

APPENDIX No. 2
TO THE
REPORT OF THE COMMISSIONER OF FISHERIES

REPORT
— ON —
FISH-BREEDING

IN THE
DOMINION OF CANADA,

1877.

Printed by Order of Parliament.

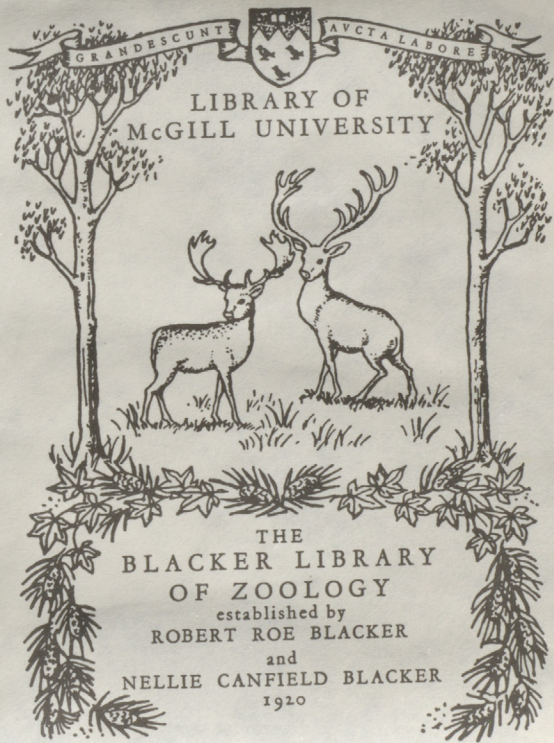


OTTAWA:
PRINTED BY MACLEAN, ROGER & CO., WELLINGTON STREET.
1878.

McGill University Libraries



3 101 164 152 7



APPENDIX No. 2
TO THE
REPORT OF THE COMMISSIONER OF FISHERIES

REPORT
— ON —
FISH-BREEDING

IN THE
DOMINION OF CANADA,

1877.

Printed by Order of Parliament.



OTTAWA:
PRINTED BY MACLEAN, ROGER & CO., WELLINGTON STREET.
1878.

AGB2735

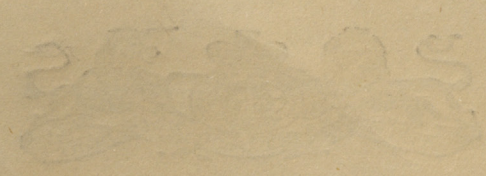
U.S. DEPARTMENT OF AGRICULTURE
BUREAU OF FISHERIES

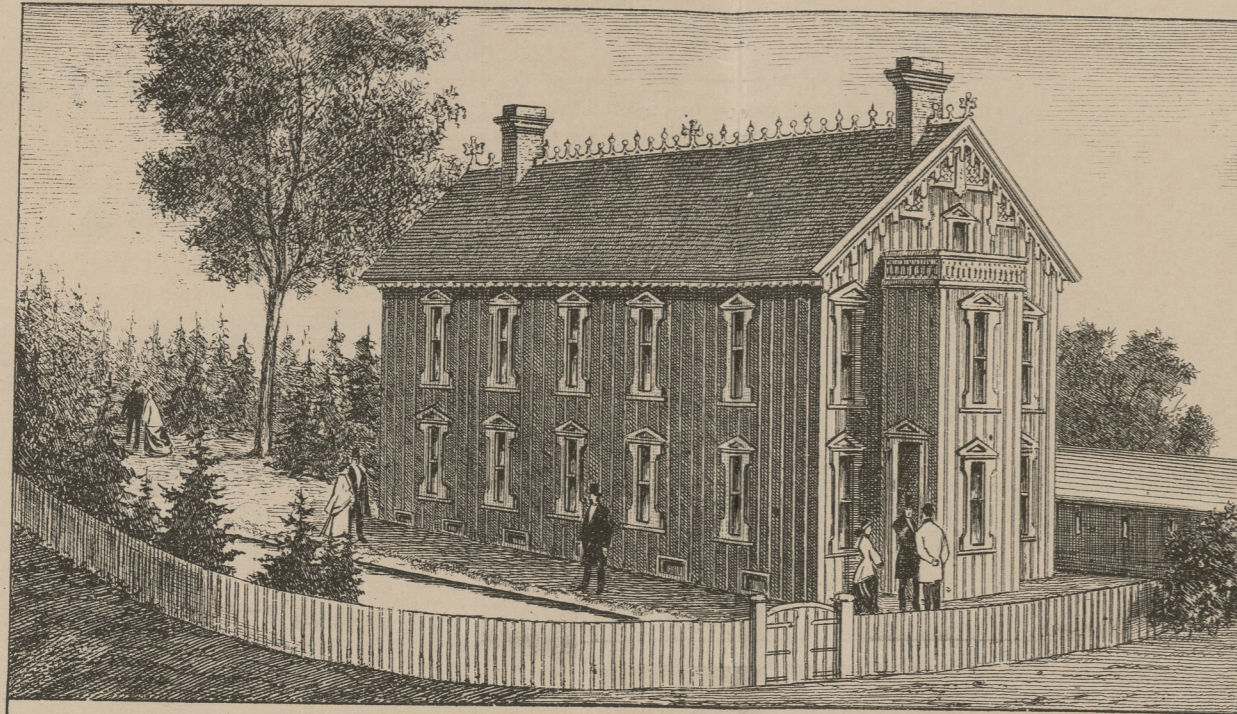
REPORT OF THE
COMMISSIONER OF FISHERIES
ON THE
FISH-BREEDING

6w
SH37
R47
1878

1877.

Office of the Commissioner of Fisheries
Washington, D.C.

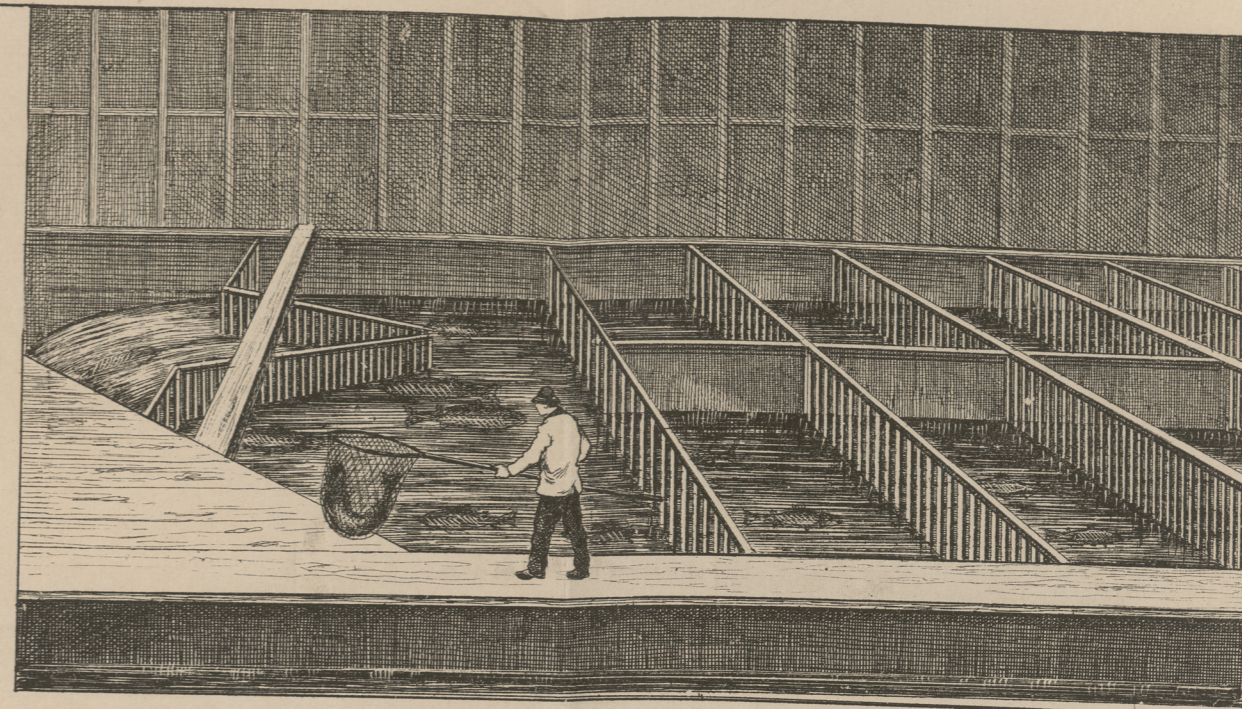




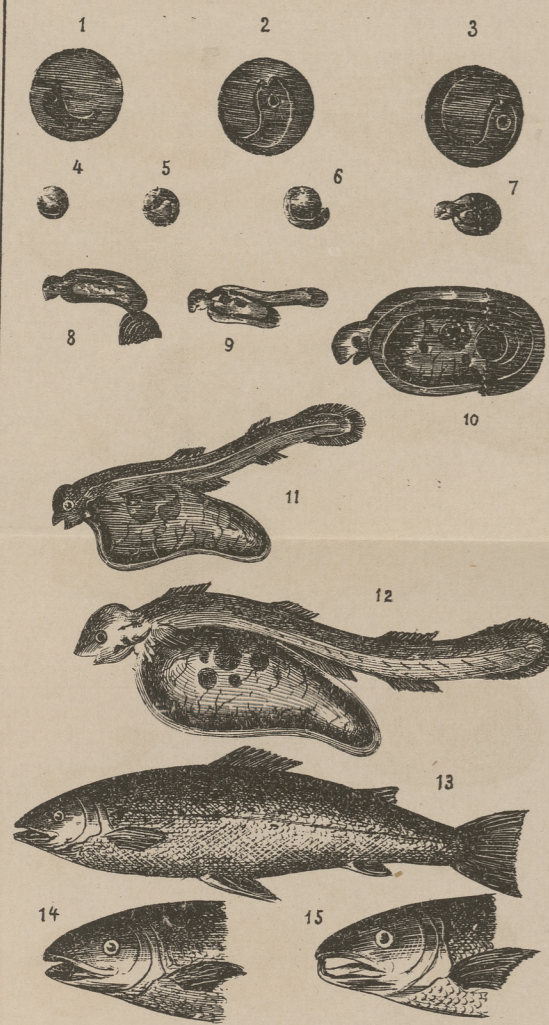
9. OUTSIDE VIEW OF BREEDING-HOUSE.



8. MUSEUM.



3. RECEPTION-HOUSE, PENS, TRAPS, &c.



11. DIFFERENT STAGES OF THE EGGS DURING THE PROGRESS OF HATCHING.



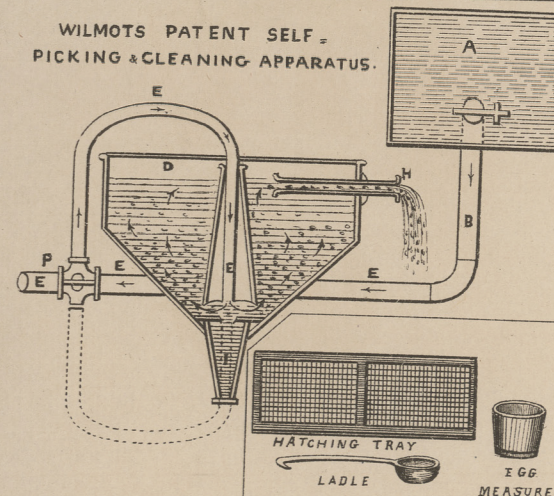
1. BIRD'S-EYE VIEW.



2. GROUND PLAN.

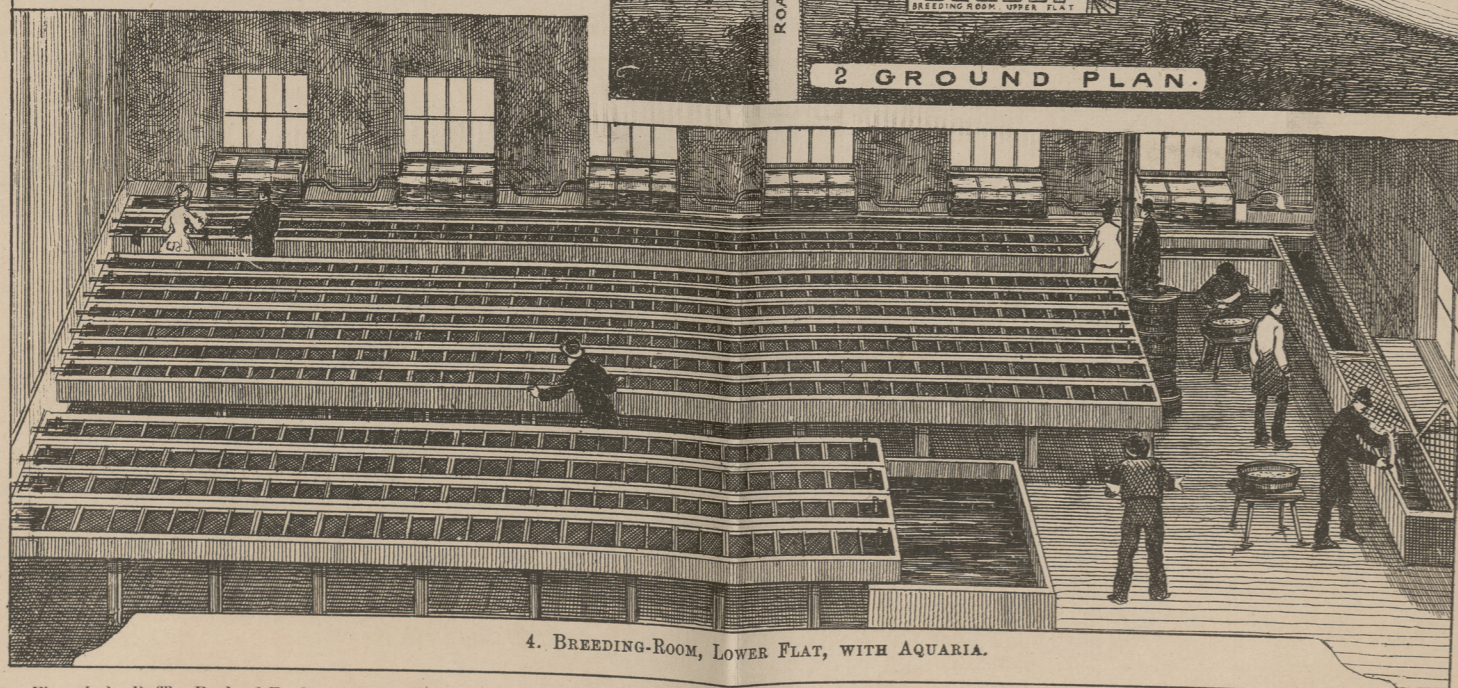


5. TAKING OVA FROM FISH AND IMPREGNATING THEM.



WILMOTS PATENT SELF-PICKING & CLEANING APPARATUS.

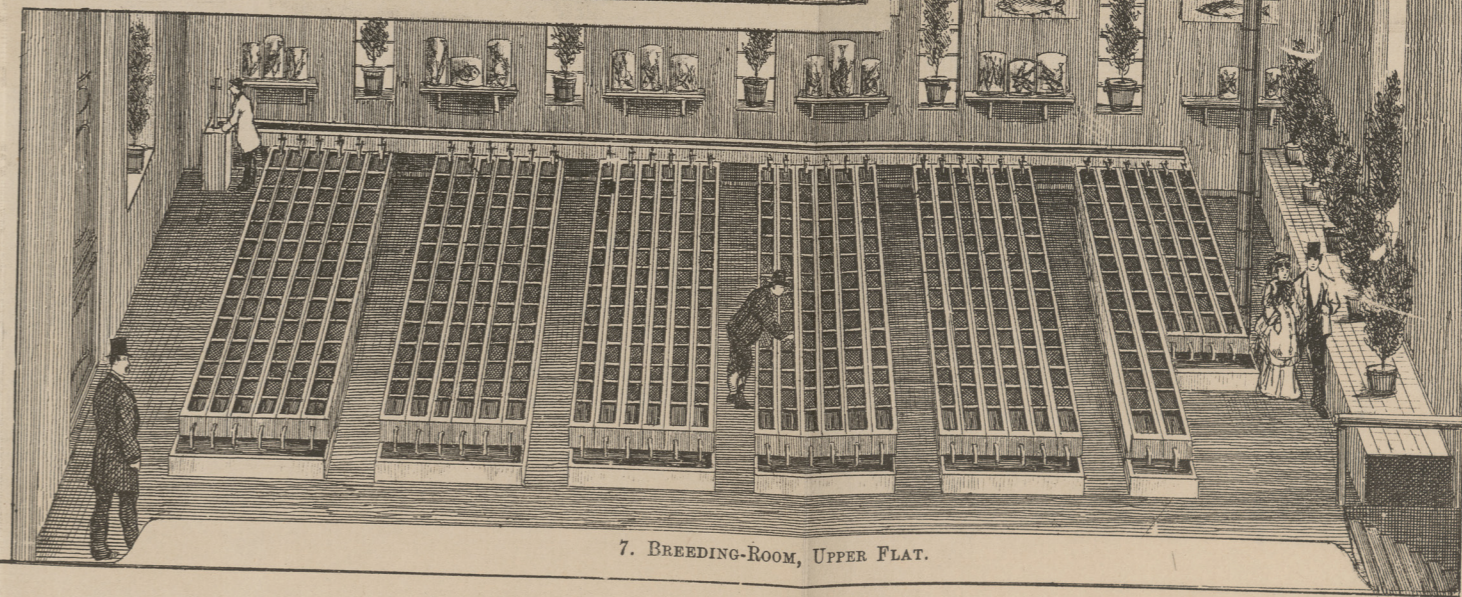
6. HATCHING APPARATUS.



