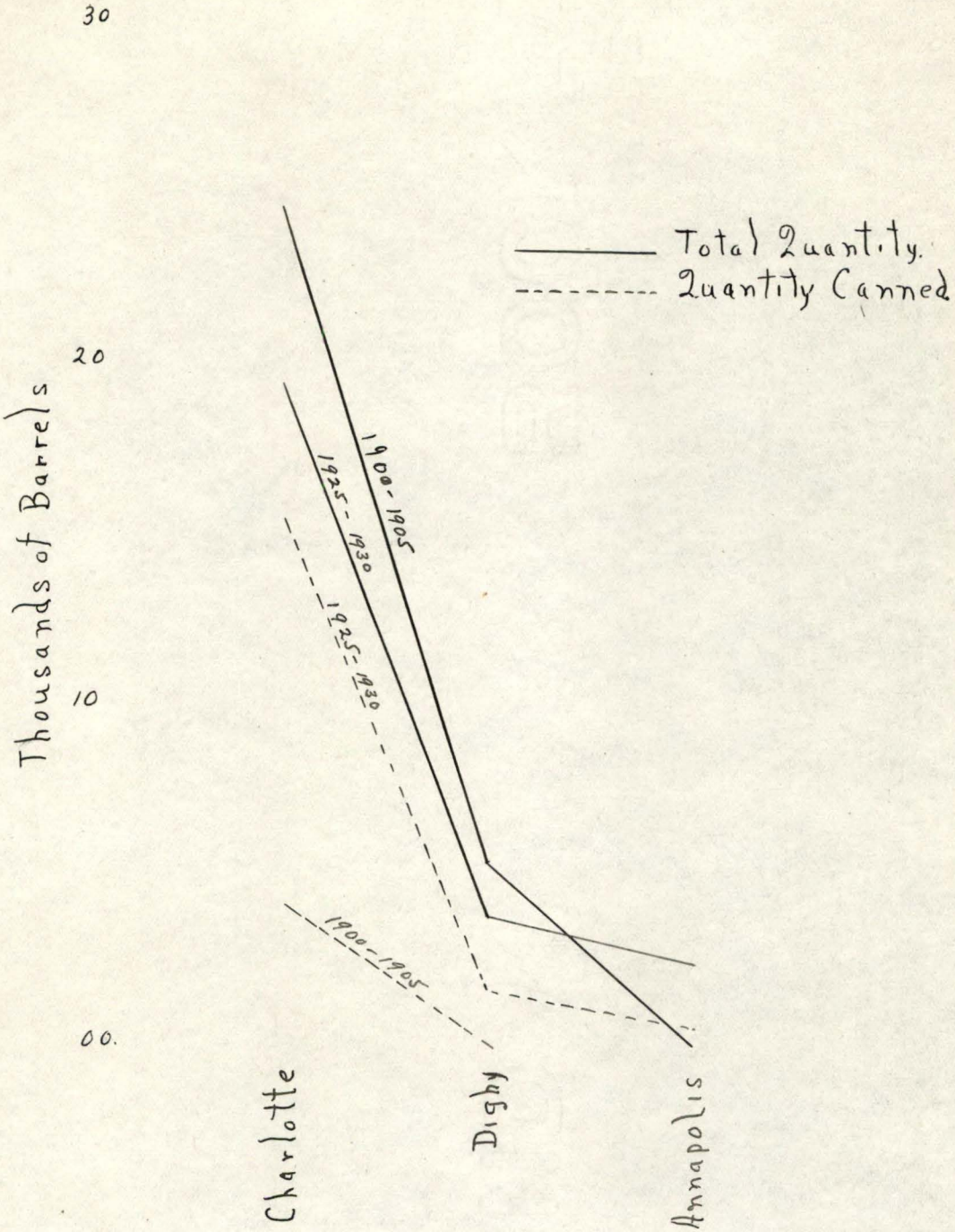


Graph 1. The average number of clams ~~dug~~ Yearly dug during 6 years 1925-1930 is shown.

figure 1.

