UNITED STATES AND CANADA.

INVESTIGATIONS AND INTERVIEWS.

--- 1893.---

VOLUME I.

NOTES TAKEN BY DICTATION FROM VINAL N. EDWARDS,

WOODS HOLL, MAY, 1893.

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MACKEREL.

Begin to appear early in May. Height of season about June 1. They run to Buzzards Bay as far north as the pounds. Last year did not get more than 30 or 35 a day to any trap. Used to be very much more abundant 10 to 12 years ago. Sometimes hauled the nets twice a day for them. Before then never heard of their being scarce since pound nets were used. Spindels trap was first put in Buzzards Bay about 32 years ago, right off Woods Holl breakwater. There were no traps before then throughout the Sound, unless there were some at Menemsha Bight. Thinks there were none there either. Increased rapidly as Spindels was successful.

At Chatham and Harwich and Monomoy Point they use very many traps, intended specially for mackerel. Put down, April 15 to May 1, and take up about July 1. Some years say many fish are full of spawn, but others rather few. In 1891 and 1892 did not get one-tenth as many as in 1890, and previous years. Had always been abundant there, and eggs used to run in great quantities.

No mackerel are caught in Bay or Sound with hook and line in the spring, but they are so caught in the fall--October and first part of November. Traps generally are not down at that season, but they do catch them at Menensha Bight in traps then.

Has seen mackerel at Menemsha two and two and a half inches long, two or three years ago, middle to latter part of July. Saw a bunch of about 400 or 500, smallest ever seen by him. Thinks he might find smaller ones early, about July 1.

Has obtained ripe mackerel eggs three different years. First year destroyed by storm; following year hatched, and subsequently got a lot for Dr. Wilson. First lot came from Spindels breakwater pound. Second and third from John Rogers pound, Quisset.

More ripe female than male; used about three or four females each time, and one or two males. Eggs only partly ripe in each, balance still looking as though they might require some little time yet. Males same, andnever saw in any species all the spermary ripe. Generally with female eggs not all ripe together. In tautog has seen nearly every egg ripe, however.

Sees ripe mackerel eggs every year, but has not taken them, 1st to 20th of June, more towards last date. In the height of run of mackerel (June 1 to 15) do not find so many ripe ones as subsequently when they are becoming more scarce. At these later dates finds nearly all the fish ripe (to the extent above described).

Off Gay Head the past few years they have caught mackerel during the summer, chiefly with hooks from small schooners and cat boats, sometimes getting four or five barrels each in a day. Also did some pursing, but made small catches. Very large mackerel occurred in the fall of 1892(last October, first November). Fishermen say they never saw so many large ones in this region as there were last year.

About 3 bbls. very large mackerel caught October 29 off Devils Bridge, with hook and line. Minal N. Edwards took ten, which were weighed and measured. All measured 20 inches, but one $20\frac{1}{4}$ inches. All weighed 2 lbs. 10 oz. No signs of any spawn. Stomachs full of toll bait.

SALMON.

When Mr. Edwards was at Truro in September, 1892, they had been taking considerable quantities of salmon in weirs with alewives, all along that part of the inner shore of the cape. Sent to New York on account of Massachusetts law which prohibits their capture.

PRINCIPAL FOOD FISHES CAUGHT IN POUNDS.

Shad. Average about 50 to a trap in Buzzards Bay for whole season.(25 traps on east side and 12 to 14 on west side of bay). Catch very few in Marthas Vineyard, but at Falmouth Heights may get 100 to 150 in a season. Run from last of April to June. Knows of no place where they spawn in this region. Nearly all have spawn during the run, but toward the end may get some that have spawned.

No absolutely fresh waters, except some very small streams.

Alewives. Commence running into ponds as soon as ice is gone. Sometimes as early as last of February. More generally sometime in March. Run into July. Last of run caught in fish traps; have no spawn, but do not appear to be those which have been spawning in streams or ponds, as the latter are reduced almost to skin and bones. Caught in traps as soon as they are placed.

Scup.

Seabass.

Tautog.

Squeateague.

The first ones that come and are taken in

traps(about middle of June) are full of spawn. Do not continue long in spawn. Caught up to November 1, when traps are kept on. Is not certain where they spawn' but think some do in Wareham River. Catch may run from 2 to 100 a day to a trap, generally about 6 to 14 early in the season. Strong northerly wind increases catch on east and south side of Bay; and in the Sound, wind blowing on shore.

Butter Fish. Commonly taken in traps June 15 to late in fall. Last two years they have been worth same as scup in New York, and more in Boston.

Mackerel. Some taken; has not amounted to much the last few years. Used to catch more in one morning than now in a season. Early in May. Height about June 1, same as scup, seabass and several other species. Feed very commonly on small sand eels (Ammodytes). Catch them at Menemsha until in the fall, but in Bay do not catch them after July 1.

Spanish Mackerel. Rare; five would be a large catch a day to a trap. Used to be much more plenty. Season July 15 until October. Never saw them in

spawn, and never saw young.

Cero. About as abundant as Spanish mackerel; season same.

Bonito. July 1 into October, but not many. Small ones(12 inches) abundant last year, but large ones rare.

Pompano. Used to catch in Spindel's trap as many as 150 during a season, about 15 to 20 years ago. Kept growing less and less, and thinks not one has been taken for eight or ten years. Small ones are seined in small numbers.

Horse Crevalle. Caught in the fall at Menemsha.

Yellow Crevalle. From July 1 to as late as traps are kept down.

Winter Flounder. Most all caught in April.

Summer Flounder. Up to middle of October.

Sand Dab Window-Pane. April to as late as traps

kept in. Begun to send to Boston market last year and bring higher price than any other flounder from this region,-5 to 6 cents-while the other flounders brought 2 cents.

Cod. Very few taken in Bay at Menemsha. Get some in spring(April) and fall(November, etc.)

Hake. Phycis tenuis, caught at Menemsha all the year; abundant after August 1. Do not send to market. Take immense quantities, but turn them out. Use some for bait.

Whiting. Caught in fall. Abundant; send some to market, but mostly turned out. North of Cape Cod spawn in August or September.

Rock fish. Very few taken now.

Sea herring. Some years taken in great abundance; other years rather scarce. Spawn in fall in Sound and Vineyard Haven. North of Cape Cod spawn in October.

LAWS.

Buzzards Bay.

Gill netsand purse seines prohibited everywhere. Shore seines and traps allowed, except north of line between West Falmouth and Mattapoisset. For traps, must get license from Selectmen of town.

March and April, 1893, new law, prohibiting fish pounds and fixed nets in water of Buzzards Bay after termination of present licenses. Longest run of license is 5 years, and law will be absolute after that time.

Edwards thinks it sufficient to stop traps from May 15 to July 1, as covering the spawning season.

Vineyard Sound.

No general law, but town of Falmouth will not grant license to pounds within half a mile of a herring creek.

BUZZARDS BAY AND VINEYARD SOUND.

Principal injury to scup and seabass caused by pounds catching them in spawning season. The latter part of spawning season, small scup, year old(7-8 inch) and 4 inch scup(age not known) run up also and are caught with the large scup in the pounds. In pursing up the net to take the fish out, the larger ones come to the top and can be removed, but the smaller ones in large proportion are killed by the squeezing together. The number killed depends upon the length of time the men are at work. Sometimes nearly all the smaller are thus killed.

These are about the only species which are hurt in this way, being the only species which are taken spawning in large quantities.

Tautog spawn in eel grass where mixed with rocks or other hard bottom, and may be caught by bait, but not so easily as at other times, but when so caught and brought up the spawn is running from them. They lie quietly andmay take in the bait without one knowing it. Soft shell lobster best bait for tautog. Begin to catch them in the Hole about 6th to 10th of May in strong current, and in the rivers at the head of Buzzards Bay on

rocky bottoms and ledges.

Edwards thinks that large tautog leave the Bay and Sound in fall, and catch them again as soon as they put in traps--generally April 25. May be there early, but not known. Generally take only 6 to 10 in each trap in the beginning, and increase in a couple of weeks to about 50, and then runs down in 10 days or 2 weeks to very few again. Catch no tautog in summer in traps. The catch ends usually about last of May. Thinks they are taken in traps as they are running into their feeding grounds. After that they are not moving around much.

In the fall when traps used to be set late enough, had the same run of tautog leaving the bay, but do not set so late now.

Tautog spawn about middle of June to middle of July.

NOTES MADE AT WOODS HOLL, MASS, MAY, 1893.

MAY 8, 1893.

Went fishing on Bobell in launch' nine fathoms. Caught one cod weighing about 8 lbs.; two barn door skates; two winter skates, and two common sculpins. (Edwards has not in his records distinguished between the sculpins). Contents of stomachs of skates noted elsewhere.

In Spindel's trap at the Breakwater, Woods Holl, took large numbers of Clupea harengus (2 buckets) young, white, line of black spots along back, $1\frac{3}{4}$ to 2 inches long. These young are abundant through April and May. Grow some larger and silver up last of May. Earlier are much smaller than above. This species spawns here November and December. Are through spawning north of Cape Cod by November. Sometimes the spawn is set so thick on the gill nets as to sink them to the bottom. (Roman's Land). Adhesive eggs.

Visited Oyster Pond, Falmouth, for alewives. Great abundance in ponds, and running in every day now. Begin running in last of February or beginning of March. This year not till March 20.

Continue running to about June 1. Black backs (called Kyacks north of Cape) appear here about June 1. They go to mouths of streams and stem the current, but never enter. Hang around until appearance of blue fish, which chase them away. About 2/3 size adult alewives. Contain no spawn. Differ from alewives only in that back is dark blue, looking black in water. Has not seen them at any other time of year, but alewives of same size are caught occasionally during summer having the lighter backs.

(At North Truro last November Mr. Edwards opened alewives and found spawn looking nearly as full as today. Fishermen there think they spawn both fall and spring.)

In oyster pond surrounded quite a large number of alewives, but took only about 25. One had black peritoneum, all the rest white. All had spawn and milts very far advanced, but not running. Eggs were separated; examined under microscope. They did not seem to be much more advanced than in menhaden taken today, and the spermatozoa were about equally active in both species. About one-half male and half female. No food in the stomach of any, except occasionally slight trace of di-

gested matter. Specimens caught a few days ago just starting to run in, and also taken in fyke net in Great Harbor, were full of crangon and nothing else. Also feed on little red-eyed sand fleas.

Tarpum taken in small quantities(1 or 2 a season) at Menemsha. Has been taken up in Buzzards Bay as far as Quisset.

Smelt are found in fresh water ponds at Brenster & Eastham, Cape Cod, landlocked. Specimens seen by Vinal N. Edwards were all about 5 to 6 inches. They appear along the shores last of February, the only time in the year when they are seen. No apparent difference from the sea form. Bean has examined them.

Mackerel. What proportion of a school spawns off Woods Holl? Arrange plans for catching large quantities in spawning season by Grampus using purse net if need be.

June 1-8, 1893.

June 1. Left Washington with Dr. H. M. Smith, 11:30 P. M., Penna. R. R., for New York. Arrived in New York June 2, 7 A. M. Went directly to Astor House. Visited Fulton Market, and spent much of the morning there. Returning to hotel, found that Dr. Wakeham and Mr. Venning had arrived about 8 A. M. The afternoon was largely spent at Fulton Market. Conferred with E. G. Blackford. Finally concluded that as it was not likely that any more vessels would bring mackerel to New York, there was no use of remaining there any longer, and it would be best to go right on to Boston. Obtained some interesting notes which will be mentioned farther on. Ordered Mr. Hardin to proceed to Washington on June 3, as there was nothing particular for him to do farther in New York. Remained over night in New York.

June 3. Left New York 9 A. M. and went to Boston, via Springfield, arriving at Boston

3:30 P. M. Put up at United States Hotel. The entire party, Dr. Wakeham, Mr. Venning, Dr. Smith and self. Called upon Mr. Dimick, Boston Fish Bureau, and conferred with him. Found that mackerel were likely to arrive in purse seines from Cape Shore soon. Decided informally to begin an investigation of the shore mackerel fisheries of Massachusetts coast, remaining in easy reach of Boston, and subject to call on arrival of smacks.

June 4. Sunday, remained in Boston.

June 5. Left on morning train for Woods Holl, arriving at 11:38 A. M. Took quarters in Fish Commission building, board at Nobska Hotel.

Afternoon, in steam launch, examined pounds in Buzzards Bay, adjacent to Woods Holl, and one off Nonamessett Island, in Vineyard Sound. Questioned V. N. Edwards about working of traps, catch, etc.

June 6. Assisted in loading Fish Commission car with live fish for Chicago Exposition. Taking off lobster spawn, and recording No. to each lobster. Observations on young fishes about harbor and wharves.

June 7. Trip in launch to Menemsha Bight. Examined traps. Seined on shore. Took supply of egg lobsters for Woods Holl. Questioned fishermen. In evening long conference with V. N. Edwards. Afternoon took off spawn from lobsters (2,170,000).

Result of evening conference was decision to begin at once visit to outer part of Cape Cod, Provincetown, N. Truro, Wellfleet, Chatham and Harwich, to examine and find out about spawning of mackerel, number taken, extent of weirs, opinions of fishermen as to cause of general decrease of fishes.

June 8. Mackerel are not taken in the trap at Falmouth Heights. (Edwards).

A list of the dates on which the mackerel were first taken in the traps about Woods Holl has been furnished by V. N. Edwards. Covers 10 or more years.

All of the mackerel from which Edwards has obtained and hatched spawn were taken in the traps in Buzzards Bay close to Woods Holl. The first were hatched in Little Harbor, some time prior to 1885, when Chester was in charge. He is not certain that this fact was noted in his natural history records, but an account was sent to Prof. Baird. The time was in June. All the hatching of mackerel has been in June. Some were hatched during the spring Ryder was in Woods Holl with Chester. It must be accounted for in his report. Only one fish was used of each sex. Never saw ripe eggs except in June. Grampus took ripe mackerel in 1891, and brought to Woods Holl.

Interesting to note that from these fish, kept in confinement, the eggs proved worthless. This is the case with other fishes and will be very interesting to bring Edward's' notes together on this subject.

Traps off Chatham and Harwich take ripe mackerel some seasons, but not constant (Edwards) From E. Harwich to Monomoy there are perhaps 75 to 100 traps. These are owned by several firms who have a certain number each, and employ a captain to look out for them.

From Harwich it is about 1 mile to place on shore where fish are landed, called the "landing." All fish from this region brought to Chatham or Harwich. Branch railroad between these two places. Eldridge Hotel in Chatham.

In N. Truro see Capt. A. Hughes. Center of large fishery. Canneries for mackerel and herring.

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PORTLAND, MAINE, JUNE 26, 1893.

John Loveitt & Co., Commercial Wharf.

Mackerel brought in from the eastern end of Casco Bay, about 5 or 6 miles west of Seguin Island. Being Monday morning this catch represented the time over Sunday, but the quantity was very small, not numbering probably over 300 fish. They were caught in pounds on the shore. Large quantities of shad were caught with them and also brought in. These shad were all small, the largest probably not measuring over 20 inches. Some of the larger ones bore a general resemblance to those of the Potomac, but the great majority were marked with the dark spots forming one or two rows, with sometimes the beginning of a third row, along the upper part of the sides. By some persons they were called hickory shad. They were described as different from the spring run of shad into the river, and some of the fishermen said they were solely a sea run which

did not enter the rivers. They may be caught at this season for about 2 weeks more or less in abundance. Saw roe from one of these shad which were not much advanced.

The mackerel may be classed under 2 sizes. 1st. small ones, which measured 10 to 11 inches; they composed about 1/3 of the catch. No ripe spawn or milt could be pressed from them, but saw none of them split, and therefore did not learn what condition their reproductive organs were in.

2nd. the larger mackerel measured from 13 to 18 inches, the larger ones appearing to be very large and in good condition for the spawning season. Pressed 97 individuals with the following results: 30 males, 27 females, 40 hard or not giving results. Perhaps a dozen were split, all containing spawn or milt about the same as at Gloucester and Boston, well developed and evidently would soon be ripe, in the course of 2 or 3 weeks. Of those

yielding results, the same remarks would apply as in former notes, namely, the milt generally flowed readily, and without much pressure. In about 6, the eggs flowed in the same way. The slightest pressure was sufficient to force out the transparent eggs, which had no adhesion together, and many of these eggs were found scattered over the sides of the fish in the basket as they were hauled up from the small boat. They were so ripe that the pressure given by handling was sufficient to force them out. They might even have been spawning when taken from the water. The other females had less ripe eggs, which generally were adhering (Not stuck together, but held in mass as they appear in the ovaries) more or less together as they came out. They were not absolutely ripe, but evidentally would have been in a very few days. On June 24, in one of the other markets, saw some mackerel, a part of which had been split, and found essentially the

same conditions as above. No fish were spent, but the proportion of ripe fish was not ascertained, as no opportunities were afforded. On this day the shore catch of mackerel had been rather large, but it was marketed early, and the markets closed at 2, being Saturday. In this region, however, they are generally marketed late, as on June 26, the fishermen having to come some distance from their grounds. This is different from Boston and Gloucester, where the mackerel generally arrive early in the day.

Portland, June 27, 1893.

Market of Henry Sargent. Examined 169 mackerel, which had just been brought in, caught the previous night in drift gill nets directly off Portland. They measured 12 3/4 to 16 1/2 inches. 132 were ripe males, 23 ripe females, 14 emitted nothing under pressure Ten of the last were split, One was a nearly ripe male, 4 nearly ripe females, 1 spent male, 4 apparently spent females. Examined the stomach contents of a number. They mostly contained only a trifle of digested material, like slime in appearance. In one found much digested copepods, of a reddish color, and in another two fishes could be made out, but they were too far gone to be identified with certainty. One seemed to be a young sand launce, the other a young herring.

Market of John Loveitt & Co. June 27. Mackerel from same source and date as above. Examined 65 fish as follows: 18 ripe males, 14

ripe females, 33 no results from pressure. They measured 12 1/2 to 17 inches. Nine of the 33 were split. They were all females. Three had large ovaries, but the eggs were all opaque yellowish, and looked as though they might require sometime yet before ripening. The ovaries were not so large but that they gave rise to the suggestion that perhaps some of the eggs had reached maturity and had been extruded. They could not, however, have been regarded as spent fish. The remaining 6 specimens had very small ovaries, with opaque eggs, and we were inclined to call them spent fish. Later in the season mackerel should be examined to see if there are any traces of eggs. If not, then it is probable that the eggs we saw would still ripen before the end of the season.

General remarks on mackerel of June 27.

It is interesting to note in Sargent's lot

the great preponderance of ripe males among the ripe fish. In Loveitt's fish they were more equally divided. The hard fish (not yielding results under pressure) were nearly all females so far as examined. If this condition should continue through all the hard fish, which is possible, it would bring up the average of females and make the 2 sexes more or less equal in numbers. It would not be strange, however, if the males and females ran more or less in separate small schools, as seems to be the case sometimes with other species.

In Sargent's fish the milt and spawn ran more freely than in Loveitt's, and the spawn averaged riper, a large number of the females giving off their eggs with the greatest freedom It was the ripest lot of fish we have seen in Portland. In all cases the milt seemed to run more freely than the spawn.

In Loveitt's fish especially, even where the milt and spawn ran under gentle pressure,

in most cases there did not seem to be much of either. They seemed like fish that had been spawning or were in the act of spawning when taken. From the specimens examined I should judge that the fish were now in the height of spawning on this coast. The proportion of females with transparent eggs, loose, and freely separating when extruded was very large considering the number of females examined. In some of Sargent's fish they could be squirted some distance in a stream, with rapid pressure.

The number of mackerel brought in on the morning of June 27 was comparatively small. Probably not over 8 or 10 barrels.

General Remarks on Portland and Vicinity.

Arrived here Friday evening, June 23, 1893 and remained through June 27. Heavy easterly gale Saturday and Sunday which prevented much work. But few mackerel were seen Saturday, and while some were stripped, not enough to make a numerical record. Most of the work was done on Monday and Tuesday, as above described.

Mr. Widden says that November will be the best month to see the fishing captains here. They are then through with their mackerel work, and later may go into coasting. He will be glad to testify, himself. Was one of the most prominent in connection with the passage of the Federal mackerel law. He thinks the law should have been passed for 10 instead of 5 years. He thought the close season covered most of the spawning season. Does not believe man can influence the abundance of off-shore fish, but when the mackerel first come on the

coast thinks they can be frightened and scattered by the use of the purse seine. The fish are then poor and not really fit to eat. In years of great abundance the New York market becomes glutted. Many are thrown away and the New York Health authorities will sometimes in such cases prevent the landing of more fish. In such years the prices run very low. This year they were high on account of their scarceness. New Yorkers are not interested in the fishery, but the dealers make a large percentage on the sale of fish, and it is to their interest to have the fishery continued

The Captain (Capt. Orchard) of the George W. Pierce, a small smack belonging to Mr. Widden, says that he has been purse seining for many years, He does not believe in it, and follows it simply because others do. He began mackereling when he was 10 years old and is now 50. Used to make good fares with hook and line in the early times, and would be

satisfied to return to the same methods now. Important to get a full statement from him.

The Cape Shore (Nova Scotia) fishery was over when we reached Portland. Two or three vessels arrived from there just previously, and the same number during our stay, but the captains were too busy to stop and confer with us, although such as we saw expressed their willingness to testify when they had the time. Details regarding the Cape Shore can be obtained from Boston Fish Bureau and Grampus.

The purse seining in the Gulf of Maine had begun just previous to our arrival in Portland, and fish were reported to be somewhat abundant. Each of the vessels returned from the Cape Shore immediately refitted for this region, taking out their barrels and salt. They may go as far south as the latitude of Cape Cod, and as far east as the mouth of the Bay of Fundy. The fish are sometimes most abundant

in shore and sometimes off, but they require sufficient depth of water to sink their seines. They may work as close in shore as 5 or 6 miles. The length of trips varies with abundance of fish, but they generally expect to be out at least two weeks. The season lasts until fall, but if fishing is not good they may break off at any time.

They have recently (for this year) begun to fish in this region with the drift gill nets. Report fish abundant on some days. These nets are set anywhere off the shore to distances of 5 or 6 miles. The traps along the shore also take considerable quantities of mackerel.

Important to determine the range in size of mackerel taken in any region.

The size at which they reach maturity.

The relative number of fish under mature size; the number above.

The rate of growth up to a certain size.

The value of immature sizes to the market.

The number of immature sizes destroyed by different methods of fishing.

Louis McDonald, lobster dealer, described the difficulty of detecting egg lobsters when brought to him. Their abdomen was folded up. They were hastily tossed into his cars. 1st.of July must stop selling lobsters under 10 1/2 inches, but fishermen claim that they have a right to sell up to the same date, and that the dealers should take them. Last year he had a large quantity of the small lobsters in his possession on that date, which he had been unable to dispose of. Was sued by State, but the judge allowed him 5 days to dispose of them after June 30. This year, however, the State claims that it will stop his selling positively on the date. He thinks that the State, in place of insisting on the return of egg lobsters to the water, should offer a

premium for them. Collect them together, and utilize them as a breeding stock. I explained to him the difficulty of so doing on account of the fact that lobsters carry their eggs for 8 or 9 months, which rather staggered him.

Some of the Mackerel dealers of Portland.

Custom House Wharf,

John Willard,

Webb & Shepard,

A. M. Smith.

Union Wharf,

D. C. Fernald.

Commercial Wharf,

John Loveitt & Co.) These gave us most
(assistance in fresh
Henry Sargent.) mackerel.

Long Wharf,

Long Wharf Fish Co., Henry Trefethen

Vessel Owners. (Schr. Wide Awake, Lincoln)

W. S. Jordan & Co.,
(Sch. George D. Pierce,
Widden) Capt. Orchard and several
(others.

The Jordans own several vessels. Two in while we were there were, James Dyer, Capt. Wm. Williamson, and Emma, Capt. Hardy McKown.

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Joseph O'Brien, Harbor Inspector and Fishery Overseer for County of St. John, N. B., July 6, 1893.

Sixty-five years old, and has always lived in St. John. Has had experience on the St. John River up to Fredericton.

The following information was given by him orally:

19 saw mills on the river in County of St. John, which extend up to the Kennebecasis, about 7 miles above the mouth of the river. From here up to Fredericton only a few small shingle mills. In most of the St. John district mills they burn the sawdust and they are now beginning to sell the ashes for fertilizing purposes. Sold both locally and to the states There are also in St. John District 26 lime kilns, and they throw into the river a good deal of the unused lime. They have been fined at times for so doing. Also in this district

the city gas works, two cotton and one nail factory, letting in tar, dyes and acids. The tar floats on water, doing damage to nets, boats, lines, etc. The acid from nail works, used in cleaning wire nails, corrodes the metal work of boats and vessels, as well as attacks the lines.

At Musquash there is a saw mill run by water. This is the only saw mill in the St. John District outside of the river.

Above St. John District the first important saw mill is that of Gibson opposite Fredericton, which lets all its sawdust and edgings run into the river. The Dominion Government has kept a dredge at work in the river nearly ever since the Confederation for the purpose of dredging out the channel which had filled partly at least from the sawdust parried down the river. Is certain that the sawdust would have seriously interfered with navigation except for the dredging.

A large part of the refuse from the saw mills in the upper waters and branches remains more or less where it is placed, until the time of heavy freshets after severe rains, especially in the spring, when this stuff is washed down the main river, some of it reaching the city of St. John.

Did not know of any tanneries on the New Brunswick side of the St. John River.

Says salmon do not go over Grand Falls, which he thinks have a descent of 45° or more. At times of low water the falls are about 30 feet high; at high water about 60 feet high. The salmon used to go up to the falls, but of late years they have not been found above the upper pool which is about 9 miles below the falls.

Salmon are first seen in the estuary of the St. John in April and May, when they are scattering. The main run is in June and the first part of July. Begin fishing for them

about June 1. Are taken in weirs and with drift nets. The city sells the right to fish 24 weirs in and about the harbor, subject to Dominion Government regulations. The weir rights are sold yearly on the first Tuesday in January. A weir costs to erect from $300. to $400. They fetch annually at auction from $100. to $1200. per year. The higher figures are not paid now. Last year one paid $800. Some of them stocked as high as $3000. a season but many very much less than this and some do not repay the license. They are put up during the first spring tides in April, and the season for fishing them ends August 15. The inner pound has been usually supplied with a wooden bottom, although sometimes formed by natural bottom where suited to the purpose. Mr. O'Brien has himself patented a grated bottom, which allows small fish to escape, through. The fish which he mentioned particularly in this connection were the young Gaspereau.

Some of the weirs are also fitted with a gate which may be hoisted up allowing all the fishes to escape. The number of Mr. O'Brien's patent, Canadian Patent Office, No. 30892. The inner weirs of St. John harbor are all net weirs; the outer ones and those along the Bay of Fundy shore are brush weirs. The mesh of the net weirs is 2 1/2 inches, which gets smaller with use and repeated tarring.

Drift nets are used in the harbor and along the coast to Point Le Preau and to the Wolves. The salmon fishing is being ruined by these drift nets which pay no license. The fishermen have been using them for 40 years past. Says the salmon coming from the westward pass through the northern channel of the Bay of Fundy, and it is in this channel that the nets are fished. The salmon do not immediately proceed up the river, but play along the shore where they enter the weirs, Above St. John city the salmon are taken in

fixed gill nets set off from the shore. The salmon proceed up along the shore, not in midstream. Salmon swim near the surface, and are generally taken in the upper part of the drift nets which are made shallow, as there is no need for a deep net.

During 1892 the outside fishermen using the drift nets, about 60 boats, caught an average of 75 salmon during the season, averaging about 12 pounds each, valued at $1.50 apiece. In 1893 they have done better, but the season is not yet over. In 1893 only 8 to 10 salmon were taken a day in all the weirs in the harbor.

Unusual number of grilse taken this year and last. Thinks something should be done to prevent the taking of such small fish, weighing from 4 pounds upward. Thinks no use of continuing the hatching unless some measures are also taken to stop the destructive methods of fishing. Formerly would take in the weirs in

the harbor from 140 to 175 salmon on a tide.

Thinks over fishing has had more to do with destruction of salmon than pollution. Considers that illegal fishing is going on. Are allowed to ice fish and sell them out of seasons, and thinks that some of the fish so sold, judging from their appearance, were captured at about the time of sale, etc.

The salmon storage pond at St. John covers at high water about 5 acres, at low water less than 1 acre. Depth at low water about 20 feet; at high water about 40 feet. This is the third year of its use. Hope to stock with about 400 salmon. Stripping is done between October 25 and November 10. Has found more females than males in the stripping. In stripping females all the eggs in each fish are found to be ripe at once. In consequence of the smaller number of males a part of the milt only may be used at a single stripping, and the male may therefore be stripped more than once. The parents are set free immediately

after stripping. The spawning fish average about 12 pounds.

Physical observations in St. John Harbor have been taken in connection with tidal observations. The Meteorological service of the Dominion Government. Taken by Mr. Hutchinson.

Gaspereau are first taken as early as March. There are three runs. First, large fish which run in March and April. Second, called gray back, smaller, shorter, with relatively large heads, go up in May. Third, June 1 to middle, the last schools, or blue backs. These are more like sea herring, smaller, rounder, more pointed at the head and harder than gray backs.

The old fish come back right after spawning. The first run do not spawn in the river, but in the lakes and marshes, and in among the trees, when the water is high. They spawn in lakes Grand, French and Quacko, and in the Porto Bello marshes. They all spawn in May and up to the middle of June.

The young fish come down all the season, the last to spawn being the last to come down. The young gaspereau come back the next spring about 3 to 4 inches long. By September the returning young fish have become very few. The close season for gaspereau begins July 1. During open season there is also a weekly close season from Friday evening to Monday morning. Large quantities of young gaspereau are destroyed in the weirs. They are allowed to fish in the lakes where they spawn.

Three sizes of young gaspereau are found in the spring measuring 4, 7 and 9 inches long.

No law to enforce use of such contrivance as that of Mr. O'Brien above described for weirs.

Gaspereau fishing ends July 1; after that a larger mesh (4 inches) is put in the weirs for salmon, up to August 15.

Shad arrive about May 20. They go right up the river and come out in about 3 to 4 weeks

They ascend the river 50 to 60 miles, and enter in to the lakes to spawn. The young shad come down in August and September at which time they are about 3 inches long. They return next year, being from 9 to 12 inches long. There is also a run of shad along the coast, beginning in July and continuing until into September. They are caught along shore in Bay of Fundy, by boats using drift nets. The fishermen in the harbor begin to fish for spring shad in April with drift nets.

Sturgeon and bass fishing is at present absolutely prohibited in the river on account of their failure.

Drift nets not used in the bay after second run of shad is over.

No quantity of sea herring of good size enter the harbor, or are caught close to St. John. Small herring sometimes abundant in the harbor. Large herring are caught at head of bay, but fishermen generally go to Grand

Manan or in that direction for them. About 10 years ago, during one year, large herring were very abundant at mouth of harbor, and some 200 or 300 vessels engaged in fishing for them. Does not remember such an occurrence previously, and none has occurred since.

The fishing off St. John is nothing now compared to what it was formerly. Practically no line fishing inside of the line of the river water. Hake sometimes come into the harbor in the winter and are found as far as 9 miles up the river, where they are caught under the ice. The tide is felt as far up as Fredericton. No lobster fishing in or about the harbor.

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Canadian Lobster Hatchery,

Bay View, Caribou Cove.

Little Entrance, N. S.

Alfred Ogden, Supt.

Visited the hatchery on July 8, 1893. It had been shut down two days, but had a good opportunity to examine the station and apparatus. This was the third year it had been run. The total number of young lobsters hatched and turned out this year, 1893, was 153,600,000. The season lasted from May 22 to July 6, and was stopped at this time because the canneries in the vicinity had shut down. He also thought that they had done enough for the season. The eggs, however, did not begin to hatch until June 13, and the same was true in 1892. The temperature of the water at the time they began to hatch was 56° to 58° F. He has hatched lobster eggs as late as July 17. That was in 1891, but thinks the season for

hatching continues longer. The close season for lobsters in this region begins July 15. The eggs are obtained from the lobsters at the canneries of the vicinity. He estimates that they get them from about 12,000 traps, covering a radius of perhaps 20 miles from the cannery. The lobsters are stripped at the canneries, and after this is done the canners are allowed to use the lobsters.

Has not estimated the number of lobsters from which the eggs are taken, and this would be difficult to do, from the fact that the stripping is done away from the station. He estimates that there is an average of about 10,000 eggs to a lobster, but he seems to have no data on which to base this.

The number of eggs is determined by the pint. He has calculated that there are about 96,000 eggs to a pint. (By Woods Holl record there are 97,440 to a pint).

The smallest lobster which he has seen

with spawn on the swimmerets measured 6 1/2 inches long. Considers that all lobsters in this region measuring 7 inches long are adults. We saw in the hatchery one egg lobster 7 5/16 inches, and another 7 1/4 inches long. Their eggs had recently been taken from them, but enough remained to show that they were egg lobsters beyond a doubt. The larger of the two was cut open, and the ovaries were seen as two rather slender elongate, dull greenish organs, in which the eggs were very soft. They could not have been extruded soon,,but would not consider it safe to say that they might not have ripened before next spring.

Mr. Ogden states that the race of lobsters in Northumberland Strait is a relatively small one, the lobsters not attaining so large a size as elsewhere generally. Spoke of a lobster weighing 7 pounds caught off Cape John as a very large one. The above notes on small

berried lobsters bears out this view, and Dr. Wakeham also was acquainted with the fact. A reference to the Canadian reports will probably add information.