4. BREEDING-ROOM, LOWER FLAT, WITH AQUARIA.



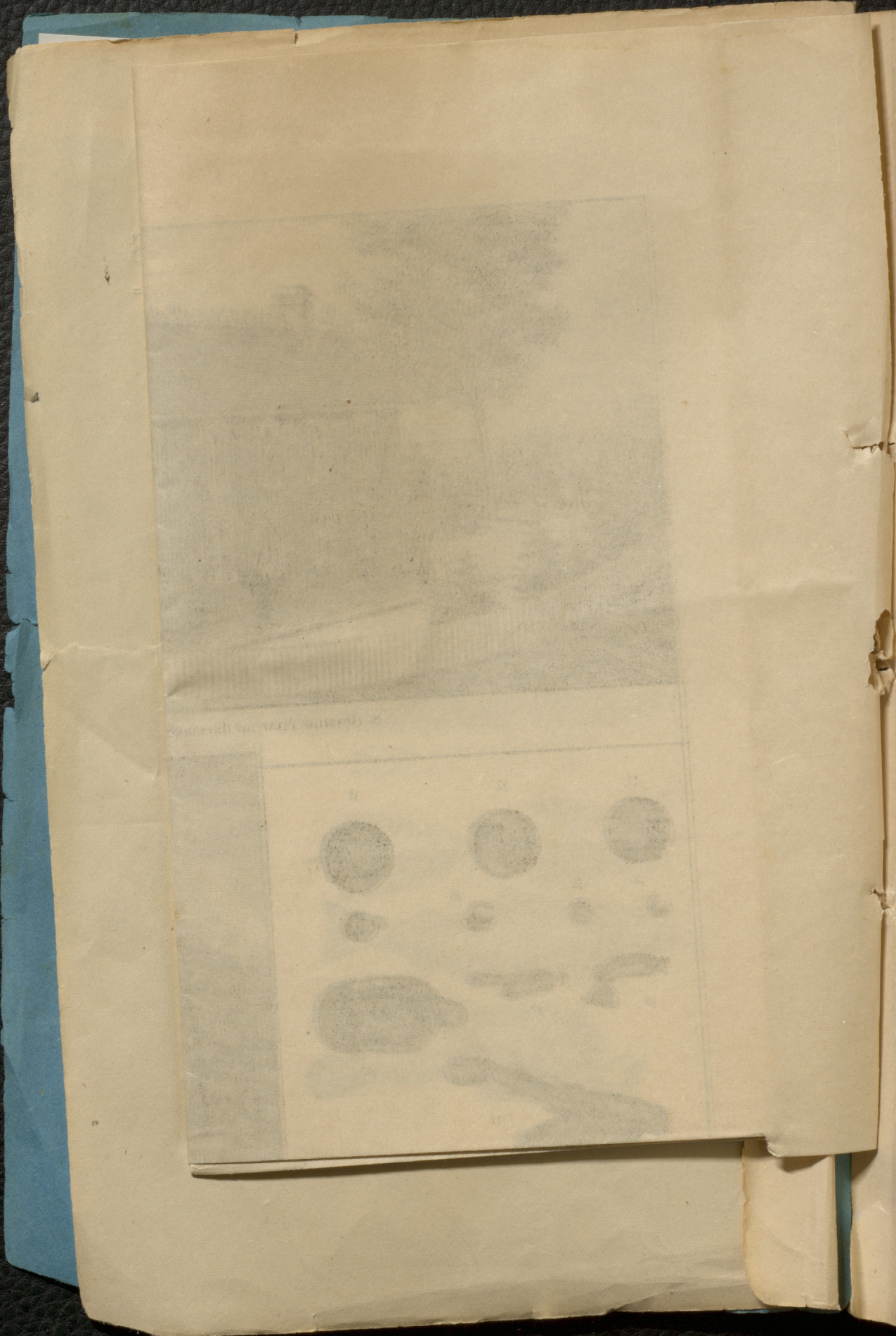
10. POND FOR RETAINING FISH AFTER MANIPULATION.



7. BREEDING-ROOM, UPPER FLAT.

Photo. Litho. By The Burland-Desbarats Litho. Co. Montreal.

DOMINION FISH-HATCHERY AT NEWCASTLE, ONT.



FISH-BREEDING.

REPORT

OF

SAMUEL WILMOT, Esquire,

ON THE

Several Fish-Breeding Establishments and Fish-Culture in
Canada, during the Season of 1877.

NEWCASTLE, Ontario, 31st December, 1877.

To the Hon. A. J. SMITH,
Minister of Marine and Fisheries,
Ottawa.

SIR,—I beg to forward to you my Annual Report in connection with the subject of artificial fish-culture as carried on in the Dominion of Canada, under my superintendence and the general control and management of your Department.

The operations during the past year, or season of 1877, have been quite in advance of all former years, both as regards the numbers of young fry that were reared and distributed throughout many sections of the country, and the increased quantities of fish eggs which have been laid down in the several fish-nurseries of the Dominion.

In the report a brief sketch of the transactions at each of the fish-breeding establishments will be given. Appended will also be found, as a more ready means of information, a tabulated statement shewing in detail the numbers of ova laid down, and of fry hatched out in each of the nurseries.

Appended hereto will also be found the reports of the several officers and caretakers, in which the minor details in connection with each establishment will be more fully related.

During last summer, I made my usual annual inspection of the several fish-breeding institutions in the Dominion, now seven in number, in order to obtain a personal knowledge of the exact position they were in, and to increase their general efficiency by the application of improved apparatus; and to give to the several officers in charge such general information in relation to the improved methods of artificial propagation as might be considered best suited to the circumstances of each institution.

 REMARKS ON THE SEVERAL FISH-BREEDING ESTABLISHMENTS, IN
 THE DOMINION OF CANADA.

 PROVINCE OF QUEBEC.

TADOUSSAC FISH-BREEDING ESTABLISHMENT.

Here, under the careful management of Mr. Radford, I found every thing in connection with the works in a very satisfactory state; general order prevailed throughout the whole of the institution and the premises connected with it. The requisite supply of parent salmon (280 in number) had been procured, and were disporting themselves in the pond to the delight and satisfaction of every one. They were all large, strong and healthy, and showed no signs of sickness or discomfort from being confined within the circumscribed limits of the small enclosure. The pond or cove which contains them is immediately alongside the hatching-house, and into it the tide ebbs and flows from the sea. This fine collection of fish, together with the imposing salmon nursery at Tadoussac, though situated in a remote section of the Dominion, has, nevertheless, through the numerous tourists who annually visit there, been the means of giving wide spread notoriety to Canada and the United States of the science and practice of the artificial breeding of fish.

The improvements ordered last year had been completed at the time of which I speak, and the various tanks, troughs and other arrangements were very perfect on both floors, both for the utilization of space and for the convenience of labour. Although the building seemed large when first procured, nearly all of its available space was taken up in accommodating the stock of ova obtained during the fall of 1876; and the indications were that the whole area of both floors would be fully covered with eggs in the season of 1877. A new and more perfect dam was in progress of construction across the small stream leading from the little lake, on the mountain side, to the hatchery; this was necessary to prevent any mishap that might occur from breakage, as the old structure had become very much decayed. The upper or fresh water reception pond, together with dams, sluices and dalls, were all in good order. Reference was made last year to the laying down of several thousand California salmon eggs at Tadoussac. These were hatched out most successfully, and the young Pacific salmon were transported safely to the water of the Escoumains River, twenty miles below the Saguenay. This experiment of introducing the Sacramento salmon of the Pacific into the waters of the Atlantic, as a matter of physiology, possesses much interest, and will, no doubt, result in the taking of some of the adult fish in that river during the seasons of 1879 or 1880.

The crop of fry produced at the Tadousac Hatchery last spring was greater than had been anticipated. Mr. Radford reports upward of a million having been planted in several important rivers on the north and south shores of the St. Lawrence.

The following list is given:—

River du Sud, south shore.....	150,000
River Ouelle, south shore.....	150,000
River Du Loup, south shore.....	60,000
Malbaie River, north shore.....	60,000
River AMars, north shore.....	200,000
St. Jean River, north shore.....	200,000
Petit Saguenay River, north shore..	60,000
Ste. Marguerite River, north shore.....	300,000

Shewing a total of.....1,180,000

Some difficulty was experienced in the transportation of this large number of fish, particularly to the points most distant from the breeding establishment, and I desire to suggest a remedy to prevent a recurrence of the slow and dangerous method

adopted in the use of small boats for carrying the fry; this is to employ a small steam tug to perform the work. I am convinced that it would be found to be more speedy, safe, and much more economical. It was the beginning of July last year before all the young fish were got rid of from the Hatchery. At this late season, the weather and the water becoming dangerously warm, losses in transporting them necessarily follow. A small convenient steam tug would perform the whole work of distribution in a few days and without endangering loss, whilst to accomplish the same with small boats takes a month or more, and is always attended with a certainty of more or less death amongst the fry.

The experiment twice alluded to in former reports, of keeping the salmon in the salt water cove until ripe for manipulation, has proved to be not only more healthy for the parent fish during confinement, but has also proved conclusively the fact that their eggs mature equally as well in the salt as in the fresh water, and no difference whatever is noticeable either in the impregnation of the ova, or in the embryonic organism afterwards.

From the 240 parent salmon that were put in the retaining pond, 1,340,000 eggs were laid upon the hatching troughs. These ova, being distributed at the rate of 4,000 on each tray, would more than cover the surface area of the two floors of the building, causing a portion of the troughs to have a double tier of trays. If a second tier were put down throughout, 2,000,000 eggs could be closely accommodated. This would be the utmost capacity that the present arrangements of the building would safely warrant.

It was proposed to send a number of the eggs of the white fish to this establishment, to be hatched out and placed in some of the large interior lakes of that region. But it was unfortunately found that on account of the early closing of the navigation on the Saguenay this could not be done, as the white fish ova were not procurable till nearly the middle of November. A similar difficulty exists with regard to the taking of fry there in the spring, navigation not opening till June, and the white fish are generally hatched out and distributed as early as March and April.

From the many reports received from Mr. Radford, the present large supply of ova are doing remarkably well, and are further advanced than at any similar period in former years; this is caused by the unusually mild winter.

GASPÉ FISH-BREEDING ESTABLISHMENT.

I found this institution in a much more satisfactory condition than it was the year previous, and I also found the officer in charge and the care-taker extremely anxious and willing to exert themselves in making this nursery as complete as all the circumstances in connection with it would possibly warrant. Having taken an inventory of all the appliances in the establishment in like manner as was done at all the others, and after giving instructions concerning many details, I proceeded to examine the two reception ponds with their contents of breeding salmon that had already been placed there. From the unusually great drought which prevailed there last year, the supply of water in the small pond at the hatchery was much reduced, and a few of the early-caught fish had perished; those in it at the time of my visit (fifteen in number) were, however, in a healthy and fresh condition and continued so the remainder of the season. This pond is quite too small. A trifling expenditure would increase its area and depth two-fold. The work could be almost wholly performed by Mr. Davis, the care-taker, in his leisure hours during the year. The pond No. 2, which was particularly described in my report of last year, possesses much more convenience for keeping a large quantity of parent fish than the one I have just alluded to. There were in it at the time of my visit fifty-five salmon, most of which were quite clean and healthy. There were, however, a few remarkable exceptions—these were scarred and wounded by the meshes of the nets in which they had become entangled at the time of their capture. A perfect whitish band encircled the body; some of these bands were very narrow, others from one to two inches wide; some were just back of the gills, others near to the large dorsal fin. The wounds at the time of which I speak had become perfectly

healed, showing no signs of byssus or any other fungoid growth, and the fish seemed quite lively and healthy. Great difficulty is experienced every year in procuring a stock of breeding fish for this Hatchery, as the fly-fishing lessees of the rivers entering the basin are unwilling to allow salmon to be taken.

This has been a great disappointment, as at the time of establishing the hatchery at Gaspé I was under the impression that the Dartmouth could be made use of for procuring the necessary supply, and I cannot too strongly urge upon the Government the absolute necessity of having this river set apart for the use of the establishment; and as the lease is about expiring, it could now be secured.

To the officers who accompanied me up the Dartmouth River, I pointed out some improvements with a view to greater safety and strength of the weirs forming the salmon pen. This having been attended to, the enclosure is now a most perfect, safe, and healthy repository for keeping the salmon in.

This pond has a large supply of cold, limpid water, is overhung with shrubs and trees, and is easy of access by means of boat or scow to the Dartmouth River, which is but a short distance off, and it forms a safe retreat for the fish until they become ripe for spawning.

Upwards of one million of salmon fry were reared, in and distributed from, the Gaspé nursery last season. Mr. Vibert reports their destination as follows:—

Dartmouth River.....	550,000
St. John River.....	313,000
Mal Baie.....	108,000
Grand Pabos.....	80,000

making a grand total of 1,051,000 salmon planted in the most important rivers of that section of the Province of Quebec. Seven hundred and fifty thousand ova were placed in the hatching rills at Gaspé last fall. These were procured from 123 salmon, 70 of which were obtained from the nets on the Dartmouth River, and kept in the ponds of the establishment, and the remaining 53 were captured in the St. John River at the time of spawning.

The decrease in the total number of eggs from last year is accounted for by the refusal of the lessees, as above stated. These 750,000 ova, from latest reports, were looking well, and promised a large percentage of fry. In the Appendix will be found the details of operations at Gaspé, given by the officer in charge.

RESTIGOUCHE FISH BREEDING ESTABLISHMENT.

The breeding-house here being the first institution of the kind that was built in the Lower Provinces, has become somewhat dilapidated. It was put up in a much ruder state than those which have been erected since. It was constructed of flatted cedar timbers roughly put together and placed alongside a high bank—one side of which was excavated for this purpose—the object being at that time to obtain as much shelter from cold as possible in that inclement section of the country. The action of the frost and the outward inclination of the steep bank, has thrown one side of the building off the perpendicular. To avoid further pressure, stays or braces are used which destroy the arrangements and convenience of the breeding-room inside, and also take up much space which is now absolutely needed for the necessary accommodation of the increased numbers of ova which are being procured at that place. It would be useless to add much expense to the present building; but in view of the extensive and important salmon fisheries at the head of the Bay des Chaleurs, which obtain their supplies from the Restigouche, together with the large fisheries in the estuary of that river, it will be found necessary that an establishment possessing greater capacity and convenience should be erected there at an early date. The whole of the available space of the building for hatching purposes was occupied last autumn with eggs, and from the practical experience which Mr. Mowat, the officer in charge, has now obtained both in the procuring of parent salmon and in the care of the eggs and distribution of fry, it is important that this knowledge should be fully utilized in procuring largely increased supplies of young

salmon from this valuable stand-point, thereby augmenting the very extensive and almost unlimited tidal fisheries below. I would therefore suggest to your Department the propriety of taking into consideration the importance of carrying out these views in the erection of more extensive and convenient works on the Restigouche River.

At the time of my visit to this river last summer, a very eligible site was chosen for a receiving pond for the safe keeping of parent salmon until they become mature for spawning in the autumn. The spot selected was at the famous Indian House Pool, where a very cold stream of pure water enters the main river. At this point Mr. Mowat was instructed by your Department to erect a dam and form a commodious pond for the purpose above mentioned. The work, as reported by that officer, has been performed, but was not available for last season's operation, as the salmon had passed up river before the nets were procured for capturing the fish. Mr. Mowat reports that with some small repairs the structure will be in readiness for the coming season's work.

From the Restigouche establishment last season, 600,000 salmon fry were produced and distributed in several of the neighbouring rivers, and the total number turned out from that institution has been 1,820,000. The following rivers have obtained their quota of this distribution, namely the Metapediae, Upsalquitch, Jacquet, Nouvelle, Little River and the main Restigouche.

The quantity of ova secured and put on the hatching trays last autumn, amounted to 1,204,000; of this number 200,000 were sent to the Miramichi Nursery. From the latest accounts received from the Restigouche, a very trifling percentage of the ova have died, and the pleasing prospects are reported that the yield of fry there next spring will be most satisfactory. In the Appendix will be found a Report in detail by the officer in charge of the Restigouche establishment.

PROVINCE OF NOVA SCOTIA.

BEDFORD BASIN FISH-BREEDING ESTABLISHMENTS.

This salmon hatchery was, upon inspection, found to be in first-class working order; the apparatus of every description was in good condition, and the building itself was cleanly and orderly throughout. Some improvements and alterations in the breeding rooms were ordered, by which the space would be increased for laying down more eggs the coming autumn. The appliances introduced here from the first were of a superior kind to those used at the older constructed establishments, and the knowledge gained from experience at the other hatcheries was applied in the building and getting up of this one.

In this salmon nursery, perforated earthenware trays are principally used for the laying down of the eggs and hatching out of the fry; they are more cumbrous and not so easily handled as the more lightly constructed perforated zinc and wire cloth ones used at the other establishments. These earthen trays were introduced by the officer in charge to overcome, as was alleged by him, the injurious effects from some chemical action of sedimentary matter in the water upon the metal tray. The earthen trays, however, are not found to be any more successful in the hatching of the fry at Bedford than the metal ones have proved to be at all of the other establishments. Filters filled with small gravel are also used here, through which the water is made to percolate before flowing through the breeding-troughs. This means of cleansing the water from sediment has not yet been adopted at any other places; should experience prove that the benefits derived from these filters are commensurately greater than their cost of construction and attendance, and taking into consideration the necessarily reduced flow of water which must pass through them, then it would be advisable to introduce them elsewhere. It is inexpedient to give additional intricacy or labour, or means of expense than is actually necessary in the working of these fish-breeding establishments.

The operations at the Bedford hatchery last year were very satisfactory. A million of fry were reared in it, and transported to more than thirty rivers of the Province of Nova Scotia

360,000	were put into the waters of Halifax County.
40,000	in Hants County.
40,000	in King's " "
165,000	in Cumberland " "
50,000	in Annapolis " "
130,000	in Colchester " "
170,000	in Pictou " "
20,000	in Lunenburg " "
20,000	in Guysboro' " "

Some losses and considerable difficulty were occasioned in carrying fry to very remote places from this establishment. This system of carrying, or rather trying to carry, young fry to distant points (particularly where no speedy means of travel as by railway is to be found) should be discontinued, because the time spent (almost invariably) in fruitless journeys of this kind could be so much better, and more profitably, applied at nearer points, where the safety of the young salmon in their carriage could be relied upon. The better way to achieve the object sought for would be to erect additional nurseries within such a radius of country as would insure safety in the transportation of the fry within its limits.

The success attending the collecting of ova for the Bedford nursery was extremely good; 1,650,000 eggs are reported to have been gathered; of these 200,000 were despatched to the Miramichi hatchery by orders from your Department. The balance, or 1,450,000, were put on the hatchery trays at Bedford. The latest reports concerning this very satisfactory supply of eggs were that the losses were trifling and that the embryo were distinctly noticeable in them.

Several improvements are asked for by the person in charge of this establishment, but the main one is a reception pond which is considered necessary for the safe-keeping of the parent salmon until they become mature for spawning. In my report of last year attention was drawn to this, with a recommendation for the construction of a reservoir just alongside the building, into which the salmon might be induced to enter from a fish-pass to be placed in the main river.

Previous to this season doubts existed as to whether any considerable number of salmon yet passed up the Sackville River. These fears have been overcome by the taking of several salmon last fall in a rudely constructed trap arranged at the dam just above the works. No positive knowledge is given of the number that ascended the river, but the officer is of the opinion that, with the necessary appliance for capturing and safely keeping them, a sufficient number might be procured in this way to stock the establishment with eggs, or to such an extent as to reduce very largely the expenditure now incurred in gathering the ova at the Musquodoboit and Philip Rivers, and at other distant points. It would be erroneous to conclude that a reservoir as stated above would be sufficient for the retaining of any large number of salmon for any length of time during the early part of the season, because the limited space where it would be necessary to construct it would not permit of the pond having sufficient area surface or depth to admit of all the freedom requisite for salmon to throw off fungoid growth or prevent the hardening of the ovaries which is invariably a consequence with the migratory fish when prevented from enjoying highly aerated water, or when enclosed in too limited bounds. But as it is found that the salmon do not enter the Sackville until they are just ready to deposit their eggs, the reservoir would not be as objectionable from the causes above mentioned; but, on the contrary, would be well adapted for the retention of these late spawning fish. A very satisfactory report of the operations at the Bedford Salmon Hatchery will be found in the Appendix hereto attached.