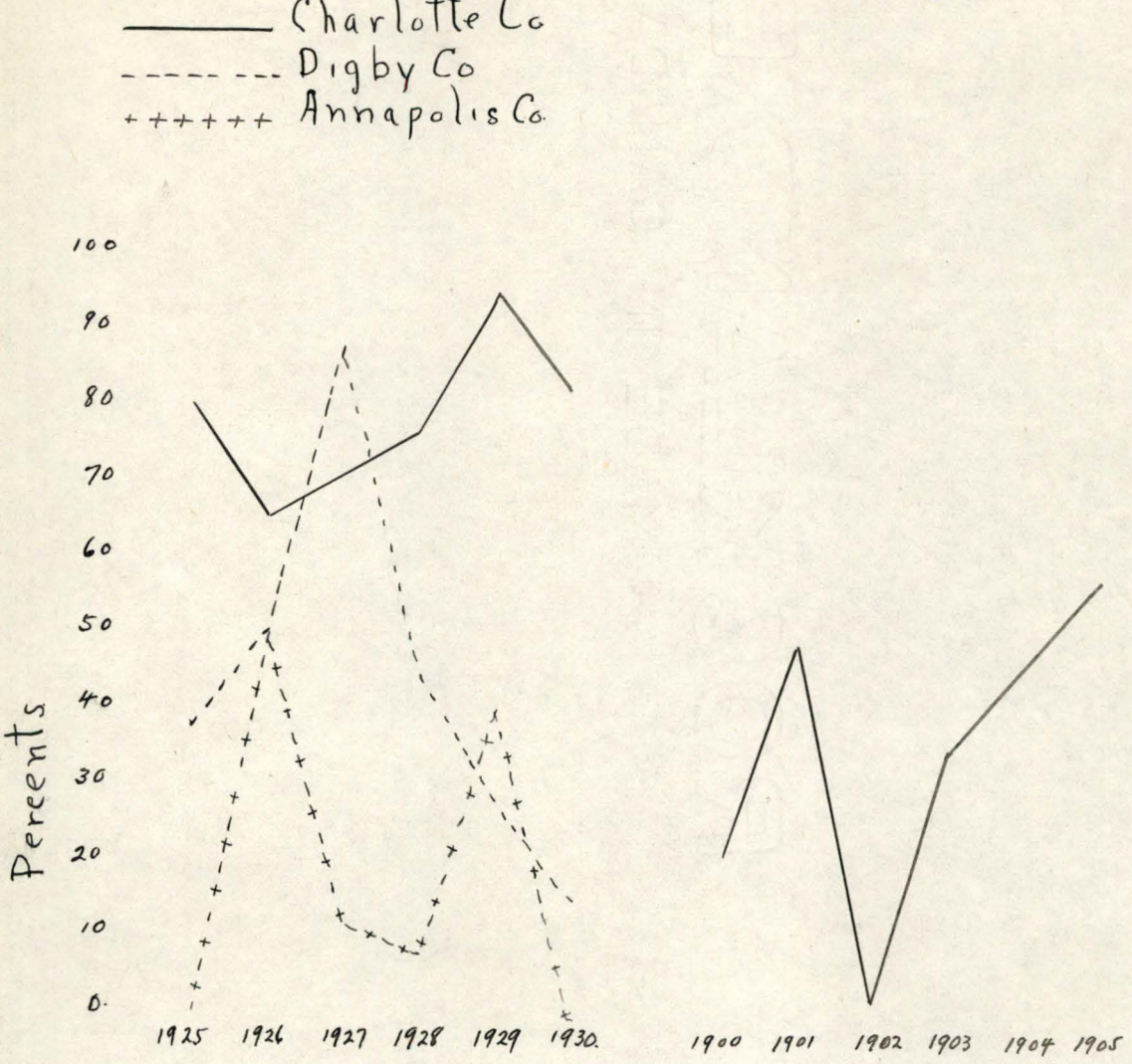


Graph 11. The average marketed value of clams dug during 6 years 1925-1930 is shown.