Mr. Ogden thinks that one year old lobsters measure about 1 1/2 and 2 year olds about 4 inches long. This probably would not agree with Woods Holl, where lobsters attain 1 1/2 inches in probably 2 months or so.

July 4, 1893, 1 lobster 5 inches long shed and became 5 3/4 inches long. Was about 10 seconds in coming out, the tail giving more trouble than front of body. The time given is undoubtedly much too short. The carapax was not split along the back. Another one somewhat longer split along back of carapax in shedding. Saw both of above specimens, and of the first one both the shed skin and the lobster which came out.

Prof. Prince told Mr. Ogden that he had

seen lobsters copulate in Europe. The female threw herself on her back and coaxed the male. Cannot vouch for this statement.

The lobster hatchery at Bay View is a very interesting place. It is located directly on the Little Entrance to Caribou, on the Northumberland Straits, about 5 miles from Picton. There is clear water and a good current directly in front of the station. The station consists of a frame building, one story and high gable roof. It stands at the edge of the water, with a good sunstantial wharf in front. The building is about 80 feet long by about 35 feet wide. The rear end has boilers and pump (Blake). All the remainder of the lower floor is used for lobster hatching. On the second floor there is a large tank at one end, to establish gravity supply of water to hatching apparatus. The remainder of second story is used for office, sleeping quarters and storage.

The hatching apparatus is on the principal of the white fish work as I saw it at Alpena, Northville and Detroit in 1887-88. The apparatus is arranged in two parallel series length wise of the room. It consists of elongate troughs, two supply and two waste troughs in each series arranged one above the other. The upper supply, next waste, next supply, next waste. Ledges along side the waste troughs give standing room for the jars, which have lips overhanging the waste troughs when in use, and emptying into them. The jars are hemispherical, nine inches deep inside and the same across at the upper edge. They are supported on a stand like the McDonald jar, which gives them a total height of 12 inches.  All in glass. Wooden spigots lead from the supply troughs at regular intervals. The water goes into the jars through long funnel-shaped glass tubes, the smaller end of which is

fastened to the spigot by a short piece of rubber tubing. The lower or flaring end is scalloped and rests upon the bottom of the jar. The water passes out through the scallops. The capacity of the jars is nearly 2 gallons.



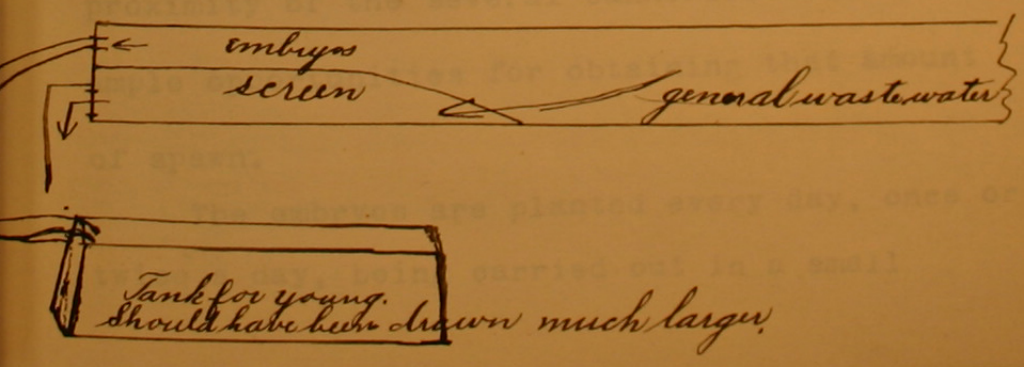
400 jars have been in use at a time. They place 4 pints of eggs (384,000 in number) in each jar, and the capacity of the station is therefore 153,600,000 eggs, the number of young lobsters which they are said to have planted this year.

There are, therefore, 8 rows of the jars, arranged along the two sides each of 4 troughs, and emptying steady streams of water into them. The troughs are square in section, probably about 5 or 6 inches wide, the waste troughs of the same height, the supply trough being built up higher.

The water is brought in from the Entrance through a six inch iron pipe. Wooden pipes

were formerly used, but have been discarded. They were made very crudely in the neighborhood and it was difficult to keep them tight, etc. It then goes up into the tank under the roof, where it is supplied by gravity to the hatching room. It passes first into the upper supply trough in each series, and thence through each of the succeeding ones, the same water passing through both tiers of jars.

When the eggs begin to hatch, the young pass into the waste trough of each series, but they are separated from the bulk of the waste water by a screen in the outer end of each waste trough, and pass from the troughs through rubber tubes into large wooden tanks on the floor. The screen consists of very fine wire netting, and is elongate.



There is not much motion among the eggs by the flow of water, but finds that no harm would result before hatching begins. At that time, however, they generally stir the eggs from time to time, so as to give the young hatched in the mass a chance to escape. Some eggs may not hatch, and some may escape through the flow being too strong, but he estimates that the loss is very small. He says that very few eggs die. As above stated, it will be seen that in estimating the number of embryos put out he gives the number of eggs placed in the jars, which is altogether too high a figure. I cannot doubt, however, that the estimate of the number of eggs placed in the jars is approximately correct, and the proximity of the several canneries affords ample opportunities for obtaining that amount of spawn.

The embryos are planted every day, once or twice a day, being carried out in a small

steamer and distributed over a considerable territory. Throughout the Strait of Northumberland, and as far as St. George's Bay. They are carried in barrels having a large square opening on the side, the barrels resting on their side.

They are deposited by means of a dipper, a siphon not being used.

The cost of running the hatchery, not including salary of Mr. Ogden, has been about $1,400. per season.

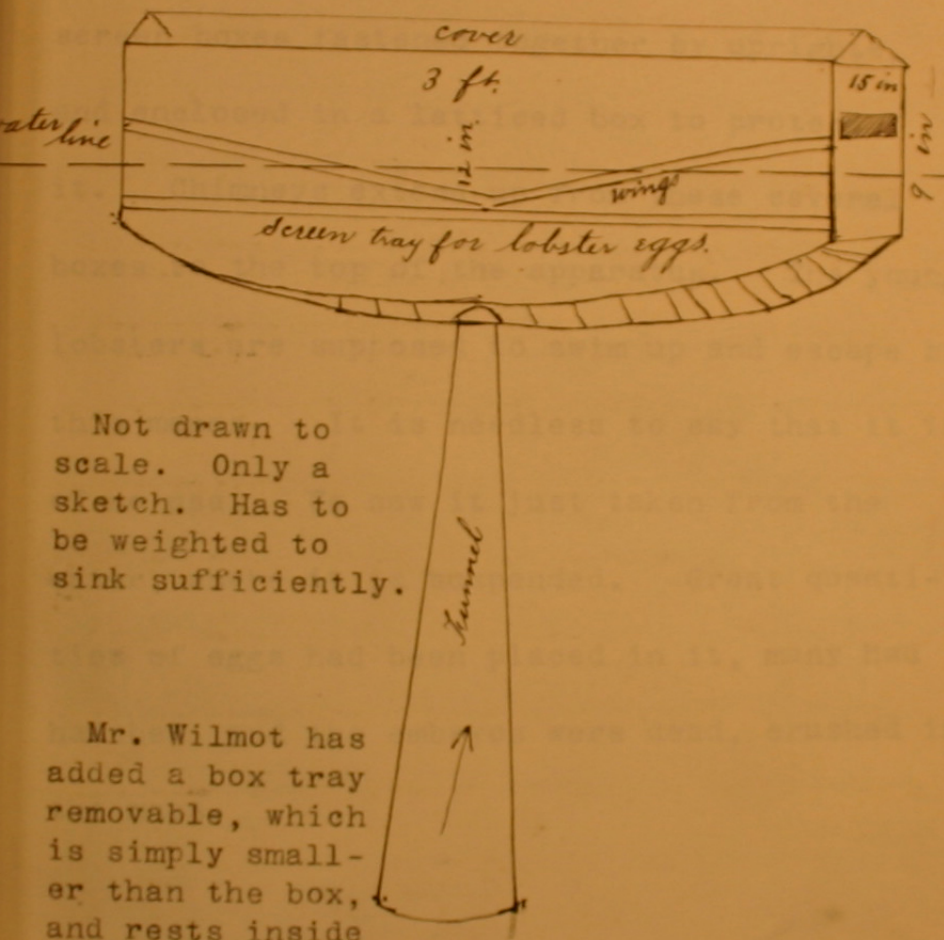
The system used at this place might be found to answer in places in the United States, and might well be considered in case it promised greater economy than the system at Woods Holl.

Saw, at Bay View, some of the Nielson hatching boxes, such as are supplied by him to the fishermen along the Newfoundland coast. At the station where he is he employs another system, however. The floating box is about

3 feet long, 15 inches wide, 12 inches deep in the middle, shallowing to 9 inches at the ends, The bottom being curved from end to end. The sides, ends and bottom are of wood. In the middle of the bottom there is a hole about 1 1/2 inches, from which is suspended a long tin funnel, or elongate cone, spreading at the lower end. On one side high up is a screen entrance. All the circulation is obtained through these openings. A flat screen bottom carries the eggs. There are wings on the side of the box, and a low gable shaped cover. The young would be liberated by submerging the box at one end, and allowing them to float out. Judging from the appearance of the box, and what I know about the experiments regarding lobster spawning, I think comparatively few eggs would be hatched by it, and that the circulation would be imperfect, causing the loss of many eggs. Mr. Ogden has no faith in it. They have tried some changes in it, but without

success, and it is not used here.

Nielson's floating lobster hatching box:



Not drawn to scale. Only a sketch. Has to be weighted to sink sufficiently.

Mr. Wilmot has added a box tray removable, which is simply smaller than the box, and rests inside of it, having screens at each end. It can be removed, which is apparently its only virtue.

Mr. Hawkings, Fishery Inspector, has invented a complicated piece of apparatus for lobster hatching, which consists of three screen boxes fastened together by uprights, and enclosed in a latticed box to protect it. Chimneys extend up from these several boxes to the top of the apparatus. The young lobsters are supposed to swim up and escape by this means. It is needless to say that it is of no use. We saw it just taken from the water, where it is suspended. Great quantities of eggs had been placed in it, many had hatched, and the embryos were dead, crushed in the mass.

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Georgetown, Prince Edwards Island,

July 10, 1893.

Early in the morning saw a few fish caught both by line and gill nets. They were taken at or just off the mouth of the harbor. It may be said that they were (both catches) in practically the same spawning condition.

Of the fish caught by line, 3 dozen were bought by the Acadia, 1 dozen of these were at once. The remainder had not been examined up to the time of writing these notes. Got neither spawn nor milt by pressure. The fish were then split. These fish measured 14 to 15 inches. There were 3 males and 9 females. The stomachs were all practically empty.

Of the gill net fish there were about 200 or 225. They were taken by Samuel Hemphill, Harbor Master, a very intelligent man, who has sailed with the Gloucester mackerel fleet in years past. He is in favor of even more

stringent fishery laws than now exist. Thinks lobster fishing should not be continued after July 1. Thinks that lobsters spawn during all the summer and into the fall, and would not have fishing continue during spawning season. Is not in favor of use of purse net anywhere. The purse seine is prohibited within three miles of the shore, but another seine is sometimes used, the "spiller," which is set in shallow water. It surrounds the fish and reaches bottom, so as to pen the fish completely, but it does not purse, and the fish have to be taken out otherwise. They cannot seine mackerel into the shore here, as the water becomes too shallow. Hemphill does not believe that the use of this seine should be permitted. He says that in the regular fishery off the eastern side of Prince Edwards Island in the proper season when fish are there, they can raise a school with chum in a few minutes and catch them readily with hooks. But if a purse

seiner comes anywheres near and begins to set a seine, these fish disappear, as though instinctively, and their line fishing ends. The purse seining therefore interferes in this manner with the hook fishing. Mr. Hemphill believes that the purse seine frightens the fish.

Off Georgetown this morning Hemphill observed about 20 schools of mackerel breaking at the surface. Each school might have been 15 yards across or thereabouts. He had no hooks and could not, therefore, fish for them. The most of the mackerel taken in his gill net this morning were caught at a depth of 2 to 3 fathoms. Some were taken from that depth up to near the surface.

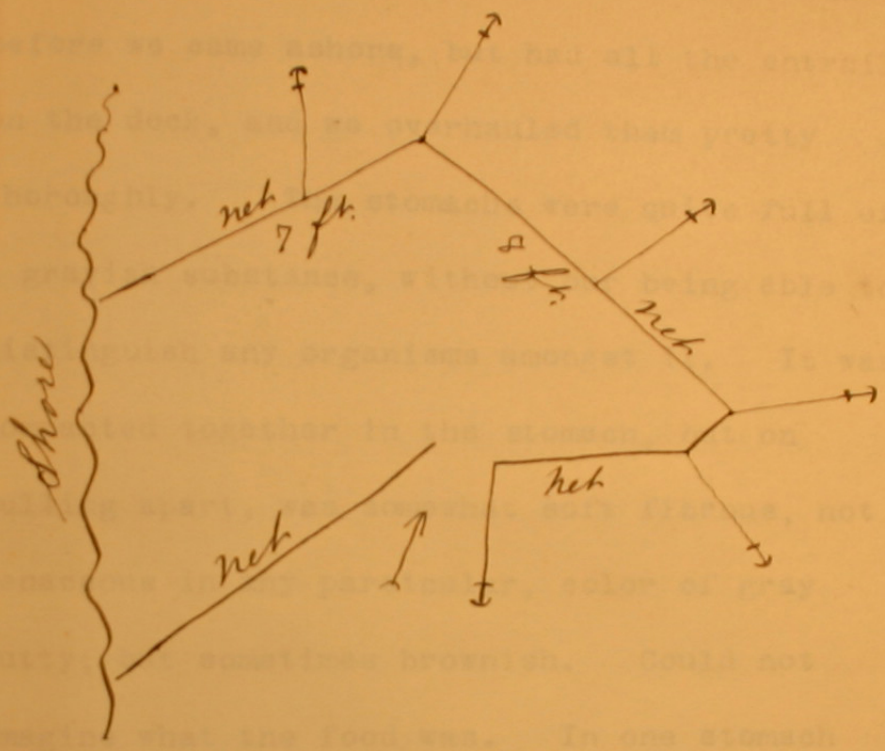
The spiller seine is not much used, but sometimes. Measure probably 100 fathoms long, feet deep. It will be placed in the water where fish may occur, and as a school approaches they draw it around. This would

make a trap about 30 feet or so in diameter. They reach to the bottom. The fish are then taken out by means of a small seine, or some other sort of net. The fishermen use this as a sort of evasion of the law. Wakeham thinks it should be considered somewhat in the sense of a weir. Moving to the fish in place of the fish moving to the weir. It is not subject to license. It was proposed this morning to use such a seine off Georgetown. One man and perhaps 2 boys could manage it readily, with a small boat of some sort.

An evasion of the law used near Halifax, was shown me by Spain. It was a seine, fixed, and with a leader. He declared it to be an evasion of the license law.

The mackerel go up the river at Georgetown at least 2 miles above the town.

The mackerel taken by Hemphill in his gill nets measured 12 to 13 3/4 inches. There may have been somewhat larger ones in the lot, but


net
7 ft.
8 ft.
net
net
net
shore

we did not see them. He had split them all before we came ashore, but had all the entrails on the dock, and we overhauled them pretty thoroughly. The stomachs were quite full of a grayish substance, without our being able to distinguish any organisms amongst it. It was compacted together in the stomach, but on pulling apart, was somewhat soft fibrous, not tenaceous in any particular, color of gray putty, but sometimes brownish. Could not imagine what the food was. In one stomach was a piece of green grass, apparently eel grass. It could not have been much digested as the stomachs were well filled, though not much distended, and the material was rather dry; that is, did not look much watery, or seem to be in condition to pass into system.

The reproductive organs in both lots of fish may be considered together, as there was essentially no difference between them. They seemed to be in all stages of development, with

some spent or nearly spent. The smallest ovary observed measured about 2 1/4 inches long. They ranged up from this size, but they seemed to average much below those taken at Boston and Gloucester. They were more like those in the fish opened in Portland.

The ovaries varied in color from a pale and bright yellow to orange of different shades. There was a striking variation in this respect. A few of the spermaries were somewhat large, they were mostly medium to small in size. A very few were spent, containing apparently no milt. None of the spermaries were fat and plump, like many that we saw farther south. They were also harder to the touch, but by pressing upon them ripe milt would exude at the outlet, in greater or less quantity. They suggested spermaries in which a part of the milt had become ripe, and had been extruded, but such might not have been the case, except in some instances. It was a

fact, however, that loose or ripe milt would issue from nearly all we tried. Some of the spermaries were long and slender, white like the rest, and rather hard, but they also furnished ripe milt. They were all rather flat.

It is very difficult to describe the ovaries. There would be no need of doing so, if we could say positively whether they would still spawn, and become empty.

They all contained some eggs. A few were undoubtedly spent, being sacks, dark flesh color, with some semblance of eggs in them; misshapen, small, irregular sizes, as though they were being absorbed. In others the eggs were all very far from ripe, opaque, more or less irregular sizes. In others we had the same with an admixture of transparent ripe eggs, which were plainly visible through the integument. The number of these ripe eggs varied in the different ovaries, being very

much more abundant in some than in others. Whenever they occurred, by gentle pressure, they could be forced out just as in the ripe fish, and they looked just the same. In none of the ovaries were the eggs all ripe or nearly so, but some of the ovaries were quite large. The ripe eggs seem to be most abundant through the middle of the ovaries, and after they were extruded or pressed out, the ovary was hollow and could be passed onto the finger like a glove finger. The immature eggs seemed to be still attached to the walls of the ovaries. They could not be detached or forced out by gentle means. Do these eggs become ripe? Do they not become absorbed gradually? and disappear in that manner? If such is the case, then a part only of the eggs in each ovary ripen and are extruded, the remainder coming to nothing. Otherwise it will be necessary to suppose that the mackerel spawn, more than once in a season, or eggs come to

maturity through a considerable period. But the immature eggs looked very immature, and were in very different stages of development. We saw only two ovaries in the lot that were entirely spent. All of the others, so far as we observed, had opaque eggs or mixture of opaque and ripe eggs. Is it not too much to think that these opaque eggs will still come to maturity this season? I am inclined to accept the view that they are absorbed. That would mean that perhaps 1/2 of the mackerel we saw this morning had done spawning. That is to say, the females at least.

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Magdalen Islands, July 11, 1893.

Entry Island.

Examined the mackerel and herring brought in by M. J. Keating as the morning catch. The catch was not large and the condition of all was not noted.

Mackerel,-- Range, from about 13 1/2 to about 17 1/2 inches.

Ripe males, - - - - - - - - - - - - - - -	43
Nearly or quite spent males, - - -	10
Females, ripe or about ripe, - - -	14
Females apparently through spawning but with opaque eggs in ovaries to a greater or less extent.	66
Females, with entirely spent ovaries,	5
	138.

In the males which were ripe, the spermaries were of very different sizes, sometimes quite large, and ranging down to very slender and flat. Noticed one in which the spermaries

were empty except a slender line along one side of each, which was still white, and yielded milt on pressure. Milt was pressed from all the 43 males by gentle pressure on abdomen. The milt was pure white as in all cases we have so far observed. The forward part of the spermaries were generally more or less hard as though they were not ripe throughout.

Of the 10 nearly or quite spent males, some were entirely spent, the spermaries being elongate, very thin, dark flesh color. Something like color of human tongue. In others they were small but still white, and containing milt, although yielding nothing under pressure.

Of the 14 ripe females, some were entirely ripe, only about 5 or 6, however, yielding any quantity of transparent eggs under pressure. Some under pressure gave out smaller opaque eggs more or less freely. Could not say whether they would still ripen this season.

When the fish were opened, those that gave out the transparent eggs most freely had the largest ovaries, but we observed in them that the two kinds of eggs were present, transparent and opaque, and through the integument the latter occupied the most space. In the interior the transparent eggs may have been the most abundant. At any rate they exuded in some, in very large quantities when pressed. In none did the ovaries contain all transparent eggs, but in the most ripe they were as described at the top of this page. This is very instructive and indicates that the view previously expressed as to all the eggs not ripening is correct.

Of females apparently through spawning but still containing eggs, 66 in number, there were no transparent eggs, but all were opaque. The ovaries were variable in size, ranging from very small to medium in size. They gave no eggs under pressure. If the above views are

correct these were spent fish. See notes on this same subject made at Georgetown, Prince Edwards Island, July 10.

The entirely spent females had ovaries reduced to about 2 1/2 or 3 inches long; narrow and thin, but not so thin as spent spermaries. They were also darker flesh color than the latter due probably to their greater thickness. They contained no trace of eggs. In the 66 previously mentioned there were some approaching this stage, resembling them somewhat in color, and with very few eggs. The same were observed at Georgetown July 10.

If the above views are correct the mackerel at the Magdalen Islands are nearly through spawning, the males,ripe, being still greatly in excess.

These fish were taken about 3 miles to the eastward of Entry Island in gill nets set over night. Mr. Keating said that the mackerel which first reach the Islands in the spring are

full of spawn, but on the evening of July 10, when we first talked with him he declared that they no longer had spawn, except an occasional one. In this he was mistaken as to the actual presence of eggs, etc., but correct apparently as to the spawning condition of the fish.

And the man split about the same number of mackerel on the beach close alongside, but we did not have the chance of giving them the same scrutiny. I examined most of the ovaries and spermaries after they had been taken out, and found them in about the same condition as in Keating's fish. There seemed, if anything, to be a larger proportion of ripe females.

Herring. Examined a number of large herring caught in the same nets. There were about the sane number taken as of mackerel, but did not examine so many. The record was

as follows: Size 11 3/4 to 14 1/2 inches.

1.	Ripe male yielding milt under pressure,	10
2.	Male with large spermaries, but milt not running under pressure.	15
3.	Spent males. - - - - - - - - - -	6
4.	Ripe females, yielding eggs under pressure, - - - - - - - - - - - - - -	4
5.	Females with large ovaries, but eggs not running under pressure.	13
6.	Spent females, - - - - - - - - - -	8
		56

No. 1. The milt was not so white as in mackerel. It was whitish to pinkish (tongue color) white in color, the spermaries have the same color. The riper seemed to be the whiter and as some of it required considerable pressure, when in a ripe condition, it might have all become whiter.

No. 2. The spermaries were large and

evidently had not yet become ripe.

No. 3. Long, slender, flat spermaries, certainly spent.

No. 4. The ripe eggs were whitish to straw yellow in color, and much larger than in mackerel. Two ovaries were especially ripe and were examined with care. All the eggs were in the same condition. All ripe, no immature eggs. In this they differed entirely from the mackerel.

In No. 5 the eggs were not in any case perceptibly ripe, but the ovaries were very large, occupying most of the inner cavity.

No. 6. The spent ovaries were long and slender like the spent spermaries, but not so flat.

Notes on the Mackerel, M. J. Keating, at the Magdalen Islands, July 11, 1893.

Mr. Keating is from Port Mulgrave, Gut of Canso. He fishes at the Magdalen Islands (Entry Islands). Comes in May and leaves last of September or first of October. Fishes with gill nets and jig. He also buys fish from other people.

His statement was as follows:

The mackerel first reached the Magdalen Islands this year about June 6, which may be considered about an average. One year came as early as about May 28, and another year as late as June 20.

They are expected there within 48 hours from the time they leave Cape North. After leaving the latter place they move rapidly. This year they did not come in as promptly. When they appeared they were large, abundant

and showed commonly at surface. Sol. Jacobs obtained 100 barrels there. They seldom school in the bay, but do outside about the islands, and in Sandy Hook Pass, where there is deeper water than in the bay. This is the spring school, and the American vessels when they are there seine them about the islands outside of 3 miles from the islands. In the summer it is the same.

The spring school remains only about a week. They expect to have good fishing during only 2 or 3 nights.

The spring run consists of what is termed large mixed fish. They run about the same sizes we saw to-day, as noted above.

Four years ago, for the first time in 20 years, large mackerel struck in here in the spring run. They have been coming every year since.

After leaving Magdalen Islands, they are found at a few places which will be described by

Wakeham, Miscow among them.

After this first spring run disappears they pick up a few mackerel right along, but they are not abundant. The summer run this year began July 8, the same day on which it appeared at Georgetown, as will be seen in notes regarding that place. The fish were larger at the Magdalens, however, The mackerel remain more or less abundant at this place during all the summer, until last of October, the abundance fluctuating from time to time. In November he has followed them from the islands as far as Sydney.

They do not hook mackerel in the spring run. Thought they could not be caught then in that way, but was not positive that they would not bite. Begin to hook mackerel July 15 to 20. Gill nets are used exclusively up to this time; after that resort more to jigs than gill nets.

Gill nets have 3 inch to 3 1/2 inch mesh.

There are about 10 boats from Entry Island, using 8 to 10 nets each. The gill nets set inside must not be set before 5 P. M. and must be taken up before 9 A. M. next day. They can be kept down continuously, however, if sunk 12 feet below surface. These rules apply to a distance of 3 miles from the islands. Outside, nets may be set as they please. Keating sets outside.

About 2000 nets are set in Pleasant Bay during summer.

There is a large fishery off South Beach in the spring and summer. One of the principal fishing places.

Mr. Keating thinks that the large mackerel schools entering the Gulf in the spring around Cape North proceed up to the westward of the Magdalen Islands, between them on the one side, and Prince Edwards Island and the mainland on the other. A small detachment only comes around the Magdalen Islands.

No tinkers come with the spring fish. He has never seen many around the islands. They come in August.

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Dr. William Wakeham, July 12, 1893.

First strike spring mackerel off White Haven, N. S. Spring mackerel do not go through gut of Cape. Follow outer shore Cape Breton. Tarry in St. Anne Bay, or off the bay, between Scatari and Cape Egmont. Last stay around vicinity of Cape North in Aspee Bay and the bay between Cape North and Cape St. Lawrence, which is properly known as Bay St. Lawrence. (Aspee Bay where Giles was taken). Aspee Bay great place for mackerel in spring and autumn.

After leaving this region they pass in a northerly direction, reaching Magdalen Islands immediately, perhaps the same day or a day or two afterwards. Do not stay around the Magdalen Islands long. (Left here about 3 weeks ago).

Keating thinks mackerel pass to south and west of Magdalen Islands and only an offshoot of the body comes around those Islands.

However, in the spring they are also found to some extent along west coast of Newfoundland Not known to be abundant there. Few caught in gill nets, set for herring bait, but vessels do not go down there.

Keating says that spring school had reached Magdalen Islands as early as May 28, and as late as June 20. This year reached there June 6, which may be considered as an average. See his further statements elsewhere,

Some years spring mackerel do not reach these islands except in very small numbers. They pass the islands by, a few stragglers coming in. There are always, after season begins, some mackerel to be found in the Grand Entry Lagoon. There they do spawn to some extent (Wakeham) and he (Wakeham) would like to have fishing stopped there, to keep it as a natural nursery. Lobsters are also in this and in the other lagoons in abundance. Forms a natural hatchery.

From now on some mackerel are always to be found around the Magdalen Islands. Wakeham thinks that the fish which remain up to second appearance (July 8) are remnants of the spring run.

The spring school does not appear at East Cape, Prince Edwards Island. Get mackerel at North Point, Prince Edwards Island, before East Cape. North Point is the next place where they get mackerel after Magdalen Islands, but are not so large as the first run of fish at Magdalen Islands. After reaching North Point they extend along north shore of Prince Edwards Island, to the eastward successively. They are first taken about East Cape and Georgetown a fortnight or so after reaching North Point. (This year reached North Point July 8).

After they have been taken off North Point one of the first places where they are found in large numbers (large schools) is off Miscou, between there and Bradelle. Early in the

season were going north. Dr. Wakeham has seen them there about August 1. They come into Bay Chaleur and about there early, however, having been reported before this date (July 10).

Are found Gaspe Bay July 15 to 20, and thence through August and September, and into October. Occur in and off the Bay. Of late years the mackerel had largely failed in this region, but during past 2 or 3 years appear to be improving. They did not occur here in same large schools as off Miscow, but in smaller schools.

Toward very end of July, August and September (but not into October) about Seven Islands, and up to Good Cove on north. On the south side as far up as Cape Chatte. Does not know of their ever having been seen above the last place. Have been taken to the eastward of Seven Islands down to Mingan, but this is rare. Never heard of mackerel between Mingan and Cape Whittle, or along north side of

Anticosti. Has never heard of mackerel either on south side Anticosti, but has seen vessels looking for them there. Below Cape Whittle have frequently been taken about Mecaltina (beginning of August). Has also seen them (large mackerel) taken at Bon Esperance, in August. Not taken at these places every season.

The mackerel taken up the St. Lawrence have generally been good, large fish. During past 3 years no mackerel have been seen about Seven Islands, but they have been taken at Good bour (Good bout). The Seven Islands fish are very well known, and that region has frequently been spoken of by the vessel fishermen.

Does not know of their ever having taken mackerel any season off the west coast of Newfoundland.

Has been told by fishermen that mackerel have been found on the outer coast of Labrador,

evidently having gone through Straits of Belle Isle, if statement is correct. Schooner Emma W. Brown, Gloucester, was looking for mackerel through Straits Belle Isle about 5 years ago, and her captain might give further information regarding that region. Did not get mackerel but filled up with large herring.

Gulf St. Lawrence end at line drawn from Point de Monts to Cape Chatte, General permission to foreign vessels to fish in the Gulf St. Lawrence ends at this place.

Distinct interval between the first spring run, and the fish now coming in. The second run, if it enters from the ocean is not especially perceptible off the east coast of Cape Breton Island. Fish do occur there after the spring run has gone in, but they are not abundant. Mackerel are caught on that shore all summer to some extent. On the spring run no mackerel come through the Gut of Canso.

They do begin to pass in here the last of June or first of July. (Some may go east of Cape Breton Island, but now known). They are abundant, but are not caught, except perhaps a few in gill nets, while passing through the Gut. The spring fish pass to the east of Cape Breton Island, the summer run through Gut of Canso, but it cannot be said that the latter furnish all the summer fishing, as the spring school must still be in the Gulf.

After passing Gut, they are taken in George Bay, but do not remain there long. Port Hood is one of the first places where United States and Canada purse seiners and jigger or gill net fishermen resort to in search of this summer school.

From this point the vessels go directly to East Point, Prince Edwards Island. Finding nothing here, they proceed northward and scatter to different parts of the Gulf.

Fish do not remain (he thinks) west and

north of Gaspe after end of September.

By middle of October thinks all have left Gaspe and Bay Chaleur.

By end of October have left East Point, Prince Edwards Island, and Magdalen Islands.

About first of November (not later) found west coast Cape Breton Island from Margaree north.

During first week in November they round Cape North and are found no longer in Gulf St. Lawrence. A few stragglers may remain a short time.

Has no knowledge of fish passing out Gut of Canso.

Immense (See Murray, Pt. Mulgrave) schools pass out by Cape North. The advance schools probably begin to pass out by Cape North during the last week in October, and to the 10th to 15th of November. Do not bend in to St. Anns Bay, but head for Flint Island and Scatari. That passage is made quickly, and they then

disappear. Hook and lines could seldom hold them here. Said to go 7 knots an hour. Bad weather comes in at this time, and one good fishing day a week is considered fortunate.

The fleet follow the fish as far as Halifax, where they go off shore. The fleet abandons them here. The season is late, between middle and end of November, weather bad and the vessels go for home.

Chedabucto Bay, at the southern entrance to Gut of Canso, was formerly a favorite fishing ground for mackerel, but they have become depleted here, owing it is supposed to purse seining. The return curve which the coast makes here, to enter Gut of Canso, might well explain why the spring run of mackerel does not pass north through Gut of Canso, but if they do not go up in spring, why do they in the summer?

Vessels,--Dr. Wakeham, July 12, 1893.

Heard of only 2 vessels which followed the spring mackerel into Gulf. It has been rather unusual for them to follow them at this season, but they may have done so more or less. Would not remain long, one reason being that they are desirous of getting home in order to take up fishing in Gulf of Maine, etc. Should mackerel be reported abundant in the Gulf, some vessels would undoubtedly be tempted to get down.

Time for these vessels to return to the Gulf is about now or soon after. Have seen one already, the Wm. H. Wellington, off East Point, Prince Edwards Island. Have heard of two others, Ethel B. Jacobs, Yosemite. They should be coming now right along.

They will range over all the western and southern part of the Gulf, omitting the extreme northeast and northwest up the St. Lawrence

River. They might go up the latter to Seven Islands and vicinity should they hear of fish, but only a few go there at any time. Perhaps one or two might venture. They depend somewhat upon information from the Canada Fishery Intelligence Bureau. Take the region south of the 100 fathom curve, roaming all over it.

Has known them to load up three times. If so successful will take out license, land a load of fish to go by Boston steamer or railroad, and thereby save time. If they hear of good fishing on American coast, might go home and return later to Gulf. They may remain in until the fish leave in the fall. Would not all remain on unless the fish were abundant. Go backwards and forwards. This record can be made up from reports, etc.

Common method of fishing is by purse seine Good many of late years carry toll bait, menhaden, which they use and when successful in tolling a school, put their seine about them.

The fishermen recognize that the fish do not come to the surface as much as formerly and they are more scattered, and are lead to use toll bait in consequence. Even purse seiners now many of them think that the seines have done this. They admit it. Purse seiners occasionally carry jigs, and use them when the fish are scattered. A few fit out as jiggers. Probably 10 or 12 out of a hundred would be fitted out in this way. Some of them would also carry gill nets. Some of the purse seiners also carry gill nets. May set his gill nets in some places fastened to his vessel and drift. They may also run into port such as Magdalens, and set gills like Keating. Do better in drifting, and would resort to this method more in the deeper water off shore.