 PROVINCE OF NEW BRUNSWICK.

MIRAMICHI FISH-BREEDING ESTABLISHMENT.

This fish-breeding establishment was visited and inspected by me in the beginning of the month of August last by your special instructions. Upon a close examination of the buildings, ponds, apparatus and other appliances, all were found to be in good repair, and in good working condition. As difficulties and losses had taken place here during former years, I took special care to investigate closely everything in connection with the premises, with a view to putting the institution upon such a basis as would warrant success for the coming season. In order to secure this end, independent of my own knowledge and judgment, I consulted with Mr. Shasegreen the caretaker, to learn his views with regard to any changes or alterations he might deem necessary, and in his opinion no further improvements, except those of a very trivial nature, were actually required. Nevertheless, I instructed him to make arrangements for an additional plank to be placed at the upper dam to keep up the supply in the event of any lowering of the water taking place in the main stream; to rearrange the entrance to the conducting pipes in order to prevent the possibility of their choking up during winter; to stop any leakage that might be found where the underground pipes were formerly united; and to put such labour upon the dams as he deemed necessary to prevent the possibility of breakage. Other matters of detail in work were ordered to be done, such as varnishing the breeding trays and hatching troughs, and painting the floor of the large room.

Expecting, then, that the institution in all probability would be placed under my control for the approaching season, I took more than ordinary pains in shewing to Mr. Shasegreen the precise manner in which all work was to be done, and explaining the arrangements that were originally made for the convenience and easy accomplishment of it. The scow which had been fitted up expressly for the safe conveyance of the salmon from the river to the pond was minutely examined and the method of working it was fully explained. The use and adaptability of the large mill pond for the safe keeping of the parent fish was referred to particularly; and the express object for which the small reception house had been built with its weirs and pens was pointed out, as well as the plan to be adopted for driving a flood of water through it by letting off the upper dam, in order to entice the salmon to enter the house from the large pond below. Another method by which the mature salmon could be easily and safely captured without injury to them, was shown by which they could be netted when in the act of spawning on the short gravelly bottomed part of the stream between the reception house and the still quiet water of the large mill pond. (See plan attached.) Having given to Mr. Shasegreen every detail that was necessary for the perfect working of the nursery, and considering that his three years previous employment there would have also strengthened his own judgment in these matters, I proceeded up the Miramichi River in company with Overseer Hogan of Newcastle, with the object of selecting some desirable point in the river at the head of the tideway where a large seine, previously ordered, might be conveniently used for the capture of spawning fish during the following September and October. From there, salmon when taken, should be quickly conveyed in the scow referred to down the river to the large pond at the hatchery.

A point at the large bridge just at the confluence of the Little South West River and the Miramichi, was considered well adapted for netting the salmon, and no difficulty was apprehended by us in getting the requisite supply during the time when the "last run" of fish were usually known to pass up, either here or at the rapids a short distance above. Mr. Hogan's usual sagacity, added to his long and intimate practical knowledge of the river, and the experience he possessed in catching the fish in former years, together with my own personal experience in capturing a large number in the river in 1873, fully satisfied me that the accomplishment of this part of the work in connection with the approaching seasons' operation at the Miramichi nursery would be safe and easy.

Of the 610,000 ova that were said to have been laid down in the fall of 1876, only 320,000 fry were reported by Mr. Venning to have been hatched out and planted in the following rivers of the Province of New Brunswick:—

North-west Miramichi.....	50,000
South-west “	50,000
Little South west.....	50,000
Sevogle.....	20,000
Bartibog.	20,000
Burnt Church.....	20,000
Tabusintac.....	20,000
Napan	15,000
Black.....	15,000
Richibucto.....	10,000
Salmon	10,000
Canaan.....	10,000
Shediac	15,000
Hopewell	15,000
	320,000

The proportion of fry hatched from the number of eggs laid down was unusually small; the great percentage of loss being accounted for by the persons in charge stating that sedementary matter of an injurious nature settled upon the eggs and destroyed them. A special report concerning this loss, after an investigation made by me, was forwarded to your Department in July last.

A number of parent salmon was caught in September and October in the Miramichi River, sufficient to fill the nursery troughs with upwards of a million of eggs. These fish were taken under the management of Overseer Hogan, and were floated down the river principally in small crate-like boxes. Of the 374 salmon that were delivered at the breeding-house, ova were obtained from 76 females only, with an average of a trifle over 4,000 each, or a total of 310,000 eggs. The cause assigned by Mr. Shasegreen for this very small number of eggs in proportion to the large number of salmon captured, was that many of the fish *sickened and died* from the effects of a skin disease, or fungoid growth upon their bodies, and that the eggs in the bodies of many of the fish became so *hardened* that it was considered necessary to liberate them; and also, that a very large proportion of the fish were found to be *males*. Immediately upon being informed of the above loss, I proceeded to the Miramichi, and made an examination into the causes of the misfortunes, the particulars of which are given in my letter of 4th February, 1878, forwarded to your Department, treating specially upon this subject. In addition to the supply of eggs procured at Miramichi, a number were transferred, by order of your Department, from the Bedford and Restigouche nurseries, where large stocks had been obtained. From each of the latter 200,000 were removed, giving a grand total of 710,000 salmon eggs in the former establishment. These, from very frequent accounts received of late from Mr. Shasegreen, are, with few exceptions, in a very healthy and prosperous condition, and far advanced in their development.

A sketch or plan of the Miramichi grounds, with buildings and ponds, is here given.

REMARKS ON THE COMPARATIVE NUMBER OF OVA SUPPLIED BY FEMALE SALMON.

The following statement on comparative numbers of ova obtained from salmon to supply the several breeding establishments in the Maritime Provinces will be found interesting and instructive to persons engaged in fish culture. The figures are calculated from the returns sent in by the officers in charge of the several establishments and are as follows, namely:

Bedford Nursery, 180 females, averaged.....	9,170 eggs
Miramichi " 76 " "	4,080 "
Restigouche " 87 " "	23,840 "
Gaspé " 60 " "	12,500 "
Tadoussac " 125 " "	10,700 "

A few instances will be given also of the great fecundity of female salmon. Two were taken in the River Philip, in Nova Scotia, weighing each over thirty-five pounds, and giving respectively 20,000 and 25,000 eggs. Three females captured in the River Restigouche, in New Brunswick, yielded individually 25,000, 27,000 and 28,000 ova. An opinion has hitherto prevailed amongst writers on the nature of salmon with regard to the prolific powers of the females, that they yield a greater number of eggs than the facts would warrant. Statements published by them make one thousand eggs as the average for every pound weight of the parent fish; thus, a twenty-pound fish would give twenty thousand, a ten-pound salmon ten thousand, and so on. This quantity I have found, after repeated trials, to be nearly double the actual amount to be obtained. Having made this statement previously I now repeat it, and give the returns of ova taken at the several fish-breeding establishments as strong evidence in favour of my conclusions. The Bedford salmon, which gave 9,000 eggs each, would average, by the former calculation, only nine pounds in weight—this would not exceed one half their actual size. The Miramichi fish would be only four pounds, whilst, in point of fact, ten pounds would be about the average. The Restigouche salmon would be thirteen pounds, whereas the whole catch of the season would weigh twenty pounds. This will also apply to Gaspé and Tadoussac. It will thus be found that *five hundred eggs to a pound of flesh of the female* is about the true statement to count from. Exceptional cases from this rule will however be found with extra large salmon, such as those quoted from the Rivers Philip and Restigouche, where 35 and 37 pounds gave respectively 25,000 and 27,000 eggs

PROVINCE OF ONTARIO.

SANDWICH FISH-BREEDING ESTABLISHMENT.

This institution, being expressly built for the artificial breeding of the famous "*Coregonus Albus*" or white fish of America, from its location on the flat, level banks of the Detroit River, and absence from other power, is supplied with water by steam; and its arrangements and apparatus, for the hatching of these very small eggs, are of quite a different description from those used in the rearing of salmon and other fry at the other establishments. It was found absolutely necessary, in order to make the artificial rearing of white fish a success both commercially and economically, that immense numbers of the ova should be procured, and that, in the care and management of the millions of eggs requisite to give importance to the work, the labour, anxiety and expense which would necessarily be attendant upon the safety of a similar number of eggs of a larger description, would neither be satisfactory nor remunerative. It has therefore been my study for years past to overcome this serious obstacle in the artificial production of such large numbers of white fish as it would be desirable to raise.

This "Eldorado" in white fish culture has undoubtedly been found in the incubator invented and patented by myself, and now used on a very large scale at the Sandwich nursery. In my report to your Department last year I made mention of this invaluable instrument for hatching the eggs of this fish; but it had not then been so thoroughly and practically tried as it has during the present season. Its method of self-picking and cleansing the eggs is quite perfect, wholly doing away with the ordinary hatching tray or grill, and the labour of hand in picking, feathering, and washing the ova. The officer in charge reports that one man can conveniently take charge of *twenty millions of white fish eggs* by this new process, whereas, by the old method it would require *ten persons* to perform the same work, and even then without equal efficiency or safety to the eggs.

During last season I superintended the fitting up of one-half of the space in the Sandwich Hatchery with this new apparatus; the other half having the old method of hatching on trays, in operation, was not interfered with as time did not permit of it. However, with your sanction, it is my intention to have the entire space of this building fitted up with these new incubators previous to next season's operations.

With this improved system, it will be found that the capacity of the building for breeding purposes will be far more than doubled, and arrangements can be so perfected as to give hatching room for sixty or seventy millions of eggs. This immense quantity of ova could not, under the old methods of propagation, by any possibility be safely taken care of and handled during the more critical time of their hatching without a daily complement of at least twenty-five or thirty hands, whilst with the improved system the whole work can be very much more satisfactorily and perfectly done with the labour of about three intelligent men. This improved labour-saving incubator speaks volumes for itself, not only in the economy of room and labour, and consequent saving of expense, but it also effects for a certainty greater cleanliness and safety to the eggs by its own action of carrying off the bad ova with all the sediment and other impurities that may be contained in the water. A very great drawback to full success in the artificial propagation of whitefish on a very extensive scale has been the unavoidable losses and the killing of large quantities of ova while in the act of picking out the bad eggs from the good ones and in cleansing them from injurious sedimentary matter which is always found in large moveable bodies of water.

The Detroit River exemplifies this fact in relation to sedimentary deposits very strongly. Though to outward appearances it would indicate purity, it is, nevertheless, at times very largely filled with earthy and decomposed vegetable matter. This injurious fungoid-producing substance, being in the lakes above, and storm-stirred to the surface, is brought down by the strong current of the river in the most inconceivable quantities. These extremely minute spores permeate through every description of screen through which water will pass, and lodging upon the egg, when in a quiet state on the ordinary hatching tray, commences its insidious byssus-like growth which, unless quickly removed by the process (known in fish culture) of feathering and washing, soon grasps in its poisonous meshes the adjoining eggs and produces deadly havoc amongst them.

The fatal effects and noxious growth of fungi amongst the whitefish eggs is wholly overcome by the gentle but constant upward rolling action of the ova, caused by this improved fish incubator, which prevents the possibility of the accumulation of any matter upon their surface; but by the upward flow of water through the mass of ova in the apparatus, these spores, with all unsound eggs and other impurities, are carried off.

It is to be regretted that, through the selfishness and cupidity of the fishermen along the Detroit River, an invaluable fishery, formerly stored with incalculable wealth, should now have become, comparatively speaking, almost destroyed by the unnatural slaughter of immense numbers of breeding whitefish that frequented it. This result, disastrous as it is, not only to themselves but to the country at large, on account of the great commercial decrease in the traffic of this valuable fish, has been brought about wholly by excessive fishing during the period in which the whitefish are migrating up the river for the express purpose of spawning. The fatal consequences, now apparent by the very great falling off in numbers and in the hitherto prosperous traffic in this fish by this immoderate mode of fishing has, by a most solicitous effort on the part of your Department, been attempted to be arrested by the introduction of the artificial method of propagation in that section of the country. With the view of carrying out this object extensively, and thereby benefitting the fishermen in that locality particularly, and the inhabitants generally, a fish-breeding establishment, unequalled on this continent for its capacity and its appliances for the work, has been erected upon the Detroit River. Many millions of young fry have already been reared in this establishment, and at the present time a stock of twenty millions and upwards of vitalized eggs are in progress of hatching out. Yet, it is

lamentable in the extreme to be compelled to state that, with the prevalence of that selfishness and cupidity which almost brought about the annihilation of the fish in this river, it is with extreme difficulty that assistance or even permission can be obtained from some of these fishermen for procuring the requisite supply of ova for this institution, which was erected at a large public expense, and the benefits of which must of a necessity be more immediately and directly felt by these very fishermen themselves. Should this same avaricious and niggardly disposition be continued, and should no means be instituted by which this feeling can be thwarted and overcome, then it will be useless for your Department to continue the necessary public expenditure for the maintenance of an institution in a locality and for a people who, by their own acts, are showing themselves utterly unworthy of it.

If it be deemed necessary that the Sandwich Institution should be worked up to its full capacity during the next year, timely arrangements should be prepared by which fully sixty millions of whitefish eggs could be obtained. In order to secure this not unnecessary supply, a large number of parent fish will be required. From pretty accurate calculations, which have been made, it has been found that 500 ova are obtained from every ounce weight of the body of the female fish. Taking a low estimated average weight of a whitefish ova to be one and a half pounds or 24 ounces, the product will be 12,000 eggs. It will be found, at times, that twenty, and even thirty thousand eggs can be secured from one adult fish, yet the estimate of 12,000 should be taken, in order to cover all emergencies. Taking this calculation as data, 5,000 females and a corresponding number of males, in all 10,000 parent fish, would be necessary to stock with certainty the Sandwich nursery.

Now it is just as well that the vital importance of this work to the fishermen and to the country at large should be clearly understood—the natural qualities of these 10,000 spawning fish, unless utilized by the artificial process, would be wholly lost, as the eggs from these fish (which latter are taken to the markets of the country for consumption) are, in the process of preparing the fish for culinary purposes, cast away, whilst by the process of fish-culture referred to, they can be utilized by the method of artificial impregnation, and be made to produce at least forty millions of living fry to be turned out to replenish the same waters which Providence first intended should be the case.

The fry thus artificially produced, when turned into the river, are carried down by the current to the broad expanse of the lake, where they find food congenial to their nature, and in process of time (about three years) become adult fish and are instinctively compelled to seek the same spawning grounds for re-production, where the parent fish from which they were taken had previously resorted to. Is it not then self-convincing to every intelligent mind, that the system of artificial propagation is not only reasonably feasible, but is also attended with great local and national importance, and that it also forms a practical subsidy for upholding a source of wealth. But, by the greed and avarice of the fishermen, the waters of that section of the country have almost been depleted of a valuable source of food and commerce.

This selfishness is shewn to such an extent that these fishermen, notwithstanding the benefits which are so clearly to be derived by them by the artificial cultivation of the whitefish, actually deny the liberty or the right of taking the ova for this object from the fish which are netted by them, and under the many pretexts which they make, they not only throw obstacles in the way of, but also prevent the employés of the breeding establishment from obtaining ova within a short distance of the works, thereby compelling them to make long, expensive, and very often fruitless, journeys to purchase supplies. On account of these difficulties and drawbacks, this hatchery has never yet been supplied with its necessary quota of ova; but now, with the improvements and labour-saving facilities for more extensive operations, the inconsistency of the fishermen will be even more severely felt.

In conversation with one of the principal fishermen, and one who is also a large dealer in the fish trade at Sandwich, I learned that the probable catch of whitefish on the Canadian side of the Detroit River, during last fall, would be about 170,000.

They were caught in the following places, namely:—

Bois Blanc Island.....	20,000
Turkey “	10,000
Fighting “	80,000
Peach “	14,000
Petite Côte Fishery.....	46,000
	170,000

Assuming that one-half of these (85,000) would be females, and that each fish would yield the very low average of 10,000 eggs the result would be that 850,000,000 of ova were totally lost to the river for re-productive purposes. This very large drain upon the natural supply of whitefish eggs, has been going on (only upon a much more extended scale) for a great number of years, and this has brought about the wonderfully great falling off in the number of whitefish at the present time.

As the number of breeding fish have become so very much lessened, and the nets and other engines for their destruction have become more numerous, and greatly improved,—add to this the increased desire amongst the fishermen to capture them in order to secure the highest prices in the markets (which these fish from their scarcity now bring), we must feel convinced that, ere long, the whitefish will be wholly exterminated from the Detroit River, and will soon be considered only as a luxury of the past, unless there be some compulsory measures instituted by which a certain portion of the ova contained in them might be saved; some regulations by which the fishermen themselves should be compelled (or be made to assist others) to gather such quantities of ripe ova as could be obtained from the parent fish, immediately when taken from the nets, and before they are forwarded to the markets.

It must be held that it is very necessary to preserve the whitefish (such a valuable source of food and riches to the country) from total destruction, and that the most pressing need is now demanded, by which their numbers, reduced as they are, shall at least be sustained—no matter whether it may or may not affect the interests of those engaged in their traffic, for it must be deemed more wise to preserve to the future this natural product of the water than to allow the mercenary desires of a few, at the present time, to exterminate it.

This national calamity has already been too truly experienced in the almost total destruction of the whitefish in Lake Ontario; it is rapidly reaching the same point in Lake Erie, and ere long the same misfortune will extend to the larger waters of Huron and Superior, and, in time, will cover those of the newly formed Provinces of the far west.

In almost every civilized country, laws have been instituted to prevent traffic in the flesh of pregnant animals. This wise provision implies the preservation of the creature itself for re-productive purposes, and the prevention of its use for food, which is at this time of an unclean and unwholesome nature. Why, then, should gravid fish be made an exception to this statutory principle, when it is well understood that, independent of their being unfit and unwholesome for food, the rapid extermination of their species is also being hastened?