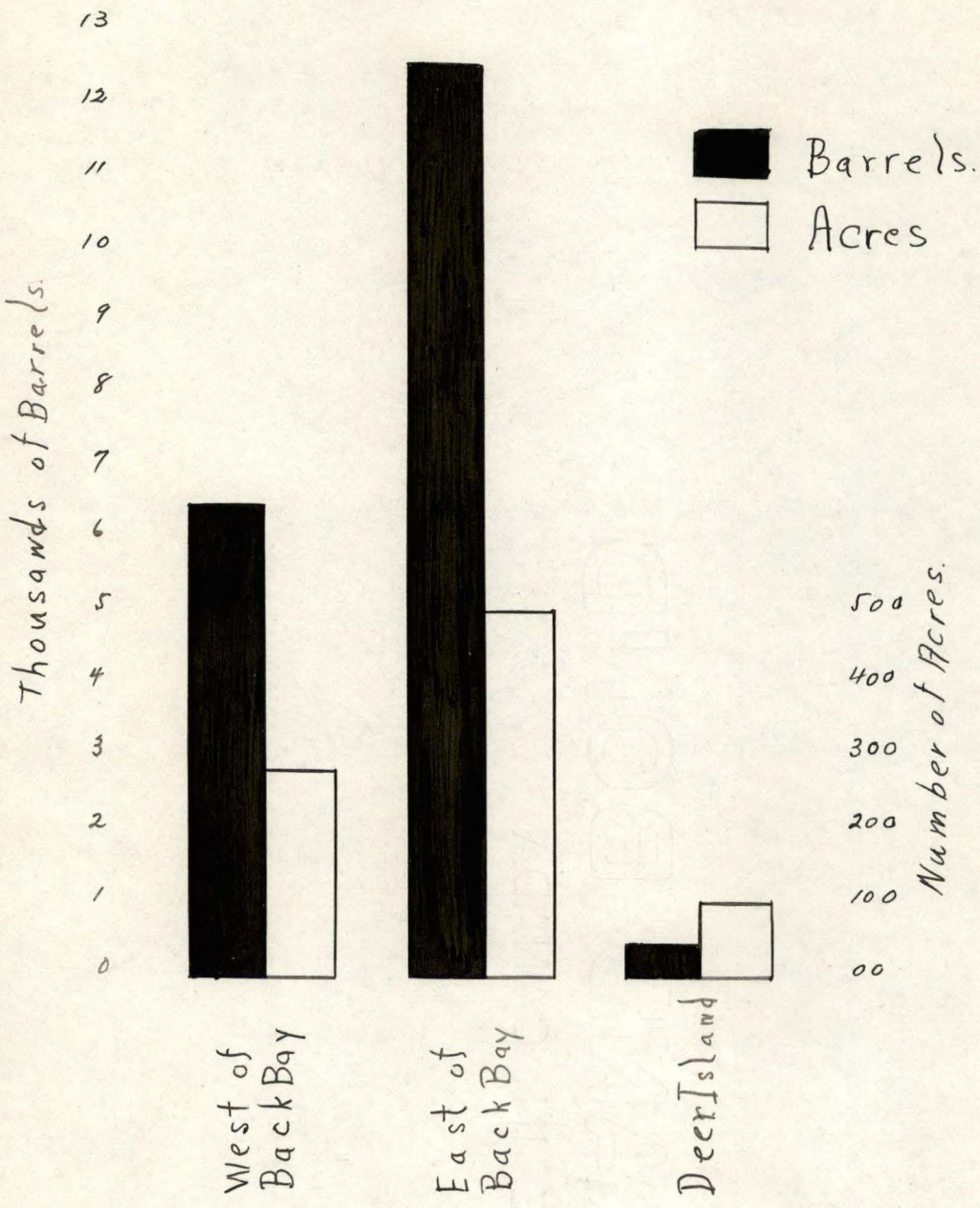


A comparison of the average total quantity of clams dug with the average quantity canned during periods 1900-1905 and 1925-1930. These graphs are based on yearly averages.