Canadian vessels resort to the same methods, but not nearly so many as United

States vessels in mackerel fishery. United States is the only market for mackerel, and this is the only fish which would be sent to United States in quantity. This is why United States men want duty on fish, and it tends to keep down Canadian fleet.

Larger proportion of Canadian vessels carrying purse seines, use jigs tham United States vessels. Others carry gill nets and jigs without purse seines. Go over the same grounds and remain in company with United States vessels. Give trouble as they will not show colors, and will not tell against United States vessels, although they grumble if U. S. vessels are allowed to fish in shore. Canadian vessels mostly come from Nova Scotia, some from Prince Edwards Island, none from the other Provinces. The gill nets are fastened together in long strings perhaps a mile or more to a vessel.

They may gill net and jig anywhere, but if a purse seine is let down near at hand, it puts an end to the jigging. Frequently do this, the purse seiners knowing that if a vessel is jigging they must have mackerel about; they run up and shoot their seines close at hand, even around the vessel jigging. The latter would have a moral right to cut the seines, but being outside of 3 miles, and no international protective regulations, there is no remedy one way or the other. (Pp. 14 and 15 apply both to vessel and boat fishing.)

Jigging would be regarded as the least destructive method of fishing. The majority of Canada fish (boats and vessels combined) are caught in this way. Will not take the jig when spawning. This method tends to bring the fish together. The purse seine to separate them. Do not begin jigging until sometime in the early part of July. In the neighborhood of Nail Pond probably jig earlier than anywhere else.

Gill nets are injurious to the jiggers inside of them. Fish taken with jig is best fish, freshest. Those taken in gill net are the worst, dying in the net and frequently allowed to remain there sometime, especially in stormy weather. Will not make such firm good fish when split. Claim they get a larger average (in size) of fish with jig. Larger percentage of large fish in a given quantity. Older testimony tends to prove this. Gill nets may be set outside 3 miles without respect to regulations. Inside must not remain down between 9 A. M. and 5 P. M. unless sunk 12 feet. (This is Gulf St. Lawrence. Does not apply outer coast N. S.).

75% of Canada fish are taken with jig, probably. This is not over the mark. A greater proportion is taken by gill nets than by seines. Not many seines. (This applies to all vessel and boat fishing). As a whole, including all Canadian fishermen in the Gulf, but half the Canadian vessels fish with purse seines.

Objections to seines, (1) all spring fish taken have not spawned and would not have taken hook. The best fish so taken at that time make only No. 3 and under. Not fat enough no matter how large; (2) and the fact that the purse seine breaks up and harrasses the schools. (Do sometimes catch herring or small fish).

Boat fishing.

Gill net fishing practiced everywhere along the shores, and in the bays. Jigging over the same ground, and generally inside of gill nets. Set their gill nets well off shore, not too far in. The fishing beginning July 8, as noted elsewhere, was this boat fishery. May have begun earlier in some places.

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Nail Pond, Near North Cape, Prince Edwards Island. Town of Tiguish, July 13,1893

Examined a quantity of mackerel just landed. Caught in vicinity with jigs. Were being split. Pressure was first applied. Size 13 inches to 16 1/2 inches.

Ripe males, milt flowing freely on opening, the spermaries were found to be of very different sizes, from small to rather large, not very large, and but few were above a medium size. They were mostly small and some very small, evidently nearly spent.) 32

Nearly spent males, milt still flowing, but only a little could be pressed out. Spermaries all very small.) 35

Spent males. No milt in spermaries) 12

79

Females, 3 gave out ripe eggs under pressure, but only a few, and on opening found the ovaries quite far gone, nearly spent. 3

Females containing rather large ovaries, but could see no transparent eggs in them. Their condition could not be determined. 3

Females, ovaries much reduced in size containing opaque eggs still, but evidently through spawning. These ran into the next below. 20

Females, still smaller than last above, and should say quite confidently that all were spent. Quite a large proportion were so far spent that contained no defined eggs, and had the dark red color mentioned in previous notes. The series was complete from the most spent up to those first mentioned above. 39

65

Add..... 79

Total..... 144

If the above statement is correct, 59 out of the 65 females were through spawning, while the others were nearly through. Leaving out of account the second three mentioned, whose condition it was impossible to determine. The males were in better spawning condition, however, a large proportion being still able to furnish a large quantity of milt.

Conference with Agno Gaudet and Geo. B. Ellis, at Nail Pond, July 13, 1893.

These men have both been fishermen, but are now fishing agents. Ellis runs a lobster cannery, but has been a purse seiner on an American vessel.

Mackerel are taken in this cove only by hooking. No nets being set. All references to captures here refer to fish that have been jigged.

In 1892, took first fish June 17; in 1893, June 16. May vary a week, more or less,

in the date of their appearance.

First fish taken at northern end of island were captured June 11 at Alberton, on the east side of Cape below Figuish, in gill nets. They would not bite then. These were the first on any part of the island.

In 1892, June 17, only a few were hooked off Nail Pond. Then took no more until June 27.

In 1893, practically same thing occurred, few fish being taken June 16, and next catch very last part of June.

Of the spring fishing the best is generally done about 3, 4 and 7 of July. This year so far the best was done July 3.

However, the fishing does not become very good during any of this time, unless the few days above mentioned, until sometime between July 20 to August 8. They regard it as slack fishing up to sometime between these two dates.

Good (best) fishing continues from the

latter date through August and September, sometimes ending by September 15 to 20, at others continuing to about October 1. In odd years may find a few stragglers into October, if very fine weather exists. A heavy gale from northeast the latter part of September, however, will drive them away entirely.

Remain longer on the north side of island, and longer at eastern than western end.

At Nail Pond tried hooks as early as June 11 (date of capture on north side of island), but they would not bite until June 16.

About 34 boats fishing from this cove. During this period they probably average about 100 mackerel to a boat. That is the slack season (June to July 20 +). On July 3 some boats went as high as 500 to 900 fish. There are 3 men to a boat.

During August and September they may be estimated to average about 350 to a boat per day.

The size of mackerel ranges pretty much

the same through the entire season, from 11 to 16 1/2 inches, being the same in August and September as in the early part of the year, but they become fatter and weigh more.

The first fish taken at Tiguish this year ranged larger, up to 18 inches.

The fish are now beginning to get fat. Do not begin to get No. 1 until about August 15 (probably a littler earlier at Tiguish). They improve constantly with the progress of the season, becoming fattest the later the season. But they never all, even where long enough, get to be number 1's. In the best of the season consider themselves fortunate if half their catch amounts to No. 1's. At present are just beginning to get No. 2's.

No nets are set about Nail Pond. The fishermen here are prejudiced against this method of fishing. They also told us that they could not get good fish this way, as they became soft before they could handle them.

Last week 5 purse seiners were observed off Nail Pond, but they did not wet their nets. Thinks one was Sol. Jacobs. Had 2 white flags, but others also carry these pennants. Two of the seiners were considered to be Americans.

The mackerel school here, and the schools are often so near that they may be distinctly seen and counted from the beach, 250 yards more or less from the beach. Big schools are seen here. These schools are generally observed between 8 A. M. and sunset. (Have been seen to school at night,--Wakeham). A school has been seen to stay up all day.

They feed on seed (fleas), and very young fish. In those we examined this morning we found only toll bait. (They were hungry fish, and that gives a hint as to success of jigging at times and seasons). They may find seed or young fish indiscriminately. Not one in one season, and the other in another.

Jigging is generally done between daylight and 8 or 9 A. M. and again from 4 or 5 P. M. to sunset. Fish generally at the very best just about sunset. Fish may be caught by jigging all day, but they reckoned that it does not pay to work during the middle of the day. They are not a very energetic race, and are satisfied with the work as it is now done. They might improve greatly their fishing work, but it is not in them. Some boats do, however fish some during the day.

May or may not see mackerel where they go to jig. Most often do not see them. When schooling at the surface they sometimes take the jig and sometimes do not. Has known of a boat filling up from a school, but that was some years ago. The schools are much more shy now, and they cannot hold them as they used to. They therefore cannot jig among them with the same success.

In tolling up mackerel from a depth, they

use the most bait. After they have come to the surface they would still use some bait, but not so much to hold them. Likewise in jigging in a school, they would use some bait to retain them, but no as much as in tolling from the bottom.

Do not generally anchor in jigging, either boats or vessels, but allow to drift, thus forming an eddy around the boat into which the bait is thrown. Some we saw this morning were at anchor, but the vessels as a rule drift free.

Off Nail Pond jig as far out as a depth of about 15 fathoms, which would be about 2 to 2 1/2 miles off shore.

Purse seining not carried on much off this region. The purse seine set near at hand will hurt the jigging. Mr. Ellis knows this from his own experience.

In tolling and jigging mackerel, they begin to jig low down, but with the bait, the

fish rapidly work up, and where fishing is active, most of the fishing is done within 2 fathoms or less of the surface. The jig no sooner reaches the surface when it seems to be seized. The majority of the fishing with jig is accomplished near the surface.

The presence of the fish in this locality may be regulated by the presence of the food, sea fleas and small fish.

Mr. Gaudet said that tinkers (3 to 6 inches long; most often about 5 inches) are often common about here the last of August. Generally about one size of these young fish will occur together. The water is sometimes covered with them, and the schools may reach across to Escuminac. He has seen them more abundant about the Cape Breton Shore than in this region. They occur in large schools, very seldom mixed with larger fish, and they stay pretty late, sometimes into October.

Large mackerel may come in to a depth of 2

fathoms, and even to 4 feet.

Thinks they are spawning during this slack period of fishing.

Do not generally get many mackerel in Northumberland Straits proper between West Point, P. E. I. and Picton Island. Some years practically none are taken there. Some fishing is carried on in Egmont Bay.

Twenty odd years ago it was not uncommon to take 1800 to 2000 mackerel to a boat for a day's fishing. The catch is very much less now.

Last year one boat took 3400 in a day at Minnemegash, about 15 miles farther south on the same side of Island.

At Horsehead, between these two places a catch of 2800 made last year also, but these were extraordinary.

For notes on the lobster, see notes of Dr. Smith.

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Georgetown, Prince Edwards Island, July 18,1893

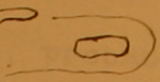
After dinner, 7 P. M., examined the mackerel brought in by Mr. Hemphill, Harbor Master, 240 in all, caught with jigs.

By pressure on the abdomen, yielded the following results:

Nothing, - - - - - - - - - - - - - - - - -	154
Males with milt running more or less freely, - - - - - - - - - - - - - - - - - -	16
Males, only a trace or very small amount of milt on hard pressure, - - -	60
Females yielding only a very few eggs on hard pressure, mixed with dark venous blood., - - - - - - - - - - - - - -	10
	240

Size of fish 12 3/4 to 15 inches.

Food consisted chiefly of a yellowish material, quite liquid, and apparently consisting of very small organisms, the nature of

which could not be made out with a pocket lense. Sample has been saved in alcohol. Looked something like this drawing in outline.  Stomachs containing this food were slightly to moderately filled. Many of the stomachs, however, contained chum, either alone or mixed with the yellow food, and with this were sometimes very much distended.

Of the spermaries only a very few were of medium size. They ranged from this down to very small, the great majority belonging to the latter category, being slender and thin, and the greater proportion having lost their white color for one of dusky to dark red. Except for those which yielded milt freely, all were practically spent.

Of the ovaries there were 3 or 4 still of medium size with opaque eggs, which did not look as though they would ripen. The largest was about 4 inches long, and 4/4 inch wide. They contained no transparent eggs (out of one

a few transparent eggs were pressed as it lay on the dish), were hollow, the eggs clinging to integument, and they had undoubtedly emitted some eggs, probably a large quantity.

All the rest of the ovaries were perceptibly spent, even those which gave a few eggs under pressure. Some still contained eggs of more or less regular form as though they had not yet undergone much change after the emission of the ripe eggs, but in the majority all semblance of defined eggs had disappeared, and the ovaries consisted of sacks, some having the appearance of undefined eggs as previously described, while in others and a large proportion, all traces of the eggs had been lost. With the disappearance of the eggs the sack becomes translucent, dull pinkish or flesh color, sometimes a deeper red, and often congested, a dark venous red, over the posterior one-third. This congested appearance, however is not solely confined to the translucent

sacks, but occurs in many of the ovaries of larger size, containing a greater or less quantity of opaque eggs.

The majority of the ovaries were between 2 1/4 and 3 1/2 inches long, slender and thin, translucent, and very inconspicuous in the body cavity.

The ovaries were undoubtedly all spent, and the eggs left in the ovaries would without (much) question be absorbed.

We did not keep a record of the sexes as the fish were split, but examined all, and there were about equal numbers of each.

The fish were becoming perceptibly fat, and cracked along the abdomen when bent back.

Was not able to make out the character of the yellow food with hand glass. Dr. Smith called attention to the yellow appearance of the menhaden slivers which we saw being ground in the bait mill, and suggested that the color may have been derived from that source. It

was the color of bile colored food, and very different in color and consistency from the food we saw in the mackerel during our first visit here.

Obtained the following information from Mr. Hemphill:

He thinks that the fish taken this day and yesterday, was a different school from the one they had been fishing in previously. They do not recognize here the two schools described in some places farther north. The date of the arrival of mackerel in this locality has been noted in former notes. After they once appear they keep right on in varying abundance during the summer. Schools or bodies of fish come and go. When a school comes it works in fast, and on leaving it goes out fast. They notice these two movements, and thereby tell the appearance of new schools.

To-day and yesterday fish were exceedingly abundant way into the harbor, and they schooled abundantly at the surface. They did not, however, bite well. This afternoon Hemphill, one man and 2 boys in his boat, caught the 240 mentioned above.

The fish may be more or less abundant until late in September, their abundance, of course, varying in different years, but during October they are rare.

They school at the surface most during July, and again when they are leaving the region in the fall. Small schools or pods may also be seen during August. Thinks they may always be schooling, but during the middle of the season they are seen less often at the surface.

The good fishing from day to day depends upon schools passing under the boat, he thinks. When a school comes under, the biting begins rapidly, and when it passes away, it lets up.

and there may be no catching. Most of the catching on each half day trip is usually accomplished in a very short space of time, perhaps not more than half an hour when the fish are hooked very rapidly. They may get no more fishing on that trip, or another school may appear.

When the surface schooling becomes less common expect fish to bite better. This may ever happen in July from time to time, in the interval between the arrival and departure of these several bodies.

In the very beginning of the season have most success always with gill nets. After that time success varies between the two methods of fishing, and he does not know which might be regarded as the best, the entire season being considered. To-day most of the boats were gilling, but Hemphill caught his fish with jigs, and probably had the biggest catch in this place.

The fish are just beginning to show a perceptible fattening. Get good fat fish in August and by the latter part of August obtain as good fish as any.

Hemphill thinks that the mackerel enter the bay to spawn. That the schools come in for that purpose and having accomplished it, soon go out again. This cannot be altogether probable, as fish are coming and going the entire summer. We saw nothing to prove the matter one way or the other. The fish brought in to-day, and which he says came in yesterday, were practically spent. They looked, judging from our previous experience, as though they might have mostly spent several days before, but they may have spawned only yesterday, and in fact partly to-day. In that case, it would indicate that the spawn issues more rapidly, and the ovaries become emptied more rapidly than we had supposed. In previous examinations of spent fish, the ovaries averaged larger than

to-day with a much greater showing of opaque eggs. The greater part of the ovaries to-day looked as though considerable changes had taken place since spawning. A very small proportion had any quantity of opaque eggs left, and the larger number had merely the sack, mostly without any or only moderate showing of the fast absorbing eggs.. The congested red appearance of the outlet end of the ovaries in most cases also indicated the absorption of the surplus matter of the ovaries.

The fact that these fish had probably spawned before entering the bay this time (if, in fact, Hemphill was correct in this surmise) does not disprove that they may enter the bays to spawn and that this is their common habit. We simply have no proof as to their habit in this particular, and they may spawn both inshore and off shore.

Previous notes will show that spawning does occur all along the coast,, and Dr. Wakeham is

also of the opinion that they spawn on the banks in the Gulf. (See also notes of spawning on the United States coast).

Hemphill says that very small mackerel, 2 3/4 to 3 inches long, occur in September in Cardigan Bay and Georgetown Harbor; also off Scott's and on Fisherman's Bank and Grand River Bank, all in this neighborhood. Nine years ago and previously they were very abundant, but since then they have not been. Thinks they are the young of the same year.

Georgetown, July 18, 1893.

In the afternoon, between 3 and 4, interviewed a fishing boat just in from the mackerel grounds. It had taken only 9 fish (3 males and 6 females). They were 13 inches long. This morning he had taken 40 and yesterday 360. The run consists of smaller fish than last week. They are beginning to get fat. They were all spent fish. Spermaries 2 1/4 inches long, 1/4 inch wide and very thin, pinkish white in color. A small drop of milt was expressed from the lower end of one.

Ovaries 3 inches long, 3/16 inch wide in middle, but soon tapering to sharp points at end. Emptied in center, but walls thick and containing eggs in process of absorption.

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HIRAM BLANCHARD & SON. EASTPORT.

Factory for sawing thin boards for cases for sardines. Imports lumber in rough and saws sardine case shooks.

1,200,000 feet yearly product.

Spruce and fir principally.

Comes to him in 4 foot pieces.

Lets no sawdust or edgings go adrift.

Sells about half of sawdust to sardine factories for packing. Remainder, with edgings, are used in furnace.

(Sawdust) brought together in heaps and wheeled to fire pit.

Said it was carried into fire room on belts, but we saw nothing of the kind. In his opinion, would not cost much to cart away or burn sawdust. Would not cost him much more to send his sawdust 1000 feet further away from the mill than he has to.

Is aware that in many places sawdust and edgings have seriously interfered with navigation.

CAMPBELLO, N. B., JULY 27, 1893.

CONVERSATION WITH A MAN IN THE EMPLOY OF MR. FLAGG AT WELCH POOL.

This man was 35 years old, but had always been engaged in this fishery in this region.

Cost of weir, the one below the Tyn-ne-coed being taken as a sample. 130 stakes at 25 cents each and 2,500-3,000 spears at 1 cent. Use hard wood for this purpose as much as possible, being most durable. In the narrows used more cedar. Ten men ten tides to drive stakes. 24 working days, to make weir, 4 men being employed balance of month to lace up the brush.

Weirs have 5 to 30 feet water at mean low water in pond in lower end. Used to be 3 weirs in Welch Cove, now only one, In Herring Cove used to use 4 weirs, now only 2. The weir in Welch Pool and one in Herring Cove belong to Flagg. Not as many weirs now as formerly, as the fish do not strike there as abundantly as formerly. In Herring Cove fish run more constantly than elsewhere about the island, and never fail to come in some-

time during the summer. About 1,200 fishermen on the island, most all interested in fishing, and that being their principal occupation. They also do some farming, raising what they require for their own use.

Formerly, they used to smoke a large quantity of the very small herring, 3 or 4 inches long, which were graded as No. 1. This was before the establishment of the canneries. Now very few of that size are used for this purpose. The No 1 herring are the smallest and rank as the poorest in the market. They really do not pay to box, but they sometimes string a few. Never get more than 6 cents a box for them.

Mediums(scaled) run on an average about 7 or 8 inches long. Average 52 to a box, and bring on an average about 12 cents a box. They are packed crosswise. These are ranked as the best quality in the market, and have the most constant market value. The larger or "lengthwise" herring run from 12 inches up, 18 to 20 in a box. Fluctuate in price, average about 8 cents, and occasionally sell as high as medium.

Bloaters, put up in the fall occasionally,

a large herring being lightly salted and smoked, 100 in a box, valued at 80 cents to $1.00.

Formerly, about 20 years ago, etc., large amounts of herring were made into pumice. A guiano factory has recently been established at the salt works in Eastport, where herring pumice will be used in connection with other ingredients.

Average size of herring has decreased. States that they school frequently at the surface, and could readily be taken in purse seines. In the fall the squid drive them into shoal water. They become frightened, and may readily be dipped up into the boat.

They feed on shrimp and red feed; are feeding on both now; both are bad for the stomachs and especially the red feed, which causes them to decay rapidly in 3 hours. The herring are reported to be in this region now in very large quantities, especially between Grand Manan and Nova Scotia, solid as he described them. They are mostly off shore, however, and for that reason do not come into the weirs.

Process of Smoking:-

Caught in the early morning tides, on

Campobello. Go out in a boat with a torch and see if there are any herring in the weir. If there are, they come back, use seine, and with dip nets dip into boat. They used to scale them while in the boat, a man in his oil skins jumping down among them, and by stirring them up, causing the scales to come off. Brought in, dip with dip nets from boats into hogshead, where a pickle is added. 2 buckets salt and 2 buckets of salt water to a hogshead. Supposing them to be put into this pickle at 10 A. M. one day, they begin to take them out and string them at 7 A.M. the next. After being strung they are put in horses or low square frames to drip and dry. Are left in them all day. Then hung up in smoke house. Fire is made of both hard and soft wood, former preferred. Drift wood and sawdust are also used, the drift wood giving most smoke. Kept up steadily for three weeks for medium herring, for bloaters about a fortnight is sufficient, while it requires 6 weeks to smoke large herring.

A few of the large herring, if fat, are pickled, smelt, young pollock, young cod, hake and haddock are taken in the weirs. Occasionally also mackerel are taken in weirs, but rarely about Camp-

obello Island. When taken is usually in August or September. Never saw a salmon in the weirs in this region. Has rarely seensome very small cod in weirs, 2 or 3 inches long.

ST. CROIX COTTON MILL, MILLTOWN, N. B.

List of drugs that are, or may be, employed in bleaching and dyeing, and the quantities used during the week ending July 29, 1893.

("An" stands for "aniline".)

Name, etc.		Lbs. used.
Acetic Acid,		
Muriatic Acid,		
Nitric Acid,		
Sulphuric Acid,		
Bismark Brown, Red,		
" Yellow,		
Alum, N. P.		6
Aniline Salts, crystals,		
Alizarine, R. B.	An.	429
" Assistant		
Auramine	An.	
Barwood Spirits,		
Bichromate Soda,		20
" Potash,		
Biarseniade Soda,		
Black dye,		

Black dye, Mordant,		
Blue Meth, o	An.	
" oo	An.	
" ooo	An.	
Blue vitriol		
Blue black, E.	An.	
Chloride Lime,		750
Chrysoidine	An.	
Copperas,		
Cutch,		
Emerald Green,	An.	
Extract Fustic,		
" Logwood		
Developer,		
Extract Sumac		500
Fast blue developer,		
Acetate Soda,		
Fustic, Bolted,		
Garnet,	An.	
Glauber Salts,		
Wzo Mauve, R.,	An.	
Indigo,		10
Iron Liquor,		
Violet,	An.	

Logwood, Bolted,		
Litherage,		
Nitrate iron,		
Indigo auxiliary,		20,
Whiting,		
Olive Oil,		
Phenal,	An.	
Stannate Soda,		
Red liquor,		
Sal Soda,		
Safranine,		
Soda Ash,		
Sugar lead, brown,		
" White,		
Sumac, Am.		535
" Sicily,		
Tannin,		
Tartar Emetic,		$2^1/2$
Tin Crystals,		$1^1/2$
Diamine violet, N.		
Turmeric,		
Salt,		
New Blue, G.	An.	$18^1/2$
" D.	An.	20

New Blue, B.	An.	
" R.	An.	
Cresotine Yellow,	An.	
Lime,		
Chlorate potash,		
Benzo flavine,	An.	
Benzal green,	An.	
Russian red,	An.	
Red developer,	An.	
Tol orange, G.	An.	
" Brown, R.	An.	12
Tol Brown, B.B.O.	An.	5 1/2
Marseilles Soap,		
Aeth. Blue,	An.	
Benzopurpurine,	An.	
Cotton softener,		
Diamine blue, B.X	An.	25 1/2
" " 3 B.	An.	48 1/2
" black, R.O.	An.	12
Ureka, G. N.	An.	7/16
Nitrate soda,		
Tol brown, G.	An.	
Diamine Sky blue,	An.	
Golden yellow, $1	An.	

Golden yellow, $2.	An.
Aeth. blue, R.	An.
Diamine Green,	An.
Br. Sul. Soda,	
Diamine bronze, G.	An.
" fast red, F.	An.
Aeth. Blue, R.R.,	An.
Naphtazurine,	An.
Diamine gold,	An.
Neutral red, extra,	An.
Phos. soda,	
Liquid caustic soda,	
B. Naphtylamine,	An.
B. Napthol,	An.
Diamine brown V.	An.
Green olive oil soap,	
Diamine cutch,	An.
Fast blue, B.	An.
Direct brown, B.B.O.	An.
" R.	An.
Tri. Sul. potassium,	
New Meth. Blue, N.X	An.
Diamine black, B.O.	An.

Red Liquor,	L.	49 gallons.

It should be noted that the small quantity of drugs used during the week in question was probably due to the fact that they shut down at the end of a week for a week's time.

SAW MILLS, ETC., ABOVE CALAIS.

July 31, 1893.

St. Stephen:---Mr. Frank Todd. Has always lived here. Frank Todd is of the firm of F. H. Todd & Sons. His father was F. H. Tood, now dead, or at least not in the firm. Frank has always lived in St. Stephen, N. B. A young man, perhaps 40 years. Owns mills on both sides of river. Active, greatly interested in fishery matters, and a fish Overseer of Canada. One steam saw mill on wharf at Calais, C. C. Whitlock. Small mill making box shooks and laths.

Millton, Me.)))F. H. Todd & Sons. 2 gangs, 2 roof boards, 1 to 2 inch principally, dimension timber, scantling, laths, shingles.

James Murchie & Sons, 3 gangs, under 2 roofs. Same stuff.

H. F. Eaton & Sons, 5 gangs under 3

roofs, and 1 box mill. Same stuff. (All water mills).

Baring, Me.---3 mills. (add data). Water mills.

Princeton, Me.---F. Mercier & Son. Water lumber mill. C. B. Eaton, steam box shooks mill. C. W. Clement, Trustee, Tannery. L. Peabody & Son, woolen mill.

Grand Lake Stream, Me.---C. W. Clement, Trustee, Tannery, and saw mill? Mr. Todd thinks saw mill was erected to furnish lumber for tannery and has been abandoned. (Is tannery steam or water?).

Talmage, Me.---H. F. Eaton, water shingle mill, West Musquash Stream, between Princeton and Grand Lake Stream.

Vanceboro, Me.---C. W. Clements, Trustee, Tannery.

Lambert Lake Plantation, Me.---L. S. Mill, steam box shook factory.

Forest City, Me.---C. W. Clements, Trustee Tannery. Said to be a lumber mill by Foster & Haley, but Mr. Todd did not know of it.

Eaton, Me.---C. H. Eaton., Steam box factory, market boxes.

Danforth, Me.---Weatherbee & Co. Water mill. Hathorn, Foss & Co., steam box factory. George & Lane, water shingle factory.

Waweig, N. B.---Water mill, box and short lumber.

Bartlett's Mills, N. B.---B. Ripley. Large steam mill.

Oak Bay, N. B. Small water mill, short lumber.

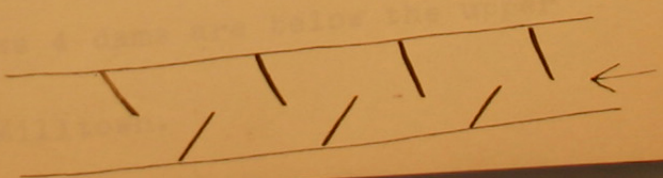
St. Stephen, N. B.---Haley & Sons, 1 box mill, planing mill, door and sash factory.

Moore's Mills, N. B.---Small water mill, run only a few weeks in the spring during high water. Maxwell.

Milltown, N. B.---F. N. Todd & Sons, 2 water saw mills. H. F. Eaton,& Sons, 2 water saw mills. Canadian Cotton Syndicate, cotton factory run by water.

Dams, St. Croix River.

1st. About 1/2 mile above Calais--St. Stephen bridge. Six feet high, from lower edge of apron to top of dam. One short part toward center only 5 feet high, but when we saw it to-day it had been temporarily raised tp full height of dam. At high water the water below occasionally backs up to top of dam, making nearly smooth water over. Has fishway on New Brunswick side. Ordinary old fashioned ladder. Slope about 1 in 7.



2nd. dam. 1/4 mile farther up. Cotton mill dam. Was a continuous dam, but now has a channel on the Maine side in the rocks for logs. Head of 18 1/2 feet. Although very swift current, can undoubtedly be readily used by salmon. Fish ladder on New Brunswick side alongside of cotton mill.

Same pattern ladder as last, 3 flights, turning back on itself, and then heading up stream again. Mr. Todd thinks that while the salmon probably prefer the log slide, the alewives probably make use of the ladder.

3rd. dam. Consists of 2 wing dams, 500 to 800 yards above last. A free channel in the center.

4th dam. Wing dam extending out from the Maine shore, with a passage way on the New Brunswick side.

All of these 4 dams are below the upper toll bridge in Milltown.

5th dam. Baring. Dam extends practically across the river, but during the early part of the season, and in most years up to September, much water flows around the dam. Has a fish ladder same as previous ones, near center of dam. Said not to be in good repair. This is about 5 1/4 miles above Calais bridge.

(No further obstructions on main branch. No obstructions on Eastern branch below Vanceboro, and on Western branch below Princetown).

Vanceboro.---Tannery dam straight across the river, with good fishway.

Few hundred yards above this is a river driving dam, for storing water to drive logs down stream. Has no fishway, but 5 gates, almost level with level of water below. All the gates are never shut at the same time, one at least being always open, to permit water to flow for use of tannery dam. From this point to the lake the water flows smooth and with no

impediment.

And no impediments in the lakes up to near Forest City. There is a river driving dam just below Forest City, in so-called Grand Lake Stream (Eastern). No fishway here, but gates are always open except during few weeks of driving time, when they may be closed at times to flush the river, and work out a jamb.

At Forest City, a tannery and river driving dam. Always open except occasionally in the spring, about March. May be said to be open 11 months of the year. This is a steam tannery and requires water only for small purposes.

No other general obstructions in this set of lakes. Numerous small streams enter the lakes, on many if not most of which are small river driving dams, which are shut generally only in March, just after the snow has begun to melt, and for the purpose of catching the rise of water which occurs at that time for floating

down the logs. This is before the fish begin to run up and should have no effect on the fisheries.

Mr. Conrad at Vanceboro, Canadian Overseer, has a small steam launch, the use of which it is said we can obtain to make a trip up the lakes.

WESTERN BRANCH ST. CROIX RIVER.

First obstruction, is at Princeton, just below the lake. Has a fishway of the Rodgers's pattern, but built before Rodgers had expounded his pattern.

Second obstruction, is a river driving dam at Grand Lake Stream (Hinckly). Offers no impediment to fishes.

Third obstruction, at head of Compass Lake, in Dobsis stream, river driving dam, 12 or 14 miles above Grand Lake Stream. Has a fishway.

River driving dams in the small streams entering the lakes as in those at head of east branch, and used to the same extent. Not important for consideration.

OUTPUT OF LUMBER,

St. Croix System, beginning Calais.

The largest cuts were made between 1860 and 1865, when it ran up to 150,000,000 feet of long lumber annually. Has been decreasing gradually since that time. Princeton used to cut 10,000,000 annually, now only about 2,000,000. Baring formerly 25,000,000 annually, now makes no long lumber. (Todd)

Decrease has been due partly to growing scarcity of timber, and partly to the failure of firms engaged in sawing. Formerly more firms were engaged in the business. Now controlled by few persons who limit the output. There is a disinclination to work beyond a certain limit, and new parties are deterred from entering the business by its uncertainties. (Todd)

The present milling business is destined to grow smaller. If the forests could be kept intact there might be a better prospect, but

the forest area is becoming much less and size of wood much smaller. (Todd)

Thinks that business is certain to turn into a pulp mill business, and the change may come inside of 10 years. The pulp mills would give them more for the crude timber than they could get by sawing it. (Todd)

Spruce is the best wood for pulp. Could, however, use all the soft woods except cedar, such as pine, fir, hemlock, poplar, and bass. There is an abundance of fir, and there is excellent poplar, bass, hemlock, etc. (Todd)

Mills saw no hard wood. They now saw spruce, pine, hemlock, principally. Cedar for shingles. The good fir is now too small, the larger timber being generally rotten on the inside. The timber should measure 7 inches at smallest end to cut boards. (Todd)

Present output on the St. Croix River is about as follows: 50,000,000 feet long lumber; 50,000,000 short lumber, such as laths, palings,

staves, shooks, etc., and perhaps 30,000,000 to 40,000,000 of shingles (by piece).

A large quantity of lumber, 30 to 50,000,000 more, comes in by rail from upper waters of St. John, etc., for shipment from here by vessel.

SAWDUST EDGINGS, ETC.

The laws on both sides prohibit any deliterious material form the mills being put into river. (Look up laws).

In sawing inch boards about 20% of the whole product goes into sawdust. The saw cutting 1/4 of an inch in thickness for each 1 1/4 inches of lumber. In sawing 2 inch would be 10% of sawdust. For all kinds of lumber cut, 8% of sawdust would be a fair average to calculate.

Large quantity of square stuff, such as scantling and frame stuff, cut. The dimensions of which we did not get an account.

Out of the 50,000,000 feet of long lumber reckoned above, 45,000,000 at least is cut between the head of tide water and 1 1/2 miles above. Very little sawdust can therefore be let in near spawning beds of important fishes.