I would now desire to describe to you the method adopted, last November, for procuring the ova that were laid down in the Sandwich nursery, in order that you may readily comprehend the *modus operandi* by which, to a certain extent, the artificial method of propagation was applied in preventing the rapid extermination of these valuable fish, and to avert from total destruction a certain percentage of the millions of eggs that were being barbarously cast away. Instructions were given to Mr. Nevin, the officer placed in charge of the establishment, to be in readiness with such persons as he could entrust with the work, and to watch the opportunity when the fishermen would be engaged in hauling in the nets in the river, or when taking the fish from the pens; and as they were being counted out to be carried to the market, to gather the eggs from those that were found ripe for spawning. The manner of performing this work was as follows: One person would pick

out a female in the act of being cast into the waggon or boat, and with gentle pressure of the hand down the abdomen, the eggs, if ripe, would flow freely from the fish into a pan or other vessel previously arranged for this purpose. Another assistant would perform a similar work by expressing the milt from the male fish into the same pan. The eggs and the fluid coming in close contact, by careful stirring about with the hand, generally caused impregnation of the ova. They were then cleansed from all impurities by washing, and as quickly afterwards as possible carried in pails to the hatching house. Here the eggs were measured out with small cups containing a certain number each, and either put into the patent incubators holding 100,000, or spread upon the ordinary wire cloth trays containing 10,000 each. With the former the eggs are at once set in motion by letting in water by means of a tap, and the process of self-picking and self-cleansing goes steadily on; with the latter a number of boys are immediately employed to pick out the bad eggs with small wooden pincers, and to wash off impurities with brushes or feathers. By this process it has been found, when care and attention is given to the work, and when reasonable time and assistance is granted by the fishermen for the employes of the nursery to select the proper ripe fish at the time of netting them, that from fifty to eighty per cent. of the ova can be made to yield living fry. These usually hatch out in March and April, and are at once allowed to pass into the Detroit River, the strong current of which carries them quickly into Lake Erie, to replace in part the total loss of the eggs, which otherwise must have been the case had not this means been adopted to save them.

The engine, pumps and other appliances which form the motive power by which the whole establishment is furnished with water, have performed the work remarkably well; the machinery and apparatus used in hatching the eggs are in good working order and repair. It has been found that the use of good sound hardwood is more economical and better adapted for running the engine than coal. I have, therefore, to advise the purchase of a sufficient supply of good cordwood for next season's operations; this should be delivered at the establishment during next summer. A good substantial boat is an indispensable requisite to the place in the collection of ova from different points on the river; considerable expense was necessarily incurred in hiring one last fall. It would answer a two-fold purpose; when not in actual employ at the fishery, it could be used for purposes in connection with the inspection of that district by the local fishery overseer.

In contemplation of working up the full capacity of the hatchery next season, which, by the introduction of the new apparatus has been nearly doubled, it will be necessary to increase the supply of water now used. This can be readily done by laying down another underground pipe from the building to the river. This conductor should be made sufficiently large to allow an abundant flow of water into the building. In this way a large amount of steam power would be saved, which is now used in forcing the water from the river through a pipe of too small dimensions. It is necessary that this improvement should be made early next spring. The number of whitefish fry reared at the Sandwich nursery last season amounted to 7,750,000; they were hatched out during last March and April, and turned into the Detroit River. The anxiety of mind experienced in the perplexity attached to the rearing of this immense number of minims was very great, the result, however, was somewhat compensating, from the fact that in the hatching and distribution of them the losses were only of small account.

The quantity of ova laid down in this hatchery the past season, or fall of 1877, was very satisfactory, being more than double that of any previous year. The officer in charge reports the gross amount gathered at 31,000,000; of these, some 5,000,000 proved to be unripe and worthless, the balance of 26,000,000 were deposited in the different kinds of hatching apparatus in the establishment; 22,000,000 of these have been saved, and are now doing remarkably well, being in an advanced stage towards hatching out, with life and motion plainly noticeable in them. The fry will emerge from these eggs about the latter end of March next, and will be ready for general distribution almost immediately afterwards. Appended hereto will be found a

report of operations at Sandwich by Mr. Nevin, my assistant in charge. This officer has performed the very important and onerous duties devolving upon him in connection with this extensive fish-breeding establishment in the most trustworthy and satisfactory manner.

NEWCASTLE FISH-BREEDING ESTABLISHMENT.

In the Report of last year, a particular description was given of the improvements that had been made in the enlargement of this building, and the increased capacity thereby obtained for the laying down of fish eggs. Nothing of an important nature has been required to add to the completeness of the arrangements in connection with the hatchery itself, but it was found necessary to lay down a conductor-pipe of larger dimensions than the former one. The more extended area for hatching purposes, and the increased number of breeding troughs on both flats of the building, necessarily required an additional supply of water. It may not be out of place, however, to make some reference to the peculiar qualities of the stream upon which this fish nursery has been erected, for it is very doubtful indeed whether it would be considered by the generality of those who are engaged in the artificial propagation of fish to be well adapted or at all suitable for the work; and there is no doubt, so far as purity and high temperature of water is concerned, the Newcastle salmon hatchery labours under more serious disadvantages than any other fish-breeding establishment on this continent. At the first inception of the work of salmon breeding here, little if anything at all, was known in relation to it in America. The idea entertained by the originator of the novel undertaking was that, as the creek was known to be formerly a salmon-breeding stream, naturally, no special reason could be well given why these fish could not be reared in it artificially. This latter view of the matter has been most practically and satisfactorily demonstrated. The stream in question had, however, become thoroughly changed from its normal state, when salmon in the olden times so largely inhabited it for spawning purposes. Then it was amply supplied with a flow of fine, cold, limpid water; the forest, from the source of the stream, all the way to its outlet into the lake, was in its primeval state, overshadowing it from the sun's rays and influences. This, with the multitude of springs of icy cold water oozing out here and there, and little rills trickling along the ever-shaded surface of the earth, together with the constantly splashing current against logs and fallen trees, gave both æration and hiding places innumerable for the fish. These obstacles and brushwood also prevented the gravelly beds in the stream from being shifted or carried away by the force of freshets. All these were nature's provisions for assisting these migratory fishes in the reproduction of their species. But now the forest has all disappeared by the labour of the husbandman, laying bare the face of the country to the rays of the sun and general influences of the atmosphere, which by the process of absorption and evaporation have almost wholly dried up the numerous springs and rills, which were the original feeders of the creek. This has also diminished the flow of water fully one-half, and increased its temperature to such an extent during the spring and summer months as to create enormous quantities of infinitesimal spores for growth of fungi and other deleterious matter.

In addition to the above must be mentioned the ungovernable force and destructive consequences of immense freshets that frequently prevail, rushing down the now unimpeded course of the stream, carrying away previously formed spawning grounds, sweeping along with its violence the offscourings from lately ploughed fields, and from turnpike roads, together with rotten vegetable substances from barn yards, compost heaps and other depositories of foul matter, and the refuse from saw mills and other manufactures erected upon the stream. This turbid and dangerous state of the water in this stream (and it is the same in all others in the populous parts of the country) invariably takes place just previous to, or immediately at, the critical time in the spring of the year when the fry are emerging from the eggs, and the difficulties referred to cannot be overcome, cannot be even ameliorated in the course of natural reproduction. And although the difficulties and damages resulting therefrom can be overcome by the artificial methods of propagation, nevertheless the operation

is attended with much labour and anxiety, for in this state of the water, lasting a fortnight or more at a time, cleansing, by means of filtrature, is found to be quite impossible. The foul particles of sediment permeate everywhere, covering the eggs at times during the course of a few hours, to the depth of half an inch with a muddy mixture of putrid earthy and vegetable matter; this insidious substance clings to the eggs with great tenacity and cannot be removed except by means of artificial cleansing. These and other causes, which neither time nor space will admit of entering into here fully, had well nigh exterminated the salmon from the waters of Ontario. But the object of mentioning in detail some of the difficulties which do prevail, and which go towards the reduction as well as destruction of the better kinds of food fishes natural to the streams and lakes of the country, is to show that, even with the many besetting drawbacks which must necessarily arise from the carrying on of various industries and from the changed state of nature in many ways in the country, a remedy to a certain extent has been instituted through the instrumentality of your Department, in the selection upon this stream of a well-timed and commodious artificial fish-breeding establishment.

This institution has already inaugurated a new industry in the Dominion, and has practically demonstrated the feasibility of a science for overcoming many of the inevitable disadvantages referred to in the fact of having reared and distributed many millions of salmon fry, and of other valuable kinds of fish, and also of introducing the salmon of the Pacific Ocean into the waters of Ontario. From the many practical experiments which have originated from this establishment in the perfecting of machinery and apparatus to simplify and economise labour and expense in the carrying out of this enterprise, a systematization of the methods of propagating fish by artificial means has been widely extended, not only in the several Provinces of the Dominion of Canada, but throughout the whole of America.

The results in connection with the ova that were laid down in the Newcastle Nursery last season (1876) were of a satisfactory nature. The crop of young fry was very good; they were distributed principally in Ontario, some were sent to the Province of Quebec; quite a number of the ova, when well advanced, were forwarded to the Fishery Commissioners of several of the States of the Union, and others were sent to England. The particular destination of the fry and of the eggs will be found as follows, namely:—

Name of Person or Place Where Sent.	Salmon.	Trout.	Whitefish.
North River, Quebec.....	10,000		
Magog do do	10,000	2,000	
Trent do Ontario.....	40,000		
Rouge do do	10,000		
Humber do do	20,000		
Credit do do	20,000		
Saugeen do do	40,000		
Grafton Creek do	20,400		
Barber's do do	40,000		
Duffin's do do	20,000		
Lynds' do do	10,000		
Baldwin do do	980,000	10,000	
Ontario Lake do	10,000	10,000	150,000
Balsam do do	10,000		
Clear do do	10,000		10,000
Sandy do do	5,000		
Gull do do	10,000		
Lord Exeter, England	5,000	2,000	30,000
Prof. Buckland, per A. Begg, Esq., England	5,000		
Prof. Baird, United States Commissioner, United States	6,000		
New York Aquarium, United States	4,000		
Wisconsin State, United States.....	5,000		
Iowa State, United States	5,000		
Seth Green, Esq., United States.....	5,000		
B. Lett, Esq., Ontario.....			10,000
Total	1,300,000	24,000	200,000

The above table shows a grand total of *one million five hundred and twenty four thousand* fry and ova, distributed from the Newcastle Hatching-house, during 1877.

In performing this unusually critical and painstaking work, covering such a wide extent of country, a great deal of anxious consideration was felt for the safety in the transportation of the young fish; as the month of June and July is sometimes reached before the whole work is completed, the extreme heat of the weather prevailing then doubly enhanced the precariousness of the labour. But, notwithstanding all this, the persons engaged in carrying out this venturesome duty, reported most satisfactory results.

Of the complement of California salmon eggs, received from Prof. Baird, in the fall of 1876, eight thousand in number, one half were forwarded to the Tadoussac establishment, the balance were retained here. These did unusually well, having hatched out without any losses worth mentioning, and the fry, after retaining a large portion for this stream, were planted in several places throughout Ontario; quite a number were put in the Saugeen River. I have again to repeat my experience with regard to these fish as being much more rapid in their growth, and apparently better adapted to the high temperature of water now prevailing in our streams than the native salmon of the country. Another consignment of forty thousand of the California eggs were received at this establishment in October last. They were sent through the courtesy of Prof. Baird, Commissioner of Fisheries for the United States, and arrived here in splendid condition; not exceeding one hundred bad eggs were taken from the lot at the time of unpacking. These ova were despatched from the United States Government Fish-breeding establishment, on the McLeod River, a branch of the great Sacramento, on the Pacific Coast. They were forwarded in a refrigerator car of the Pacific Railway across the continent to Chicago, along with some millions of others, for several States Commissioners in the Union, and for public establishments in Europe. At Chicago, the several consignments of ova were transferred from the refrigerator car to others, and expressed to their destinations, where, with but very few exceptions, they arrived in the same sound condition as those received at this Nursery.

Misfortune, however, befel the second lot of eighty thousand that were sent at a much later period, and by another mode of shipment. An application for half a million eggs had been made through your Department to Prof. Baird early in the season; but, from some unforeseen cause at the McLeod hatchery, only forty thousand, as above related, were sent. With this reduced contingent, Prof. Baird expressed much regret, and being solicitous to supply our wants, kindly ventured the latter shipment of 80,000. These came by ordinary express all the way through, arriving here late in November. They had evidently been placed in some very warm part of the car, as, upon opening out, steam arose from the straw packing, and the contents were found to be uncomfortably warm in handling, yet the ova, to outward appearances, looked remarkably well; but it was noticed that, whilst the eyes and the embryo were particularly visible, neither motion nor vitality of any kind was discernable in the eggs. From previous experience in like cases, the critical position of the contents of this package was keenly felt, and it was evident that extreme caution had to be applied to save them if it were yet possible to do so. Nearly a whole day was spent in reducing the high temperature of the eggs in the crate to the cold standard of the water in which they were to be put. This was done by lightly sprinkling water over the crate at different periods until the proper temperature was reached. They were then carefully removed to the hatching trays, and gently immersed in the breeding troughs. During the whole of this proceeding no evidence of life whatever was given, but a small opaque white line began to show itself transversely in many of the eggs. By the next day this line was strongly shown in almost every one of them; many began to burst open. This continued increasing daily until every egg perished. This disaster was no doubt caused by negligence on the part of the expressmen in placing the crate alongside or near the stove in the cars. They were literally cooked, but retained the outward appearances of health and soundness, for several hours after being taken out of the crate.

Difficulties and losses in connection with the shipment of fish-eggs by express companies, when the journey exceeds two or three days, have proved to be so disastrous (with my experience) that it may be said to be utterly useless to continue this means of transporting them. Yet no injury need necessarily happen during a passage of a fortnight, or even longer periods, should the instructions, which are invariably written upon the package, be carried out. The method of packing has become so perfect, and the eggs themselves have been found to stand even rough handling, so that nothing further is required to ensure safety than to avoid freezing and too much heat. The great secret lies in keeping them *as cold as possible without freezing them*. I have forwarded and received fish-eggs to and from England with perfect safety when they have been given in charge of private individuals, whilst in every case they have perished while in the care of the express carriers.

California Salmon.

The experiment of introducing and acclimatizing the salmon of the Pacific coast to the waters on this side of the continent, commenced at this establishment (kindly aided by Professors Baird and Mr. Livingstone Stone of the United States Fishery Commission) has been practically demonstrated by the fact that several of these salmon have been taken in Lake Ontario and in this stream (Wilmot's Creek) during last season.

In October, 1873 the first ova of the California salmon (*Salmo Quinnet*) were brought over from the McLeod River. Twenty thousand of these were donated to this institution by Professor Baird. The eggs arrived safely and were hatched out in the following December. Many of the fry were let loose into this creek in April, 1874. In the fall of 1874, a second lot of these eggs were obtained from the United States hatchery on the McLeod River. The crop of fry from these proved most satisfactory. A large number of the young fish were put in Wilmot's Creek, and at other points in the spring of 1875. A third consignment was received in October, 1875. The fry of these were distributed during the spring of 1876; some in the Saugeen River, others in some of the back lakes, and the balance in the different streams. The fourth quota received, in October, 1876, has already been referred to; I will now state that the success attending all these consignments of ova, both in their transportation, their hatching into fry, and their distribution afterwards, was with the one exception of a remarkably satisfactory nature.

The assiduity practised in connection with this interesting venture met its reward in the face of 1876, by the capture of a veritable California salmon in Wilmot's Creek. Publicity was given to this fact, and I here quote an extract from the annual report of 1876 in which mention is made of it. "It is well to make mention here (for it is the first record of the kind on this Atlantic side of the continent) that a California salmon was taken last autumn in this creek, in company with his Ontario cousins. This fish, following out the instinct of its species, must have migrated from Lake Ontario (some would say the Atlantic or Pacific Ocean) up this stream, for it was taken out of the trap in the reception house along with other salmon that had entered it. The appearance at once indicated the *salmo quinnet* or California salmon; the length was fifteen inches, the body deep and narrow, with a deeply vermiculated greenish shade on the back inclining to brown towards the belly. The first lot of California eggs received at this place was in the fall of 1874; this salmon must, therefore, have been two years old, from the egg, as it was taken in the month of October last. It was totally unlike the ordinary grilse or smolt of the stream; it was a male fish and had matured milt. The fact of this young Californian being taken here goes to show that it is not requisite that salmon should go to salt water to obtain their growth; and is also evidence in favour of the opinion advanced by me that the *salmo salar* (in like manner as the *salmo quinnet*) can be acclimated to, and also be made natives of, our fresh water lakes."

Further and more convincing proofs of these fish becoming acclimatized to the fresh waters of Ontario is found in the fact of the netting of several of them in July last (1877) in Lake Ontario, near the estuary of Wilmot's Creek; they were captured

along with others of the native salmon of the country. One was a very beautifully developed specimen of upwards of five pounds in weight; its symmetry, though perfect, was different to the native salmon, its body was much deeper, and more of the bass form; its flesh had changed from the deep red of the Pacific salmon to a whitish orange color; it was, however, wonderfully fat and extremely delicious for the table. The skin of this fish was preserved and mounted, and is retained here as an interesting specimen of the first adult *salmo quinnet* taken on this side of the Pacific slope.

Still further evidence is given of their naturalization here and of retaining their instinctive migratory habits, as several of these California salmon returned in September and October last to the hatching-house where they were reared, for the purposes of spawning. All of these were males, and of fair size; one measured twenty-three inches in length. These fish were undoubtedly a portion of the first fry turned out from this nursery in the spring of 1874, and will be found to be the "advanced guard" or forerunners of others of their species that will show themselves next season.

These salmon give interesting data for the naturalist and the study of physiology. They furthermore practically prove statements hitherto advanced by myself, that the salmon of the sea can be acclimatized and made natives of the fresh water lakes, and that it is not indispensably requisite for salmon to go to salt water; large bodies of either salt or fresh water, with an abundant supply of food, is all that is requisite to give them growth and reproducing powers; and that the procreative qualities of the male salmon are usually developed at an earlier stage than the female, the former invariably commence their migration up the rivers for spawning purposes one year in advance of the latter; hence the indisputable fact of grilse taken in rivers being always males.

A large number of eggs were gathered last October and November and placed in the breeding troughs of this nursery. The quantity obtained was not as great as that of the previous year, but this is accounted for by the salmon not coming as far up the stream as usual, and having entered the creek some ten days later than formerly. Seven hundred and fifty thousand ova were gathered by the artificial methods, and are now in a very healthy condition, and are doing remarkably well, and bid fair to yield a satisfactory percentage of fry.

Upwards of a million of the salmon trout eggs were also laid down here; these were gathered from fish caught in the Georgian Bay. The officer deputed to perform this work reported great difficulty in securing ripe eggs. The fish were found to be later in spawning than in former years, and the weather becoming rough and cold retarded the netting of the fish and prevented satisfactory impregnation of the eggs. It has hitherto been found more difficult to gather the ova of the salmon trout and to vitalize them than those of other fishes. The mode of taking the fish and manipulating them in boats on the open lakes, very frequently in rough disagreeable weather, necessarily prevents the requisite care and attention to insure full success. A very large percentage of these eggs, gathered last fall, proved to have been unfertilized.

A number of sea-trout eggs were obtained from the Saguenay district. They are doing very well and are further advanced towards hatching than the ova of the salmon or salmon trout.