Graph 3
Fig 3



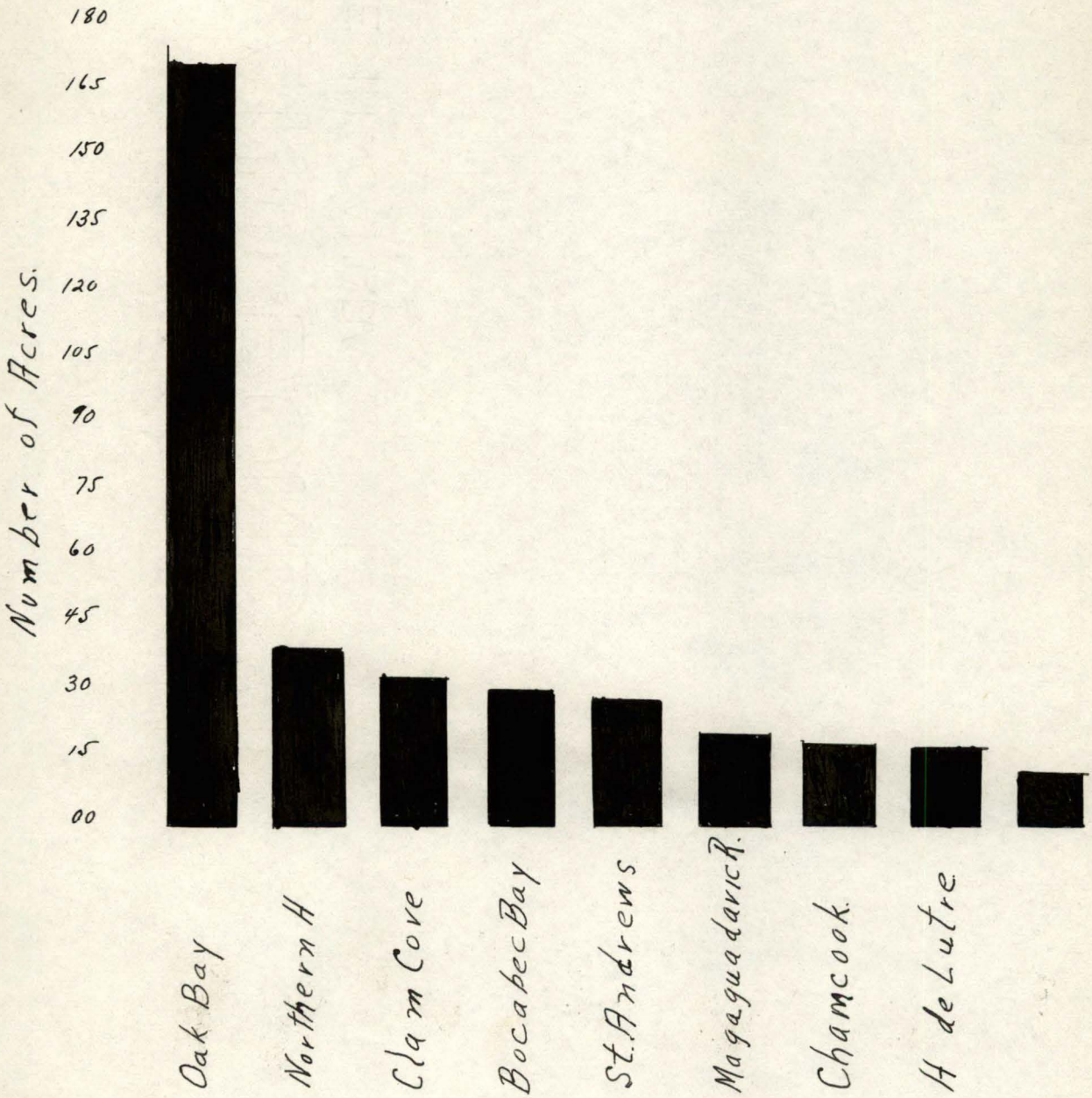
Graph showing the percentage canned of the total quantity of clams dug during the years 1925-1930 and 1900-1905.



Comparison between yearly average quantity of clams dug during 6 year period 1925-1930 and the area of commercial clam beaches in Charlotte Co.

Average quantity of Clams dug in each county during 12 years 1918-1929

Fig 6



Approximate Area of Commercial Clam Beaches of Charlotte Co., N B.

Possible Changes.

Plates may be provided if desired.

Page 2. Chapter entitled -Desc iption of clam and related species" could be omitted.

Page 6-9 Could be omitted unless the history of the trend in each county is desired.

Table 11. Please fill in 1931 and 1932 data from recent statistics.

Page 12. Description of forks should probably be omitted.

Page 13. Plate showing "creels" questionable as to inclusion.

Page 14. Also plate showing containers questionable as to inclusion.

Page 15 - 18 The detailed account of canning methods may not be desired.

Page 18-19 On cost of marketing clams may not be desired.

Page 27 Fig. A available if desired.