The edgings are now all burned, except

what is carted away for domestic use. The mill owners are all anxious to see that no edgings are thrown in. This reform has been due mostly to the action and desires of mill owners themselves. (Mr. French, Am. Fish Warden, states that this good result has been brought about chiefly through the energetic action of Frank Todd). Edging beds he says have not increased, but in fact, have decreased within the past 30 years. The ice has helped to take them away. The beds which have been filling up the bed of the river in places is due almost exclusively to old edgings, which do not decay, but remain upon the bottom, except where ice action has removed them. The effect of the edgings has been felt down as far as the ledge near Devils Head, and may be seen at low water. Considers that sawdust causes no impediment to fishes or navigation. The tendency of spring rains and ice is to flush out such as may have lodged during pre-

vious seasons. Instanced the lower pool just above the Calais bridge where the sawdust covers all the shallow water borders. This is mostly cleaned away in spring. Sawdust troubles them some between the lower wharf and the ledges, about 6 miles down. Above this wharf no trouble is experienced.

Spruce sawdust remains on surface longest, a number of days, sometimes a week or more. Hemlock does not remain as long and pine still shorter, a very short time. Hard wood sawdust sinks at once, but practically no hard wood is sawed here.

Edgings are burnt in open furnaces below mills. The ice freezes to edgings where they occur in the river and tends to carry them down stream.

As the mills are built at present they are placed too low, too near the level of the water to permit of the arrangement of machinery to carry off the sawdust. If the mills were

obliged to remove sawdust, it would necessitate their rebuilding at a very great expense, more than they could afford. To oblige the mills to carry off sawdust would mean absolutely that the mills should close down, as they could not possibly provide for it. New mills could be built, but it would not pay,, and he does not think they would be built, if this requirement was made obligatory. They were built as they are, low down, so that the sawdust and edgings could readily fall into the water. The sawdust must drop down below the floor on which the saw is, but the edgings fall on the floor and can be saved. (The chief trouble is with the gang saws, which run down through the lower part of the mill, with the circular saws, the sawdust is left above the floor and might be controlled). Saw mills should be built high to control sawdust.

At the Ledge above referred to (mouth of St. Croix as understood in Calais) the sawdust

goes off into deep water where it practically disappears.

FISHES.

Salmon reach the large lakes at the head of each branch. Have been taken as far up as Forest City on eastern branch, and Dobsis stream on western. There are many streams on both sides of the river, and they turn off into nearly all of them. They are known to spawn in some of them. Instanced stream entering near Baring on east side.

Alewives have been taken at Vanceboro. They spawn in the dead waters along main and side streams, and on the overflowed meadows, between Calais and Baring and above. Is not, however, much acquainted with their habits, and his statements should be corroborated.

Shad used to be abundant before his experience, say 20 or more years, but since

that time have been very scarce. A few (2?) were taken this year in salmon nets near the toll bridge (First for 20 years). The St. Croix always used to be regarded as a good shad river, though not as good as the St. John. It was a better salmon than shad river.

Occasionally used to get striped bass in the upper weirs, just below Calais.

Brook trout are more or less abundant in the main river.

Pickerel in still water in lower parts of streams.

Other fishes in river and lakes are white fish, chub, white perch, smelt and alewives.

A few cod, haddock and halibut are taken as far up tidal river as the ledge.

Menhaden, when they used to be abundant on this coast would come up to within 2 or 3 miles of Calais.

About 3 years ago they again appeared, and schools were seen in a little bay, called Joe

Donald's Cove, about 3 miles below Calais.

Tinker mackerel come up every year as far as Oak Bay and the lower steamboat wharf. Formerly when the brush weirs extended further up the river they used to be taken in them. 40 barrels have been taken in a single weir.

Herring come up to about the same localities.

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POLLUTIONS, NORTHAMPTON, MASS., AUG. 1893.

E. Horton, of Cotton Mill, Milltown, N. ., told us that he used to live at Mt. Toan, Mass., nd was well acquainted with the conditions sur- ounding the Belden silk mill at Northamptom, Mass. his mill is situated on a little stream which lows into Mill River. This stream is quite small nd large quantities of dye stuff are run into it. as known of its killing large numbers of horned out, shiners, dace, suckers, yellow perch, etc., hich would float a long distance down the stream. ill River empties into Connecticut River about 1/2 miles below the mill. These dead fish were ften found down in the Connecticut and for some ime the cause was not known.

It would be important to follow this mat- ter up.

ROM ANNALS OF CALAIS, ME. AND ST. STEPHEN, N. B.
BY REV. I. C. KNOWLTON, CALAIS, 1875.
(Mills, beginning p. 184).

About 1780, Daniel Hill, Jeremiah Frost
nd Jacob Libbey built a small, rude mill, on Por-
ers Stream, near its mouth. This was the first
w mill. It was supplied with ~~saw~~ logs from trees
owing near the stream, cut and rolled in, without
e aid of a team. Here the first boards were sawed,
d here the great business of the place began.

About 1785, Mr. Moore built a saw mill
d grist mill, in the parish of St. David, at the
ace ever since called "Moore's Mills". These
lls, often rebuilt or repaired, are still running,
d partly owned by thrifty descendents. There is
so at the present time, machinery for carding
ol and making shingles and turning on the same
m.

In 1789 or 90, Henry Holdsmith erected a
ist mill and saw mill on the Waweig River; and
ither the farmers of St. Stephen and St. George
rried their grain to be ground.

Not long after, Daniel Hill's mill having
en swept away by a great freshet, another mill was

erected by Peter Christie, Joseph Porter, and others, on the same stream and near the site of the first one. This was run profitably for many years.

The first mill on the main river was built at Milltown about the beginning of the present century, by Abner Hill, Peter Christie and others. On its completion it was found to go so swiftly and strongly that it was christend the "Brisk Mill". It stood on the American side of the river; and a mill bearing the same name still saws briskly on the old site. The Washington mills were built soon after, on the same dam. In 1805, a mill was erected at Baring, by Daniel Rhodes and Maltiah Lane, for William Vance, Esq.; and soon after, other mills were built at such places on the river as seemed most convenient for the lumbermen.

These mills run well, and it was easy to procure logs for them; but it was very difficult to get the manufactured lumber to tide water. Rafts could not be run down Salmon falls without breaking, and the roads in summer were almost impassible fora loaded team. In this emergency, a sluice from the mills to the head of the tide was suggested, and

about 1805, after much talk and correspondence, Margaret and Susanna Campbell, of Scotland, furnished the money, and the sluice was built for them, on the St. Stephen side of the river. It proved so useful and profitable that it has been kept in operation ever since. It remained the property of the Campbells until five or six years ago, when it was sold at auction in St. Andrews, and bought for a few hundred dollars, by C. F. Todd and the Eaton Bros., by whom it is still owned.

About the same time, i.e. 1805, a broad sluice was also built on the American side of the river, from Milltown to Middle Landing. It worked well and was much used until the Union Mills were built, when lacking a convenient place to discharge its freight, it ceased to be used.

In 1824, Capt. Seth Emerson and Amaziah Nash built a saw mill and grist mill, for Green and Shaw, at Ferry Point Rapids, near the site of Samuel Rideout's grist mill. These mills for a long time were valuable property.

In 1826 and 1827, Capt. Emerson built for Joseph Whitney, A. Pond, Jones, Pike and Whipple, at Middle Landing, now Union Village, the Lafayette

Mills. They went into operation in the spring of 1827. A few years after, these mills were purchased and for a time successfully run by Messrs. Henry and Frank Richards.

. . . . . .

Since then, many mills have been built and rebuilt, and great improvements have been made in their machinery. There are now in Baring eight gangs, two mules or muleys(single saws that move very rapidly), four shingle and six lath machines; in Milltown, seventeen gangs, two muleys, and seventeen lath machines; at the Union, nine gangs, one muley, nine lath and two shingle machines, all in active and profitable motion except during the winter.

(Ferry Point, referred to in one place above, is the site of the lowest or Calais-St. Stephen bridge, and the Ferry Point rapids must be the first rapids above the bridge. These rapids are not used now to furnish power. R.R.)

(Shipping, p. 160).

The river(St. Croix) has bold and picturesque shores, and varies in width from 50 rods to 200. The tide rises and falls 26 feet, making the river navigable for large vessels twice in every 24 hours. At low water, however, the river appears like a shallow stream running through a wide and deep valley. The bed of the river, made soft by vast accumulations of mud and sawdust, permit vessels of any size to ground without injury.

Calais, Me., August 1, 1893.

ALBERT FRENCH, MAINE FISH & GAME WARDEN.

Has been warden 9 years, stationed on St. Croix River during salmon season as late as first part of August. Then goes elsewhere. Previously was a fisherman on the St. Croix River about Calais, and has poached, being therefore acquainted with posching methods.

Grand Lake Stream(Hinckley). The saw mill still exists, connected with tannery. Used to saw for tannery and local trade. At work only occasionally.

During very high spring tides has known the water to flow up over lower or Union dam 200 or 300 yards.

Has actually seen salmon go half way up log run in 2nd(Cotton Mill) dam, and has no doubt they go through Western Grand Lake stream dam above tannery. Keep the gates closed down most of the time during summer, and not open as they should be. Considers that this dam does much harm to fish run as now managed, and something should be done to stop it. A ladder might be placed there.

The stream on which the Talmage mill is located is a fine fish stream(trout), but the dam has no way, and the fish cannot get through. Something should be provided in the interest of trout; salmon do not go up.

The togue is very abundant in the Western Grand Lakes, and West Musquash Lake(probably in all lakes) weighing 2 1/2 to 30 lbs. Important food fish found in deep water of lake and may come into shallow water to spawn.

About 10 small boats on the St. Croix River above Baring, but there is no navigation, and this matter does not give rise to question.

Thinks that salmon could go over all the dams at any time of the season, except cotton mill dam, without fishways. The fishways existing are sufficient for all purposes of salmon, the log shut in cotton mill dam being also readily ascended by them.

Salmon begin to run in April 1st to middle, and continue to run until last of September; main run May and June; run principally at night. Sees them lying about in the pools for a day or two; then they would suddenly disappear from that pool between dusk and daylight next day.

When dams shut down at night, there is higher water than at other times of day. At noon, when men go to dinner, the same thing happens for a shorter time, and this is taken advantage of to run logs down as we saw while here. Seldom see the dams dry on top, Even this year, which has been an unusually dry season.

Has seen alewives above the 1st dam, but never above cotton mill dam. Doubts their going up further, and has no evidence of their reaching higher place. He is not, however, entirely certain on this matter. Between the two lower dams he has seen them dipped out in quantities every year, in the pool above the Union, or 1st dam. Has been told that they go above Milltown and even to Vanceboro.

Good many Indians live about Princeton. They fish throughout the length of both streams above Baring, by spearing, etc., evading the law wherever they can. They claimed to have a treaty right which allowed them to do so. They were protested against by French, and the law was decided against them. They continue their practices on the sly, and he thinks they do much harm to the fisheries.

As to the down-run of salmon, has first seen them running down in December. Occasionally one or two have been seen in November. Are nextseen in the spring after the ice has gone--April, but never get them after April. They are black and poor, not fit for food, andmay readily be distinguished from the up run.

Salmon spawn in the main river, there being several places suitable for this purpose, as at Grand Falls(meeting of East and West branches), Spednic falls, andthe rips below Vanceboro. The Indians spear them commonly in this last place. Has seldom heardof their entering the Grand Lakes. 2 or 3 have been recorded from each of these systems (East & West lakes), some of these captures having been made near the F. C. Station at Grand Lake Stream, in connection with landlocked salmon.

They also enter numerous side streams of the St. Croix, but cannot say all that they enter. Knows especially of the following Magurrawock(Calais), Moannes(N.B. flowing in near Baring) and Wapsedaegan(about 9 miles above Calais, in Baileyville).

Sees young salmon coming down the river

in May and June, 4 to 5 inches long. A few may also bee seen the very last of April. They are abundant, and he supposes they run right down the river. They will take bait and many are dipped out with smelt. Has had hard work keeping the boys from catching them. Salmon have been increasing during the past 8 or 9 years. Thinks this is largely due to the fact that illegal drifting nets were put a stop to, and poaching prevented. On the Maine side, law permits drifting nets to be used only outside of a distance of 500 yards from any fishway, mill race or dam. He thinks that drifting should be entirely prohibited.

Alewives begin to run up the last few days of May, and continue running for about a month. The biggest run takes place in June, they come up in schools. Go up Porter's Mill stream(N.B. below St. Stephen) in large numbers; and are very thick about the lower mills, between 1st and 2nd dams. In this locality they are not captured except few desired for local use. They are not fished for regularly. Has seen them thick above 1st dam, especially in the pool. They disappear by the last of June from the river. They may be about somewhere, but are not where they can be observed.

Alewives were decreasing until nets were stopped about 8 years ago, since which time they have been increasing. Never saw them as abundant as they have been during past 4 or 5 years. 14 or 15 years ago, as he remembers it, they were very scarce. They subsequently increased, decreased again, and since 8 years ago have been once more increasing.

Does not think that decrease of alewives or salmon in this river was ever due to the presence of dams. Mainly due to overfishing, although perhaps sawdust and edgings may have had some influence. (Has Maine Fish Commrs. a history of fisheries on this river?).

Young alewives, 2 or 3 inches long, and seen abundantly below the dams in July and August--large schools at a time.

He has never seen the smelt go above the lowr dam.

Has not seen shad here for years. Two were taka this year in salmon set nets at the toll bridge One was taken about 7 years ago in drift salmon net. 20 to 25 years ago andpreviously they used to be abundant. Thisinformation came from his father,

but he had no experience with them at that time himself.

Salmon, alewives, smelt and eels are the only valuable fishes in the river at Calais below the dams. A few white perch are taken around the mill dams.

The only commercial fishing is the net fishing for salmon. Some hook and line fishing is done for sport.

On American side, about 10 men are engaged in salmon fishing between the dams and 3 or 4 miles down. They sometimes steal in above the lower dam when the warden is absent. The season lasts from April 1 to July 15. They use 1 set net each, and of drift nets one to two men. That is to say, they use 10 set nets and 5 drift nets altogether. Drift nets are 50 to 90 feet long, 7 to 9 ft. deep. Set nets 150 to 300 ft. long, 12 to 15 ft. deep(has known one 24 ft. deep). Mesh 6 inch stretched measure. Set nets are placed lengthwise of river, and must be set where water does not exceed 2 feet at low tide. Drift nets must naturally be worked crosswise. Nets must be taken on shore between Saturday morning at sunrise to Monday morning

rise. No nets allowed anywhere above the dams in the salmon fishery, or in any fishery except as follows:

During May and November nets may be used for whitefish in the lakes and in the tributaries of the St. Croix. The whitefish are abundant in some of the lakes. He thinks they spawn in November, same as salmon. Therefore, they ought not to be taken with nets in November, and he would also prevent their netting at any time. The right to use nets for whitefish was given on the representation that they could not be taken by any other method. French has caught them himself with fine hooks, and thinks they can be sufficintly well taken by that method. There are sveral persons whom he can produce as witnesses to prove this fact. During other months than May and November they are mostly in the deeper parts of the lake, where they may also be taken with the hook and line according to him.

Pickerel and perch are netted to some extent, but this is illegal. He thinks it is carried on to a considerable extent, and he has detected it by examining the fish which have been shipped away

in barrels. Says he can distinguish between hooked and netted fish, but he is notable to gain sufficient evidence in this way to conflict. Where seizures were attempted it was claimed that fish were taken in other side of river, etc. Has seen nets set illegally on this side, but could not prove owners.

There is a good deal of hook and line fishing in the lakes of this region, the principal species taken being pickerel and white perch. 8 or 10 small boats on the Maine side make this a business. They hail from several of the small towns.

No person is allowed in the lakes to take more than 50 lbs. of landlocked salmon, togue or trout, and is not allowed to ship them, unless he goes along with them; they cannot be sent away unless he accompanies them.

The open season for above fish(3 species) is February 1 to September 15, throughout the St. Croix system.

He has seen no difference in the abundance of the above fish during the past 12 to 15 years. The fishermen claim that they now find better fishing than they used to.

He used to fish for pickerel through the ice. He thinks they spawn in June. The spawn is attached to grass and lily pads, like that of frogs, for which it is often mistaken by the people. With one partner he had caught 2,600 lbs. pickerel in a week. The two together used 30 lines through the ice. He fished for them during 8 years before he became warden. His attention was first called specially to the cotton mill 4 or 5 years ago, after many fish had been found dead above the lower mills(saw). He collected a quantity of the dye waste and of white substance from rocks and sent to Augusta, but never heard of it afterwards. When the dye waste is flowed into the stream the salmon in the pool below fall back until the water becomes clear. Had not heard of any dead fish being seen in those places until they began to allow dye stuff to go into stream(Cotton Mill started about 1884). The fish found dead are chubs, horned pouts, suckers, small pickerel, a few trout and also a few salmon. The 3 species first mentioned have at times been found dead abundantly. (He acknowledged that some of the fish had cuts or marks upon them). Every year a few salmon are found from time to time.

The dead fish are found from the pool below the cotton mill, down a distance of about 2 miles. Could not say positively that this was due to the cotton mill, but everything in his opinion points that way. From where the dye waste drops into the water to the outlet of the archway at lower end of mill is 50 to 75 yards. From this outlet he has seen the dark water, in the open water, reach 25 or 30 feet or more below the mouth of the arch, before it began to mingle well with the water in the pool.

Has seen salmon, but not alewives, in the pool just below cotton mill where the dye comes out. The white stuff(bleaching material?) finds its outlet through a covered conduit at lower end of cotton mill. Thinks it is blown out. It falls down over the rocks below and into the pool. He does not know its composition. There is great difficulty in getting admitted to mills, and they take every pains to prevent visitors from entering.

The best time to examine pool and obtain material for analysis would be during period of drought--August or September.

Tanneries are not allowed to throw bark into the water, and now they burn it. The waste li-

quid, however, flows into the stream. They have been fined for allowing bark to go into water, about 5 years ago. French does not know entire nature of waste liquid from tanneries, but they use large quantities of vitriol, and other liquids.

Grand Lake Stream(west) was one of the finest fishing streams before building of tannery, but since then no good fishing has been obtained in the stream below the tannery, although it is still good above tannery to the lake(salmon, trout, togue, trout). A few years ago, when the Shaws failed, the tannery remained closed for 2 or 3 years, and during this interval the fish came back as plenty as ever. Since the tannery has started up again, the good fishing has ceased. This same principle applies generally to other tannery localities.

French has had a hard fight with the saw mills above Calais. They were heavily fined, and promised to remedy the evil of throwing things into the river, which they did as best they could, considering the manner in which they are built. They stopped putting anything in except sawdust. French begun this crusade as soon as he was made

warden. He considers that the law properly covers the prohibition of sawdust in the general clause. He thinks the mills are now doing the best they can without going to great expense.

He has seen no difference in the bottom of the river in tide water since he was a boy. Consists mainly of sawdust, with some edgings and shavings. Thinks that the river is not filling up, and that no change is now taking place. The ice carries this material away every spring and it is more or less replaced the following season. There is a bad bed of sawdust in the narrows, about 2 or 3 miles below Calais. It is constantly removed and added to. He used to drift there with gill nets up to 12 years ago. Has never heard vessel people complain of filling up. Capt. Ryan of the Rose Standish would be a good person to consult on this subject.

While the sawdust cannot readily be saved with the gang saws at these mills, but with the circular saws they might be able to gather all the sawdust and burn it.

Very little hard wood is sawed here. Hard wood sawdust sinks at once, while other saw-

dust remains a greater or less time at surface. Sees sawdust on the surface abundantly 2 or 3 miles below Calais.

There is now no more sawdust in the pool below the several mills than there always has been since they have been running.

Sawdust is very deep in some places. Always remains loose; can thrust a pole through it to the hard bottom underneath, and its depth might be measured in this way.

If no more sawdust were put in the river, thinks that the sawdust now there would in time be completely swept out by the ice and spring freshets, which have great force.

C. C. Whitlock, Calais, Maine.

August 1, 1893.

Steam saw mill on the end of a wharf in Calais, a short distance below the bridge. Saws box shooks (market and sardine boxes) and laths (from round lumber). Use spruce, fir and pine chiefly, some, but not much hemlock, receiving lumber in short (4 ft.) round logs. Uses small circular saws and one planer. The shooks are roughly sawn, and are finished to evenness by being planed on one side. Shooks for sardine cases go to Maine coast, and market boxes to Boston. The edgings and shavings are burned in his furnace. The sawdust is sold at 3 cents a barrel. Is bought here in Calais for some purposes and also sold to Eastport sardine packers. The sawdust is carried out on a belt at the upper end of the mill and falls on the wharf. In heavy winds some may blow overboard.

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Calais, Maine, August 2, 1893.

Joseph Eaton in lower part of Calais, at inside end of wharf, a short distance north of Granite Works. Planing, tonguing and groving. Small steam mill, shavings burnt in furnace, and sold for use in stables as bedding, etc. Saw some shavings on adjacent slip bottom, which may have blown over.

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Calais, Maine, August 2, 1893.

Conversation with a man in employ of Joseph Eaton, while at his mill, August 2, 1893 Told us that at one time the channel of river came right up to wharves, and vessels could come right alongside of end of wharf at low water. Thinks that the channel has been filled up by combination of sawdust, edgings, and mud sediment. We saw at low water an exposed ridge or bank, extending lengthwise through mid channel in front of the middle and upper wharves of Calais. Said that in this place used to be deep water of channel. We could distinguish the edgings and sawdust composing it. The muddy bottoms on the sides of the river he said are composed largely of edgings and sawdust. The river bed is still filling up with the sawdust and that some edgings and larger stuff still come down.

The sawdust never becomes firm on the bottom, but readily stirs up, and is so stirred up at every tide in large masses that a boat can hardly get through. A man may step into it, thinking it solid, might sink in to his neck.

Large vessels cannot now load to completion at the wharves, but after partly filling have to drop down before receiving balance of cargo, which is taken down in scows.

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CALAIS, MAINE? AUGUST 3, 1893.

Conference with toll keeper at 1st bridge above the lower or Union mill dam. There were 2 or 3 persons with him working in the neighboring mills, etc.

One person had seen 2 salmon dead taken from rock of lower mill, which had been injured externally. Did not know of any other dead salmon. Toll keeper stated he had seen a few dead salmon between 1st and 2nd dams. Thought it was due to injury by logs coming over the Cotton dam before log slide was cut there, Does not remember to have seen them before cotton mill was built, and has not seen them since log slide was excavated. The salmon play all about at the foot of the 2nd dam. Has seen no evidence that dye waste has done any harm. Has not seen any of the common fishes of this part of the river dead. Chubs, suckers, horned pout and trout occur here

abundantly. Smelt never come above the 1st fishway.

The fishway in the lower (Union) dam is the oldest and has been in about 15 years. The fishway at the cotton mill has been in 11 years (1882). Before that time there was simply a natural fall in the position of the cotton mill dam. Log slide built about 4 years ago. There is no grass growing in the river until you get above Milltown. All swift water from Milltown down. See young salmon very plenty in the spring.

W. H. NICHOLS, PAYMASTER,

COTTON MILLS.

The cotton mill began to run in July, 1882.

The white refuse blown out at the lower end of the mill. Is blown out at the edge of the cliff, which is much discolored by it at this place, and most of it must run into the water. This refuse consists of lint from the broad sheeting and is white (issues from the cloth room), and of a sizing made from wheat flour, potato starch and china clay. No oil or grease. The lint is dry, the other a thick paste.

The drain opening for the dye is below the dam, outside of and above the level of the ladder mouth, near the foot of the apron which is farthest up stream and nearest the mill. The distance from the mouth of the drain to the pool at the foot of the ladder is from 100 to 150 feet.

The fishway partitions are at right angles to sides and not inclined. They are full height of sides, with openings alternately on one side and the other.

Says that salmon used to go over the falls before cotton dam was built. He was there while building was going on.

A great deal of the accumulated sawdust and refuse from above is carried down by spring freshets. Are much troubled all the time with sawdust and bark, and some edgings (edgings formerly; not so much now) accumulating on the rack, especially in spring and fall. Two men are kept at work all the time to keep the rack clear of this material. There are two racks, one by the edge of the pool (at the head of the flume) leading into the mill, the other just above the wheels. Use 3 turbine (open) wheels made by the Holyoke Co.

The sawdust along the side of the mill,

being in an eddy, accumulates to depth of 20 feet. The spring freshets do not clean out much in eddy places. The bottom at and about the mill consists of rock. Have to clean the pool by the side of the mill out twice or more every season, through a door low down in the side of the dam. A large rake is worked for this purpose by horses to stir up sawdust, which then flushes out with current.

There is a boom along the edge of channel to corner of dam from coal wharf above to set the surface drift (logs especially) away from that part of the pool leading into the mill, but the smaller refuse sucks under and reaches eddy alongside of mill.

The cotton mill dam is built on the rocks across where the falls used to be.

They use mainly anneline dyes, with some indigo, and a small quantity of acids. The chief dyer, who can give full information, is Andrew Mungall, Milltown, N. B. He has

charge of the dyeing work in all the mills of this combine.

Since the log slide was cut, not so many salmon have been seen in the pool below the fishway.

They employ about 700 persons in the mill.

MR. HIGGINS.

Superintendent of H. F. Eaton & Sons' mills at the 4th dam, and James Rapley, a very old employee, who is acquainted with the fishes and Horace A. Hansen, another employee.

All edgings from the upper mills on Maine side are hauled away and sold. The planer shavings are blown out through large hoppers into carts and also hauled away, but burned. It pays them to save and sell edgings at this mill, as they do not do so at most of the other mills, and the market for them is left open to this mill. Some years, however, it might better pay them to burn than to sell, but they do not burn at all.

Rapley states that the passage way for fishes at this place between the two dams has existed for over 40 years. Salmon used to come up before the cotton mills were built.

Thinks they had a better chance then than now to pass the cotton mill locality. Never saw alewives above the cotton mill dam, but has above the Union dam, where they are abundant.

WATER WORKS.

Which supplies both Calais and St. Stephen with water, through a reservoir in Milltown, N. B., Is located directly below the upper bridge in Milltown, Me., and just above the upper mills on that side. Use large Blake pumps. The water is taken from the river directly under the first arch of the bridge. Pumped in and filtered by means of Warren filters, and then pumped to reservoir. The engineer states that there is plenty of sawdust on the bottom and sides of the river about here, but we saw none floating above these upper mills in Milltown. Some sawdust, however, is always contained in the water pumped in, and filters would scarcely be required except on this account. The sawdust becomes much more abundant during times of freshets, especially in the spring and fall. Pump from 800,000 to 1,000,000 gallons of water per day. Does not consider that the

sawdust gives them any material trouble.

MR. GRAHAM, in charge of Eaton's mills at 4th dam, N. B. side. Examined the passage way for fishes between and at the head of the two dams. Natural bottom, no attempt to construct a fish way. Narrow as a fish way at upper end, but broadening below.

Plenty of water was passing down, although the river was low. Many logs had been allowed to run in and were jammed in it. There seemed to be room for fish to pass up, but considering narrowness of channel, no logs should be allowed to remain in or at head. They are cleaned out occasionally. At noon and night, when water is not passing down under mills, this passage way becomes half full of water (some of the mills have electric lights and are run at night). He has seen salmon passing

through. Has never seen alewives and has never heard of them. Could not save sawdust at gangs as at present constructed. Edgings and planer shavings are burned. The crank shaft of the gang works in the water. The saw dust would average 1/5 of sawed lumber. At these mills have 4 gang saws, 1 planer, 2 edge saws, 3 lath saws;-15 logs to make 1000 feet of boards, average.

Calais, August 4, 1893.

George Eaton, says they use finer, thinner saws now than formerly, and consequently used to make a greater amount of sawdust.

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Calais and St. Stephen, N. B.

August 4, 1893.

Mr. Ed. Hill, now of St. Stephen, used to live at Vanceboro, 20 years, between 1870 and 1875. He was out and some boys were dipping suckers from the river at Vanceboro. They dipped up one alewife among the suckers. He has no knowledge of the rest of the river as he was never on it. At about the same time a young salmon, a grilse, about 6 pounds, weight was dipped up at the same place.

He is not a fisherman, and has no further information regarding alewives on the St. Croix above St. Stephen. Has caught alewives 3 miles up the St. Dennis stream, and he knows that alewives go to lake at head of this stream There are 2 dams on this stream, one near mouth the other 6 miles up. They both have common fish ladders. Dennis stream flows in just

below St. Stephen.

Frank Todd.---States that he can secure witness to prove that alewives passed up through log shoot in cotton mill dam, during course of construction, when men were working there and had the means of observing them. They were seen in crevices, etc., on the way up. He is positive that alewives pass up through all 4 of the dams.

As alewives are not fished for above the lower dam, and do not take the hook, the people living along that part of the stream have not had the opportunity of observing them, and therefore it is not surprising that they cannot give more testimony regarding this subject.

The Union dam fishway has a rise of 1 in 7, and that at the Cotton mill 1 in 10. So that if the alewives pass through the former they certainly should be able to pass the latter. The cotton mill, however, is somewhat larger.

He has no evidence that any fish have been killed by dye waste from cotton mill. Has known of dead fish of several common species being found in the stream between Cotton mill and Union dam, but it resulted from their having stranded through the drawing off of water at the lower dam. They were thus left dry upon beds of edgings, etc., and when water was raised again they floated off. This happened particularly at one time when a temporary dam had been built. The occurrence of these dead fish might readily give rise to the belief that they had been killed by dye waste.

He knows from personal observations that salmon commonly go up into that part of the cotton mill dam close by the mill, where the exit of the drain is located, and endeavor to find their way up there. Whenever the dye comes down they retreat before it, but he has no knowledge that they are directly affected

by it. As soon as the water clears, they work back again.

He states that vessels were never able to come up to the ends of the wharves at low tide, and could not have done so at any of them, had they (vessels) drawn more than 3 or 4 feet of water. He pointed out the natural bed and the rocks in the river, along the wharves on the St. Stephen side, to show that there had been no filling in there. Whatever damage had been done by edgings and sawdust had taken place farther down river, below the mouth of Dennis Stream, and thence down through the narrows.

Told us of conferences with Chas. D. Owen, Vice President, Canadian Cotton Syndicate, and manager of the mills of that Syndicate in Canada (lives in Providence), in relation to trouble about dye waste. Mr. Owens had assured him that they would do anything they could to prevent their waste killing fish, but was confident that it had never destroyed any,

and that there could be no danger from that source. In response to demands from the Canadian Government to abolish the nuisance, they had offered to carry their waste through pipes to a pit which they would construct on the shore in the low land below the mill. This would involve much expense in working way through rocks, and the pit would be near the river. The water would percolate through but would undoubtedly filter out most of the refuse. They have not done so yet, and are pending further action by the Government. The present drain into the river, Mr. Todd thinks, measures 12 to 18 inches in diameter. Thinks they empty on an average about 2 vats a day, each probably holding about 400 or 500 gallons.

Bags holding catch are allowed to go out through drain, and on a small scale may be regarded as a nuisance. If many go through would settle and form a nucleus for other

things. They are often fished and left to dry on the shore.

The consistency of dye stuff poured out is that of meal and water, rather thick, and, on occasions when they were watched, opened the drain on the floor of the building, taken it out and hauled away in carts. Capt. Pratt was at one time instructed by Government to fine them daily, and it was then that they made a pretence of taking it out and hauling away.

In building up their defence they complained that other establishments, such as the tanneries above, the sheepskin factory in Calais (away from water) and a woolen mill at Princeton were also polluting the river. They made the case out against these parties to be worse than it was, and the result of an investigation did not sustain them (By Capt. Pratt).

The cotton mill and the Union mills have both been much troubled with edgings and saw dust from above. As regards Union mills, this

has been largely corrected, and they have no special trouble now. The cotton mill still suffers, but Mr. Todd thinks that a sluice way run through their dam near the fish way would create a current which would largely, if not entirely, remedy this.

As many of the logs are left in the stream a considerable length of time, a year or more, sometimes longer, the bark tends to soak off and a large number of logs become stripped of bark, which floats down stream, and is one of the greatest sources of trouble. It cannot be prevented. Enters largely into the debris, helping to fill up channel, and also passes through mill gratings.

Calais, August 6, 1892.

H. V. Eaton, of H. F. Eaton & Sons, knows of 2 salmon taken in the Western Grand Lakes. One was caught off the mouth of Ox Brook by Frank Brimmer. The other was taken by Wm. Rose of Grand Lake Stream, who has a crayon picture of it. Does not know precise locality.

There are no pickerel in Grand Lake. They occur, however, in Big Lake. His cousin, 3 years ago, caught a togue in West Musquash Lake, through the ice, weighing 34 pounds 12 ounces.

Calais, August 4, 1893.

Conference with Geo. Eaton, and his father H. F. Eaton. The latter is 82 years old and has been in business here and St. Stephen since 1833. They state that at no time have vessels been able to come up to end of the wharves at Calais and St. Stephen at low tide. It was customary in olden times to load vessels at the ledge several miles down the river.

(Mr. Todd stated to-day that the mud which we have seen between the wharves was always there to his remembrance. There is little sawdust and other refuse mixed with it. This rubbish does not sweep in between the wharves, but is carried down the channel).

Geo. A. Boardman, and Mr. Copeland state that vessels were able at one time to reach ends of wharves at low tide, and the river has filled up since. Mr. Boardman is especially positive in this matter. He is 75 years old, and has always lived in Calais and Milltown, N. B.

Mr. B. says that it would be possible to save the saw dust from the gang mills if they were obliged to. He used to contend that it would be impossible, but knows that if the law had obliged them, they would have found a means. He thought it would be a very good thing if the river below the mills could be cleared of sawdust and no more permitted to run. Considers it a very great nuisance for the city.