A million and a half of the whitefish eggs were laid down here. They were obtained in order to give a thorough and practical test of the new patent incubator. A close personal observation made daily as to the operation of this apparatus, has given the most convincing proofs of its wonderful adaptation and great capacity as a labour-saving and economical means of hatching whitefish ova. These eggs have progressed very satisfactorily and are near hatching.

A small lot of eggs of the English char (*salmo umbla*) were also laid down in this establishment. These, through the kindness of Alexander Begg, Esq., were safely brought across the Atlantic. This gentleman has taken a very deep interest in the

work of fish culture, and through his untiring exertions quite a number of the Canadian fishes have, during the past year, been introduced into English waters.

Three millions three hundred and forty thousand two hundred eggs of the most valuable commercial fishes of the country were placed in the hatching troughs of the Newcastle fish-breeding establishment during the past season, as follows, viz. :—

Salmon (<i>Salmo Wilmoti</i>).....	750,000
California salmon (<i>Salmo Quinnet</i>).....	40,000
Char, English (<i>Salmo Umbla</i>)	200
Sea and speckled trout.....	40,000
Salmon trout.....	1,000,000
Whitefish (<i>Corregonus Albus</i>)	1,500,000
Total.....	3,340,200

The general appearance of salmon in this stream during last autumn was very satisfactory, though the numbers might not have been quite as large as in the previous season. A general disposition was shown, more particularly by the larger sized salmon, to make their spawning beds at lower points in the creek; and so apparent was this, that for some distance above the sluggish part of the stream, near the lake, the whole gravel bed of the creek was completely upturned by their laborious movements in making the beds and laying their eggs. It was not unusual to see a score at a time thus engaged in the broad open day, and so intent were they in this operation that it was with great difficulty that they could be driven off.

The quantity of ova laid in the manner above described must have been very large indeed, and judging from the numbers of salmon seen spawning, the natural deposit of eggs must have been much greater than the supply obtained by the artificial means.

Extracts from the report of Mr. Kerr, Fishery Officer at Hamilton, will be found appended hereto, in which he gives a statement of salmon that were observed spawning in Duffin's Creek, the River Rouge, Lyons' Creek and the Credit River. He further states that several salmon were accidentally caught in several of the fishermen's nets at different points in Lake Ontario. A number of salmon entered the Grafton and Darlington Creeks, but not in such numbers as in the previous year.

Several violations of the law in respect to the killing of salmon, took place on the Trent River, but were punished through the instrumentality of Mr. Charles Gilchrist, Fishery Officer.

One hundred and forty-three salmon were captured in nets set along the shore of Lake Ontario, near Newcastle, and a number were also taken in trap nets set in the lake at Cobourg.

The general progress of the science of fish culture is extending very widely throughout the world. On the continent of America the interest shewn is perhaps greater than elsewhere. Nearly every State in the adjoining Republic is now aiding the work by public grants and by the appointment of Fishery Commissioners, and a very pleasant rivalry exists among the several States as to which shall be most successful in redeeming the waters from previous barrenness, and supplying their populations with an edible food which is so generally prized by the people for its delicacy and wholesomeness. Nor is the Dominion of Canada behind in advancing this important industry of propagating fish by artificial means. This is evidenced by the many establishments now in full operation, which for numbers, capacity and completeness, are not equalled by any other country. This desire to increase and multiply a valuable article of food and commerce is further evinced in the efforts which are being put forth by one of the most distant Provinces of this Dominion, where hitherto it had been considered, from the vast numbers of salmon that migrated up its rivers, that the supply could never be exhausted. With the unlimited demand, and the very great efforts that have been put forth to supply it, the unrestricted slaughter of the salmon in the Fraser River, in British Columbia, is creating considerable alarm, as it is seriously affecting the extensive

traffic in this source of wealth. This feeling has caused a public expression to be given by the people of New Westminster for an application to the Dominion Government for a grant to erect a salmon-breeding establishment upon a large scale, on the Fraser River. This application will no doubt be laid before your Department, and will receive that consideration which its importance demands. A suggestion is, however, here offered: That whilst heartily acquiescing in the wish of the inhabitants of British Columbia in having a salmon-breeding establishment to assist in retaining the stock of fish that at present exists there, it is of equal necessity, also, that a policy for the preservation and protection of fish by setting aside close-seasons for their natural reproduction should be most stringently enforced.

In connection with this now popular enterprise I beg to submit for your approval and publication, a series of pictorial illustrations of the Newcastle fish-breeding establishments with explanatory remarks in relation to each picture.

In conclusion, I beg to draw your attention to the appended table, which shews the statement of vitalized fish eggs at the several establishments in the Dominion, to be thirty millions six hundred and ninety-four thousand; to this may be added the number of fry which have been distributed from them in former years, amounting to twenty-eight millions five hundred and fifteen thousand, making a grand total of eggs and fry, up to the present time, of *fifty-nine millions two hundred and nine thousand*.

TABLE showing Number of Fry and of Vitalized Ova in the several Fish Nurseries in the Year 1877.

	Fry Distributed in Spring of 1877.						Eggs Laid Down in Fall of 1877.					
	Salmon.	Salmon Trout.	Speckled Trout.	California Salmon.	Whitefish.	Total.	Salmon.	Salmon Trout.	Speckled Trout.	California Salmon.	Whitefish.	Total.
Bedford	1,000,000	.....	.....	.....	.....	1,000,000	1,450,000	.....	.....	.....	.....	1,450,000
Miramichi	320,000	.....	.....	.....	.....	320,000	710,000	.....	.....	.....	.....	710,000
Restigouche	60,000	.....	.....	.....	.....	600,000	1,004,000	.....	.....	.....	.....	1,004,000
Gaspé	1,051,000	.....	.....	.....	.....	1,051,000	750,000	.....	.....	.....	.....	750,000
Tadoussac	1,180,000	.....	75,000	3,500	.....	1,258,500	1,340,000	.....	.....	.....	100,000	1,440,000
Sandwich .....	.....	.....	.....	.....	7,750,000	7,750,000	.....	.....	.....	.....	.....	22,000,000
Newcastle	1,300,000	.....	24,000	3,500	200,000	1,527,500	750,000	1,000,000	50,000	40,000	1,500,000	3,340,000
Total	5,451,000	.....	99,000	7,000	7,950,000	13,507,000	6,004,000	1,000,000	150,000	40,000	23,500,000	30,694,000

Pictorial Illustration.

A very general desire now prevails with the people of Canada to encourage by every possible means the artificial method of propagating fish, and also to obtain general information in relation to the *modus operandi* of fish culture. With this view, I beg to submit a series of sketches of the buildings and grounds in connection with the Newcastle establishment, in which are delineated as minutely as possible, by pictorial drawings, the internal arrangements of the breeding-rooms and the apparatus used in the practice of artificial fish-breeding. These pictures will give a comprehensive idea of this national enterprise, from which I trust the public will derive general information and useful knowledge.

The pictorial illustration includes in it eleven drawings, each representing different sketches of the outside premises and grounds, as well as views and plans of the interior arrangements of the buildings, as are more particularly adapted for the work. These drawings will be found numbered from one to eleven for more ready reference.

No. 1 is a panoramic view of the building and grounds, and of the surrounding country. The building on the left of the picture, on the edge of the stream, is the Government fish-breeding establishment, with its long, low reception house alongside; just here a permanent weir or carrier is thrown across the stream, which prevents the upward passage of the salmon. Being thus stopped on their progress up the main channel, they are attracted by the rapid outflow of water coming through the reception house, and rushing up the current they pass through an ingeniously-contrived triangular-shaped weir (No. 3), and become entrapped within the house where they are kept confined till they become ripe for spawning. From this building the stream runs (along the side of the picture) down a distance of some two miles, where it empties into Lake Ontario.

Beneath the two large clumps of evergreen trees, in front of the middle and the main stream, the several nurseries and retaining ponds are shown, dotted here and there with miniature islands. In some of these ponds the parent salmon are retained for a while to recuperate after the exhaustion produced by spawning; others are used as nurseries in which the young fry are kept for a time just after they are hatched out, and have absorbed the umbilical sac.

The small building to the extreme right of the view was the old or original reception house, but it is now used as the gateway and general outlet from the ponds. On the extreme left, just above the main building, is an old mill with its raceway and mill-pond beyond. From the higher elevation of this large reservoir a sufficient head is obtained to force through an underground pipe a large flow of water into the first and second apartments or breeding-rooms; thus giving a constant and sufficient supply at all times for the hatching troughs.

The premises and ponds cover some ten acres of land. Two public roads lead from the grounds, one at each extremity of the picture, and converge together at the village of Newcastle, about three-quarters of a mile distant, where an important station of the Grand Trunk Railway is located. The town of Bowmanville is situated about four miles to the west, and the town of Port Hope seventeen miles to the east.

On the summit of the mill is my own farm and residence.

No. 2 is a ground plan of the premises with the location of the buildings and ponds as described in the panoramic view No. 1.

No. 3 shows the inside arrangements of the reception house for entrapping and penning up the parent salmon. The fish enter this building through the triangular-formed weir, and become imprisoned in the first or large compartment. They are afterwards transferred (as represented by the assistant dipping them out with a small net) into the smaller pens above. The males and females are then separated and placed in different pens; in this way they remain quiet, and are more easily retaken at the time when they become ripe for laying their eggs. When mature, a dozen or more of these fish at one time are again caught with the hand net, and carried (only a few feet) to their tanks arranged for their safe keeping at the right

hand side of the breeding-room, lower flat ; (No. 4,) where the workmen are engaged at their work.

No. 4. Here the process of taking the ova from the fish and impregnating it is carried on ; this is done by lifting from the tank a ripe female fish and holding her over a vessel securely, and gently pressing her body with the hand when the eggs will flow freely from her. (See figure No. 5). After this operation is performed, she is liberated by dropping her into a raceway running from the room, down which she quickly swims into the pond, (marked A, on the ground plan No. 2.) A male fish is then taken from another tank, and operated on in a like manner as the female ; the milk extruded from him is mixed with the eggs by a gentle stirring with the hand ; this causes immediate impregnation.

The ova are then dipped out of the pan with a small lade, and put into a measure made to contain one thousand eggs ; from this they are spread evenly on the hatching trays (see apparatus plate No. 6.) These trays are made two feet long and ten inches wide, with a division in the centre, and hold four thousand eggs each ; when filled they are carefully laid in the breeding troughs (shown in figures 4 and 7). After the ova are thus deposited they are closely watched, and regularly cleansed from all sediments or other impurities which may settle upon them during the process of incubation.

The eggs are of a clear salmon color, but should any prove to be unfertilized, or become injured in any way, they change their appearance to an opaque white, when they are picked out with forceps and cast away, thus preventing the remaining ova from becoming contaminated.

No. 4 and 7 explain the manner in which the breeding troughs are distributed in the rooms. In the lower flat they are placed lengthwise, in the upper room crosswise of the building. Six of these are laid side by side with intervening aisles two feet wide for the convenience of the workmen in picking and washing the eggs. The troughs are each supplied with a constant flow of living water from the tanks which are fed from the raceway above, and are regulated in quantity by wooden taps, as shown in the cut. In the lower flat a series of aquaria are shown ; they are placed alongside the wall and contain young salmon and other fish which are kept for observation, and also for exhibition, to the numerous visitors who frequent the institution.

No. 8 represents the upper story of the building, which, after taking from it office rooms, leaves a large commodious apartment used as a museum, in which are collected a number of specimens of fish of various kinds and other animals. This natural history depository is only of a few months' existence ; yet it comprises numerous specimens of the salmon family and other fish, prominent among which are the large ones shown in the plate ; the one on the right is a sturgeon weighing 280 lbs. ; the one on the left is the tunny or giant mackerel ; its weight when alive was upwards of 600 lbs. ; a Greenland shark ten feet long, an immense moose deer, male and female cariboo, a bear and other animals ; also an alligator ten feet long. All these specimens present a life-like appearance and are artistically mounted.

No. 9 shows the front and side elevation of the fish-breeding house proper ; its dimensions are 64ft. in length by 22ft. in width, with a cellar or lower flat built of stone, and two frame stories above ground. The building presents a handsome and commanding appearance externally, and the arrangements inside are convenient and well adapted for the purposes for which they are intended. The whole establishment gives convincing proof throughout of the exercise of practical ingenuity and personal industry.

No. 10 gives a view of one of the retaining ponds (marked A, figure 2) into which the spent salmon pass from the main building after manipulation. It is about forty feet in diameter and circular in form, with an average depth of water from two to three feet.

At the time this view was taken there were in this pond between three and four hundred adult salmon, weighing from six to sixteen pounds each. It is doubtful, indeed, whether in any other part of the world a more wonderful or pleasing exhibi-

bition can be enjoyed at one sight, of such numbers of large salmon as were enclosed within this small space. This extraordinary display is not of long duration, lasting only about a fortnight, generally during the last week of October and first week of November.

No. 11 gives views of the several shapes of the eggs during incubation and the growth of the embryo.

Explanation to No. 11:

No. 1. Shows the young ova developing the head (magnified).

No. 2. Shows the young ova developed (magnified).

No. 3. The head and body of the fish developed (magnified).

No. 4. Young ova before the developing, in natural size.

No. 5. Shows the ova of the natural size, after the vital principle has been developed. The body of the fish in this state has a pinkish tinge and the eyes are very large.

No. 6. The shell of the ovum just burst, and the head of the fish protruding from it.

No. 7. The state of the ovum shown after the bursting of the shell, when the pulsations of the heart become visible.

No. 8. The shell just thrown off; the tail drooping; about a third part of the shell, which is transparent, is fractured by the fish in its exertions to extricate itself. Before the shell is broken the tail envelopes the yoke, which is seen attached to the body of the fish.

No. 9. The tail in a short time becomes straight and the fish more lively, the mouth assumes a different form, and the lower and pectoral fins, which are quite transparent, are in motion simultaneously with the actions of the heart, which beats from 60 to 65 times in a minute.

No. 10 is a magnified representation of No. 7, the fish adhering to the shell, which is partly broken. No. 11 represents No. 9 magnified; the heart is before the pectoral fins under the throat.

No. 12 is a still more enlarged view of No. 9, showing the direction in which the blood circulates, as seen by a microscope.

The blood flows from under the body of the fish through the blood-vessels ramified along the sides of the back, and is there collected into a large vessel which runs along the front and bottom of the bag, communicating directly with the heart. An equal quantity of air or some transparent matter circulates with the blood. The blood is drawn by the heart from the large vessel alluded to, and thrown into regular pulsations into the vessels of the heart and throat where it assumes a dark colour. The rays of the gills are visible, and the fish soon begins to assume a brownish colour.

No. 13 Salmon, developed shape.

No. 14 Salmon, general appearance in proper season.

No. 14 Salmon (male) at the spawning season.

I have the honor to be, Sir,
Your obedient servant,

SAMUEL WILMOT,
Superintendent Fish-Breeding Establishments.

Newcastle, Ont.,
31st Decem̄ber, 1877.

REPORT OF MR. P. VIBERT, FISHERY OFFICER IN CHARGE OF THE
GASPE FISH-BREEDING ESTABLISHMENT IN THE PROVINCE OF
QUEBEC, FOR THE YEAR 1877.

GASPÉ BASIN, 31st December, 1877.

Hon. A. J. SMITH,
Minister of Marine and Fisheries.

SIR,—I have the honour to submit my report on the operations connected with this establishment for the past season.

Last year I stated that the number of salmon eggs laid down was 920,000; but, according to the young fish distributed, the number of ova must have been underestimated and may be placed at 1,100,000.

The result of last winters operations was very satisfactory, for during five months the average loss of ova was only 50 per diem. We commenced removing the fry about the 15th June, and placed them according to instructions from your Department as follows:—

Dartmouth River.....	550,000
St. John do	313,000
Mal Bay do	108,000
Grand Pabos River	80,000
	1,051,000

And besides these I planted about 20,000 at the pond in rear of the establishment. The loss in transporting the young fish was small, and the work was generally attended with success.

I set a net in the Dartmouth River as early as practicable, and caught 100 parent salmon; out of this number, unfortunately, over thirty died at pond at the fish house, owing to the low and impure state of the water. A few fish purchased from nets at Anse au Cousin in June appeared to thrive well there, although some were much injured by gill nets. I, therefore, placed the remainder at the upper retaining pond, 61 salmon, and they did very well.

At this pond (No. 2) we have now two solid dams, scows, and all that is required for the prosecution of the work; and I believe that if the Dartmouth River was reserved principally for supplying parent salmon for this establishment, there would be no trouble in securing 150 to 200 breeding fish every season by setting a net as early as possible, and placing them all in this pond, which is only a short distance from the main river; and in case it was deemed advisable to seine in the river in October, so as to have a large supply of ova, this could generally be accomplished; although it may sometimes be found impossible to do so on account of heavy rains, and this is why it is so necessary to secure a number of fish during the summer. When the spawning time arrived we had 76 fish in ponds, from which 400,000 ova was obtained.

Fifty-three salmon were seined in St. John River for this purpose, which gave 300,000 eggs; the size of the fish both in pond and on the river was very small, consequently the number of ova obtained was much less than it would otherwise have been, and these salmon were all late in spawning, it being the first day of November before all was finished.

If I could have seined in the Dartmouth River, as last year, I am sure that over one million and a half of eggs might have been laid on the rills.

It will thus be noticed that the actual number of ova in the troughs of this establishment is 750,000, which at present are looking well, and promise a large percentage of young fry for distribution next year.

Mr. Samuel Wilnot visited the establishment and retaining ponds this summer. Both my assistant and myself derived some valuable information from Mr. Wilnot with regard to fish culture, and the operations generally connected therewith.

The troughs were all thoroughly dried and varnished as also the trays. The water was drawn off the Reservoir and all the sediment removed.

The dam is in good order, and the outside of the building has been properly secured for winter; the roof requires painting next summer.

I have the honour to be, Sir,
Your obedient servant,

PHILIP VILBERT,
*Fishery Officer in charge of the Gaspé
Fish-breeding Establishment.*

REPORT OF MR. JOHN MOWAT, FISHERY OFFICER IN CHARGE OF THE
RESTIGOUCHE FISH-BREEDING ESTABLISHMENT, IN THE PROVINCE
OF QUEBEC, FOR THE YEAR 1877.

MATAPEDIA, 31st December, 1877.

Hon. A. J. SMITH,
Minister of Marine and Fisheries.