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J. R. KIMBALL, PROPRIETOR ST. CROIX EXCHANGE,

CALAIS, ME., AUGUST 4, 1893.

Statement to Dr. Wakeham.

Was born and brought up here. When a young man was employed on the wharves in Calais. Believes that one time before his day it was possible for light draft vessels to come up below the bridge abreast of the wharves at low tide on the Calais side. He did not see it, but always understood it was possible. Large vessels in former times never came up to the city to load. That was in his day, but anchored below the ledge. Has known as many as 15 vessels to be loading there at once. Loading with deals for Europe. There used to be quite a settlement at that place which supplied those vessels, and worked at the loading. It has since disappeared. The deals used to be scowed down. A deal is 3 inch stuff, 12 inches wide, and 9 to 12 feet

long. Not cut here now. The main channel was always on St. Stephen side, or toward that side. There the bottom is harder. Vessels were never able to go to the other side on low water, up to the wharves. On this side there has always been more of an eddy, a back-setting and a settling of sediment. Principal deposits are below the town, between there and the ledge. Vessels have always hauled in along side of the wharves, and have lain in the mud to be loaded.

In former days when he was a boy, salmon used to frequent the river in great abundance. Their favorite resting place in the lower part of the river was the pool at the foot of Salmon falls (the site of the Cotton Mill dam). They went over the falls quite easily. There was no guardianship then and anyone could take salmon as they pleased. A common practice was for everyone to secure a barrel for their family use, and this used to be done in that

pool, by spearing, netting and dipping. In the early days of the lumbering and when the mills were in full blast, about 30 or 40 years ago, no attempt was made to save any part of the refuse. Sawdust, bark, edgings and deal ends were all sent adrift in the river. It was in those days that great injury was done to navigation. It is only within the last 10 years that an attempt has been made to remedy the evil. He thinks within last 3 years there has been a considerable augmentation in the number of salmon going up the river.

Thinks all the sawdust made by the circular saws could be saved.

JOHN MILLER, FISHERMAN, AT TOLL BRIDGE.
CALAIS, AUG. 5, 1893.

33 years old; born here. Has been engaged in fishing three seasons. Had done a little salmon fishing at times previously. Acknowledged that he was a poacher, and rather bragged of it. Not inclined to give much information, and his experience was evidently very limited. Used fixed nets just above Calais bridge, but was in the habit of drifting on the sly whenever he got a chance. Best fishing is done with drift nets, but not allowed on Maine side above ledge. The fishery at this point is for salmon solely. Took two shad, about 4 lbs. each in one of his set nets this season. The only ones he had heard of for a number of years. No regular fishery here for alewives. They come up very abundantly and are most abundant just below Union dam. They also pass over that dam, but has not heard of them above Cotton Mill dam. Five men, more or less regularly engaged in salmon fishing about Calais bridge. All using set nets. Complained that they were not allowed better privileges for fishing. Thinks that the few rich men are down on the poor ones. Salmon more abundant last two

years than for sometime before. Thinks that waste from cotton mill harms fish. Saw a number of dead salmon last year, but none this. On those he saw there were no external marks of damage. The gills were full of sawdust as he picked them up, but does not think that fish are killed by getting sawdust in gills. Has sometimes caught salmon in his nets that had scars upon them. The salmon become very abundant in the pool just below the cotton mill.

SWAIN NOSTRUM, FISHERMAN, AT THE BRIDGE.

CALAIS, AUG. 5, 1893.

In the fish business here 20 years. Only salmon fishing done about Calais as a business. No business in taking alewives. The only place where they are taken now is Porter's Mill Stream on New Brunswick side. The weirs used to extend up the river to just below the ledge. They did not pay so far up, and the upper weirs were abandoned about two years ago. A few alewives have been taken above the bridge during each of the few years past, except this year. Has never heard of them above Union dam.

This year and last have been the best fishing years they have had for salmon since he began. Supposes there have been other good years within his experience, but they did not fish so much, and they knew less about them. They have been seen in greatest abundance, jumping, in the space between the narrows and Devil Head. While laws existed before they first began to enforce them strictly when Mr. French became warden, eight or nine years ago. Thinks they would not be allowed to build weirs above the ledge, but weirs here

would, in his opinion, be very profitable now. Mr. Bostrum sets his gill net, by attaching one end to Calais bridge, and allowing it to drop down from there. It fishes best just before high water and on beginning of ebb tide. The net is not in over two feet at low tide.

Four men made a regular business of setting nets on American side this spring. They are not allowed to set drift nets above the ledge, and it, therefore, cannot be done openly. Better catches can be made with the drifting than with the set nets.

All the salmon taken here are sold locally, and do not catch enough to supply local trade. They obtain some salmon from St. John. The range of the salmon this year in size wasfrom about eight to twenty-six lbs. The average would probably not exceed twelve lbs. The largest salmon he knows of having been caught at any time in this locality weighed about 35 lbs.

Says there are plenty of salmon below the ledge, and was inclined to think from their abundance there that they did not all run way up the river, but this was a matter of opinion only.

During the past two years he has not seen many dead salmon, but previously had seen more. The extreme number he had seen in a year, however, he thought would not exceed five or six. This larger number he saw about four years ago. Has no positive opinion as to how these fish were killed. Formerly it was almost always laid to the refuse from cotton. This opinion still prevails to some extent, but is not so universal. He had no evidence on which to base an opinion. The fish did not show external marks of injury. One large fish which he picked up dead once did, however. One side of head looked as though it had been struck by a piece of timber.

Doesn't see how the salmon can come up the river, as they do, considering the amount of sawdust in the water, especially at the narrows, where it banks up and the water becomes very thick.

Thinks the sawdust deposits are increasing. At extreme low tides the Eastport steamer "Rose Standish" cannot reach the lower wharf now. The "Rose Standish" draws less than "Houghton" or "Belle Brown". Within at least eight years and previously she would go in at all times without trouble. (Have also heard similar statement from others). The bottom, abreast of wharves, on the

Maine side, consists of mud and sawdust. Edging bed in middle is deep. During past twenty years vessels have not been able to come up to outer end of wharves at low tide.

JAMES MURCHIE, SENIOR MEMBER OF JAMES MURCHIE & SONS, LUMBER MILLS, ETC., CALAIS & MILLTOWN, N.B.

AUG. 5, 1893.

80 years old and has always resided in the neighborhood. Born in New Brunswick near St. Stephen. Until 12 years old lived on a farm, through which Porter's Mill Stream flowed.

There has always been a passage for fish at Baring. There is now a passageway around the mill on the American side and a fishway near the middle of the river. (The latter is now in poor condition).

Always a free passage through the two upper mill dams at Milltown. These are not fish-ways, but narrow open channels between the wing dams.

Salmon have always been able to go over Salmon falls except the first year, when the dam was built--1881. The ladder was put in the fall of that year. About 25 years ago a short dam for a grist mill was built above the shoot on the American side of salmon falls, but rest of fall was available for salmon. This dam did not last long.

Union dam about 45 years old. For 8 or

r 10 years it was without a pass, but high water requently flowed over dam. Salmon could be seen umping. Alewives he thought could not get over. t the end of 8 or 10 years a pass was built, but e thought it was not a suitable one for the pur- ose. The present ladder was built about 15 or 6 years ago.

Shad were caught at Salmon falls 50 or 60 ears ago, and he thought they were able to pass he falls and run up.

Before Union dam was built, alewives used o pass by all the mills up to and including Baring. ome seasons probably 1,000 bbls. would be taken y dipping. They were taken mainly on the Cana- ian side of what now is the cotton mill pool below he salmon falls. He had at this place caught almon, shad and alewives by the cartload. This as when he was a boy. Some salmon(40 or 50 a ay) used to be caught with a set-net off the Amer- can shore below these falls. People used to come n numbers to Canada side early in the morning and cast lots for their turn to dip. Dipping used to take place part way up the fall in a hole or rest- ing place.

Net fishing for salmon has been carried on in the estuary for the last 70 years. There were a number of weirs above those now in use, but the upper ones now existing do take salmon, and he buys salmon from them.

Smelt never went above the Union dam.

Salmon have always gone up both branches of river into the lakes. He instanced one salmon caught in West Grand Lake by Frank Brimmer, 30 inches long.

He thinks the alewives never entered Porter's Mill stream(just below St. Stephen) until after the Union Mill dam was built, which prevented their ascending the main stream. 39 years ago he said, from his experience, he knew they never entered Porter's Mill stream, and he thinks they began to go up about 30 years ago. They spawn above Moore's Mill(the testimony of others is to the effect that alewives have always entered this side stream, and this is more likely to be corrected, the waters being well suited to their spawning, but the stream itself becomes very small in summer.)

Does not know where the alewives used to spawn on the main St. Croix River.

His father was a fisherman.

Over 60 years ago they used to send salmon, shad and alewives away to market.

Salmon falls were very steep, and salmon had some difficulty in getting up. They used to set nets in the main pitch of the falls. The falls had two shoots. Turns were taken to fish in the favored places. Dip nets were used there. The catches were very large, sometimes as many as 100 bbls. of fish would be taken at the falls in a single day. Nets were also set in the eddy on the American side.

There were 20 salmon when he was a boy to 1 now, but the number of fish has been greater this year than for sometime. There has been a long period of very poor fishing.

Salmon have never gone up Porter's Mill stream.

Used to take smelt abundantly above the lower bridge. They are much less common now.

The main part of the lumbering on the St. Croix began about 65 or 70 years ago. It was at its height about 15 or 20 years ago, before the mills at Baring burnt. It has been on the decline

or 15 years.

The cut of long lumber now for the river mounts to about 70,000,000 feet.

Formerly 4 logs would cut about 1,000 ft., but now 10 logs would be required for the same mount.

The river should be dredged and a good channel be made for steamers and large vessels.

Does not think the refuse from the Cotton Mill has done any harm to fishes. The river is so large, that the effects of the refuse is dissipated.

There is just as much water in the river now as formerly. This does not relate to depth, but volume, dependent upon the rainfall. While the old growth of forests has been cut down, young growth has sprung up in its place, and the precipitation of moisture remains the same.

CAPT RYAN--MASTER OF FRONTIER STEAMBOAT CO.'S STEAMER "ROSE STANDISH", RUNNING DAILY BETWEEN CALAIS AND EASTPORT, EXCEPT IN THE WINTER.

Calais, Aug. 7, 1893.

54 years old, born and always lived at Calais. Has been steamboating 35 years, and for many years has been captain on above line. Within his experience the condition of the river has changed enormously, by filling in, this having taken place lately to a greater extent down the river than up.

In former years all mill refuse was thrown into river, edgings, slabs, bark, sawdust, etc. This continued until about 15 years ago, although there was a law previously enacted which prohibited such practice. The milling interests united with others in stopping this practice, and some one was appointed to look out for the matter. The heavier refuse, such as edgings, and slabs tended to do more damage in those former times than takes place now, as that built a more solid foundation to which all other refuse clung. Ballast was also commonly thrown over in the channel of the river,

by large vessels, and that helped to cause the filling up. This practice has been stopped. There never has been, nor is there at present, any one who has made it his particular business to look after the harbor interests as it should have been, and in this respect matters drifted along in a very unsatisfactory way. (There is a harbor master). (By whom is harbor master appointed and to whom is he responsible?). Capt. Ryan also said that the mooring of vessels in the harbor had not always been properly looked after and they were sometimes allowed to lay xx so as to interfere with the navigation. This does not seem to be the case just at present.

Capt. Ryan called attention to a survey by Gen. Thorn(stationed at Portland) of the St. Croix River about Calais, about 20 years ago. The map made by him will show the depths of water and amount of sawdust at that time.

About four years ago the coast survey made a very careful survey of this same region, sounding the depth of sawdust, etc.

In and about 1857, Capt. Ryan, in a steamer drawing six feet of water, could land at the end of Barnard's wharf at all low tides, except the ex-

ome spring tides, when he might have to land on
e St. Stephen shore directly across. Now there
s only three feet of water at low tide at the end
f Barnard's wharf.

There used to be eight fathoms throughout
he river channel, from the lower steamboat wharf
o the ledge(breakwater) below, (This will be shown
n Thorn's map). Now the depth is very much less,
ot amounting to more than two fathoms in some places.

From the ledge to Devils Head there used
o be six fathoms, now not over three fathoms.

At the lower steamboat wharf the wharf
sed to extend plumb down twelve feet under water
t low tide. Now the steamer drawing $5\frac{1}{2}$ feet
rounds there at low tides of the same elevation.

A heavy spring freshet carries out a
reat deal of the refuse, and improves matters un-
il the next season. The amount of stuff thuscar-
ied out, however, does not equal, on an average at
east, the amount brought down from above, and the
esult is that the deposits are always increasing
n height, and the condition of the river is becom-
ng constantly worse. There has not been a strong
reshet for two or three years, and the river is
onsequently in a very bad condition now.

The "Rose Standish", in coming up the river from the breakwater to the lower wharf, any time between two hours before low tide to low water, stirs up the sawdust, which rises in great quantities and makes the water very thick. Saw more salmon jumping this season in this region than ever before, and thinks it may be due to the thickness of the water.

Barks, drawing 9 ft. could at one time sail up the end of Mark's Wharf, St. Stephen. The channel is on that side, and deep water has always come nearer the wharves on that side than on Calais side. This current forms an eddy on the Calais side, which has caused more filling up on that side than on the St. Stephen. Mark's wharf is abreast of Barnard's wharf. Below the lower steamboat wharf, however, the eddying and filling in has been much greater on the New Brunswick side.

The filling in with the mill refuse has also narrowed the mid channel, as must naturally happen. In one place, about one mile below the lower wharf, there is scarcely any indication of a distinct channel, the refuse matter having obliterated its margins, and filled in the bottom.

There is a very deep bank of refuse in

the center of channel just below Calais bridge, which are formed in the wake of one of the bridge piers. There are logs here(and elsewhere) as well as edgings, sawdust, etc.

The bark does not float as readily or as long as sawdust, but during freshets especially it is brought down in large quantities and distributed everywhere.

Sawdust is most abundant on the surface from Calais to the ledge. Seldom sees it on the surface below Devil's Head, and does not think that any from up here reaches mouth of river.

There is one place in the narrows, at Hill's Point, N. B., where there is a ridge or bluff of sawdust, six feet high, exposed at low tide. Its height is sometimes increased to nine feet.

He sees more sawdust in the river now than he ever did before. Last year C. C. Whitlock used to dump his sawdust over the edge of the wharf by his mill. Could not see that any one attempted to stop him.

Spring freshet cleans out the river a great deal, but they have not had one now for two or three years. In the course of several years,

owever, there is more filled in than carried off. The freshets take off the sawdust most in the shallow parts up stream(apparently) and and leave it in the deeper places below.

There have always been mud flats between the wharves, but these places have been largely filled in with sawdust.

Has seen 18 big ships, foreign and American, anchored at a time below the ledge, loading deals for foreign markets. His acquantance with the practice of loading there ranges from about 1864 to twenty years ago, during which period there were always more or less loading there.

The water at the wharves was too shallow for the larger vessels, while the others were not acquainted with the harbor above, andnot accustomed to running up. Vessels owned locally, however, have always been in the habit of coming up to the wharves. There was a settlement on the New Brunswick side adjoining this anchoring ground which isnow abandoned.

Most all of the vessels whish come here take away lumber, although a few may bring cargoes here. Some coal barges from Nova Scotia leave here light.

Three steamers, "Rose Standish"(385 tons), "Flushing"(120-150(?) tons, runs once a week). "Arctus"(not more than 40 tons, runs to Deer Island.

COTTON MILL, MILLTOWN, N. B.

AUGUST 7, 1893.

WITH MR. DEXTER AND MR. MUNGALL, DYE MASTER OF ALL THE MILLS OF THIS COMBINE.

For dyes and other substances used in this connection see separate list.

Aniline dyes are mixed both with acids and with alkilis. The dyes are as nearly neutral as possible to avoid injuring the cotton. Most of the mixtures in the baths are slightly acid at the start, but when finished with are neutral. The refuse from the aniline dye allowed to go into the river. Muriatic and acetic acids are used for dissolving the aniline dyes. From 4 to 6 lbs. of acid are used for a tank of 2,000 gallons. They calculate to exhaust all aniline baths.

Indigo used in dyeing blue, and is mixed with slacked lime and zinc dust. This bath is not let into the drain, except a small amount of sediment.

Turkey red, The yarn is first placed in a neutral castor oil, called alizarine oil. No expense to let off in waste. The cloth then passes

through solution of acetate of aluminum and phosphate of soda. It is then dyed in the bath of alizarine, an aniline dye.

Cutch brown dye. Mixed in solution with blue vitriol. The stock kettle of this is not emptied, but a slight amount ~~might~~ may escape. The yarn then goes through bath of bichromate of soda or potash, depending upon the shades. The bichromate bath left goes into water.

Logwood, black dye. This is used in large quantities mixed with a little soda. It totally dissolves. The remainder, after use, goes into drain.

Nitrate of iron and black iron liquid are prepared either from sulphate or nitrate of iron used in black dyes. There is no waste into river.

Sumac, mixed or dissolved only in water. Used as a mordant for yarns before dyeing with all the anilines. The yarns are passed through this mixture to furnish a body for the dye. When exhausted this mixture goes into the river. Vegetable.

Chloride of lime for bleaching. Not run into the drain from the bleaching tank, but much water has to be used for rinsing the yarn, and this goes into river. After coming through the above

leaching, passed through a weak solution of muriatic acid, 20 or 30 lbs. of acid to 4,000 gallons of water. The chloride of lime is mixed to the extent of 1 1/2 per cent with water by Twaddles glass.

All the sewage from the mill passes through this same drain. About six inches of water passes through drain. Of this amount 5 3/4 inches are clear water. Clear water running through all the time.

Never had seen dead fish in pool below mill.

There is a grating in the mill floor, at a place where there is a man hole. All solids are stopped here, and are taken out and hauled to a dumping ground. This consists mainly of loose cotton and cotton yarn which escape from the baths. All the waste otherwise is in solution, is thoroughly mixed with the water in the drain before passing into the river. The solids at the grating have to be taken out only at long intervals. There may be three or four wheelbarrow loads at a time, perhaps once a month or less often.

Allow no waste possible. Object is to get the utmost amount of good out of dyes. They are reduced to the utmost in strength.

Tank below grating in sewer, where solids are taken out, might be made deeper to allow more settling to take place.

There is some refuse running into the drain all the time. They are letting it out constantly from the baths.

Let out no sediment except from the indigo and sumac which might settle better in a deeper tank at grating.

White product at the lower end of factory consists of cotton dust, starch from potato starch or mostly flour starch. A very small amount of china clay is used in stiffening one special line of ticking only. The waste goes out this same way, but is very slight.

Salmon are very abundant in waters below the factory. See them in the neighboring pool and also passing through the fishway. We see most fish passing up in July, when the water is low. See no other fish but salmon.

The white stuff at end of mill might be blown out on the land, and formerly was.

Havegreat inconvnience from bark and edgings against grating, and also from sawdust which accumulated in the pool by grating, about eleven

t deep in this pool. Sawdust comes to surface
upper part.

Mr. Mungall.

What different kind of dyes used?(See list).

What other substances are used with them?

What is the nature of the mixture when made? Ans. Liquid state.

What nature of mixture after it has been used, and is to be turned out? Ans. Cannot say precisely.

When is refuse turned out. Ans. Something running all the time.

How often and how much each time? Ans. Will supply.

What is its consistency? Ans. Solids taken up, and dumped on dump to form new land. Consists largely of yarns, etc., which they save.

Does it run alone through the waste pipe, or is water going with it? What proportion of water?

What is solubility of the mixture? Ans. Practically all are soluble before going into river.

Give size, course and length of drain?

How far below drain is discolored liquid seen?

What mixtures give rise to the refuse at lower end of mill? Ans. Dust from shearing machines, cotton, the white stuff blown out through wooden sluice. Might be blown anywhere; used to be blown on the land between the two buildings.

Name each?

How are they combined?

What is the nature and consistency of the refuse?

What quantity is emptied out at a time? Ans. Perhaps not a pound weight a month of this stuff.

When and at what times is it emptied?

What is the process of emptying?

Are any of the products, or the mixtures made injurious? Ans. Only starch, potato starch, mostly flour starch. Thinks they do not use china clay. Used to be used in the cloth. May use in yarn. Purpose to weight cloth now being abandoned.

Could they not be saved in some way?

Has he an analysis of the water at intervals

...ow the drain during running out of mixture?

Does not the refuse contain some product ...t could be saved and utilized. Ans. Knows of ...ing.

Is any part of the refuse of sufficient ...sistency to be removed otherwise than through ...in?

What has been done toward constructing ...s and drain to carry refuse away from river?

Could not refuse be pumped up, to avoid ...structing drain through rocks?

What can he say about the passage of fish ... the fishway and up the log shoot?

Does he know of anything but salmon going ...

What does he know about salmon playing ...und the end of the refuse drain? Ans. See fish ...cidant going up fishway, shoot and in eddy just ...w mill, when sun has particular slant. Seen ...t when water is low in summer. Large numbers ... taken , but mostly illegally.

CHARLES R. WHIDDEN, PROPRIETOR OF CALAIS TIMES--44 YEARS OLD--CALAIS, AUGUST 7, 1893.

Always much interested in the fisheries in this region, and has taken an active part in their improvement. Is used to fishing throughout the river and connecting lakes.

The salmon originally ran up the entire length of both branches of the St. Croix River, and to some extent entered the western lakes beyond. In colonial times vessels were fitted out in Plymouth and Boston to obtain salmon. So great were the quantities known to be in the St. Croix that they passed by all theother large rivers of the intervening coast, such as Penobscot and Kennebec, and came here to load with this fish. At that time it was considered to be themost important salmon river on the coast, and in Whidden's opinion it deserved that reputation. Remembers, when a little boy, seeing the ruins of extensive smoke-houses on the present site of the St. Croix and Penobscot Railroad. This used to be an extensive industry.

Calais used to let the privilege of dipping salmon at Salmon Falls, and as late as 1830 sold

the privilege at one small rock--called Salmon Rock--for as high as $600 a year. Used an ordinary large dip net(The City Records of Calais will furnish all facts of this character.)

In former times the Indians used to spear salmon, and he remembers going when a boy with an Indian who speared nine salmon on one birch bark torch. The river was fairly swarming with salmon at those times.

Alewives and shad were also then abundant. Said he saw alewives going up the log shoot at the Cotton Mills in 1886(?) Has taken them at Sprague's falls with a white miller fly as late as June, 1888. Has never seen them above Spragues Falls. Thinks they spawn along river below there and in the Mehannes on gravel beds. Thinks alewives spawn in June.

Smelt spawn in rapid water or on rips, on gravel beds, mainly below Union Mills and not above the Mehannes; also just above mouth of Mehannes near Baring.

On the western branch knows of salmon going as far up as Grand Lake Stream, where a few have been taken with ripe spawn, which was mixed

with milt of landlocked salmon, the eggs hatching and being planted there. Saw them in Grand Lake stream when fishing for landlocked salmon, in the spring, as a kelt, spent fish or black fish, etc. In the east branch go up as far as Vanceboro, but does not know of their getting into those lakes.

Shad will not stand sawdust. They used to go over Salmon falls. Indians say they have seen them above and this is the source of his information. This used to be a great shad river and thinks the sawdust chiefly responsible for their extinction. Young shad have never been planted in this river, and he would not advise their introduction, while the sawdust nuisance continued. Thinks it would be entirely useless to do so.

At a time when the salmon could not run readily above Union Mills, they used to, he thinks, from observation, that they spawned in the meeting place of fresh and salt water below the dam. Could not say if the eggs came to anything.

Thefirst dam was constructed at Milltown, but thinks there must always have been a passage way there for fish. He thinks that at certain times of tide the fish could always go over Union

dam, even before fishway was constructed. Has seen them go over dam. They first play between salt and fresh water as though to get used to latter. Remain sometime below Union dam before passing over.

Cited instances where he hooked a salmon about the Union Mills. Line broke off, leaving hook in mouth. A week later this salmon was taken in Pettegroves weir at Red Beach. This was during the up run, and the salmon had apparently run back on account of accident to it.(This is said to happen, or similar cases, when hurt. Wakeham.) The Union dam was the only one ~~xxxx~~ in this part of the river which could have retarded salmon at all, and there only in part.

Believes that fishway at Cotton Mill is of no good as poachers dam up lower end, shut off water from above, and take out salmon. Is positive that this has been and still is carried on to a great extent. Thinks that more fish have been taken illegally at this point than anywhere else on river. He recommended the placing of a fishway in this dam, but desired to have it placed elsewhere, nearer the American side of the river. The shoot

he considers to answer well for the salmon, and he would advise shutting up fishway. Thinks that Cotton Mill authorities have not done what they should in aiding the work on the river, have not exercised such vigilance at the fishway as they should. He thinks the fishway all right in its construction.

(Dr. Wakeham has conferred with French Warden and Frank Todd. Thinks there is very little poaching there now. No systematic poaching, and thinks that fishway should stand. They are more anxious about fish being poached in the place near entrance to drain, where we saw them. Think that place might well be filled up with rocks, to prevent fish getting in there at all.)

Thinks that fishway in Union dam is all right, but greater care shouldbe taken to keep it clear. More care should also be taken to guard the pool below this dam. Alewives and smelts go over this ladder without trouble.

The fishway at Baring is of a suitable kind, but is in bad condition and should be repaired. Sometimes it has broken off at the bottom and the fish have had to jump to get into it.(A new

ladder is needed). Salmon can also go up the log-
ay over the dam.

At Princeton dam they sometimes shut off all
he water, and the salmon cannot get through. The
ater is undoubtedly shut off too much of the time.
his is during a draught. Ladder needs extensive
epairs.

None of the fishways are kept clear as they
hould be. They are sometimes allowed to fill up
ith drift.

FISHES IN THIS SYSTEM.

Landlocked salmon weigh 2-6 lbs. Have greatly lessened in numbers. Blames the tannery on Grand Lake Stream for the destruction of these fish, as their principal spawning ground was in this stream. The tannery refuse has become scattered over all of this spawning ground. The fish have found new spawning grounds since, especially in two places, one of which is Ox Creek. He thinks that artificial culture is all that has saved this species from total destruction. Very few of this species are now to be found in the eastern lakes of this system, very much less abundant there than in western lakes.

Speckled trout abundant.

Togue follow up and destroy eggs of other species.

Blue-backed trout. Introduced by Dobsis Club.

Pickerel. Live in Big Lake, but not in Grand Lake, which has too clear water for them. Occur principally in still waters where there is vegatation.

Chubs, little streams, and along shallow

parts of river.

Minnows, both lakes and rivers, furnish abundant food for other fish.

White fish occur in Junior Thoroughfare between Junior and Dobsis Lakes. A good fish; not inclined to take fly, and seldom taken in that way, but mostly by nets.

Pickerel were introduced into the western lakes about 30 years ago, by two men who brought them over in a bark receptacle. In Big Lake and the narrows there was a good place for trout, but the pickerel have driven them out.

White perch, native of these waters. Most plentiful in Dobsis Lake, where they prevented the introduction of blue back trout, which he and some others attempted. The young of landlocked salmon, togue and trout were driven up into the shallow waters along the edge of the lake in places by white perch, of which they were very much afraid, but seemed to know how to escape them in this way. Used to see these young in large numbers along the shore, especially in one cove.

Horned pout occur in sluggish and stagnant places in the streams.

committed.

On account of lack of uniformity in the laws, there can seldom be concert of action in dealing with criminals by the justices of the two sides, i.e., an offender will claim, if caught, that his offense was committed on the side where the law will not hold him, or will deal with him most lightly.

In speaking of Union dam before fishway was built, he said that salmon ran mostly at night, when water was highest, which aided them in getting over the dam.

Poaching has been carried on , more or less, at all fishways and passes, and in the pools below them. The fishways have been a convenient place for practicing this occupation. They should all be watched more closely than they have been.

CALAIS, ME., AUGUST 8, 1893.

While waiting on Barnard's Wharf, about 3 to 3-30 P. M., the water as far as I could see was covered with sawdust, mixed with a very large proportion of planer shavings, the latter evidently from Whitlock's mill. As the tide comes in this drift is carried into the slips, where it is left by the ebb tide. It may be carried out by the next tide.

Gullies are formed on each side of the wharves, where the vessels become imbedded at low tide. These gullies remain for a long time after the vessels have left. See notes of August 27, 1893, on footprints made in the same material lower down stream.

VANCEBORO, AUGUST 9, 1893.

The only dams are one at Tannery just
railroad crossing, and one river driving(or
poration) dam, between 1/4 and 1/2 mile up riv-
from railroad bridge. The tannery dam extends
right across river. Has a log roll way near
ter and sluice way leading to wheels close upon
Maine shore. In fact it is built upon the
most way. The fishway leads out of sluice
at right angles, into what might be regarded
sufficient depth of water. This has been a
dry season, but there is plenty of water now
foot of ladder. The Superintendent, Mr. Hunter,
that he knows of no map showing the dam and
nections. The fishway we will measure later.

In fleshing hides the fleshy parts and
are stripped off . These are hauled away,
it has been the custom the last few years to
them upon land as a fertilizer. They were put
the land in the winter, but objection has been
to their use by the residents of the town, and
has been stopped. The water in which the rins-
is done goes into river. Some hair, but only

very little could escape. Assured us that nothing harmful from this source was allowed to reach the river.

It should have been said above that some of the hair was hauled away and burned, only the fleshings used on land.

The liquor, or bark mixture, in which the hides are tanned, is never allowed to run into river. Whatever remains in vats after tanning is used over again in making new liquor. Assured us that they never allowed the liquor to go to waste. (Mr. Conrad says he is confident that the old liquor sometimes reaches a state when it cannot be utilized, and that it is then passed into the river. This could readily be done at a time when it would not be noticed. He had no defienite information on the subject, however. James Ross, on the other hand, states that he has seen the liquor passing into the river a few times, and that it discolored the water for some distance.

The green hides are soaked in water in vats, about 9 by 7 ft. square and 5 ft. deep. Ten of these vats may be in use at a time. In the winter the soaking of each lot lasts 8 to 10 days; in

the summer, 3 to 4 days. When soaking to this ex-
tent, they may average emptying about 1 vat a day
into river, but much of the time they are not doing
much work. They had no green hides while we were
there.

None of the bark allowed to go into river.
It is all burnt after the liquor is made from it.
Stopped putting bark into river about 15 years ago.

The bark is first ground, then goes into
large circular tanks in which the hot waste liquor
is first run by means of a sprinkler, which revolves
about the top of the tank. This liquor being ex-
hausted, hot water is added to the required amount.
This process is called leaching, and the tanks are
leachers. The liquor is thence conveyed to cool-
ers, and finally into the tan vats, of which there
are 400(346 layer ways).

The hides after tanning and draining are
washed and brushed in falling water, by revolving
brushes. Considerable water is used in this pro-
cess, and it passes into the river close by the
building where this is done. Some refuse must go
out in this way, but we examined the stream here
and tasted the water from it. There were some

small floating particles in it, but no particular, or any perceptible, discoloration, and no appreciable taste. The hides are now dried and then burnished or polished.

The above information, in addition to what we saw ourselves, was given us by Mr. Hunter, who is Superintendent of the tanneries at Vanceboro, Princeton, Grand Lake Stream, Forest City, Brookton, and township 39. The diagram, page 2, shows approximately the condition of matters at this tannery. The figures are mere guess work, but the Coast Survey should show them accurately.

At the log roll way the water below was only about 3 ft. below the outer edge of the flooring. Mr. Hunter said in high water the water was often nearly level at this place. With much water flowing over any fish like salmon would have no trouble in getting over.

The part of dam under the bark grinding building we did not see, and is of no consequence. At the inner end begins the sluiceway, which runs along the edge of the river for some distance as an open square conduit, and then changes to a round wooden conduit, perhaps something over 2 ft. in di-

water, leading to the lower building of all, where the freshly tanned hides were washed and brushed. The dimensions of the sluice were not taken, but it must have been 3 to 4 ft. wide, perhaps fully the latter, and quite high. There is no gate at the upper end of the sluice, and there is, therefore, a continuous channel through. The side outlets leading to the wheels may be closed and the lower outlet may be closed at the lower wheel, which would simply cause more water to escape by the fishway and other openings. There was a deep flow of water through it as we saw it.

The fishway is the oldfashioned ladder, with oblique partitions, is of good size, and the slant seems to be entirely within bounds. It had an ample supply of water when we saw it, and sufficiently dep water at the lower end. It occurred to us that fish ascending, and getting into the sluice might pass down the sluice and get into the wheels. Although they would have a free passage that way, it does not seem, however, as though they would take a direction with the current when they had started in to ascend. There is a further question as to whether the direction of the ladder and the posi-

tion of the lower end are the best, whether it would not be better to have it run straight up through the dam. The water at the upper end of the sluice, however, is sufficiently deep and is kept clear of refuse by the boom of logs indicated on page 2. It seems as though it would be kept cleaner located as it is, as the tannery, of course, will see to it that no refuse enters their sluice.

A series of experiments only could determine whether the position of the fishway is advantageous. Observations should be made to see if fishes actually ascend it, and what species do. The ladder is somewhat out of repair and requires attention.

TALK WITH MR. HUNTER ABOUT FISHES.

Never saw anything but chubs and suckers ascend this ladder. Landlocked salmon used to be seen going up the former fishway, which had practically the same position as this one, but it was shallower, longer and with less pitch, the water passing through in a shallower stream. They may pass up the present one.

He has taken 10 landlocked salmon in a day's fishing close by the drive dam a short distance above. A number are taken further down stream than atnnery dam, but they are smaller than those above. May is the best month for this species, that is, they are the most abundant, but the water is very much higher, and full of dirt or logs, so that the fish cannot be seen, and fishing is more difficult.

Only a very small amount of sawdust is made at Forest City, and none is seen near Vanceboro.

Heard of 2 sea salmon caught last year at Loon Bay, about 20 miles below Vanceboro.

Pickerel are very abundant in the lake, and occur to some extent about the tannery.

Black bass were planted some 8 or 10

ears ago in Lapute Lake by State Commission, where
hey are now abundant. He is confident that a few
ave been caught about tannery.

Speckled trout occur all along the main
iver.

There are no endof horned pouts, and
lenty of eels in their season.

White fish occur in the lakes.

VANCEBORO.

The driving dam is located directly below the site of the abandoned railroad bridge, of the private railroad which used to connect McAdam and Vanceboro. The site of this bridge is indicated on the Coast Survey field map(Forney). The driving dam ismade part of a wagon bridge, the stream being rather narrow at this place. The total width between the side piers of the bridge is about 55 feet. There is a central pier about 10 feet wide. Four gates which haul up are each about 10 feet wide. The frames between the gates, etc. are about 18 inches each. There is deep water through this passageway, somewhat deeper than just above and below, and there was a strong current with plenty of water. With gates open the bridge is no more of an obstruction than any ordinary bridge. The gates are shut down a good part of 2 months, beginning last of March. The remainder of the year they are kept open. They are bound to let water through to the tannery dam below, and James Ross, who is in charge of the bridge, assured us that one gate was always kept open in the spring, on account special-

of the tannery. According to his statement
never is a time when there is not a gate open.

There is a small steam saw mill for short lumber just above the abandoned railroad bridge--Maine side. I saw only laths being made there. There is one circular saw for cutting logs into 4 foot lengths, and 2 lath machines. The edgings and other refuse pieces of wood are burned in the furnace. The sawdust is piled up around the mill. It is sold locally for different purposes, stabling, banking around houses in winter. The mill is located a little back from the river. We were assured that no sawdust was allowed to go into river, and we saw no traces of it.

JAMES ROSS, IN CHARGE OF LOGGING FOR THE CALAIS ST. STEPHEN MILLS.

The lower lakes referred to are those below the river emptying into Mud Lake.

The shutting of the log gates at Vanceboro will in time of high water raise the water in the lower lakes, (up to the narrows only) about 12 feet above what it was at the time of our visit. It then had a head of about 4 feet at the driving dam. The highest water is usually from middle of May to 1st of June, but such high water as this has not taken place now for three years. These freshets cause the water to extend back over the present shores, and in under the trees for some distance wherever the shores are low. The average high water at the dam is about 13 feet.

The high water resulting from the driving dam at Vanceboro is felt as far up as Forest City landing, which is at the foot of the stream draining Mud Lake. It could not be felt at Forest City, as will be observed from the notes later on. It is felt, however, 4 or 5 miles up Pirates Brook, at the head of the lower lakes.

Never heard of the sea salmon being taken in these lakes. Never saw any in the St. Croix near Vanceboro, but had heard persons speak of their occurrence there.

The following fishes occur in the lower lakes: pickerel, white perch, white fish, suckers, horned pout, chubs, minnows, trout, landlocked salmon, eels and black bass.

The commoner fishes taken the year around are pickerel and white perch.

About the same species occur in the river below(St. Croix) except white fish and black bass.

CAPT. FORNEY, IN CHARGE OF U. S. COAST & GEODETIC SURVEY PARTY, WITH CAMP NOW AT COLD WATER TAVERN ON THE LOWEST LAKE.

Informed us that at Forest City the tannery dam had one gate, but no fishway. The driving dam at lower end of Mud Lake had gates, but no fishway.

At the tannery dam, which is also a driving dam, the gates are kept closed until they get the logs out of Monument Stream, and down through North and Grand Lake to Forest City. This is generally from about March 1 to August 1.

The dam at lower end of Mud Lake is then closed until the logs are all run into Mud Lake, when dam at lower end of Mud Lake is opened and that at Forest City closed. The latter is kept closed the better part of the year--always except when sluicing logs. The lower dam is generally kept open except as stated above.

Monument Stream has 3 driving dams between its mouth and the initial monument, which is about 13 miles up the river by its course. These are provided with gates, but have no fishways.

they were open when he was there, during the logging season.

From the dam at lower end of Mud Lake to the upper part of the lakes fish are now very scarce.

He thought there was more netting done in Grand Lake than in the lower lakes(probably mistaken, at least for present time).

(There are 2 men at Vanceboro who net fish in the lower lake, Gorden and Knight. They live on the American side, but some of their men on the Canadian. Not being allowed to net on the American side, they resort to that method on the Canadian, probably not legally. Their fish are marketed through Vanceboro. There is no other commercial fishery in this lake, and nothing of that sort above Forest City, so far as we could learn.)

CONFERENCE AT VANCEBORO, AUG. 9, 1893, WITH SIMEON CONRAD(CANADIAN FISHERY OVERSEER), HORACE KELLOGG(STOREKEEPER AND ONE OF THE PRINCIPAL RESIDENTS), AND JAMES ROSS, IN CHARGE OF LOGGING DOWN THE RIVER BY THE CALAIS-ST. STEPHEN CORPORATION IN STORE OF HORACE KELLOGG.

Netting is carried in on the Canadian side of the lower lake. No license is exacted, but a close time prevails each week, over Sunday.

There was good hook and line fishing when he came here, especially for pickerel and white and yellow perch. Landlocked salmon have been scarce since he lived here. Never heard that they were abundant at any time. Considerable number of suckers are taken from the lake and shipped to market. With the pickerel white perch mostly are taken. Perch are about as abundant as ever, pickerel not. The majority of the white fish run about 7 inches long. They are taken for the market to some extent. They are shipped mostly to towns in Maine. All the other kinds of fish are generally shipped together mainly to Boston. Togue are abundant in some places in the lake, not many are taken, however. Trout are pretty well thinned out. Eels occur all through the lakes; they are not caught as a business. They

are never caught fish in this region with hook and line for the market in his day. All fishing for the market is done with nets(Conrad).

There are two men only, with help, who set between Vanceboro and Forest City--Gorden and Knight. They use between 1,000 and 1,500 feet of gill nets each, having $2\frac{3}{4}$ inch mesh. There is scarcely any business above Forest City. Not allowed to net openly on the Maine side, and do most of their fishing on the Canadian side. Their help resides partly on one and partly on the other side. Never heard of salmon, smelt, alewives or shad in these lakes. The fishermen think that the tannery has done much harm, and great changes have taken place in the river since it was built(Conrad).

When he was a boy could go out most any day and catch all the trout and landlocked salmon he wanted. Now there are scarcely any. 20 to 25 years ago landlocked salmon used to be caught in lower part of lower lake, and upper part of St. Croix river below(Ross).

Once in a while they do run liquor from the tannery into the river. Has sometimes seen it going in in a red stream. They used to put every-

thing in, but this was stopped 10 years or more ago. The fleshings have been put on the land about the town for some time, but it should be burnt, as it is a bad nuisance, and smells badly, besides menacing health. Objection has been made, and they have virtually stopped using it near the town. Burn all the bark; has not seen them put any in stream of late year. Has examined frequently, but never saw any fish going up the tannery fishway. It might do better if it passed through the dam. The old fishway which preceded this one was built somewhat differently. He thought it turned down river at lower end, but went into the flume like this one. Thinks the tannery is doing the best it can with respect to allowing refuse to enter river(Ross). (The question as to whether this fishway(at Vanceboro tannery) has the right position and direction can only be decided by observation. Landlocked salmon and trout would probably be the principal fish to use it. These fish might be observed in the way, and their habits should be studied to know whether they pass up middle or sides of stream, etc.)

Some one said they still catch some trout

and young landlocked salmon in the stream above tannery. About the bridge and driving dam is one of the places where they fish.

Close the gates in tannery and driving dam at Forest City, and in driving dam at foot of Mud Lake as soon as the logs are all through for the season(Ross).

There are no dams in the lakes above Forest City. Only one brook above Forest City is dammed. Nearly every stream entering the lakes below Forest City, however, have driving dams. All the commoner fish go up these streams, except those which belong distinctively to the lakes.(Ross.)

Fish will go over Grand Falls in the St. Croix River. Sprague's Falls are worse than Grand Falls. The fish enumerated above for the upper part of the river are more or less common to all the St. Croix down to Baring, the exceptions to those enumerated for the lakes being white perch, white fish and togue. Never saw sea salmon in the St. Croix between Vanceboro and Baring, but had heard of them. Saw one salmon go through pass in upper dam at Milltown about September of last year. This is the farthest up he has seen them(Ross.) The only source of sawdust above Vanceboro which he

knows of is a small mill at Forest City(Canadian side) where they work only a few weeks every year, to make lumber for the local trade. They cut long and short lumber and shingles. They cannot make much sawdust, but suppose some may get into the stream from this source. It is a water mill.(Ross)

There is an abundance of large togue in Grand Lake which are taken through the ice. Knows nothing about landlocked salmon there. One was taken last year near the dam in Forest City.(Ross).

Conrad says that the two men fishing in the lower lake ship about 6 bbls. of fish a week. There are about 100 lbs. of fish to a bbl., the remainer being ice. They get about 4 cents a pound for it. The help is hired on wages.

FOREST CITY, ME., AUG. 10, 1893.

The river is very narrow here, with a small settlement on each side connected by a bridge. The water power is produced just below this bridge, and is utilized for 3 purposes--the tannery on American side, a small saw mill on Canadian side(W. O. Foster & Son), and as a log driving dam.

The dam is short, being only about 150 ft. long, including gratings on sides. It extends entirely across the river. There is only a short free part in the middle of the river. The mill and one tannery building are built over the sides of the river, so as to apparently contract it. The gratings leading to the two buildings are directly under the upper fronts of the buildings. The center of the dam is occupied by a very long log shoot, about 11 or 12 feet wide, with a single gate at the upper end. This gate was closed when we saw it, and there was a packing of earth along the lower part to prevent leakage, showing that it had apparently been closed for some time. The log way of boards was dry. This tight closing of dam was owing to the low water, and the attempt to cause all

water to pass through the gratings in the flumes.

Thefall ofwater to the wheels on both sides of river at the present time isabout 6 1/2 feet, but during high water in the spring it increases to 9 or 10 feet.

The distance from the surface of water above dam to surface below was estimated at about 10 feet. There was no water running over dam or through log shoot. Water was running through mill flume, although the mill has not been in operation for some time. A considerable body of water relatively would be required to render the log shoot serviceable for fishes. On account of landlocked salmon at least this dam should have a fishway.

Below this regular dam, just the distance of a small pool from it the tannery has built a small temporary wooden dam to head in some water for one of their lower buildings. As it stands it is a complete prevention to the passage of any fish. It could be removed in a few hours. Consists simply of boards driven in slanting, with perhaps some banking on the lower side.

Conference with three men in store of Tannery Co. Two were connected with the tannery, the other somewhere outside.

There was formerly a fishway at the tannery dam at Forest City. The state made or approved the plans, but the way was built by owners of dams. This is common practice. This fishway was given up about 15 years ago. It was about 12 feet wide. The partitions were slanting.

Did not consider a fishway necessary here, as no fish, they were confident, could pass over the falls below foot of Mud Lake.

The temporary dam below regular dam referred to, is put in every year, after the drives of logs are through. It leads to a lower building of the tannery. It could be torn up in 20 minutes (nevertheless it is there every year, and the two dams completely obstruct the passage of fish).

The saw mill does not run more than two months each year. Supplies local demand only. Cuts on an average probably 50,000 feet of long lumber, and a few shingles and laths a year. Saw a large pile of sawdust and edgings on the shore below the mill, but did not have time to examine and see whether there were any in stream.

Dam is controlled by the Tannery Co.--W. O. Foster & Son--the millers, and the log driving corporation.

There is much togue fishing through the ice in Grand Lake every winter for sport, not for market. Has seen as many as 50 men fishing at a time, each having several lines.

Landlocked salmon are caught in the lake along the shore and in the stream above the tannery. One of the men had caught them from the bridge. Called shiners here and elsewhere in these lakes. This species is frequently seen.

No pickerel occur in Grand Lake, but they live in Monument Stream.

The tan bark from the tannery is used as fuel in the furnace. Do not have as much as they would like for that purpose. None allowed to enter the water.

Soakings of the hides go into the stream. They are soaked only in water to soften up. In curing them for shipment(the raw hides) they follow different methods, lime, salt and perhaps other things being used. They do not have a clear idea here of what may result from the soakings, but the refuse from that source of all sorts go into the stream.

None of the fleshings go into the stream.

it is all used now as a dressing for the land.

The old liquor is used over and over again. It never becomes bad, though week after it is exhausted. None is ever allowed to escape. They protested that no liquor was ever allowed to go to waste.

A sediment accumulates in the vats, which is shoveled out, dried, and used for different purposes, such as banking houses in winter. Never goes into stream.

This tannery contains about 300 vats and 8 leaches. When business is brisk they may use some of the leaches twice the same day, so as to make more than eight leachings a day.

The capacity of the tannery is three tons of leather per day. At this tannery they use only Buffalo hides received from the East Indies. They are shipped here from Boston by railroad.

Pickerel are as abundant in Mud Lake as in Spednie Lake below.

FOREST CITY, MAINE.

AUG. 10, 1893.

In the afternoon we took a canoe and went down through Mud Lake from Forest City, to its lower end. Our canoe man was Samuel Patterson, an artisan in town, not connected with the tannery, who has done much fishing about here, and displayed considerable intelligence. In returning here another year, it would be well to get more information from him, and he might be a good one to assist in any work. He was an old man and had lived at Forest City about 30 years.

He has been well acquainted with the land-locked salmon, having done much fishing for them ever since he lived here. He states that they have decreased in numbers very greatly, and there is no comparison now in their numbers to what there was. He lays the blame for this to the tannery, and the dams. The dams have prevented the fish running to their spawning grounds, and tannery refuse has filled in many places, and put in much bad stuff. They have mostly stopped this practice now, but it is still carried on to some extent. He

showed us where the old tan bark had been allowed to form extensive and deep banks at the head of Mud Lake, and the foot of the stream from Forest City, about the small island which occurs there. These banks arevery deep in places, and have closed the channel on the Canadian side to all navigation and log rolling. The bark is there, and can plainly be seen from the surface. Our canoe grounded in it as we triedto make a landing, but it is soft on top and the paddles could be thrust down some distance into it. Some was taken up in our hands, and seemed to have changed little or none since it was deposited. We could not get an adequate idea of the extent of those banks, as our time was limited, but they covered a considerable area which may possibly be indicated on the C.S. plans.

Mr. Patterson says that many ashes have also been heaped up by the tannery, where they get into the stream and lake more or less and that there has been a tendency on the part of the tannery to fill up all the lower part of stream and head of Mud Lake. He says that whatever the tannery people may say some refuse is still allowed to get into stream and that fresh damage is still being done

it. He cannot say that new bark is still being in.

Moreover, the closed dams are keeping the land locked salmon from their natural spawning grounds. This species was formerly abundant in all of the lakes, including Mud Lake. Those from Grand Lake are kept from the stream below by the tannery dam. Those in Mud Lake cannot enter the stream below it on account of dam, nor the stream above it on account of tannery refuse. If these causes are overcome he sees no reasons why the species should not increase.

12 to 15 years ago Patterson used to catch many landlocked salmon in the rapids or falls below the dam at the endof Mud Lake, and the fish used then to attain a large size, many running up to 6 or 7 lbs. and an occasional one up to 10 lbs. 20 years ago they were even more numerous. Now the larger ones reach only 3 and 4 lbs. Last spring he caught quite a number in this stream, but there is nothing now compared to what there was formerly.

Mud Lake is so called because much of its bottom consists of mud.

When Mr. Patterson came to Forest City the dam at foot of Mud Lake was in existence, and it is practically the same structure now standing.

Immediately at the foot of the lake, where it constricts to form the rapids, or falls, as it is called. The dam is at the head of these rapids, and the water begins to fall immediately from it.

Mud Lake is so narrow that it is only a lake in contrast with thestreams which enter and leave it at the two ends. Its banks consist everywhere of large boulders, and there are very many scattered everywhere through the lake.

The falls in the streamsbelow the dam are only a series of rapids, not very long, the water tumbling over and among huge rocks and boulders. The highest fall is only a short distance below the dam. It is easy of access, and Dr. Wakeham thinks most any fish would have no trouble in working up, certainly not any of the salmonidae. This largest fall is a broken tumble, irregular in outline, and only a few feet in entire height.

The head of the stream has not been artificially constructed, except that the logs and boards

of the dam at the sides would cut off some of the flow of water, more in proportion at times of freshets than when we were there. It is naturally narrow here, and many boulders lie in front of the dam. The channel does not widen much below the dam. There are great rocks at the side of the dam, and the entire channel, as far as we could see, was bordered and filled in by large boulders. Outside of the boulders, close to the stream, the land is low, but the surrounding region is hilly.

The gates were both shut when we were there, but they and the dam leak badly, and at this season they do not serve to hold back the water, although they would prevent the running of any fish. So far as concerns the holding back of the water, the gates might as well have been open, as the water was not banked up against them, having a perceptible descent in front of them. In the spring, according to Mr. Patterson, the lake is about 4 feet higher than at present. This is an ideal place for landlocked salmon and trout.

GEORGE WALLS, MAIL CARRIER BETWEEN FOREST AND FOREST CITY.

An elderly man, well acquainted in the region, and has a large farm at Forest City. He took us over and back. Gave us the following information:-

The fruit box factory at Forest, near the station, belongs to C. H. Eaton. Logs are peeled the same as at James Murchie's mill at Princeton. It is a steam mill, using birch, beech and maple. During a part of the year some sawing is also done here. Tomah Stream, coming out of Tomah Lake, passes here, and flows into the St. Croix River below Princeton. There is a small dam in the stream to gather sufficient water for the engine. This stream is, in reality, only a little brook, more or less filled in with growing brush, and has not enough water to drive a mill. We saw the stream and also the mill, but did not have time to examine either. Such sawdust as is produced at this mill is hauled out over the land, and has been used for filling in to a very large extent. Some edg-

ings have also been used for the same purpose. The refuse wood generally, however, is burned.

"Lambert Lake", on the lake of the same name. There is a small mill here which formerly sawed box stuff, but lately and up to this year has sawed long lumber, staves, shingles and laths. It is a steam mill at the foot of the lake below the railroad. The sawdust is hauled out to make land along the shore, ~~and~~around the station. All the refuse of sufficient size has been sold for fire wood. The remainder burnt in furnace to make steam. Nothing goes into the lake.

JOHN H. ROSE, CASHIER AND BOOK KEEPER FOR THE TANNERY, GRAND LAKE STREAM.

AUG. 11, 1893.

Small landlocked salmon, weighing 1 to 1 1/2 lbs. have been abundant during the past 2 years. Thinks this species has been on the increase.

Has lived at Grand Lake Stream 10 years, and does much fishing every year. He finds lots of landlocked salmon, and says the stream is full of them.

The sluicing of logs through the dam continues about 30 days, beginning somewhere between May 15 and June 1. Thinks gates in dam are open sufficient length of time for the landlocked salmon, but one practice in closing the gates had been very harmful(The same thing was also described to us by W. B. Hoar, who has lived here 11 years, does much fishing, and gave us the impression of being very intelligent and honest). This practice was as follows: Logs are sluiced when the wind is favorable, blowing westerly or northerly. The gates are then opened and the logs pass through. In case of a change in the wind from a direction which tends to hold the logs back, the gates were all closed sud-

denly, and the entire body of water was shut off from the stream. As the stream is rapid below the dam, the water ran out quickly from the stream, so quickly as to leave many fish stranded in pools and elsewhere in the bed of the stream. Many of these became dry and died, and large numbers of dead ones would be seen. Mr. Rose called attention to this fact, and since then the gates have been closed one at a time, so as to stop the flow moregradually and give the fish a chance to escape. This has had a beneficial effect, and he is not aware of much trouble from this cause at present.

There is plenty of water on the aprons below the dam to allow the fish to run freely.

After the close of the sluicing sason it was customary to open the gates and keep them open till fall, when the net of the hatchery was stretched across. They were then closed to raise the water and simply for the benefit of the hatchery. They were probably not opened again until the following spring. Beginning last fall, however, the gates were left open until fall. Their being closed at present, during our visit, was probably an oversight.

Landlocked salmon come down into the

stream in September and October. Some of them remain in the stream all winter. Knows of an important spawning ground about 2 miles down the stream. It is a large eddy, having a sandy bottom. Suppose, however, that they spawn all along the stream, and even above the dam when they were not given the opportunity of passing by it.

Adult landlocked salmon are most abundant in the stream in the fall and early spring, until about July 15, when they go back into the deep water of the lake. They may be said to average about 2 1/2 lbs. each, and to range from 1 1/2 to 6 lbs. The larger sizes, however, are scarce. They come down into the stream to spawn. Lice become abundant on the fish while in the stream, but they have no lice upon them when they first come into the stream from deep water in the fall. They will not take the fly in the spring until June, but will take bait most any time. They will take the fly when they come down in the fall.

The saw mill is run by water. It belongs to the tannery, and saws only for the tannery. Is shut down most of the time. Will saw on an average about 50,000 ft. of lumber in a year. Has only

one rotary saw and one planer. Very little sawdust goes into the stream, not more than 5 lbs. went in last season. It is hauled away to use in ice houses, for banking around houses in the winter, etc. The demand for it is greater than they can supply. The edgings are used for fuel, etc. We saw no signs of sawdust in the stream. Thinks there is nothing harmful in the green hides when they are soaked. They use here hides from Madagascar, which come dried. The fleshings and hair are hauled away for fertilizing, or are thrown away. None go into the stream.

The liquor is entirely exhausted, being used over in the leaches, never thrown away. Bark is burned. This is a larger tannery than those at Vanceboro, Forest City, and Princeton, but is worked only to about the same capacity as the two former. Use both steam and water.

The rise of water to top of apron at dam is about 4 1/2 ft. on an average. Extreme rise would be about 5 ft. 10 in.

Thinks fishway might be serviceable, but would not be needed much except at high water, when the gates are shut. Last spring the gates were

not shut until about April 1.

The following fishes occur in the lakes above Grand Lake Stream:

Togue are very abundant. They prey upon whitefish and brook trout.

Brook trout arenot plenty in the lakes, but are in the tributary brooks.

Whitefish are not abundant in Grand Lake, but are in the thoroughfare between Compass Lake and Grand Lake, on a sandy bottom. They do not take the hook.

White perch occur at the mouths of streams. Not abundant in Grand Lake, but areabove.

Yellow perch, rare.

Chubs, suckers, minnows and eels are abundant.

No pickerel in Grand Lake, except occasionally at the mouths of muddy streams.

Sea salmon taken only once in a great while. Besides those taka by Fish Commission could remember only one captured by Mr. Grimmer. It was a spent female, weighing 25 lbs.

Small fresh water smelt occur in Grand Lake and the lakes above it, but are more plenty in

Big Lake.

No black bass in these lakes.

The ice goes out from the lake between May 1 and 10. Landlocked salmon are taken most abundantly in the stream just after this time.

It is complained that the hatchery returned only 25% of the fry to the lake. Thinks this is reason why the fish have not increased here as rapidly as they should, considering that the ingress of the fish into the stream was entirely cut off during the season when they run in to spawn by the nets set across the head of the stream by the Fish Commission. Thinks that a larger percentage of young would have resulted from the natural spawning, providing the fish had uninterrupted access to the stream.

The decrease of landlocked salmon has been greater in the eastern than in the western lakes. Grand Lake Stream has been a natural spawning ground for them.

Do not occur now below this stream excepting rarely.

There is now no netting in these lakes, but there used to be. The matter is now looked

after better than it was.

Grand Lake is especially clear, and the water cool and nice as any spring, although it naturally becomes warm at this season.

Has caught trout weighing as high as 3 lbs. They mostly range from 1 to 2 lbs.

The Grand Lake Stream dam belongs to the log corporation. This tannery has nothing to do with it, but when the water gets low may ask to have the gates shut at times.

Steam is the power used at the cannery. Water is only brought in for such purposes as are necessary--washing, soaking, making tan liquor, etc.

ST. CROIX RIVER, PRINCETON.

AUG. 11, 1893.

We spent not over an hour in a general examination of the river at Princeton. The general features are represented on the accompanying sketches and in the Atlas of Washington Co. In the latter, however, more mills are represented on the end of the dam in Princeton than now exist, and the projection of mills shown there is reduced in size to one mill. All of the mills are on the Princeton side of the river. One saw mill, owned by F. Mercier & Son is directly at the end of the dam. Just below it is the small woolen mill of L. Peabody & Son, and in an adjacent very small building was done last winter the temporary sawing of hoops for orange boxes referred to elsewhere. A short distance below this is the tannery, the smallest one of the four we have yet seen. These are all the factories there are. There is a bridge across the river just below the tannery, and just below the bridge on the other side of the river is a burning ground for edgings and other large refuse from the saw mill. A large pile of it was on fire

when we were there.

We obtained none of the measurements of the dam, but they may probably be taken approximately from Colby's atlas. A diagram of the fishway was obtained from Mr. Rolfe, and a copy of it made. It seemed to me that the fishway did not correspond entirely to the drawings, but I might have been mistaken. It was, at any rate, the same in all essential details.

As to the fishway, it struck us that the system of small gates above was not satisfactory and subject to great abuse. When we saw it, gates 1 and 2 were out of water. 3 and4 were closed, and 5 only open. The ladder is greatly out of repair, leaks badly, and notwithstanding the small opening afforded by gate 5, there was a large flow of water through it. It might as well have opened boldly above, so far as waste of water was concerned. The stream on the side of the fishway where the gates are is very shallow, and it is doubtful if salmon would find their way to the gates.(Col. McDonald says this is not essential; that salmon would be more apt to go down over the dam.) The fishway is very much out of repair, and needs imme-

late attention.

The saw mill is provided with one large rotary saw for logs, 1 edger, 1 planer machine, 2 lath machines and a shingle saw.

These machines are all above the main floor of the mill, which in turn is about 8 feet above the upper edge of the dam(level of lower floor of mill). From the top of the dam to the level of the water under the mill when we saw it was 9 or 10 feet. These saws were, therefore, in the neighborhood of 18 feet above the water. The lower floor of mill is continued out as a spacious wharf. In the mill, however, it is not floored over as it should be; and there is the greatest opportunity possible for all the rubbish from the mill to fall into the water.

The entire mill is underlaid by the rapidly flowing water. There is one opening in the upper floor at the large rotary saw, and one at the edging saw, for throwing edgings through. There was a car under one to receive the refuse, but under the other there was nothing, and all the rubbish was being thrown through into the stream in large quantities.

There is no automatic arrangemat for sav-

ing the planer shavings. They fall on the floor and on the wharf outside, where much of it readily finds its way into the water.

The shingle sawdust is supposed to be carried out by an automatic contrivance, but it opens over the water, and apparently a large proportion of this stuff falls directly into the water. There is a slide into the stream for the regular sawdust.

In none of our experience so far had we seen such a deplorable state of affairs as exists here resulting from this saw mill. There is some appearance of conforming to the law, but it is superficial, andit is safe to say that, at the time of our visit, perhaps ~~a~~ half of the coarse rubbish, as well as all of the sawdust, was escaping into the river. This included the slabs, edgings, planer shavings and shingle sawdust. All of these articles were falling from the mill into the current, and were being carried down stream, as we could see standing on the wharf and on the bridge, until they found a resting place on the bottom.

There was formerly a large island at this place, called Lewey's Island. The building of the dam and the diversion of the current resulted in

cutting away most of the island, leaving in its place 3 or 4 smaller islands. The main current flows on the Indian township side of the river, the bottom on this side of the river above the bridge being clear from mill rubbish. On the Princeton side, however, everything is filled up with this rubbish, and the width of area so filled in widens as one goes down stream. We did not have time to follow it below the bridge, but standing on the bridge we could see it as far down as the turn in the river, showing everywhere at the surface, and in places rising above it. This rubbish was composed of all the material above described, each occurring in large quantities. Shingle sawdust was a very prominent component of the mass, and edgings and planer shavings were piled in everywhere amongst the sawdust. It was very evident that no special effort was being made to save any of the rubbish, and the river was in a very unfortunate condition. It would be no trouble to save and burn everything at this place.

Some of the edgings are saved for fuel. They were using them in the tannery. We were informed that the pile of edgings being burned on the other side of the river were accumulations from win-

ter sawing. The railroad does not run down to this place, but only out into the yard at the mill. This subject requires further investigation and should be carried down the river as far as it continues. Down the river the rubbish from the tannery should also be found.

TO ACCOMPANY DIAGRAM OF FISHWAY IN THE PRINCETON DAM.

This fishway was designed by Chas. G. Atkins, as Engineer for the Commissioners of Fisheries for Maine, the speifications being dated Aug. 24, 1878. Sept. 4, of the same year, the owners of the dam were notified by these Commissioners to construct the fishway, the letter being signed by Stilwell and Stanley.

Scale 1/8 in. to 1 foot.

Elevations are stated with reference to the crest of the dam in the most northerly gate. The sign + so much above crest of dam, and - so much below same.

The gates to be fixed as to securely lock open, halfway or closed, at pleasure(We saw no means of locking).

Upper part of fishway down to near crust of dam to be planked completely in, sides and top. The latter was covered with stones.

PRINCETON, ME., AUG. 12, 1893.

Examined the stream to a point a short distance below the dam. Also tannery, woolen mill, saw mill, and the mill of James Murchie for preparing wood for orange boxes.

Murchie Mill uses three kinds of hard wood. The logs are sawed into short length, and these pieces are revolved under a knife which cuts a continuous shaving between an eighth and a quarter of an inch thick. This is then cut into suitable lengths by a knife. There is also a small thin saw for cutting the slender hoops used upon these boxes from small stems or twigs. The sawdust is fine, andnot much of it. This mill is on the lake front, opposite the rail road station, but some distance from the water, andit would be difficult to put the rubbish in the water. There is no danger from this source. The sawdust was piled up. The small round log left in each instance is xxx sold for firewood.

The woolen mill, run by Mr. Peabody, is a small affair, and presented nothing for consideration. It is a single old frame building, situated between the saw mill and tannery, and is now restricted to carding and making yarn from wool brought in from the neighborhood. Does not run all the time. Run by water; one wheel, supplied through a closed square flume, running under the inner side of saw mill. No dyeing is done. Nothing much can go into stream, and Mr. Peabody assured us that not more than a barrel or two would so go in during a year. It would consist of pickings from the wool. No oil, grease or any other deleterious substances are used.

In a very small building adjacent to woolen building, some of the slender hoops for orange boxes were sawed for the Murchie mill, the weather being too cold to operate in the latter mill. It is not likely to occur, and if any sawdust went in last winter it was a very small amount.

Tannery, one of the Shaw system, and much smaller capacity than the other three we have visited. Contains three leaches and 100 vats. They tan a variety of kinds of hides, all sole leather, however.

Mr. Dole, foreman, showed us through entire building. It is run by steam. They get a very small amount of water from the flume which supplies the woolen mill. Other water is obtained from two springs near by. Water is utilized only where it is needed in the different processes.

Mr. Dole assured us that the water in which the hides were soaked was used in the leaches, as water supply was small, and it saved some pumping. We saw the vat in which soaking was done, and they were full of old water about to be pumped into the leaches.

The fleshings are all carted away and generally disposed of to farmers.

After fleshing the hides are soaked in a very weak solution of vitriol, contained in several vats. This mixture is so weak that we tasted it, and observed only a very slight taste, that was not unpleasant. Mr. Dole said a cup could be drank without harm, andhe may have been correct. The running out of this mixture it seemed to us could do no injury. It is used to cause the hides to thicken, or swell out some.

The tan liquor is never wasted, but used over in the leaches.

The exhausted bark is all burned in the furnace, and they also burn edgings from the saw mill, and in the winter sawdust from the same source.

The water used in washing the leather after tanning runs into river, but is undoubtedly harmless.

We saw no signs of tannery refuse in the river here, and heardno complaints about it.

Saw Mill. The saw mill is to be condemned in its practices. It has violated the spirit and letter of the law, more than we have yet seen. Notes on the structure are given elsewhere. They profess to save everything but the sawdust, and do save most of it, but a large proportion of everything--edgings, slabs, planer shavings and shingle sawdust, as well as all the sawdust, were pouring into the stream in great abundance. The entire river below the mill was in a fearful state from this cause, as far as we could see, and in the channel on the mill side were shoals of rubbish, reaching everywhere nearly or quite to the surface. The rubbish on top of these shoals and on the shores was fresh and of recent origin. For some distance down there was more of the coarser stuff, edgings

pieces of wood, planer shavings and shingle
dust, than of ordinary sawdust, and this thing
evidently been going on for some time.

C. A. ROLFE, PRINCETON, MAINE, AUG. 12, 1893.

Mr. Rolfe is one of the principal store-keepers here, and was recommended to us by Chas. R. Tidden, of Calais as a man whose statements could be thoroughly relied upon. He does a great deal of fishing for sport.

The saw mill firm of F. Mercier & Son, now comprises only the two sons, the father having died a few years ago.

(Some one informed us that the father used to defy the law against running mill refuse into the river. Considered it cheaper to pay a fine occasionally and not bother with caring for the refuse. The scene about the mill indicated that such might have been the case.)

F. Mercier & Son own about 80 feet of the Princeton dam privilege. Mr. Peabody owns about 12 ft. The town owns remainder of the dam. The entire dam was originally built by theLewy's Island Mill Co. The rights of the town have been given to the Log Driving Corporation, on condition that they keep the farther end of the dam and the gates in repair.