SIR,—In presenting my Annual Report on this establishment, I am happy to be able to inform you that a very fine and large lot of eggs have been secured, and are at present in good condition. I caused the usual nets to be set near the house on the 24th of August, and from that date until the 11th September, caught thirty-seven males, twenty-eight females, and eleven grilse. On that date nets had to be lifted owing to rise of water, and were not again set until the 17th, fish going up in large numbers during the rise. On the 27th they were again lifted; owing to leaves and rapid current it was impossible to keep them to bottom, the small meshes of the nets forming a complete dam; small lots of lumber also were being driven down the river, and they had to be discontinued; in the interval, however, 19 males and 22 females, with 10 more grilse were secured. Those fish were carefully transferred to the ponds. Out of this number, 2 males and 11 females sickened, previous to 28th September, and were let go again, and 3 males and 11 females died without giving any ova, the fungus carrying them off very rapidly; some of the fish took it after a day or two in pond, and without the slightest sign of abrasion, whilst others, who bore marks of injury, remained healthy until turned out. They were all used with the greatest possible care. Although, on account of their large size and strength, it is difficult to handle them without injury, particularly the females, who, at this period, will not stand rough usage.

On the 28th September the river rose greatly, and from former experience, afraid I could not secure fish here, I started up the river taking four floating cribs, seine, two large eight-inch mesh nets, two canoes, three men, scow and two horses. At both Indian House and Patapedia pools, the rise of water prevented me from using seine; the fish also had left the pools to go further up, and on the bars; I at once went on to the Lodge pool, seven miles up the main river above the Kedgwick junction; the river here is very smooth bottom and a forty fathom net sweeps the whole river. There were a good many fish showing on the bars, still they were shy and difficult to surround, retreating instantly into deep water. The men here commenced work with orders to cross down the river, while I visited the Upper Kedgwick. This river, for thirty miles, was full of salmon just commencing to nest, and it was a great sight, running down the river, seeing the fish busy on the gravel. The roughness of the bottom on this stream prevents nets from being used on it; it is full of large white quartz boulders, generally from 20 to 500 lbs. weight. The Patapedia is of the same formation, while the main river is perfectly smooth above the Kedgwick seven miles below this last named river, on the 7th, I overtook the men with 74 fish, and the same night took 22 more, 55 males, 41 females, all very large. As some of them seemed ripe, I found it necessary to get down, so, leaving a spare crib, I got to Dee side on the 9th, sending the men immediately back to fill it; they arrived on the 16th with 45 more fish and caught ten more after arrival, by night, seining 133 males, 87 females and 20 grilse. I cannot account for the preponderance of males; but as 22 females from pond died and were turned out without maturing, the difference is not so great.

Out of those fish I got 1,204,000 eggs or an average of 13,800 per fish; many of them were over 36 lbs, none under 20; three fish gave 28,000, 27,000 and 25,000 respectively. The very large mesh net with which the last fish were taken accounts partly for

this; the 14 lb fish went through. I had to enlarge floor room in house and made room for fifty more trays, and there are now two tiers of trays, containing 290. When the eggs ordered for Miramichi are taken out there will be more room; still there will be danger of smothering when fry come out. Should eggs all keep well, I expect to deliver those eggs shortly now as their eyes are quite visible.

The opportunity did not occur to test the Indian house pond this season, as the seine ordered, through some mistake, did not arrive here until 27th October, when the rise of water not only prevented its use, but the fish left the only pools on that account, where it can be used successfully, but it will be tested next season. As the water is colder and the flow greater there is every prospect of the fish keeping without disease. Up to date I have measured 51,000 dead eggs, a large portion of which has come from two lots; treated the same as the others, but from some cause or failure in the fish, very few of their eggs were impregnated. The only method of impregnating was closely adhered to as ordered by Mr. Wilmot, and the percentage of unfertilized eggs is very small.

The first ova laid down here was:—

1873	120,000
1874	800,000
1875	300,000
1876	600,000
1877	1,200,000

and were distributed as follows:—

From 1874 to 1877, in Metapedia River.....	350,000
do do in Upsalquitch.....	300,000
do do in Main Restigouche.....	800,000
1874, 1875 and 1877, in Jacquet River.....	150,000
1875, 1876 and 1877, in Nouvelle River.....	150,000
1876 and 1877, in Little River.....	70,000

The building was cheaply put up, of hewn cedar logs, plank supply pipes, brush dam; it was placed in an excavation, and has no light only on one side; the action of frost, combined with the weight of embankment behind, is continually throwing and twisting the building, causing troughs to be renewed and re-levelled every season. I am also apprehensive of the supply pipe giving out, and would respectfully suggest the necessity of making preparations to put up a new building in place of putting costly repairs on the old. We have a fine level plot on our own ground, and from what I have seen now of Bedford and Newcastle, I am satisfied that this establishment can easily be made warm without earth embankments to the eaves. It can be built at a very moderate expense, particularly if the erection and finishing is extended over two seasons, enabling the work to be cheaply done, utilizing the present building until the new is completed, and I believe that a building equal to either of the above houses, excepting such a fine outside finish, can be placed for \$200 if extended over two years.

The utility of fish-breeding is now acknowledged, and the Restigouche River shows, from its continued increase, the value of artificial means, assisted by thorough protection. I have no hesitation in asserting that for the future a regular annual supply of salmon will be assured, not subject, as formerly, to one good year and two bad ones, caused by the heavy ice jams and freshets, completely destroying the whole season's young brood, and no means of replenishing the loss. The artificial means adopted by your Department will now obviate this, and at least one million young fry should be yearly placed in this river.

I have the honour to be, Sir,

Your obedient servant,

JOHN MOWAT,

*Fishery Officer in charge of the
Restigouche Fish-breeding Establishment.*

REPORT OF MR. A. B. WILMOT, FISHERY OFFICER IN CHARGE OF THE
BEDFORD FISH-BREEDING ESTABLISHMENT, IN THE PROVINCE OF
NOVA SCOTIA, FOR THE YEAR 1877.

BEDFORD, 31st December, 1877.

Hon. A. J. SMITH,
Minister of Marine and Fisheries.

SIR,—I have the honour herewith to submit my Report upon the operations at the Bedford Fish-breeding establishment, for the past year.

It affords me very great pleasure to inform your Department, that the great success which attended the opening of this establishment, and the introduction of the system of artificial fish propagation, as detailed in my last annual report, has been far exceeded by the successful results obtained from my more extensive operations during the past year.

A more intimate knowledge of the great work in hand, and the urgent necessity of its adoption is also being gradually diffused among the people, and I find that many who at first were inclined to oppose what they considered a mere speculative theory, have now become convinced that the artificial propagation of salmon is really a feasible and practical art, and that by its means many thousands of dollars will, in a short time, be added to the value of our coast and inland fisheries.

The spirit of opposition which existed among the fishermen so largely last year, I am pleased to find, has almost entirely disappeared. During my travels through the Province, and while operating upon the different rivers, many opportunities of meeting and conversing with the fishermen presented themselves, and I have endeavoured to enlighten them upon this important and somewhat novel national enterprise, and to impress them with the necessity of their hearty co-operation with your Department in carrying out the means introduced for the creation of a great wealth for their direct benefit. The further convincing evidence of seeing thousands of artificially-hatched infant salmon placed in their rivers has very materially assisted in removing many of the old prejudices existing; and I am now happy to state that the moral support and assistance I have received from all classes of people during the last year have been very encouraging, and, in a measure, removed the difficulties to be met with in the prosecution of a work, which, in some of its branches, is of such a precarious nature.

In my report upon this establishment for the year ending 30th December, 1876, I stated that 1,000,000 eggs had been successfully laid down in the hatching troughs, and from their healthy and promising appearance I assured your Department of a very satisfactory result to the season's operations. I am now happy to inform you that the issue quite exceeded my most sanguine expectations, and that 1,000,000 fry, or about 90 per cent. of the original number, were safely hatched. This favourable result, while being chiefly attributed to systematic arrangement of the interior of this hatchery room, and the perfect nature of the appliances introduced for the safe and easy management of a large number of ova, was, to a large extent, brought about by the propitious circumstances attending the process of incubation.

The weather, from the 1st of January to the 15th of March, was very steady and equable in temperature; the ground was well covered with snow; no thaws or freshets took place during that period, and the water in the river continued clear and pure. Consequently very little sediment or other foul matter was deposited upon the ova, and the loss occasioned by the washing and handling required when frequent freshets occur, was almost entirely avoided. The period during which the young fry burst the shell, and the following six weeks or nursing season were also exceptionally favourable. The temperature of the water continued low, thus preventing the rapid growth of fungus, and lessening the care and labour usually necessary during

this critical period, so that notwithstanding the somewhat overcrowded state of the nursery troughs, the loss of fry was quite inappreciable.

Distribution of Fry last Spring.

As soon as the infant fish had attained the proper age this important part of the work was undertaken, and was performed with the greatest possible despatch. The work of distribution is of necessity very much hurried, and is a season of great anxiety and labour to all concerned. In order to be successful the transportation of the fry should not be attempted until the age of three weeks has been reached, and should be completed before the umbilical sac is entirely absorbed, which is about forty days from the time of emerging from the shell. During transportation care must be taken that the water be kept well aerated and at a uniform temperature, otherwise the fry will become exhausted before reaching their destination. Caution and judgment, which can only be acquired by experience in the business, are necessary in every detail of this work, which is the consummation of all the labour and pains bestowed upon the ova during the previous seven months. Under these conditions, and with a million fry in the nursing troughs, all ready for distribution, the magnitude of the work at this season can be understood.

The distribution which extended over a very large portion of the Province, and comprised thirty rivers, was performed with almost perfect success, no loss being met with except from those intended for the rivers entering Mahone Bay, Lunenburg County. The loss from this lot amounted to about 50 per cent, from the unfavorable circumstances I was obliged to contend with in attempting to reach that remote point.

In accordance with the instructions received from your Department, the distribution was as follows:—

Sackville River, Halifax Co.....	150,000
Shubenacadie River, “	50,000
Musquodoboit “ “	50,000
Gay’s “ “	20,000
Indian “ “	20,000
Ingraham “ “	20,000
North East “ “	10,000
Little Salmon “ “	10,000
Mosher’s “ “	10,000
Nine Mile “ “	20,000
Total Halifax Co.....	360,000
Meander River, Hants Co.....	20,000
Windsor “ “	20,000
Total Hants Co.....	40,000
Gaspereaux River, King’s Co.....	20,000
Cornwallis “ “	20,000
Total King’s Co.....	40,000
Philip River, Cumberland Co.....	100,000
Wallace “ “	40,000
Pugwash “ “	25,000
Total Cumberland Co.....	165,000
Annapolis River, Annapolis Co.....	50,000

Salmon River, Colchester Co.	60,000
Stewiacke " "	25,000
North " "	25,000
Debert " "	20,000
Total Colchester Co.	130,000
West River, Pictou Co.	50,000
East " "	50,000
Middle " "	50,000
Sutherland's River, Pictou Co.	20,000
Total Pictou Co.	170,000
Martin's River, Lunenburg Co.	8,000
Gold " "	6,000
Middle " "	6,000
Total Lunenburg Co.	20,000
Tracadie River, Guysboro' Co.	20,000
Retained for experimental purposes.	5,000
	25,000
Showing a grand total of.	1,000,000

salmon fry distributed among the principal rivers of the central counties of this Province. The cool and favorable state of the weather during the greater part of the month of May materially assisted me in this important and arduous work, and reduced the risks of loss during the long and tedious journeys some of the fry were subjected to before reaching their destination, and in almost every instance they were quite as strong and healthy when placed in the rivers as when first taken from the hatching troughs.

The attempt to deposit 20,000 fry in the waters of Martins, Gold and Middle Rivers, as stated above, was unsuccessful. In consequence of the failure in regard to those streams the previous year, I was particularly anxious to secure success this season, and to this end I communicated with Overseer Redden and requested him to render me assistance and give me information as to the best and most expeditious route by which Chester Basin could be reached. He advised chartering a sailing vessel from Halifax direct to the mouth of Gold River; but, in consequence of the uncertainty of this route and the probable detention from fogs, calms, storms or head winds, I decided to take the more speedy route by steamers from Halifax to Lunenburg, then by wagon twelve miles, to Martin's River, and thence by row-boat to Gold and Middle Rivers. The necessary arrangements being made, I left the hatching-house, on the morning of the 16th May, with three barrels containing the above number of fry; they were conveyed to Halifax by whale-boat, where passage was taken by steamer, and the town of Lunenburg reached at 12 noon the same day, when no signs of exhaustion was exhibited, but the fry was as strong and lively as when first taken from the nursing troughs. From here they were conveyed to Martin's River on a light spring wagon; but before reaching that point I observed that many became exhausted from the effects of the violent motion imparted to the water in the barrels, caused by the exceedingly rough state of the roads. At the river I was met by C. E. Church, Esq., M.P., Overseer Redden and others, and the condition of the fry stated. As very few had as yet become exhausted beyond recovery, if placed into running water, I had decided to put the whole number in this river and thus avoid any great loss; but finding that a strong desire existed among the parties present to

have a portion put into Gold River, I yielded to their wishes, but met with a very heavy loss by so doing.

From this second failure in attempting to convey salmon fry to such remote points, and actuated by an earnest desire to successfully carry out in all its details the work entrusted to me, and to prevent any partial subversion of the great benefits accruing to the country through its introduction, I beg most respectfully to submit the following remarks.

I do not consider it advisable, or in the best interests of the enterprise, to attempt at present to restock from this establishment those rivers which are not within 15 or 20 miles of the lines of railway now in operation. It cannot be done with any certainty of success, and, besides entailing a probable loss, it occupies two or three days of time (which at that season is invaluable) in the transportation of a comparatively small number of fry to those remote points which might be much more profitably employed in distributing a larger number among those rivers to which a round trip can be made by means of the railway in operation in one day. When the large number of rivers (about 30) so situated is considered, and the enormity of work which is always requisite at this season is taken into account, it will be seen that a very large field is to be covered. As railway conveyance is the only easy and rapid and, consequently, safe mode of transporting the young fry to any great distance, it would be useless to attempt to restock the rivers at the extreme parts of this Province until the lines now in course of construction are completed; then every river from Yarmouth in the west to the Gut of Canso can be reached in safety and receive its quota of fry annually.

When selecting suitable localities on the different rivers in which to deposit the young fry, the upper portions of the stream were invariably chosen, as offering the greatest natural advantages for their rapid growth and protection. Animalculæ and the eggs of the water insects, which comprise the principal food of the infant fish during the parr stage, are found there in the largest quantities, and greater immunity from destruction by the swarms of predacious fish which enter the rivers in the spring of the year in search of food, is obtained. Many of these streams possess admirable natural facilities for the rearing of young salmon; generally the beds are of a gravelly nature and afford magnificent spawning grounds for the parent fish, and now, that in many instances the lumbering interests are of but slight importance, in consequence of most of the valuable timber being cut off, it appears to be an opportune time to regain the wealth they formerly possessed in their salmon fisheries. The great obstacle to the accomplishment of this object in a short space of time, is the number of impassable dams which obstruct the parent salmon to the spawning grounds. In some instances, as many as seven or eight of these obstructions exist. The mill owners, generally, are very reluctant to provide suitable fish passes, but appear to entertain the idea that the rivers are their special properties, and that they alone are entitled to the benefits to be derived from the existence of those streams. This disposition will materially retard the progress of the work contemplated by your Department, and until efficient fish ladders are erected over every dam, the great object can never be reached; the rivers will never become self-sustaining, but will be useful only as nursing or feeding grounds for the artificially hatched salmon. It is a well established fact, that all anadromous fish seek to return, for the purpose of spawning, to the place where they were first introduced into the water, and that their homes for reproduction are those rivers where their first or parr stage is passed, hence the necessity for a free and uninterrupted passage way from the sea to the heads of the rivers. The fact that almost unlimited numbers of salmon fry can be hatched and successfully planted in our rivers, has long since been fully demonstrated, but that our river or coast fisheries will be benefitted by this is doubtful indeed, unless means are adopted which will enable these fish to ascend to the spawning grounds, and in turn produce their kind.

Ova collected this Season.

The work of collecting a stock of ova for this establishment during the past season was accompanied by much less difficulty than in former years, but I was

unable to reduce the expenditure to any great extent, in consequence of the necessity for operating upon so many rivers, and employing four or five different crews of fishermen. During the past summer considerable improvements and additions were made to the appliances for catching and retaining a supply of the parent fish on the Philip, where an efficient reception tank was built last year, and that the temporary creels which I had used last season were not satisfactory, I obtained permission from your Department to build additional reception tanks on West River, Pictou Co., and Musquodoboit River, Halifax Co.; these appliances were accordingly prepared for the reception of the parent fish, and gave perfect satisfaction. The choice of the Musquodoboit as one of the points of collection proved to be a fortunate one, as a much larger number of salmon were caught on this river than from any of the others. The presence of a very efficient fish ladder over the dam which obstructs the channel of this river immediately at its mouth, rendered the work of catching the salmon a comparatively easy matter. By means of a small wooden trap placed at the head of this ladder, the fish were captured without any handling, and free from the bruises and injuries always received when the ordinary mesh or gill nets are used as on the other rivers. After being caught in this trap, they were conveyed a distance of two miles by waggon to a beautifully clear raceway, where they were allowed to disport themselves on the fine gravelly beds until ready for manipulation, when they were driven into a reception tank built at the lower end of this raceway, and separated preparatory to spawning. The natural advantages for the work which this place possesses are of an exceptionally favorable nature, and as an evidence of this I might state that of 190 fish caught and treated as above, not one died or was found injured or at all scarred. From my experience of this place, I am so favorably impressed with its perfect adaptability for the purpose, that, with the consent of your Department, I purpose making it the principal point of collection for the future. The fish in that river are as large as those frequenting River Philip or the rivers of Pictou Co., and in numbers far exceed those streams. I have reason to believe that had the fishermen been permitted to labour undisturbed during the month of October, that over 300 salmon would have been taken from this river alone. At West River, owing to the high freshets of October, the catch was small, being only 80, and of this number about two-thirds were males, and, consequently, of no value to me. On River Philip the catch amounted to 120, with a great superabundance of males; some beautiful specimens were taken from this river, many weighing over 25 lbs, and two females exceeded 35 lbs in weight each, and yielding respectively 20,000 and 25,000 eggs.

For the purpose of obtaining an approximate idea of the number of salmon entering the Sackville River, and the extent to which that stream could be depended upon for a supply of ova, I placed a small trap at the head of the fish ladder over the dam, immediately above the hatching house, and succeeded in capturing about 60 fish, mostly grilse or small salmon. These were taken in the latter part of September, and a subsequent large run in October entered the river, but escaped me. From the numbers seen leaping over the dam at this time, I have reason to believe that fully 200 might have been caught if more efficient means had been employed; but with the rather limited knowledge I possessed of its resources, I did not deem it advisable to expend much money or devote much time to it at this busy season of the year. However, enough was observed to warrant me in advising your Department to adopt some means which will enable me to utilize these fish, and thus reduce the annual outlay for the collection of ova as under the present system. The details and requirements by which this can be accomplished have been furnished your Department, and I beg to again urge upon you their adoption during the coming year.