There is at present, time of our visit,

...t 5 feet head of water at the dam. During ... of spring freshet the head may increase to ...t 7 feet. The present season is most unusually ...

It is customary to keep the gates in the ... closed from about July 15 to about April 1 fol- ...ing. From April to July they are opened more ... less as required for sluicing logs. In case of ...y fall freshets, may have to put up one of the ...s then for a time. The opening today by the ...riff of two of the gates, on an injunction is- ...d from Calais, was quite unusual.

The plans of the fishway in this dam ...re made bu Chas. G. Atkins, as Engineer for the ...te Fish Commissioners, by whom it was transmit- ...d to the mill owners, with directions to build at ...ir expense, etc.(See copy of plans of dam else- ...re). (We did not have plan of the fishway be- ...re examining it, and cannot say, therefore, that ... fishway at present corresponds exactly with it. ...re seemed to be some slight differences, but ...y would be immaterial).

The tannery is run by steam, using water ...y where required as such, washing, etc. They

ke a small amount of water from the flume which pplies the woolen wmill. The most of their wa-r, however, comes from two springs.

James Murchie's mill for cutting orange x stuff can only work during the warmer months, d last winter they made use of a small building jacent to the woolen mill for sawing hoops for eir boxes. The machinery was taken there and af-rwards removed back to the regular mill. This ange is not likely to be repeated again. This is e third season of Mr. Murchie's mill(See account it elsewhere.)

Had heard of three sea salmon being taken Grand Lake Stream, one by Mr. Grimmer, caught on hook, and two taken in the nets of the Fish Com-ission hatchery. Persons had told him that they d seen sea salmon at the foot of the Princeton am, but he had no personal knowledge of their oc-rrence there, and did not know what credence should e given to these stories.

Never heard of shad or alewives at Prince-on.

Landlocked salmon are now rarely taken elow Grand Lake Stream. They are occasionally

caught at the head of the St. Croix in Princeton.

40 years ago, previous to the construction of the Princeton dam(built about 1852), it was all quick running water in the St. Croix from the lake to the Princeton tannery. Landlocked salmon used then to be very abundant in that part of the river, and were frequently taken at Black Cat Rips, about two miles farther down the river. At that time they were occasionally secured in the three lower lakes, not in still water, but in the rips, especially in the narrow channels connecting the lakes.

This species,has, however, always been most abundant in Grand Lake Stream. Thirty years ago all landlocked salmon above Big Lake were taken in Grand Lake Stream, or in Dobsis stream. They did not then fish for them in Grand Lake as they do now. June 1 to 15 is the best fishing season, and it is then that most of the sportsmen visit this region. September and October are also good fishing months. He thinks that this species comes down from Grand Lake into the stream. Cited several reasons for his view. One was that good runs of salmon follow a boom of logs into the stream. Bet-

r fishing follows immediately after the passage
s boom.

Had not observed the spawning of landlocked
lmon at the head of the St. Croix at Princeton.
y have, he thinks, spawned more in other streams
m the Grand Lake, since the introduction of the
thod of barring fish at the hatchery of the Fish
mission.

The average size of the landlocked salmon
the head of the St. Croix at Princeton forty
rs ago was about $2\frac{1}{2}$ lbs. They sometimes run
to $4\frac{1}{4}$ lbs. In the eastern Grand Lakes(above
zeboro) they run larger in size than in the wes-
rn Grand Lakes(above Princeton).

Brook trout are taken now in the St. Croix
ver below the Princeton dam and at Black Cat Rips;
so in the small streams; but not in the lakes be-
w Grand Lake Stream. Very much less abundant
w than formerly, and average much smaller. Forty
rs ago they would average about 2 lbs. in weight,
d run up to 4 or $4\frac{1}{2}$ lbs. Does not know spec-
lly where their spawning grounds are, but suppose
y spawn in the main river as well as in the
aller streams.

The other fishes occurring in the river are yellow perch, chub, horned pout, minnows, eels and occasionally pickerel.

The same species with the addition of white perch occur in the three lower lakes, which are all practically alike in character and conditions. No togue nor white fish occur below Grand Lake Stream.

West Musquash lake contains landlocked salmon, togue, the salmon being smaller than in Grand Lake Stream, and averaging about 2 lbs. There are good spawning grounds in the stream from this lake. East Musquash Lake contains landlocked salmon, but never heard of togue there. This latter species has, however, been taken in the streams emptying from Farrar's Lake into East Musquash Lake.

The togue in the lakes average about 5 lbs. and are captured by trolling as well as through the ice.

Never took a white fish with a fly. No black bass in these lakes.

In May and November are allowed to take white fish with nets. (This should be verified). Nets are set between Compass Lake and Grand Lake.

does not know of their fishing elsewhere by this means. The whitefish average about 1 lb. each; range up to 2 lbs.

About fifteen men fish as a business on these lakes. There are about eight at Princeton. They fish with hooks and troll. Pickerel are taken in still water. Musquash is the best stream for them, and they are abundant there. The fish are shipped to Boston from Princeton in barrels with ice. Each person ships on his own account. The shipments amounted to about 1,500 lbs. of fish for two months, from early in July to early in September. Do not fish in the winter as a business, but sporting parties fish for togue through the ice. At present through the ice it may be said that five togue are taken to one landlocked salmon. Forty years ago more salmon would be taken than togue by this method. However, during the past year the salmon have been most abundant, taking the entire season through.

The first week after the ice goes out (early in May) more landlocked salmon than togue will be taken any year. This is in Grand Lake, not in the stream. This is the best time for trolling.

There are rapids in all the streams flowing into Grand Lake, and landlocked salmon occur in all of them to a greater or less extent.

COTTON MILL DAM, MILLTOWN, N. B., AUG. 12, 1893.

In passing from Princeton to Calais on the train, we observed that the water had been run out of the space between the Cotton Mill dam and the next dam above, by means of the deep gates in the latter. There was water only in the deeper places, and the stream was flowing down through the gates. We observed, however, that water was still passing out through the fishway alongside the cotton mill. They were building a temporary wooden dam at the head of the log sluice to increase their head of water during this dry season. The most curious feature observed was the great thickness and extent of the sawdust, which seemed to fill in most of the bed of the river from the dam up. It was thickest in the eddy by the side of the mill. These beds of sawdust were cut through by many deep, abrupt channels, where currents had been flowing, which served to emphasize the thickness of the beds. We had only a glance at this strange sight, but after seeing it one could not help being impressed with the great amount of filling which could result from the letting of sawdust into the stream.

We do not know how long the temporary dam will be allowed to remain, but so long as it does it means cutting off the ascent of the fish by that passage. The fishway then becomes the only place for salmon to be certain of a means of ascending, and it becomes doubly important to determine if the waste from the cotton mill approaches too near the lower entrance to the fishway. The log sluice may be cut off at any time in this way. There was no water passing through it when we saw it, and its entrance must be much lower than that of the fishway. Among the upper dams at Milltown the water was also very low, and the banks of sawdust were everywhere visible above the surface. The only deep water seems to be where the currents have actually to force their channels. The river from the upper dam at Milltown to Union dam is everywhere in the same bad condition, and it is a wonder that salmon can find their way up. Certain it is that there are no places here where spawning grounds can exist for any fishes, and this would probably also be true as far up as Baring.

W. H. MUNSON, PRINCETON, ME., AUGUST 12, 1893.

Had been in the service of the U. S. Fish Commission 18 years, all of the time except the last year having been connected with the work at the Grand Lake Stream hatchery. Had been thoroughly acquainted with the region for some 40 years.

Some refuse from the tannery and a good deal from the saw mill still go into the river, but nothing compared with former times. At one time everything nearly was allowed to go adrift, and it was in the early days of the tannery that the great damage to Grand Lake Stream was done. He thought the tannery had been built about 21 years, but does not remember when they stopped putting in all the refuse. The material originally allowed to go to waste were the exhausted tan bark, fleshings, ashes, and some of the tan liquor. Had the practice continued thinks the mouth of the stream would have practically become filled up by this time. There used to be a deep place at the mouth of the stream, right at the head of Big Lake, the depth having been 10 feet at low water. This was in a cove, but

e eddy formed there by the stream brought in the
bark to such an extent as to fill it up so that
extreme low water you can walk over it dry shod.
is place is about 2 1/2 miles from the tannery.

The tan bark, fleshings and ashes also
umulate in many places on the bottom throughout
e length of the stream below the tannery. This
terial has been more or less covered with gravel
as not to be evident always from on top, but it
readily uncovered with a shovel, and some years
p he and Major Ferguson spent two days in digging
order to determine its extent and the damage it
d done. The conclusion they came to was that the
ny places where the landlocked salmon had been
the habit of spawning were so underlaid with
is rubbish as to be entirely spoiled for this pur-
se, and that the salmon no longer resorted to
em, at least as before. They concluded that
e spawning grounds had been permanently destroyed
t he could not say but that the condition of the
aces might improve again with time. He thinks,
wever, that as long as the bark remains in those
aces it will be bad for the fish. The fleshings
ich they found partly buried were still in an of-

tensive state, the presence of the water not seeming to purify or to dissipate them.

Bark and ashes are not allowed to go into the stream at present. All of the sawdust from the saw mill does go in, however, and also some liquor, the soakings of the green hides and the washings of the freshly tanned leather. Thinks that the tannery probably puts nothing more in at present than they can help, and is not certain that the refuse now allowed to go adrift from the tannery does any special harm. The sawdust probably should be kept from entering the stream. The harm to the stream has already been done by the tannery.

He explained that only the middle gate in the dam above the tannery is used for sluicing logs. It is a larger and deeper gate than the others and was intended as well to take the place of a fishway, leaving a large channel through the center of the stream. Mr. Munson always looked after the opening and closing of the gates while he was at the hatchery and states that they were always kept open all the time necessary for the passage of landlocked salmon. They were in fact kept open all the year(the single one in the middle at

least) except from the last of March to the last of April, When they were getting a headway of water for log driving. No fish were running at that time. The sluicing of logs continued until the last of June. While the sluicing continued the gates were opened by day and closed by night. After that they were open all the time, being locked up. He thought the closing of the gates at night while the salmon were running did no harm, as they had plenty of opportunity by day.

The landlocked salmon begin to run down into the stream about the middle of May, soon after the ice goes out. In the spring they rarely went through the dam, but remained in the upper part of the stream, returning to the lake about the middle of June as the water warms up.

They commence to run into the stream again the last of September, they then pass the tannery and proceed to their spawning grounds. He thinks that many remain in the stream all winter, as the stream getsso low that he does not see how they can get back.(This statement may be questioned). The following spring he thinks they run back to Grand Lake in May after the ice goes out. He strengthens

is argument by stating that in May there is a difference in the fish above and below the dam. Those below are thin, while those above are fat and plump, having been in the lake all winter.

The landlocked salmon which run into Grand Lake Stream must come from Grand Lake, as there are none of this species now in Big Lake. A very interesting problem is suggested by the fact that the salmon here run down stream and not up, while going to their spawning grounds).

The manner of taking landlocked salmon at Grand Lake Stream for hatching purposes during the past 10 or 12 years at least, has been as follows:

On Sept. 15 of every year a fine mesh barrier net was placed across the northern entrance to the stream, at the small stripping building. This kept the fish from proceeding down the stream, and held them back in the lake. About October 25' one end of the barrier net was taken up and in its place were arranged 8 pounds or traps for taking and holding the fish as they came up. The number secured this way each season ranged from about 1,000 to 2,000, and the number of eggs from about 900,000

to 2,000,000. The pounds were kept down until about November 24. The fish after stripping were retained until the stripping season was over, as it was feared thatif realeased at once they would return to the stream and be caught again. They would finally be taken some distance up the lake in floating cars, and there released.

By this means no fish were allowed to reach their natural spawning grounds. The average number of eggs hatched may be estimated at about 80%. 25% of the fry were always returned to these waters and some years 30%. It was considered that this gave better results than would have come from allowing the fish to spawn naturally, as it is probable that only a relatively small percentage of the eggs would be fertilized in nature, and the eggs were subject to great mortality from their natural enemies.

Mr. Munson had seen this species spawn and had watched the male hover over the nest. He has also taken up the eggs from the nests. There were many chances that the milt from a single male would not be extruded so as to cover all the eggs. It might land upon one edge of the nest, and as the

spawning is all done in rapid water it was possible for all the milt to be swept away by the current before it had reached the eggs. I suggested that it would be a good plan to take up the contents of several nests, and observe what proportion of the eggs had been fertilized in each. Mr. Atkins has many observations on the spawning habits of this species.

The landlocked salmon are very much less abundant now than they were 35 or 40 years ago, which has been within the experience of Mr. Munson in this stream. They have, however, much increased in numbers and in average size since the hatching operations have been carried on there. Mr. Atkins has a record of the weight and size of every fish taken by him at Grand Lake Stream hatchery.

Sea Salmon, During the continuation of the hatching operations on Grand Lake Stream he knows of 4 or 5 sea salmon being taken there. Mr. Atkins has a record of them. He heard of the one taken by Mr. Grimmer, but did not see it. Never knew of sea salmon being taken around Princeton.

Brook Trout are not abundant in the lakes but are in the stream. Could not say anything

positive about their decrease. A few trout might pass the dam in Grand Lake Stream, but the passage-way there was not needed specially for any fish but the landlocked salmon.

A few landlocked salmon spawn in Dobsis stream and a very few in Junior stream.

Pickerel have always been in this system of lakes since he has lived there and he supposes they are native to them. There are very few in Grand Lake, as the water is too clear for them. The occur principally in Big Lake and Lower Dobsis Lake, in both of which they are captured for market. Pickerel and white perch are the species taken for market. Does not know whether either of these species has decreased in abundance.

Never saw or heard of any cusk in these lakes.

Does not understand that nets can be legally used in these lakes, but thinks it is done on the sly. Trolling is allowed with a minnow attached to a hook, but not with the other special devices.

The fry of sea salmon have been planted in Grand Lake Stream and in Junior Stream.

He has taken the eggs of landlocked salmon

from suckers captured in Grand Lake Stream. Thinks the chubs also may destroy many of these eggs.

REGARDING POLLUTION BY ST. CROIX COTTON MILL.

From files Dept. of Fisheries, Ottawa. No. 5,501, 1889.

LEWIS DEXTER, SECRETARY, ST. CROIX COTTON MILL, MILLtown, N. B., TO TUPPER, MINISTER OF FISHERIES, AUGUST 23, 1889.

* * * * * * * * * *

The facts in regard to our dyehouse are these: We mix our dyes in vats for the purpose of colouring yarns, and extract from that mixture, as fully as it is possible, all of the coloring matter in the process of dying our yarns. When these vats are ready to drain off and throw away, there is comparatively but very little colouring in the water. This water we allow to run into our drains which lead into the river. All of the sediment from our vats is taken from our dyehouse and deposited on the land andnot allowed to be washed into the river. We use water in washing our yarns after they are dyed. This water we also allow to run into the drain which leads into the river.

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(CAPT.) JOHN H. PRATT TO DEP. MIN. FISHERIES. Nov. 6, 1889.

(Inspected the mill) * * * * *

I found that everything of a liquid nature, after being used in the dye vats, is allowed to pass into their drain, which runs under the dye-house, and thence into the river, and the only substance that is now allowed to make its exit in that manner is the wicker work binding around the bundles of a dye named cutch, which, if allowed to pass through the drain, would be liable to choke it up.

(Sends lists of drugs, diagrams, etc.)

Before leaving the mills, in conversing with Mr. Dexter, he argued(reasonably enough) that the dyes used, being very valuable, it was to their own interest to extract every vestage of dye possible, etc.

* * * * * * * * *

I have, during my visits to this locality, interviewed several respectable citizens of St. Stephen and Calais. * * * and Mr. Todd. * * *.

After discussing the matter fully * * * I do not feel justified in reporting to this department that our fisheries are injured to any perceptible extent.

Halifax, 10 Feby., 1890.

The Commr. of Internal Revenue,

Ottawa.

Sir:-

I submit herewith my report on three samples of water received from St. Stephen, N. B.

* * * * * * * * * *

No. 8,768, taken about a mile above the mill on the St. Croix River, and 8,770, taken about the same distance below, were clear waters, while 8,769 taken at the mill, contained a large amount of red coloring matter in suspension, and quite unfit for any purpose as water.

I found in this sample decided traces of lead and indications of aniline color.

The difference in the samples taken above and below 8,769 is not as marked as might be anticipated. The effect of the water flowing from the mill, though its influence is visible, does not appear at the distance below named, to have a very serious effect. Judging from their valuation 192 & 204, Class III, IV, in each case, I have reported

Nos. 87,680 & 8,770 as impure.

(signed) Maynard Bowman,

Public Analyst.

MEMORANDUM OF S. WILMOT, SEPTEMBER 8, 1890.

After reading Prof. Bowman's report, and looking over the plan showing the numerous dyeing vats, used for aniline colors, and other noxious matter to fish life, which are employed at the St. Croix Cotton Mills, and which are allowed to run into the river as refuse, he cannot but conclude that these deleterious substances are, and must be injurious to fish life, and that the water of the river must be largely polluted from the effects of this liquid dye refuse being allowed to run into it.

Quotes from Bowman's report.

Quotes from Prof. Fryer's report to the Board of Trade, regarding effect of refuse in rivers(Fishery Inspector's reports).

MEMORANDUM BY C. H. TUPPER, MIN. FISHERIES, JAN. 7, '93

Mr. Gault and Mr. Morrice, Manager of the St. Croix Cotton Mills Co., waited upon me on the 6th of January.

They represented that it would cost some $15,000 to make arrangements to dispose of the refuse from the mill on land, and that in any event this refuse would leach through into the river ultimately; that a comparatively small portion of the chemicals ever reach the main waters of the river; that the salmon pass up the river in clear and clean water, and a visible improvement is observable in the salmon fishery of the river; that the tests upon which I am acting do not indicate that the pollution is sufficient to be deleterious to fish life; that the river is an international one, and on the United States side sulphuric acid is put in it from foundry works, and there are dye works further above the cotton mill in the state of Maine on this river, and that since the sawdust act is not enforced because of similar circumstances on the American side, they contend that no action should be taken touching the St. Croix Cotton Mills Co.

They further allege that the refuse reaches the water a mile and a half from the tide water.

They state that enormous quantities of sawdust are deposited in the river, and that there are large banks of it at various places; that there is no similar law in the state of Maine to sub-section 2 of Section 15, Fisheries Act.

For the above reasons they hope that the instructions contained in the Departmental letter of the 26th October, to Capt. Platt, will not be carried out.

Milltown, N. B., Jan. 25, 1893

Chas. D. Owen, Esq.,
Managing Director, C. C. C. Mills Co.,
Providence, R. I.

Dear Sir:-

The following is the result of my inquiries made at your request as to whether any parties on the American side of the St. Croix River are allowing acids, dye stuffs or other refuse to flow into the river.

At Princetown, 20 miles above us on the west branch of the St. Croix, and at Vanceboro, about 30 miles above us on east branch, are tanneries, both of which claim to allow no deleterious substances or acids to flow into the river, but both are known to be using acids; and furthermore I have reliable information that the tannery at Princeton is actually allowing its acids to flow into the river.

There is also at Princeton a small woolen mill, whose owner, Mr. S. L. Peabody, advises me, that what acids he uses when running in the summer months, find their way into the river.

In Milltown, Maine, directly opposite our ...ill is a railroad machine shop belonging to the ...t. Croix & Penobscot R. R. The foreman of this ...hop has admitted to us that what acids they use in ...leaning their castings find their way to the river, ...nd that in former years they did outside job work ...nd used considerable acid, but at present are not ...oing any job work.

In Calais, Maine, below the lower dam of ...iver' is a wool pulling establishment run by H. C. ...rant and other parties, who allow large quantities ...f acids to flow into the river, and who are free ...o admit this fact.

Yours truly,

(Signed) L. Dexter, Jr.

D. S. S. Carlew,
Grand Harbor, N. B.
Jan. 28, 1893.

ir:-

I have the honor to acknowledge the receipt f the enclosed fyle No. 3501/89, containing letter f A. F. Gault, Esq., in which he mentions other nufacturing establishments on the St. Croix Riv-r, besides the dye house of the St. Croix Cotton ills, that are allowing matter deleterious to fish ife to escape into the river.

I proceeded to St. Stephen yesterday and ade necessary inquiries. The railway machine shop s the small one of the Princeton railway, where a ouple of locomotives are repaired, and we all know hat in a shop of this kind there is no refuse which he proprietors wish to throw into the river or any ther place.

Regarding the wool-pulling establishment , xcepting a small one, employing probably one or wo men, in the back part of Calais, without any onnection with the river, there is not any. I do ot believe anything injurious to fish life is used n this small mill.

There is not any mill 20 miles up river now. It failed 5 years ago; a little carding and weaving is carried on in it during the summer and in winter the building is used by some persons in the manufacture of hoops for barrels.

In my second report of this date on this matter I refer to the tannery.

(Signed) John H. Pratt.

Inspector of Fisheries.

The Deputy Minister
of Marine Fisheries,
Ottawa.

FROM CAPT. PRATT, JAN. 28, 1893.

Believes that the statement that it would cost $15,000 to dispose of refuse to be exaggerated.

No foundry works nor dye works on the United States side of river, or Canadian side.

Cannot find that anything escapes from tanneries injurious to fish life.

MEMORANDUM OF SAMUEL WILMOT TO DEPUTY MINISTER, FEB. 8, 1893.

Refers to the letter of Mr. Gault(dated Feb. 2, 1893, transmitting letter of Mr. Dexter, a copy of which is given) and to reports of Inspector Pratt, of Jan. 28, 1893, and then adds:

Notwithstanding these statements in Inspector Pratt's report, the undersigned is of the opinion that more or less injurious substances must flow into the river from the establishments referred to, which must, in a greater or less degree, affect the water injuriously, and necessarily have a tendency to militate against fish life. Thisdeleterious matter from these establishments, of which the St. Croix Cotton Mills are by far the most extensive, and the deposition of sawdust and mill rubbish into the river from both sides, without any restriction whatever, must, if not stopped, bring about, in a short time, a total destruction of the salmon and other fisheries connected with the St. Croix River.

As this river is an international boundary for some distance up it, the subject of polluting

its waters, would be a fit matter for consideration by the Fishery Commission appointed by the United States and Canada, and might be referred to them.

March 1, 1893.

Chas. D. Owen, Vice President, transmits $100., amount of fine imposed upon Cotton Mill.

"In this connection we beg to say that at an interview with the Hon. Mr. Tupper by the officer of our Company, on Jan. 6, it was understood(this river being partly in American territory) that if we found on examination any deleterious substances were being put in on the American side, the Minister would then take into consideration the exemption of this river from the restriction of the Fisheries Act, the same as has been done here relative to sawdust and refuse from saw mills. We learn that Capt. Pratt's report admits such impurities thrown in on the American side. We will, however, be glad to leave the matter to the decision of your Department".

Subsequently , March 2, 1893, Capt. Pratt was instructed to take no further action against Cotton Mill Co. until ordered.

St. John, New Brunswick.

August 23, 1893.

From Joseph O'Brien, Harbor Inspector and Fishery Overseer.

All of the mills on the St. John River in St. John Co. are steam, and they burn every thing, including saw dust. That is, they intend to, or are supposed to. At Cushing's mill saw dust and other rubbish has been allowed to go into the river, and O'Brien now has him before the Court on this charge. He says some refuse also goes in from Miller and Woodman's mill. Lime kilns are connected with many of the mills.

Fishery Overseer Orr in Fredericton will know about the mills there and above.

Capt. Pratt has a list of the mills and kilns, furnished by O'Brien.

The bad place for navigation in the St. John caused by saw dust, etc., is at Oromocto

Shoals, about 12-14 miles below Fredericton, near mouth of Oromocto River.

Nail factory, acid used in cleaning nails corrodes iron work of boats in river adjacent.

Two dyeing establishments let dyes into sewers which pass into river (This must be pretty small compared with sewage.)

There is now on a case of the Government against the St. John Gas Works, for allowing coal tar to pass into the river. The Government is assisted by Jas. G. Forbes, an able local lawyer, who will know all about the case. It was brought by O'Brien for injury to fisheries.

Jas. Hanney, Editor St. John Telegraph, will know about history of mills and lime kilns in this region.

Mr. Purvis, of Carleton, may have determined proportion of saw dust to wood cut.

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Saw Mills in St. John, August 23, 1893.

East Side St. John River, North End.

This is order beginning at lower end:

Hilyard Bros. Hilyard,

Chas. Hamilton & Co., Strait Shore,

Jas. R. Warner & Co. "

W. H. Murray, Manager, Marble Cove Mills,

Cowan & McGinty,

John McMulkin, Robertson's Wharf,

Stetson, Cutler & Co., Spar Cove,

Chas. Miller (Shingle mill),

One other mill some distance farther up.

Millidgeville.

Jewett & Co. Walker's Wharf.

Saw mill and lime kilns.

West Side St. John River.

Carleton.

W. C. Purves, King St. W. E.

Galey & Co., Water St. W. E.

Clark Bros. " Closed 3 years.

Union Pt.

Andre Cushing & Co.

Miller and Woodman's Cove.

Miller & Woodman.

Pleasant Point.

Stetson, Cutler & Co.,

Geo. E. Barnhill.

Kingsville.

S. T. King & Son.

Mosquito Cove.

Randolph & Baker.

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St. John, N. B., August 23, 1893.

Randolph & Baker's saw mill. Steam.
Has 2 gang saws, 2 edgers, 3 lath machines,
barrel making machinery, butters.

Cut about

20,000,000 feet long lumber yearly,

18,000,000 M laths, "

Make about 60,000 barrels "

of which they use about 2/3 themselves in barreling lime made by them.

There are two lime kilns in connection with the mill. The limestone comes from near at hand.

All rubbish is burned. Use sawdust and larger refuse in furnace, larger refuse in lime kilns, while the smaller refuse, general waste, bark, etc., are burnt in a burning dump, on the bank a short distance up the river, to which a hand railroad runs. There is not a careful discrimination in the material used in furnace and sent to dump.

Some sawdust clings to refuse sent to latter, but all the sawdust is practically burnt in furnace. The dump is open, the fire being on the shore, the refuse being dumped onto it from the end of the rails. There is a chance for some of the pieces to find their way into the water, as is also the case at some of the mills farther down stream, and this happens at times, as we saw a small quantity of edgings floating on the surface.

The wet wood is used in lime kilns. Mr. Baker said it made better lime than dry wood, as the steam seemed to benefit making lime.

There are no other lime kilns on the west side of the river below these,-as far as the bridge at least.

The sawdust is dumped into the furnace through a series of holes on top, being carried out from the saws by an endless chain, with a cross piece of wood at short intervals.

The edgings are fed at the end of the furnace. This same general system held at the other mills visited to-day, but none of them seemed to have nearly so large a furnace, or to produce nearly so much sawdust as this one. The immense amount of sawdust which we saw led to this furnace gave us an idea of the great quantity which must go into the stream from water mills. The amount had not been figured up.

They complained here as elsewhere of the very large quantity of refuse which came down the river with the logs, and found its way up into the mills with the logs. It is taken out and burnt with the other rubbish. It is a source of great annoyance and cost to them, as one or more men are required at times to take care of it. It is cheaper to let it come up into the mill than to clean off the logs on the water, and on account of the eddies on this side, if cleaned off in the water, it would

float around the mill and have to be taken out anyway. This refuse consists almost exclusive ly of cedar which floats a long time. Will never sink they said. It is made up of cedar butts, slabs, pieces of shingles, etc., with some bark, and its origin was claimed to be in Maine. Probably the refuse from small shingle mills scattered along the small tributaries, many of which we may not be able to reach and examine.

Very little sawdust is ever seen in the water about here.

-----o-----

S. T. King & Son, Kingville.

1 gang, 1 rotary, butters, 2 edgers, 2 lath machines, 2 shingle machines.

Saw practically all kinds of lumber, but no cooperage. Could not give quantity, but the mill is a much smaller one than Randolph & Baker's.

No lime kilns here.

Burn all refuse in furnace, and have no burning dump. Have use for all their refuse in furnace.

The cedar refuse from up stream a great nuisance. Comes down in large quantities. All burnt in furnace.

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Geo. E. Barnhill.

1 gang saw, 1 edger, butters, 2 lath machines, stave machine.

Saw yearly about

12,000,000 feet long lumber,

9,000,000 " laths

500,000 staves.

No lime kilns here.

Burn all their refuse in the furnace and in an open dump. Sawdust and larger pieces in the former. Have also a waste furnace adjoining the mill, with a separate chimney, in which surplus sawdust and small stuff is burnt. We did not examine this furnace, but it seemed to be low, flat above, and fed from above like that at the boilers.

Complained bitterly of the refuse cedar from up stream. Said also that they had great trouble with it at Fredericton, where they might know something of its origin.

No perceptible sawdust was ever seen in the streams here.

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Stetson, Cutler & Co., Pleasant Point.

1 band saw, 1 edger, butter, clapboard machine and planer, stave machine, 6 shingle machines, 2 lath machines. Cut about as follows:

(300,000 feet long lumber a week,
(
(See account of their mill on East side River.)
(37,000 " laths a day,
(
(3,500 " clapboards a day.
(
(Staves are cut off and on.

No lime kilns here.

Refuse all burned. Sawdust and larger pieces in furnace under boilers, and smaller stuff, general waste, etc., in an open dump.

Great trouble from the cedar refuse from above, especially every time a new raft comes down. Keeps one man busy nearly all the time taking care of this rubbish.

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Miller and Woodman.

1 general saw mill, one shingle mill near at hand.

In former have 2 gangs, 1 muley (single saw), 3 edgers, 2 box machines, 3 lath machines

Saw about 20,000,000 feet long lumber yearly. Could not estimate quantity of others

No lime kiln here.

Burn all refuse. All sawdust and larger pieces in boiler furnace, balance in open dump which is a large one reaching some distance along the steep shore, and going directly down to the water. A line of logs below is supposed to keep the edgings, etc., from going out into the water, but some could readily escape, and Mr. O'Brien said that there was rubbish set adrift from this mill at times. The stuff burnt in dump includes all the smaller refuse, general waste, drift stuff, bark, etc.

The cedar drift from above is very bad,

and requires extra help to take care of it. Two extra men sometimes.

In the shingle mill there are 14 shingle machines. Use cedar only. There is not so much waste relatively as in saw mill. Burn refuse under boilers, and also have a separate dump for burning surplus waste.

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Regarding the mills visited to-day, described above, it may be said that they are all steam mills. All dispose of waste in essentially the same way, and there is no reason why all waste should not be consumed. If otherwise, it is due to carelessness, as all the means have been provided. Only one mill has lime kilns attached. All but one have open fire dumps. One only has a waste furnace

The universal way of taking out sawdust is by endless chain with small blocks attached at intervals. All the edgings and other pieces of wood are handled by hand, but are carried out to piles, or to the dumps in little push cars on railroad tracks.

The draft through the sawdust furnaces is very strong. Sawdust could not be burned alone, in the open air. The furnace chimneys are very tall, of brick, to provide draft.

All of this region is very hilly, and the

mills are situated along side of the river at the base of the hills.

St. John, N. B., August 24, 1893.

Continuation of examination of mills.

East Side St. John River.

Stetson, Cutler & Co. Spar Cove.

(There is only one mill, a shingle mill, on the main St. John, in St. John Co., above this. It belongs to Chas. Miller, son of the member of firm of Miller & Woodman. Besides this there is Jewett's Mill, on the Kennebecasis. Lime kiln at Miller's mill).

Saw Mr. Stetson.

Mill has 2 gangs, 2 edges, butters, 6 shingle machines, 2 lath machines, 1 clapboard machine, 2 stave machines.

Six lime kilns in connection with this mill. The same firm has another kiln, about 1 mile farther up.

The cut of Stetson, Cutler & Co. at this mill, and the one at Pleasant Point, on west side of river, per year, about as follows:

30,000,000 feet long lumber,

20,000,000 laths,

32,000,000 shingles,

40,000 barrels.

The barrels are all used for the lime they make.

Cedar is cut for shingles.

Of all other cutting they use chiefly spruce (90%) and pine (10%). These percentages hold good for all the mills in St. John. Very little hemlock or hard wood is sawed here.

Scribner's measurements are the lumber standards used in Maine, and he referred us to them to find proportion of waste on sawing.

They burn all rubbish, (1) in boiler furnace, (2) waste furnace and (3) lime kilns. Have no open fire dump. Sometimes have to buy cord wood for lime burning, as they do not always have enough refuse from sawing.

This burning has been going on during his entire experience, 14 years. Does not know

how much longer.

Are troubled very much with drift coming down river. Chiefly refuse from shingle mills, cedar butts, rejected shingles, slabs, etc. Thinks they come largely from the Aroostook and Maine side of river. Large quantities come over the Aroostook falls during freshets. Rafts of logs are made up at Fredericton. The loose drift also passes down through St. John Harbor and into Bay of Fundy. It is worst in spring during freshets.

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Cowan & McGinty.

1 rotary, 1 edger, 2 trimmers, 4 lath and 1 shingle machine.

Cut about,-

2,500,000 feet long lumber,

2,000,000 " short "

a year, but not many shingles.

The larger pieces of refuse mostly sold for firewood. The remainder is mostly burnt, including sawdust. Also sells some sawdust and use some for filling in. This is a small mill.

The drift from up river is very bad and gives them much trouble. Becomes especially abundant in their cove in the spring. They have had to dredge to deepen water in this cove, and it would not do for them to let this drift or any of their own refuse to go adrift, as it would rapidly fill in.

The cedar drift comes mostly from small

shingle mills, which were largely on the Aroostook. Not many cedar mills on the New Brunswick side.

The above information was given us by Mr. Cowan.

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John McMulkin.

This is a very small mill adjacent to Cowan & McGinty's, and makes shingles exclusively. It was closed, and Mr. Cowan gave us the information.

Has 4 shingle machines.

Cuts about 60,000 shingles a day for about 9 months.

Uses cedar, rarely spruce.

Disposes of rubbish same as Cowan & McGinty

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Marble Cove Mill.

W. H. Murray.

This is one of the oldest mills here, and Mr. Murray has been in the business many years. We talked with him.

Has, 1 gang, 1 rotary, 2 edgers, trimmers, 2 lath, 2 stave, 1 paling and 1 box shook machines. No shingles. No lime kilns.

(There are no lime kilns between Stetson, Cutler & Co's and the bridge, except a small one, which burns only rarely. It is near bridge).

Cuts annually about as follows:

16,000,000 feet long lumber,

12,000,000 laths,

1,500,000 staves,

200,000 pairs heads.

Burn their refuse in boiler furnace, waste furnace, and open dump. In the spring, from logs which have been sometime in water, they obtain a large quantity of bark, which peels

off easily. This is obtained in larger quantities than they can readily burn, and it is carted and dumped along edge of bank below mill. Assured us that it never went into water with their knowledge. We saw a large quantity, said to have been accumulations of about 4 years. This has been set fire to in past, and probably will again.

Complain greatly of the cedar drift from above, which accumulates in their cove to a very great extent. Have set fully 100 acres of it adrift in the spring besides what comes up into mill.

Cushing on the opposite bank frequently allows his rubbish to go adrift. Has a shute which leads into fall, and it is difficult to see him do it.

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James R. Warner & Co.

Talked with Mr. Lenard, foreman.

1 gang, 1 rotary, 2 edgers and trimmers, 4 box shook saws, 2 lath and paling machines.

Saw annually about as follows:

10,000,000 feet long lumber,

10,000,000 laths.

300,000 boxes (entire).

No lime kiln.

Much of the coarser stuff is sold for firewood. All the rest is burnt in mill, in boiler furnace and a waste furnace. Have no open burning dump.

The taking care of the drift from above, mostly cedar generally, they require on an average the services of 1 extra man throughout year. Sometimes 2 are put on it. (This was same at all the other larger mills). Comes mostly from above Woodstock, and practically all from above Fredericton.

In sawing fresh logs, all of the waste that comes into the mill with the logs consists of this cedar drift. With old logs on which the bark has become detached, 1/4 of the refuse may consist of the bark.

Besides the above, however, they have a large quantity of drift from the mills immediately above in St. John City. Consists of spruce, etc., edgings, and the like. Some of this is known to come from Cushing's mill. There is an eddy at Warner's mill, which favors drift coming in.

This mill has now been shut down 10 days, on account of state of market.

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Charles Hamilton & Co.

Were shown around by the foreman.

1 gang, 1 rotary, 2 edgers, trimmers, 1 lath and 1 stave machine.

This mill does not run steadily, but may average 4 months a year, of 24 days each.

Cut about as follows:

75,000 long a day,

30,000 laths "

3,000 staves "

Some of larger pieces of refuse sold as fire wood. Balance, including sawdust, burnt in boiler furnace and a waste furnace. No open dump. No lime kilns.

The sawdust in this mill is wheeled by hand to furnace. Could sell more fire wood than they produce.

Suffer great annoyance from the cedar drift and also some from fresh drift from mills just above. Average one man all the time caring for drift.

-----o-----

Hilyard Bros.

Shown about by the foreman, Mr. Knight.

1 gang saw, 1 single long saw, edgers, trimmers, 2 lath and 1 box machines. One machine for making barrel heads. No staves made here, however.

During 1892 worked 180 days, sawing about as follows each day:

60,000 ft long lumber,

60,000 laths.

Could not say about box shooks and barrel heads.

Sell some of larger refuse for fire wood. Burn all balance, including sawdust, in boiler furnace and a waste furnace. Have no open fire dump and no lime kilns. Sawdust carried to furnace on chains.

Much bothered with the cedar drift from up river. Require 1 to 2 men extra all the time to care for it. One-half of all the drift comes from way up stream. Very little

fresh drift coming from neighboring mills.

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Jewett & Co's mill is in Millidgeville, about 2 miles above Indiantown. It is on the Kennebecasis River about 1 mile from its outlet into the St. John. All about it is dead water and in case any rubbish was put in it could not get down into St. John River. It is not important for consideration. This is from Mr. O'Brien.

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St. John, N. B., August 25, 1893.

Continuation of examination of saw mills.

West side river.

Wm. C. Purves, King St., W. E., Carleton.

1 gang, 1 edger, 1 rotary, 2 lath and 1 box machine, 1 planer.

Average annual capacity about as follows:

6,000,000 feet long lumber,

6,000,000 laths.

60,000 boxes (7 pieces each).

Do not always work up to this capacity.

Sells such of the coarser rubbish as may not be needed for making steam. All the balance burned. One waste furnace especially for sawdust, 2 furnaces under boilers. No outside burning dump.

Three chains to carry sawdust to furnace.

The waste furnace cost $3,500 or more to build. Costs $3. per day for 200 days to run.

The refuse has always been burnt here since he can remember, 20 years.

Cuts chiefly spruce, scarcely any pine. Last year sawed 1,500,000 ft hemlock; not usual.

The drift (cedar) from mills up the river gives them very great trouble. There is no special eddy in front of this mill to bring in the loose drift, but it comes on the rafts of logs, and some rafts are much worse than others. Consists of butts, ~~roller~~ rotten hearts, slabs, waste shingles, etc. Not much other drift except of this character troubles this mill.

This rubbish has not been noticed on logs coming from Grand Lake, but only on those which come down through Fredericton. They have no way of sluicing it away, and it could not be done here, so they have to burn it in their furnaces. Cost $200. to $300. a year to care for this drift. Does not consider it fair that they should be so strict here in making

them care for refuse from mills, when they let them throw in everything above.

Cedar bark and sawdust will sink, but not the cedar wood.

Mr. Purves and his foreman (his brother) showed us about the mill, and gave us the above information.

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Galey & Co., Water St., W. E., Carleton.

1 rotary, 7 ripping saws, 3 planers.

This mill turns out short lumber almost exclusively, and principally for boxes.

The cut yearly amounts to about 1,500,000 ft. long lumber, which is cut down into short.

Last year cut 200,000 feet of birch deal.

He has neither waste furnace nor open burning dump. Sells much sawdust which goes to the West Indies, Grand Manan and elsewhere for packing purposes. Last year shipped between 700 and 800 bags sawdust to West Indies. Burns rest of sawdust, and all other refuse in boiler furnace. The sawdust is carried from the saws by ~~the~~ a plain belt.

In one week's time, sawing 70,000 feet lumber, he would produce about 3,000 bags of sawdust, each containing 2 1/2 bushels.

Does not have much trouble with cedar

drift, as most of his logs come from Grand Lake or lower down the St. John.

The proprietor, John Galey, gaves us the following proportion of sawdust to cut wood, based upon his former experience in a large mill. They are only approximate, but suggestive. This was at a time when the sawdust was wheeled away from the saws, and before automatic arrangements had been put in. He said:--

From a gang, working 10 hours a day, cutting 40,000 feet long lumber in that time, one man would wheel away about 10 barrows an hour, each barrow containing about 2 1/2 barrels, of 2 1/2 bushels each.

From the edger connected with this gang, one boy would wheel 3 1/3 barrows in an hour, or about 1/3 as much as from the gang.

From a lath machine cutting 30,000 laths a day, a boy would carry away about 13 bushel baskets of sawdust an hour.

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Andre Cushing & Co.

Union Point, West Side River.

2 gangs, 1 band saw, 3 lath machines, 1 clapboard machine, 8 box machines, 2 small planers, edgers, trimmers, etc.

Yearly cut of mill about 22 to 25,000,000 long lumber.

Also about 90,000 laths a day for 300 days

Could not estimate the box stuff; boxes of all sizes from small herring boxes to fruit boxes of different sizes.

This was the foreman who said full figures could be obtained at the office in town.

No open burning dump.

The larger refuse is sold to a man who pays 15 cents a load for it. He carts it away to sell as fire wood, keeping 5 teams so engaged. A large quantity of the small refuse is given away. All the remainder is burned in the furnaces all of which connect with the

boilers. There are two sets of furnaces, one containing 3 furnaces for sawdust, the other 4 furnaces for the larger refuse. Each set has a separate chimney. There are 14 boilers.

There are 7 endless chains for collecting the sawdust from the different saws, but all of these do not lead directly to the furnace room.

The above was from the foreman, and our own examination. We then saw one of the Cushings, who gave us the following:

Much of the cedar drift from up stream, drifting loose, comes into the eddy or pond in front of their mill, and is thence brought up with the logs. They have not so much trouble as the other mills, however, as they are in the habit of cording up their logs on the shore or flat alongside of the mill, and in so doing the drift which occurs on the floats is cleaned off, or drifts away in breaking up the booms.

They have no trouble with refuse from the mills directly above them.

Bark comes off from logs lying long in the stream and tends to fill up the shallow places all along the shores.

Mr. Cushing was emphatic in denouncing the law which prohibited throwing refuse into the water here. It is unjust considering that it is allowed further up, and he does not believe in it any way. He has no interest in fishing or in navigation, and does not understand why every one has not the right to throw anything into the water he chooses to. In this tidal water everything would be drifted out to sea anyway. (In expressing these sentiments, he was opposed to every other mill owner in St. John whom we have talked with). He acknowledged that his men sometimes allowed refuse to go into the water, when that was the easiest way to dispose of it.

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General. St. John, N. B.

The mills here are as well looked after now as can be expected under the circumstances. With the single exception of Cushing, they approve the law (in speaking to us). Mr. O'Brien is diligent in bringing offenders to trial, but he says the court does not uphold him always as it should, and there are many influences brought to bear, successfully at times, to defeat justice.

Nothing probably goes into the river here which could injure either the fisheries or navigation (This has reference only to the saw mills), but should they be permitted to throw in everything it would be quite different

On the other hand, the mills up the river cause great annoyance and expense to the St. John mills. They also cause interference slightly to navigation in connection with ice. Their drift probably can have no effect upon

the fisheries in this part of the river, however.

The St. John mills are well provided with means for disposing of all their refuse, and if they allow any to go adrift, it is their carelessness, or wilfulness.

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ST. JOHN, N. B., AUG. 24, 1893.

Mr. Woodman(of Miller & Woodman) and Gen. ner gave us the following as an approximate es- ate of the quantity of lumber now sawed yearly St. John City mills, those enumerated in the list the note book, namely,

250,000,000 ft. of all kinds of lumber except shingles.
65,000,000 shingles.

Mr. I. Allen Jack, of St. John, gave me a one which was taken from a (sea) trout, weighing out 3 lbs., which was captured several years ago ar Campbleton on the Restigouche River, N. B.

OBRIEN SAYS:-

The drift stuff coming down the St. John
er in the spring, and entering St. John Harbor,
enormous in its quantity, but he has no means of
imating it. All of the eddies and slack plac-
in the lower part of the river and the harbor
me completely covered with it. It finally drifts
into the bay and on to the shores where it is
llected by the people living along the shore.
does no harm after it gets out into the bay. In
e harbor, however, it becomes the source of great
noyance in navigation, especially when the ice
companies it, when the two become so thick togeth-
that boats at times cannot cross the harbor.
e drift clogs and fills in the slips and makes it
fficult for vessels to come up to the wharves.
is is the greatest hindrance to navigation on the
iver. Is a very serious matter, and should be
topped for the benefit of navigation here.

(Confer with captains of I.S.S. and others).

This drift is made in small streams up
he river, where it accumulates, filling in the
hallow places until a freshet comes and drives it
ut.

It accumulates on the log rafts at Fred-
cton, in which condition it becomes a nuisance
the mills supplied by these logs.

The refuse from the lime kilns about St.
n does not amount to much now. The evil has
en mainly stopped.

Cushing mill, on the Carleton side, was ed today $50.00 for throwing refuse into the er. They may stop for a time, but cannot be de- ded upon. They have a chute which leads into er at the falls.

Calais, Maine, August 26, 1893.

With the steamer Fish Hawk.

The Fish Hawk was moored to lower (Flushing) wharf on the St. Stephen side, being just below the lower Rose Standish wharf on the Calais side. Detailed here to determine the thickness and character of the sawdust deposits between Calais bridge and Devil's Head.

At high tide 11: A. M. went down to the Ledge on the steam launch.

At 3: P. M. went out with Lieut. Platt in the flat bottom boat and worked during the low tide. Long iron poles were used to probe the bottom.

Interesting observations were made on the flats just below the Rose Standish lower landing. The sawdust here is quite thick and reaches pretty well up to high tide level. When the tide ebbs the sawdust dries more or less, and absorbs much air. This sawdust has

sunk once, has been waterlogged, but the dryness, especially if it be sunny and warm, as to-day, renders it buoyant for a time en mass (not singly). When the tide floods it raises up all the upper part of this bed, which is seen to be lifted all along the edge of the water, the thickness of the lifted layer being as great sometimes as 8 or 9 inches, possibly more. It breaks off with the movement of the water and great patches drift off a short distance. As the water penetrates this dry mass of sawdust, it forces out the air, which appears as bubbles of scum, arising generally in smaller or larger hemispher~~oid~~ical clusters, sometimes of quite good size. As soon, however, as this floating sawdust becomes aggitated by any movement and the water thoroughly working through it, the masses lose their compactness, go to pieces, the sawdust becoming disseminated through the water and gradually sinking, being drifted more or less by the

currents. The scum accumulates together in large patches or streaks which are drifted with the currents.

Out in flat boat with Capt. Platt, Calais side of the river, on the long flat which begins on the upper side of the lower steamboat wharf, and extends up the clusters of wharves in the city. At steamboat lower wharf, the flat does not extend out beyond the outer edge of wharf, but it soon broadens and reaches far beyond the outer edges of the wharves above. Capt. Platt's sections will give its extent and outer line.

As this flat uncovered on the ebb it gave out a very disagreeable foul odor. Digging down to the depth of a foot the material seemed all to have this odor, but the mud brought up on the rod forced down to a depth of several feet had no odor at all. The day was warm with sun shining brightly.

Made this afternoon the section just above

the wharf marked "long" on the field charts, the first one above the lower steamboat wharf. The conditions seem to be practically the same all along the flat above indicated. It is not a bed of pure sawdust, and in fact seems to contain comparatively little sawdust. There may, however, be thick patches in places.

The top of the flat is covered with a dirty sawdust which gives it a yellowish brown color, when uncovered. Some new sawdust settles upon it at every tide, which adds a fresh and bright color in places, generally in longitudinal streaks. The sawdust on top gives it a coarse granulated appearance. The sawdust is coarse, and apparently not very old. The superficial layer is thin, and changes soon into a mud, which is soft and sticky. Stepping onto it the feet sink down from 3 or 4 to 10 or 12 inches, and it is very difficult to draw them out.

There are distinct evidences of sawdust

only near the surface. I dug down about a foot. The coarse grains of sawdust extended down not over 2 or 3 inches (this will probably vary), then it changed to a bluish mud, but by washing it, I obtained some sawdust, but it was very much finer than that on the surface. (Could it have been reduced to this size by a partial disintegration?). The mud to this depth was foul smelling, and the lower part contained less sawdust.

At probing station 22, depth , all of the bottom of the bore was through a tenacious mud, having no smell. I washed some but got no sawdust from it.

Over the surface of the flat amphipods of small to medium size were legion. They were actively scudding to and fro. They were everywhere, and very thick. Could not tell whether more than one species. Annelids were also somewhat abundant, buried in the bottom, and we found some dead shells of Mya arenaria,

which had been living here. The shells were hinged together. There was also one much smaller bivalve, dead.

Can it be that in some such places as this the sawdust being uncovered at every tide, that it decays and helps to form the mud? Such does not seem to be the case lower down, where thick beds of pure sawdust occur under the same conditions.

A large amount of mud must be brought down by the river, especially in the spring, and this must be deposited, but why not also in the places where we find the pure sawdust, as just below the lower steamboat wharf?

The river was very thick and muddy to-day, during the last of ebb, and first of flood, so that we could not see down through it more than 3 or 4 inches.

On the upper part of this section, Capt. Platt found a bank of sawdust 8 feet thick, resting on slabs, forming a springy mass, and

covering a large area.

There were no cracks on this flat such as occur on the pure sawdust beds when laid dry. Only little shallow channels, winding, were formed by the little rills of water coming down from the upper levels. The foot prints made the day before were nearly as distinct as when first made, showing the more or less tenacious character of the material.

There is evidently a great difference in the character of the deposits making up these flats, especially as to the quantity of sawdust which they may contain. Anything coarser than sawdust is very rare on the flats which I have examined. That is to say, the edgings, etc., form only an inconspicuous proportion. However, planer shavings composed to-day, and have every time I have examined the river along or below the Calais wharves, the greater part, as regards bulk, of the surface drift.

very possibly they came from Whitlock's small mill in Calais. On the flats above and just below lower steamer wharf, these planer shavings did not, however, appear as a factor.

To-day there has been comparatively little drift of any kind. At high tide and beginning of ebb, the water was especially clean as regards sawdust, and I was almost of the opinion that the mills were not running. Throughout the ebb tide the quantity of this drift did not much increase. This has reference not only to the surface, but to the intermediate depths as far as we could see.

However, a towing net 12 inches in diameter was swung from the Fish Hawk from 10 to 11 A. M., the very last of the flood, but the current on the surface was down stream alongside the steamer. In an hour it had choked up with sawdust, planer shavings and a few small edgings and pieces of wood.

The thickness of the sawdust deposit on

the flat just below lower Standish wharf had not been determined, but it was considerable, nothing else being visible except rocks which projected through it. It is a characteristic of this material that when left dry for any time, it shrinks, causing deep furrows to run through, giving it the appearance of being cracked through in all directions, the cracks often being quite regular in their courses. This flat was pure sawdust on top, and I walked over it. It was like a springy bed, my feet went into it two or three inches or more, but they did not stick as on the flat above. At low tide the distinction between the pure sawdust flats, and those composed mostly of mud is very plain, and they can be told at some distance off.

While down the river in the launch between the Fish Hawk and the Ledge we could see the sawdust in deep water being stirred up by the water whirls or eddies, and lifted to near or

quite to the surface, in frequent patches. This must be going on all the while where the sawdust is not uncovered, and it must be an important means of movement, of stirring up, and feeding to the currents. When the tide goes down, the surface of sawdust flats are, to some extent at least, lightly pot-holed. This may be due to the eddies.

The wind has great influence in determining the place of deposit of the drift, which is actually on the surface. It tends to blow it on one shore or the other as the tide ebbs. On the succeeding flood it is again lifted, and a contrary wind may help to direct its movement elsewhere.

I am inclined to think that the shore deposits of pure sawdust are mostly below the lower steamer wharf. There are, however, heavy deposits of sawdust and coarse refuse in mid channel, way up to the bridge.

It is very important to note that the saw

dust washed from the mud, I think from all sources where it has lain sometime under water, is much smaller than the fresh sawdust just brought down. It will be important to determine if sawdust disintegrates under any of the conditions found in this river. May not the large fresh grains of sawdust go partly to pieces without actually decaying?

What effects have density (the varying densities in this river) upon the transportation and deposition of sawdust?

How much sawdust is carried down stream in Calais river annually? What becomes of all of it? What quantity of other stuff goes down?

Put some one in the field to study the sawdust question in this region.

Make thorough natural history survey of these waters.

August 27, 1893.

On the morning of this Sunday I took the Rose Standish at Calais upper wharf and went to Eastport. While passing through the upper part of the river, the tide was about 2 1/2 to 3 hours flood, and I was enabled to continue the observations recorded above. A large part of the surface from the bridge to some distance below the ledge was covered with the scum.

It formed more or less continuous streaks and patches, sometimes very wide and in places actually covering the width of the river. Over much of this distance mentioned there was more scum than pure water surface. This scum held small patches of sawdust all through it, of variable sizes, but whose thickness I had no means of knowing. These patches of sawdust were in the middle of the river as well as at the sides. They were everywhere, gently floating with the tide. This method of

transporting sawdust, of lifting it from one bed and carrying it to others is very interesting, and should be thoroughly studied. Can it occur in wet weather? Does it occur in anything but dry warm weather, and is it not intensified by the dryness? (There was a heavy shower during this night, (26-27). The sun was up in the morning and shining only an hour or two when a thick fog set in, which was prevailing when I went down the river. The weather generally, however, has been dry and warm).

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St. John, N. B., Aug. 28,1893.

t. Platt,
"Fish Hawk",
Calais, Me.

r Capt. Platt:-

Please save a few samples of sawdust, as llows, and take to Washington. The coarse saw- st just as it comes down the river on the surface; rdust from the bed on the Calais side just oppo- te the Fish Hawk, and from two or three other s farther down stream; sawdust taken from the dy whirls below the Fish Hawk and coming from the per water; and sawdust washed out from themud. is is to show the size and character of the ins of sawdust under different conditions. Please o have some one obtain a few of the shrimps ch the boys were collecting from the sawdust, preserve the same in alcohol. The surface of flat where you were working when I was with you covered with multitudes of a small crustacean, ch were moving actively about. The sailor who left with me in the boat noticed them especial- I wish you would have some one scrape up,strain preserve some of this stuff. A medium sized

ttle of the material just as it comes from the
p of the flat would be sufficient.

R.R.

ST. JOHN RIVER.

Aug. 29, 1893, made a trip up the St. [J]ohn River, St. John to Fredericton, in Str. David [W]eston. Were in a heavy fog beyond to Oak Point, and could see scarcely anything of the shore. On Fluer's Island, near Oak Point, saw 3 moose, which had swam over from the mainland, 1/2 mile distant.

Information chiefly from Robert Dingee, pilot, who has been on the river since 1854.

At this time of year the tide is felt way to Fredericton, where the rise and fall now amount to 6 or 7 inches. In the spring, however, the water is 12 feet higher, and no tide can be felt up there. Salinity may be felt as far up as over Gagetown in the summer. Never takes water on board until after reaching this point. In the spring it remains fresh a good deal farther down.

Sturgeon jump as well as salmon, but have a different movement. Sturgeon fishing was engaged in by several Americans some years ago, who caught and purchased of the natives large quantities. Have had 300 on board the Weston on a single trip.

We saw no drift floating on the water un-

l well up to Fredericton.

The low lands or intervales begin about lf way up the river to Fredericton.

A steam dredge was at work in a shoal lled "Middle Ground", just below Grimrose Island. here is 8 ft. of water on it. Consists of gravel, c., but no sawdust.

On Oromocto shoal not over 9 or 10 feet f water. Has been dredged and made deeper, but eeps filling in. Consists entirely of fine sand Dingee). The captain said the engineers told him hat in recent dredging they had found some sawdust nd edgings.

Alewives very common all through this iver. Knows of them as far up as Sprinhill. Some re even caught through the ice in winter with pick- erel. Pickerel fishing is the largest one on the iver, and will soon begin. Sturgeon used to be very common, now much reduced in numbers, and there has been no fishing for them of late years. Cause of decrease overfishing; seem to have been more abundant past season than for some years. Alewives spawn on hard bottom through a large part of the iver. Doesn't know but that they may also spawn

the meadows amongst the grass, etc.

The spring drift of cedar was apparent
ll along the banks of the river, and piled up on
e farms in the intervale, but the river itself is
y clear now of this stuff. Many loose logs on
e shore down to about Sheffield Academy. They
ll be picked up later.

Oromocto bar is located along side of
annel just above Oromocto shoal. It is under wa-
r during high water, but was out when we passed.
y be covered by a day's rain up stream. It con-
ists of fine sand, with cross ridges like the shoal.

A great abundance of loose logs and cedar
rift onthe shores about Oromocto and thence up to
redericton. The rafting ground(from below) be-
ins below Oromocto and Wilmot's Landing at Bel-
ont, and continues up here about $2\frac{1}{2}$ miles. There
re other rafting places further up.

On this river the logs are rafted instea d
f being sent down loose as in the St. Croix. The
afts are towed by steamers.

Mr. Dingee says that there is a good deal
f shoal water now compared with former times.
oesn't know whether due to sand or sawdust. Shoals

occur in the middle of the river, reaching up and down stream. This is up towards Fredericton. There is no trouble in passing between them, if nothing is in the way, but otherwise have to wait until obstruction has passed. Some of the old channels here they used to go are now filled up.

Oromocto shoals have been in the river since he can remember, and they have always been dredging in them.

There has been much filling up of the river on the east side of the river opposite Fredericton lower mills, and they now have to keep nearer west side.

As we neared Fredericton we encountered large numbers of loose logs, which were drifting down from the upper booms. They drift crosswise of the channel, and the the steamer has much difficulty in avoiding them. This is constantly going on.

MISCELLANEOUS AT FREDERICTON.

The dredging work on Oromocto Shoal, and elsewhere in the St. John River, has been done under the Canadian Government, and reports made to Ottawa. The character of the shoals can best be learned from this source.

Get a set of the Admiralty charts of the St. John River, which should extend to the upper limit of tide water. The survey is an old one, and was made by Admiral Owen.

MARYSVILLE, ON THE NASHWACK RIVER, NEAR FREDERICTON, N. B.

Aug. 31, 1893.

Spent most of this day at Marysville. The sketch on the preceding page shows the general positions of the mills, dam, etc., but is roughly drawn, and to no scale.

The dam extends completely across, except where the sluice passes down to the gang mills. It has gates for the passage of logs, but no fishway. On this day the height from the surface of the water below to the top of the dam, over which a slight film of water was flowing in places, was 10 to 12 ft. Could not tell what it would be in time of freshet.

The saw mills are on one side of the river, the cotton mill on the other.

Beginning above comes a shingle mill, which is very modern. Everything is burnt together here in the furnace, and to let it go would be to clog up their own sluice below and incommode the gang mills. This is a steam mill.

There are two water gang mills next below,

awing boards and deals. The larger one is situated
n the edge of an island, the smaller one on the
iver bank. All the sawdust from these mills goes
nto the water, together with the cut lumber, which
asses down stream afloat, to be loaded at the mouth
f the river. The edgings, slabs, etc. are taken
y a tramway to the lath mill below, except such as
re unfit for cutting, which are carted over to the
otton mill, to be used as fuel. The lath mill is
bout 1/8 mile below.

It takes all the suitable edgings and
labs from the gang mills and cuts them intolaths,
sing no fresh lumber for that purpose. This is a
team mill. The sawdust is wheeled out in barrows
n to the edge of the river bank, and there dropped
ver todrift down with the current. Much bark and
naller refuse goes with the sawdust, the remainder
s burnt in an open dump below. The larger refuse
s used in the furnace for making steam, beingta-
en there in hand cars on a tramway. This larger
efuse, the surplus, is teamed to the cotton mill.

From the cotton mill, all liquid refuse
oes into the river. The question is, does any of
his refuse affect the St. John River, as we have
othing to do with the Nashwack alone?

There is a steady stream of sawdust and ut lumber from the gang saws. The latter are ickedup at the mouth of the river. How far down oes the sawdust go? The dam gates were shut to- ay, but some cedar drift must come through them at imes from the few mills up stream. Much in the ay of edgings and bark lies everywhere along the ank by the mills, andlarge quantities of this tuff must go down in the spring or fall freshets. he bank of sawdust by the edge of thelath mill is ery large, and must mostly wash away every spring.

It is not probable that the Cotton Mill rainage has any effect at the mouth of the Nash- ack.

The height of the saw floor in the large gang mill above the lower floor seems to be great nough to allow them to put in some apparatus for disposing of the sawdust. There are no saws on the lower floor.

At the cotton mill, which sells to the Canadian Consolidated Co., they are now making only flanneletts. Use mostly aniline dyes; very little indigo. Do no bleaching. They are now running full blast, and employing 500 hands. A stream of

resh water runs through the mill in one large rain, which take all the sewage. We went to lower nd of drain on bank of river. Not much of a stream as flowing in. The water was discolored only a undred feet or so down, and close to the shore.

There are trout above the dam, but they ould not tell us how far down they went.

Mr. Pugh, lumber surveyor, a very old man, ho has been here many years, said that the first aw mill was built here in 1826. It had a small ing dam. The present dam was built in 1835-'36, nd the present gang mill in 1837-'38. According to radition, this used to be a great salmon stream, nd he remembers salmon being abundant below the ill in his time. It is still a trout stream in ts upper part, but there are no fish in the lower art. Only common fish there.

The mill of Stanley has a rotary and hingle machine. It is a water mill. A great deal of cedar drift comes down from it.

Sanson has another mill on Cross Creek, ix miles from Stanley. There is another small ill belonging to Aaron Hay.

The shingle mill cuts 20,000,000 shingles early. Every bit of refuse is burnt, being brought in on a single chain. In this mill the bark is first cut off by a special machine. The bark goes into furnace. Have ten shingle machines. Only run in the summer, and the same is true of the other mills here. The burning arrangements are very complete here and altogether. They have no trouble from the cedar drift coming from above.

The lath mill has three lath machines and three cross-cut saws. Make 14,500,000 laths a season. Do not burn any sawdust. All put on bank of river. Coarse refuse burnt in furnace here, and surplus taken to Cotton Mill. Bark and refuse picked up on floor, not good for anything else; is burnt in an open dump lower down stream. The stuff carried to cotton mill consists largely of edgings, which are tied up in bundles; also larger stuff not suited for laths.

Had at this mill a good opportunity to obtain figures bearing upon the amount of sawdust made in cutting laths. The chain belt delivers the sawdust in large wheelbarrows on the lower floor, which are wheeled out by hand. The sawdust from

l three machines comes here.

One barrow was filled in $1^{3}/4$ minutes; ive barrows in nine minutes. Cut 120 to 125,000 ths a day, of 10 hours. There are about 10 bush- ls to a barrow. Work about $6^{1}/2$ months of the ar, the same as the gang mills, on which they de- end for stock.

Two men are wheeling sawdust all the time. ix men are taking care of the larger rubbish all he time, two under each lath machine. Three or our teams are employed to haul stuff to cotton ill.

There is one gang in the smaller mill, nd four gangs in the larger.

ST. CROIX RIVER, CALAIS REGION.

AUGUST 1893.

Additional inquiries to be made.

Some of the fishermen were not seen, but hey are a hard lot.

The chief dyer of the Cotton Mill was to rnish us some additional facts.

Mr. George A. Boardman can give us much istorical information respecting saw mills.

Benj. French, father of the fish warden, lbert French, can give much information regarding istory of fisheries. Lives in Calais, near Union ills.

Charles Pond, Princeton, has been fish nd game warden. A very reliable man.

Louis Wilson.

Mrs. F. A. Pike, Plainfield, N. J., or are C. Hart Smith, #1409 Eutaw Place, Baltimore, as material collected by her husband relative to he history of Calais. Mr. Pike had intended to repare such an account. Mrs. Pike will probably e with Mrs. Lee Porter, in Washington, sometime he coming winter.

Look up reports on Agriculture and Geolo-

y of Maine, and publications of Maine Historical ociety.

Capt. Jas. Worcester, Steam Tug.

" Wm. Coleman, " "

Roach, Engineer, Rose Standish, Lives in astport.

The cotton mill at Milltown, N. B., be-ongs in the Canadian Colored Cotton Co. Limited, nd is called St. Croix Cotton Mill.

Navigation close at the Calais-St. Stephan ridge, and that subject needs to be considered nly below that point.

THE QUESTIONS PUT TO THE FISHERMEN

Were about as follows:-

What fish are taken(in different sections f the river)?

What is the character of the fishery?

What is the extent?

Can they give any definite figures as to he catch for this and previous years?

Especially as to salmon?

What has been the history of the fishery?

What has been the decline?

To what is the decline due; over-fishing, awdust, etc.?

Has there been an improvement lately?

To what is it due?

What is the extent of the increase?

When do the salmon run up stream?

When do they come down?

Where do they go to spawn?

Where and when do the young appear, their sizes, etc.?

Alewives, same.

Shad, same.

QUESTIONS--COTTON MILL, MILLTOWN, N. B.

What do dye stuffs consist of?

What quantities of each are discharged daily?

Could waste dyes be kept separate from other wastes, and be emptied separately?

Bleaching material, same.

Oil or grease.

Is strength of dyes, etc. much reduced before going into waste?

Cannot these wastes be kept away from the river?

What is their opinion as to the effects of these wastes upon the river?

Size of drain.

Length of drain.

Number of vats used.

Size and capacity of vats.

Number of vats and of gallons emptied daily.

How often are vats emptied?

How about cutch and bags holding same, which are said to be allowed to go into drain?

What is cutch?

How much bleaching is done?

What material is used for this purpose?

How is the waste disposed of?

What is the consistency of waste of all kinds let into drain?

What is the white waste at lower end of mill?

JOHN MILLER, JR., CALAIS FISHERMAN.

ADDITIONAL STATEMENT.

August, 1893.

Has been accustomed to setting his gill nets attached to the pier of the Calais-St. Stephen bridge, sometimes below, at other above, according as the tide ebbed or flowed. The net is about 90 feet long and would trend in the wake of the pier. A large part of the net would lie on the bottom, especially as the tide was low(the law prescribes the maximum depth of water), and the drift would come down so thick, and settle upon the net to such an extent, as to give him much trouble to clear it. The drift would mesh in the net and weight it down, so that the salmon could pass over it. The net would be torn, and at times it has been so completely buried that he has been obliged to abandon it. Very often impossible to haul it. This trouble has happened as late as the past spring. Bark has given the most trouble, but edgings interfere also, and sawdust helps to bury net.