The total number of fish secured at the different points of collection was 420, of these 240 were males and 180 females, from which I obtained 1,650,000 eggs; 200,000 of this quantity were disposed of as directed by your Department; the balance of 1,450,000 were deposited in the hatching troughs of this Establishment. The loss up to the present time has been very light, and, as the embryo is now plainly visible, I have every reason to expect a most successful hatching.

The interior of the hatching-room is in the same satisfactory condition as reported last year, and I hope to be able to lay down a much larger number of ova next season.

I have the honour to be, Sir,
Your obedient Servant,

A. B. WILMOT,
*Fishery Officer in charge
of the Bedford Fish breeding Establishment.*

REPORT OF W. H. VENNING, Esq., INSPECTOR OF FISHERIES, ON THE
MIRAMICHI FISH-BREEDING ESTABLISHMENT FOR THE SEASON
OF 1877, AND THE TRANSPORT OF SALMON OVA FROM BEDFORD
AND RESTIGOUCHE.

St. JOHN, N.B., 31st December, 1877.

Hon. A. J. SMITH,
Minister of Marine and Fisheries.

SIR,—The ova laid down in the fall of 1876 continued to progress favourably with very small loss until the latter part of March, 1877, when a heavy freshet set in. Large deposits of black sediment covered the eggs, and a very serious loss by addling occurred. On being informed of these facts by Mr. Sheasgreen, the caretaker of the establishment, I supposed that this loss was occasioned by some substance in the water, which acted on the zinc of which the trays were made, and I immediately instructed him to transfer all the eggs from zinc trays to earthen ones obtained from Mr. A. B. Wilmot, of the Bedford House, and to reduce the number on these, so as to give them more room, thinking they would be better if but a single layer of eggs was on the bottom of each tray, as this would prevent so much sediment from adhering. He did this, but an alarming loss still continued, and on the 7th April I went to Miramichi to see if anything could be done to remedy this serious and unexpected misfortune.

On arriving at the Hatching House I found the freshet still very high and the water loaded with an amount of sediment that completely covered the eggs, rendering it necessary to wash them every day. This had continued for ten days, and the loss in that time had more than trebled the total loss since the eggs were placed in the troughs. The deaths had been greatest on the zinc trays, next on the gravelled ones, and was very serious indeed. I carefully measured the trays, and found as follows:—

217 earthen trays, containing 1,500 each	325,500
106 saucers, " 350 "	37,100
3 double zinc, " 3,000 "	9,000
2 wire, " 3,000 "	6,000
	377,600

Showing that over forty per cent of the whole number laid down had perished, while the daily loss still going on was very considerable.

I immediately apprised you of all these facts in my report, dated 11th April, and Samuel Wilmot, Esq., was sent from Ontario to ascertain the causes that had led to this disastrous loss. I met Mr. Wilmot at Newcastle on the 16th April, and with him visited the House. The freshet was then subsiding and the water running much clearer than when I saw it on the 7th.

All the facts above recorded were stated to Mr. Wilmot, and every occurrence known to me was fully detailed, to enable him to form a correct opinion as to the cause of this unfortunate calamity. He measured the trays, and found as follows:—

217 earthen trays, each 1,400	303,800
4 zinc " " 1,400	4,600
2 wire " " 850	1,700
106 earthen saucers, 180	19,080
	330,800
Deduct some scant trays	4,180
	326,000

Showing a loss between the 8th and 16th April of 51,600 eggs.

As the freshet fell and the water ran clearer the daily loss grew smaller, until about the last of April, up to which date only about 7,500 more were lost, and from that time until the fish emerged from the shell, early in May, the loss did not exceed 500, leaving 318,000 healthy young fish in the troughs.

These were nursed without further loss, and early in June were distributed as follows:—

North-west Miramichi.....	50,000
South-west do	50,000
Little South-west Miramichi.....	50,000
Sevogle	20,000
Bartibog	20,000
Tabusintac	20,000
Burnt Church.....	20,000
Napan River.....	20,000
Black River	20,000
Salmon River, Kent County	20,000
Shediac River, Westmoreland County.....	20,000
	318,000

The transportation, principally by horse and waggon, was made without any appreciable loss, as the weather was cool and favourable for the purpose.

The report made by Mr. Wilmot attributes the loss to want of judgment and carelessness on the part of Mr. Sheasgreen. In my remarks on this report, submitted to you, I have given my reasons for dissenting from the conclusions arrived at by Mr. Wilmot, and have also given you my opinion of the real cause of the two disasters that have befallen this house. The first one occurred when it was under the care of Mr. A. B. Wilmot, and the superintendence of Samuel Wilmot Esq.; the second one occurred under the care of Mr. Sheasgreen, and my superintendence, undertaken at the earnest wish of the Commissioner of Fisheries, while Mr. Samuel Wilmot was busily engaged at Sandwich, and Mr. A. B. Wilmot at Bedford.

Of course it is an easy solution of the difficulty to attribute it in both cases to incompetence and negligence, as Mr. Wilmot has done.

Neither of the accused parties has had an opportunity given him of rebutting this charge, nor has Mr. Wilmot given any proofs of its truth, further than to state that such is his opinion, based upon a very limited induction. As I have had much better opportunities of judging in this matter, and a much more intimate knowledge of the stream that supplied the House, and its peculiarities, I am forced to a conclusion entirely different from the one expressed by Mr. Wilmot, and I have given you my reasons for believing that the "carelessness and want of judgment" were shown in the original arrangement of the House and not in the subsequent management of it.

In my opinion, based upon a careful consideration of the facts recorded and detailed to you in my special letter on this subject, the real cause of all the trouble has been an inadequate flow of water from the tank into the hatching troughs, owing to the insufficient head in the supply pond, or to the incapacity of the supplying pipes to keep the water at a sufficient height in the tank. I have stated this opinion to Samuel Wilmot, Esq., and expressed my belief that in order to make this establishment successful it will be necessary to largely increase the supply of water, either by raising the head in the pond or by increasing the capacity of the pipes that lead from the pond to the reservoir in the hatching room. I think it my duty to record my conviction that until this is done the same loss will occur in future whenever a large number of ova are laid down, because the flow through the hatching troughs is not sufficient to supply the requisite aerated water to a large number of ova in an advanced stage of development. If this defect is remedied, I see no reason why this House should not succeed as well as any other now in operation.

During last summer, Samuel Wilmot, Esq., took the entire control and management of the House, and I trust that, with his superior knowledge and experience, and with the change I have pointed out as absolutely necessary, the difficulties that have beset this establishment will be overcome.

On the 14th November, I received a telegram from Mr. A. B. Wilmot requesting me to meet him at Moncton and take charge of 200,000 salmon ova for the Miramichi Hatching-House. I left here on the night train, and on arriving at Moncton met Mr. Wilmot with the eggs in charge. I requested him to accompany me to Miramichi to assist me in carefully handling the eggs and also to give me his opinion as to the sufficiency of the head of water now in that establishment to hatch and nurse all ova the troughs will hold.

We were met at the Station by Overseer Hogan with a good spring waggon, and immediately started for the House, where we arrived about 4 a.m. on the morning of Saturday. Mr. Wilmot assisted in laying down the eggs, which I am happy to state looked well and gave every indication of being healthy and in good condition. Mr. Wilmot then inspected the feeding dam, measured the height of water in the tank, and expressed his belief that the increased flow of water will remove at least one cause of failure, and that the chances of success are now much increased.

There are in the troughs 510,000 ova, which are doing well, with a small percentage of loss. With the 200,000 to be supplied by Mr. Mowat, there will be 710,000, which will enable us to test the establishment this winter and next spring. I have great confidence in the successful result, and hope my judgment will be found correct.

On the 17th January, 1878, I left St. John by night train for Dee Side, Mata-pedia, in order to transfer to the Miramichi hatching-house the overplus of 200,000 salmon eggs, of which Mr. Mowat was desirous of being relieved, fearing overcrowding in his restricted trough room when the young fish came from the shell.

I arrived at Dee Side on Saturday, and as the down trains lay over Sunday at Campbellton, I could not leave until Monday night. On Monday afternoon, with Mr. Mowat's assistance, I packed the eggs, which were in good condition, the young fish being plainly visible in all. The weather was very favourable, being soft and mild, and we reached Miramichi station about two o'clock on the morning of Tuesday. Overseer Hogan met us at the station with a suitable conveyance, and about 4.30 a.m. we reached the House and proceeded to transfer the eggs to the hatching troughs which was done as quickly as possible.

The eggs turned out exceedingly well, having stood the journey and the double operation of packing and unpacking with very small loss, not over 2,000 having died. They were transferred to the troughs, and when I left the house on Tuesday morning all looked well and promising.

There are now in this house 710,000 healthy ova; the embryos are visible in all the eggs, and many of them show signs of life, their motions being very perceptible. From present appearances I confidently anticipate a successful issue. If anything should happen, I have no hesitation in saying it will be in consequence of the limited supply of water flowing into the troughs. Although this is nearly double what it was last winter and previously, in consequence of raising the head in the supply pond, which was done last winter by Mr. S. Wilmot's directions, still the supply is not much more than one half that of the Bedford house, and not more than quarter that of the Dee Side house. I am in hopes, however, that it will prove sufficient to hatch and nurse the quantity now in the troughs; but I must again repeat my conviction, that, before it will be safe to lay down a million in this House, the supply of water must be largely increased. I have expressed this conviction to Mr. S. Wilmot, and I trust he will see the necessity of having the requisite alterations made before next season passes.

I have the honour to be, Sir,

Your obedient servant,

W. H. VENNING,

Inspector of Fisheries, New Brunswick.

REPORT OF MR. JOHN NEVIN, FISHERY OFFICER IN CHARGE OF
THE SANDWICH FISH-BREEDING ESTABLISHMENT, IN THE
PROVINCE OF ONTARIO, FOR THE YEAR 1877.

HON. A. J. SMITH,
Minister of Marine and Fisheries.

SANDWICH, 31st December, 1877.

SIR,—I herewith beg leave to present my annual report as officer in charge of the Fish-breeding Establishment at Sandwich:—

Owing to the small catch of white-fish, and to the fact that the fish did not commence spawning this year until the 9th of November, some fourteen days later than last year, we were unable to obtain any spawn from the swing-nets, and we had considerable difficulty in obtaining the amount we required. We collected altogether 26,000,000 eggs, of which we have at present, in an advanced state of hatching, some 22,000,000.

The following list will show the numbers of eggs taken from each ground, the date of getting them, and the names of parties owning the grounds; also the names of the persons who collected the eggs; and also the names of those persons who did not furnish any eggs, and the reasons why:—

Date of Gathering.	Number of Eggs.	Ground where taken.	Name of Person who gave Eggs.	Persons who collected Eggs.
1877.				
Nov. 9.	500,000	Fighting Island..	J. P. Clark	J. Nevin.....
do 10 & 11	1,500,000	do	do	M. O'Brien
do 11.....	1,000,000	do	D. Meloche.....	J. Nevin.....
do 12.....	8,000,000	do	L. Gerard	do
do 15.....	1,000,000	Turkey Island ..	D. Norvell.....	C. Lemandre
do 16.....	500,000	Detroit River....	J. Meloche.....	J. Nevin
do 9.....	1,000,000	Bois Blanc.....	A. Rankin	E. Boismier
do 10.....	500,000	do	do	A. Martin.....
do 11 to 17	12,000,000	do	do	Wm. Hill.....
	26,000,000			

The new hatching tins work remarkably well, if the spawn be collected by competent persons, it will only require one person to look after every 25,000,000 eggs, which by the other plan required about ten.

The engine and pumps are working well; by burning wood we will make a saving in fuel of fully one half over coal. Everything being in good order in the House, we are prepared to lay down and take care of 35,000,000 eggs.

I have the honour to be, Sir,
Your obedient servant,

JAMES NEVIN,
Fishery Officer in charge of the
Sandwich Fish-breeding Establishment.

EXTRACTS FROM FISHERY OVERSEER JOHN W. KERR'S REPORT ON
SALMON FREQUENTING THE RIVERS AND CREEKS OF LAKE
ONTARIO.

DUFFIN'S CREEK.

On the 19th October, in company with Mr. John Gordon, Sr., the local guardian of this creek, I made a careful examination and found the first bed of the season, and from this date up to the 24th day of November last, salmon were daily seen, when the last salmon took his departure. In all, there appeared to be 40 distinct beds, and 55 salmon were counted in this creek from time to time during the period herein set forth.

LYON'S CREEK.

Mr. James Story, the guardian on this creek, reports that he observed six salmon beds in this creek, between the Grand Trunk Railway and the Kingston Road, upon the Flats and on the Rapids, but he saw no fish, although twelve salmon were seen there by other persons. I would recommend that a gate, wired, should be placed under the bridge at the Kingston Road every fall during the spawning season, so as to prevent the salmon going beyond this bridge; for the simple reason that during other and previous years, I have heard and known parent salmon to ascend the two branches of this creek, which run north and west, and getting frozen in; and when spring broke up the ice and it came down stream, salmon were found embedded therein dead.

THE ROUGE RIVER.

Mr. Henry Moon, the guardian, states that he noticed five salmon beds in the Little Rouge, and three beds in the Big Rouge; and he reports that, to his belief, a salmon was speared and taken away one night, after he had passed a certain spot on the Little Rouge to cross over to the Big Rouge.

THE RIVER CREDIT.

Mr. James G. Wilcox, Fishery Warden on a portion of this stream, reported no salmon being observed in that stream during the spawning season last fall. The Messrs. Barber, of Streetsville, being remonstrated with for permitting dye-stuffs, creosote &c., to pass into this river from their woollen and other factories, alleged that no salmon has been seen north of Dundas Street at Springfield, during the last thirty years. I differ from them, as a few salmon were caught last spring by anglers, in a small creek which enters the River Credit at Norval, and in which Mr. Samuel Wilmot deposited some fry about four or five years ago. Two salmon were also caught, one of them with a fry in the Credit, on Lot No. 3, 2nd Concession, Township of Toronto, about 13 inches long, and on the same day after a freshet, the person who caught this salmon, states he saw several small salmon left dead after the water receded.

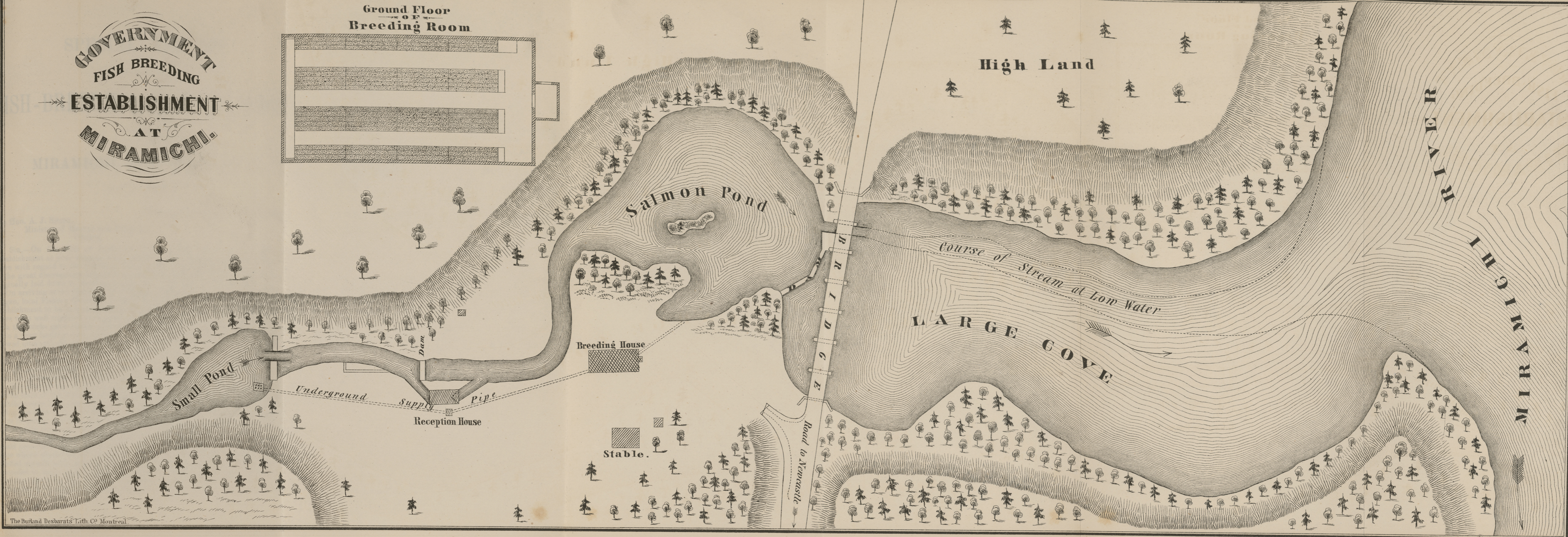
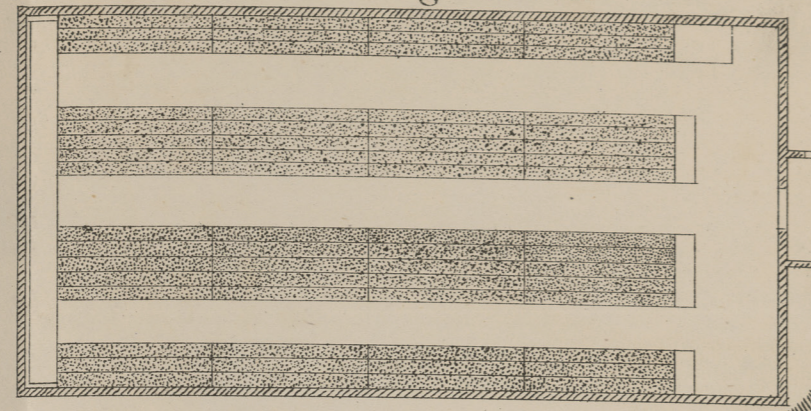
LAKE ONTARIO.

With respect to the catch of salmon during the past year in Lake Ontario, I beg to report that a salmon was caught at the mouth of the Rouge, by Mr. William Cowan, and liberated. Mr. Black caught two salmon at Frenchman's Bay. Mr. David Ward, of Toronto Island, caught two salmon in a hauling seine, and one in a herring gill-net. Mr. Gray, Toronto, caught a young salmon and liberated it. Mr. Patrick Hand, caught a salmon in a herring gill-net, 5 pounds weight, at Winona. Mr. Duncan McGillivray, Burlington Beach, caught a speckled trout 2 lbs. weight, and a salmon 1½ lbs. weight, in Lake Ontario. Mr. David Tryson, same place, caught two salmon in Lake Ontario, 2½ and 1½ lbs. weight. Mr. Mortimer Cory,

same place, caught a small salmon. Mr. Ben. Folds, same place, caught two small salmon; Mr. Ben. Clink, same place, caught a small salmon in Lake Ontario, Burlington Beach. Mr. John Taaffe, caught two small salmon in Lake Ontario, at Burlington Beach; and Mr. Charles Shears, when spearing last spring in a fish-house on Burlington Bay, near Willow Point, speared a 7 lb. salmon. This shows that, whatever others may say to the contrary, salmon are still on the increase in Lake Ontario. The cost of guarding the salmon creeks last fall was \$160. I may also state that many salmon that were found alive in the gill-nets by fishermen, were liberated; thus showing that there was no intention on the part of fishermen of taking these young salmon fish, wherever it could be avoided. The people in general have a more kindly disposition towards our salmon.

**GOVERNMENT
FISH BREEDING
ESTABLISHMENT
AT
MIRAMICHI.**

**Ground Floor
OF
Breeding Room**



The Burland Desbarats Lith. Co. Montreal

same
salmon
ton
Beacon
ton
other
The
that
thus
young
kind

ESTABLISHMENT
FISH BREEDING
MIRAMICHI

ESTABLISHMENT

MIRAMICHI



SPECIAL REPORTS

ON THE CONDITION OF THE

FISH-BREEDING ESTABLISHMENT

— AT —

MIRAMICHI, NEW BRUNSWICK.

NEWCASTLE, ONTARIO, 28th June, 1877.

The Hon. A. J. SMITH,
Minister of Marine and Fisheries,
Ottawa.

SIR,—On the 16th of April last, I visited the Miramichi Salmon-Breeding Establishment at your request, with a view to ascertain, if possible, the true position there with regard to the numbers of ova on the hatching trays, and learn the cause of the great discrepancy reported to exist between the quantity of eggs that were originally laid down in November last.

On arriving at the Hatchery in company with Mr. Inspector Venning and Mr. John Hogan, local Fishery Overseer, I found the external and internal appearance of the establishment to be in a satisfactory condition. The breeding troughs and hatching trays were well supplied with good living water and all the appliances in connection with the works gave evidence of cleanliness and order, and the ova were found to be in a very healthy state and far advanced. The embryos were well developed and showed unmistakable signs of strength and vigour.

A heavy flow of water was running in the stream which supplies the hatchery at the time of my visit; this was accounted for by the general melting of the snow throughout the country, and was called a "freshet" by the persons present as well as by Mr. Sheasgreen the officer in charge.

The time of my inspection was therefore an opportune one, as I was enabled to see the state of the water as compared with other streams upon which other breeding establishments have been built in other sections of the country, and particularly so during the time of a "freshet." I therefore examined this water very closely so far as its purity and taste was concerned. I found it dark or porter coloured, nevertheless quite pure and seemingly free from sedimentary matter, and quite palatable to drink. In fact, judging from general appearances and without a chemical test, I should pronounce the water of this stream for fish-breeding purposes equal to any other where similar establishments are now being carried on successfully. Having satisfied myself with regard to the unexceptionable character of the water, I then proceeded to make a fair and accurate calculation of the number of ova then lying upon the hatching trays. This was done by the usual process of counting and measurement, which for all reasonable and practical purposes will so nearly app roxi

mate the actual numbers as to leave no doubts concerning the correctness of the result. The sum total of eggs thus ascertained amounted to 326,000 healthy vivified spawn. They were distributed as follows:—

On 217 Earthen trays each.....	1400 =	303,800
“ 4 Zinc “ “	1400 =	5,600
“ 2 Wire “ “	850 =	1,700
“ 106 Earthen saucers “	180 =	19,080
		330,180
Deduct on some trays.....		4,180
		326,000

On the 6th of November last, 650,000 eggs were reported to your Department by the officials as having been laid down in the Miramichi Hatchery.

On the 17th of November, Mr. Sheasgreen, the caretaker, writes thus: “Between 600,000 and 700,000 eggs laid down here; they look well.”

On the 2nd December, Mr. Venning reports: “Loss almost inappreciable, not more than 1,500 dead ones having been removed; the eggs showed a bright and “healthy appearance, the embryo being plainly discernable in all.”

From the above official statements I made mention in my annual return to your Department, of 31st December last, “that 600,000 salmon ova were deposited in the “Miramichi Breeding Establishment during the fall of 1876.”

The difference between the numbers of eggs reported to have been laid down in the autumn of 1876, and the actual quantity on hand at the time of my visit to the hatchery on the 16th April, would show a falling off of one-half of the whole, or fifty per cent of a loss. This appears very extraordinary indeed, in the face of the several statements which were made from time to time, “that everything was going on well, “and that the losses were inappreciable.”

The alleged cause of this extremely unusual loss of eggs is attributed by the officer in charge to the large quantity of sedimentary matter that was deposited on them from the effects of heavy spring freshets, and from being placed on zinc trays, or from both causes combined, by which some chemical action was produced which killed the ova. Should either of these causes, or a union of the two, have produced this terrible loss, then the disaster might be accounted for. But it is very doubtful indeed whether these were the real causes of the great reduction in the numbers of eggs.

At a period as late as the end of the month of March, it was reported by the caretaker “that the total loss of eggs did not exceed 50,000.” Taking this statement to be correct, there would still have been on hand about 92 per cent, or nearly 600,000 ova.

On the 4th of April, the works were visited by Messrs. Snowball and Smith; these gentlemen each made a hurried calculation of the number of eggs on the trays, putting them down at 280,000. Whilst this count may have approximated the quantity, it was nevertheless quite under the mark, as the true estimate should have been upwards of 320,000.

On the 9th of April, Mr. Venning, during a visit which he made to the hatchery, made a calculation of the number of eggs, as near as could be, which was as follows:

On 217 earthen trays, each 1,500 eggs.....	325,500
“ 106 “ saucers, each 350.....	37,100
“ 10 zinc and 1 wire tray, 1,500.....	15,000
	377,600

As the correct count was 326,000 on the 16th April, being the time of my inspection of the establishment, the estimates made by Messrs. Snowball and Smith

of 280,000 on the 4th of April, and that of Mr. Venning on the 9th April, of 377,600 (though differing widely) may be taken as some data from which to fix the time in which the great bulk of the alleged loss of ova took place; this, then, must have been between the latter part of the month of March and the 4th or 9th of April. During this period of time some 270,000 eggs (which just previously were reported to be in good condition) all at once perished.

This great loss of fish eggs being of such an extraordinary nature, the statement of their numbers on the trays so conflicting, and the cause of their mortality as related being untenable, has not been satisfactorily explained; I am therefore compelled, however unpleasant it may be, in following out the dictates of my judgment, to say that the true cause of the difficulty and loss of ova at the Miramichi Fish-Breeding Establishment, has resulted, in my opinion, from incompetency or neglect, or both, on the part of the officer in charge of the building, and that deception has been resorted to in order to cover up the actual state of affairs.

Incompetency has been shown either in the incorrect method of counting the eggs when first taken, or in the improper mode of impregnating them, whereby the numbers became so greatly reduced on the 16th April, to what they were represented to be when first laid on the hatching trays in the previous month of March.

Neglect must have been practised to allow such an extraordinary percentage of ova to die (assuming that the alleged numbers were laid down and properly fertilized) as it would be almost impossible, even with the most ordinary care, (and quite unprecedented elsewhere) that the enormous loss of fifty per cent of the whole should take place in so short a time, and at that advanced period of incubation when the embryos had become almost perfect fry, and possessed great powers of endurance and vitality.

Deception, I fear, has been resorted to in order to cover up incompetency or neglect, by attributing the falling off in numbers and the death of the eggs, to sedimentary matter in the water, and to alleged injury in the use of zinc trays.

As this is the second occurrence of a similar misfortune in the serious loss of salmon ova at the Miramichi Salmon-Breeding Establishment, I feel it incumbent upon me to make these plain statements of my views with regard to the working of that institution. Of the loss there in 1875, I very plainly stated to your Department that it was caused by negligence and want of attention to the work; I am of the same opinion still. Of the loss of 1876, I am compelled to say that incompetency, added to misstatements of the number of ova, and of other facts, have produced results similar to the season of 1875.

In addition to my instructions concerning the loss of eggs at Miramichi, my attention was directed to a complaint against the officer in charge, for incivility offered to certain gentlemen when visiting the Hatchery. As Mr. Sheasgreen has already, by letter, admitted his error in this case, it will be unnecessary for me to further revert to it. I may, however, here state, for your information, that I have made it an invariable rule to draw the attention of the officers in charge of the several fish-breeding establishments, that it was desirable that every possible attention and civility should be extended to visitors; and one of the principal objects aimed at by me has been to make the several institutions as attractive as possible, in order to induce persons to visit and inspect them, for by this means more knowledge would be disseminated amongst the people in relation to this somewhat novel, yet highly important national enterprise.

I have the honour to be, &c.,

SAMUEL WILMOT,
Supt. Fish Culture.

FISHERIES OFFICE, ST. JOHN, N.B.,
1st December, 1877.

The Hon. Minister of
Marine and Fisheries,
Dorchester, N.B.

SIR,—I thank you for directing a copy of Mr. Wilmot's report, on the Miramichi Hatching House, dated 28th June last, to be sent to me.

I have carefully read it, and am glad to find that no charges against my official integrity have been made, and that the reiterated slanders of the Editor of the *Advance*, against me personally, are entirely unsupported by anything Mr. Wilmot has written. My own reports to the Department, dated 7th and 11th April last, are fully corroborated by Mr. Wilmot, who also corrects the erroneous statements of Messrs. Snowball and Smith, as to the number of ova in the House at the time of their visit.

As the Miramichi River sadly needs the assistance of this establishment to keep up its stock of salmon, which has been visibly failing for some years, I have always felt a great interest in its success, and I still hope that it can be made as successful as any other house now in operation; but I am convinced it has some serious obstacles to contend with.

While I freely admit the great ability of Mr. Samuel Wilmot, and his superior knowledge of all matters connected with practical fish culture, still, with deference and respect, I venture to submit some remarks on several opinions expressed in his report, for which I respectfully beg your consideration, because I have had better opportunities than he has had for knowing the nature and peculiarities of the stream which supplies the hatching trough, and the character and honesty of Mr. Sheasgreen, the officer in immediate charge of the House.

1st. Mr. Wilmot errs in saying that he was "enabled to see the state of the water during the time of a freshet." At the time he considers so opportune for this purpose, the freshet had nearly subsided, and the stream was comparatively clear and pure. Had he seen it on the 9th April and previously, instead of on the 16th, he would scarcely have written his remarks on its purity and freedom from sedimentary matter. Even on the 16th of April, six days after the water had fallen several feet, he describes it as "dark or porter coloured." How pure and free from sedimentary matter such water could be, you are quite as well able to judge as either Mr. Wilmot or myself. But this I affirm—that when I saw the water on the 9th of April, and described it in my report to you of the 11th of April, its character was entirely different from that which Mr. Wilmot describes on the 16th, and no man with eyes could truthfully say that it was anything but most foul and dirty. Therefore I submit that Mr. Wilmot was sadly in error when he says he "satisfied himself with regard to the unexceptionable character of the water," and pronounces it, for fish-breeding purposes, equal to any other where similar establishments are now being carried on successfully.

2nd. I honestly believe that Mr. Wilmot errs in attributing the loss of either 1875 or 1877 to incompetency or neglect. Of the former year, Mr. A. B. Wilmot's report gives his opinion, founded on the facts recorded, and I see no fair grounds for questioning these facts, while there are grounds for his opinion, of which Mr. Samuel Wilmot appears to be ignorant; at all events, he has not alluded to them. From my knowledge of Mr. Sheasgreen and from the character he bears among his neighbours, I am very unwilling to believe, without some show of proof, he would resort to deception to cover up anything that happened or knowingly make misstatements to deceive me or the Department as to the loss of 1877. Besides, he could not possibly do these things without the knowledge and connivance of Overseer John Hogan, and this man, at least, is quite incapable of such conduct, as the record of his whole life shows. Therefore, I think Mr. Wilmot has been hasty in jumping to this harsh conclusion. I have seen more of this man than Mr. Wilmot has, and I have seen much

more of the Hatching-House while under his care. Had I seen anything in his conduct to lead me to the conclusion Mr. Wilmot expresses, I would not have hesitated one moment to report the facts to you, and I would have gone further than Mr. Wilmot has done—I would have strongly urged his dismissal—for no establishment could succeed under the charge of so dishonest and unreliable a man as Mr. Wilmot describes. As to his competency to manipulate the fish, to impregnate the ova, and to take proper care of the ova in the troughs, I think Mr. Wilmot will admit that he was the best man then available for these services, having had more practice and experience than anyone that could then have been obtained. His practical experience of the house through all its past troubles, now qualifies him for its care much better than any other man; and I have not a shadow of doubt of his intense wish to succeed in overcoming the difficulties that have beset him. It should be borne in mind that Mr. Sheasgreen has never seen any other hatching house, and had to follow the directions given him by the Messrs. Wilmot and myself, and I have no reason to doubt that he has done so with more than ordinary intelligence and care. I feel that in thus giving you my opinion of Mr. Sheasgreen, in opposition to that expressed by Mr. Wilmot, I have done only scant justice to a man who has no opportunity to defend himself against very grave and damaging suspicions, expressed, as I believe, hastily and without sufficient grounds.

With these remarks on Mr. Wilmot's report, I will now, with your permission, state my present opinion of the cause that has led to the ill-success of the Hatching-House, and my reasons for believing that this cause has already been partially, and can be entirely removed. As this opinion has been arrived at after much careful observation and anxious thought, I submit it as worthy of consideration.

I will premise by a short *resumé* of the facts as shown by the records of the Department. Late in the fall of 1873, the house was only partially finished, and many of the ova laid down that fall were lost from exposure to cold and want of proper conveniences for caring for them. During the summer of 1874, the House was completed, and means provided to keep up a suitable temperature. That fall, Mr. A. B. Wilmot laid down in the troughs 1,500,000 ova, which continued to progress favourably until the month of May, 1875, just as the young fish were bursting the shell. At that time, a sudden and great fatality befel the ova,—so great that only 150,000 young fish were produced. In the fall of 1875, owing to extensive freshets, the dam of the retaining pond gave way, and all the parent fish escaped before they were ripe for spawning. By great exertions, Mr. A. B. Wilmot succeeded in getting some 65,000 ova, by going far up one of the tributaries of the South-West. After having laid these down in the troughs, Mr. Wilmot was removed to Bedford, and, at the request of Mr. Whitecher, I consented to do the best I could to supply his place; Mr. Sheasgreen having the immediate care of the house. The ova then in the troughs were hatched out with very small loss, and in the spring of 1876 the young fry were successfully planted according to your directions. In the summer of that year, the dams were rebuilt, and in the fall, 610,000 ova were laid down, which continued to do exceptionally well until the latter part of March, 1877. Between that time and the 9th of April, a loss occurred, amounting to 50 per cent of the whole number. This loss occurred during a very heavy freshet, which deposited a great quantity of black sediment on the eggs. Only 318,000 fry were hatched and distributed. Now, in all this time, from 1874 to 1877, Mr. Samuel Wilmot paid but three or four flying visits to the House, and had no sufficient opportunity of investigating facts or making careful observations. He never gave me any notice of his visits, consequently I had no opportunity of advising with him, or even of taking his instructions. Neither did he communicate with me by letter.

When the first great loss occurred in 1874-5 Mr. A. B. Wilmot attributed it to the foul water and its action on the zinc trays. From certain facts stated in his reports to you, there were some strong grounds in support of his opinion. So firmly convinced was he of the correctness of this opinion, that when he found the same character of water at Bedford, he urged your Department to furnish him with earthenware trays, and he also applied filters that intercepted the sediment before it reached the

eggs. He was very successful with these appliances and consequently more firmly convinced that zinc trays were not suitable for the Miramichi House. But from the above *resumé* you will observe a fact that operates strongly against his conclusion. This fact is, that in 1876-7, the loss occurred on both zinc and earthen trays, although less on the latter. You will also observe another fact that operates even more strongly against his conclusion—that is, when only a small number of eggs were in the troughs, they did well and no unusual loss occurred. Now, these two facts struck me with great force, and I could not but see that Mr. A. B. Wilmot's theory did not meet these facts. If the peculiar nature of the water was the cause of the loss, why did it not kill *all* the eggs—why did a portion escape out of the large crops of ova, and why did all the small crops escape? These questions caused me much anxious thought. Mr. Samuel Wilmot, not having my opportunities for observation, hastily concluded that neglect was the cause of loss, but I had strong reasons for believing otherwise. In the course of my thinking over all the circumstances, another fact in the *resumé* struck me with the force of a sledge hammer—and that fact is that the great losses in the large crops of ova occurred just before the young fish were ready to emerge from the shell! Here a new direction was given to my thoughts, and I was led to suppose that at this particular time the sediment did the mischief. This was my belief up to April last, when I accompanied Mr. Samuel Wilmot on his visit to the Bedford House. The first thing that struck me was the greater body of water flowing out of his tank over the eggs, and I called Mr. S. Wilmot's attention to it, and asked him if the small supply of water might not have had something to do with our trouble. He replied that our pipes ought to supply all the water needed. When next I saw our House I was still more forcibly struck with the difference. Our streams were small, and the water flowed very sluggishly over the eggs. Suddenly, as if by inspiration, it became clear to me, that at the time when our large crops of ova were about bursting the shell, the pipes did not supply water enough to give them the air they needed. Previous to this, and before the act of breathing, the embryos do not need so highly aerated water, and consequently the ova would do well until the time came when more air was wanted. Now, a small sluggish stream flowing through the troughs would give only a certain quantity of air, and that quantity was not enough to supply the wants of hundreds of thousands of embryos struggling in their shells. The consequence would be that suffocation would commence and continue until enough had died to give the remainder the air they needed to sustain them. This is precisely what occurs in the natural process. While the eggs are developing under the ice in winter, they need but slightly aerated water, but when they are nearly hatched and need the air, in the months of May or April, the ice breaks up, the streams rise, the flow of water is greatly increased in the rivers and streams, and the water becomes much more highly aerated, and so supplies the wants of the now breathing embryos. This want of sufficient water flowing from the supply tank to the troughs was, I am now persuaded, the radical trouble with our House, and another consequence of this deficient supply was that the flow would not carry off the sediment, and hence the great accumulation on the ova.

I cannot help thinking that Mr. Samuel Wilmot must have come to this conclusion himself, and must have had doubts of the correctness of his opinion, that incompetency, neglect and deceit were the causes of our loss. Else why did he, this season, order the supply dam to be raised over a foot? Why did he have the pipes over-hauled and made tight? the result of which is that there is now nearly double the quantity of water flowing over the eggs, but still not such full and rapid streams as the Bedford troughs have. This, Mr. A. B. Wilmot and myself tested when he was there with the ova from the River Philip—while it took 30 seconds for one of our streams to fill a bucket, one of his streams filled the same bucket in 19 seconds. And these full rapid streams, passing over his ova, are, in my opinion, the cause of his great success in the Bedford House. He has treated his ova just as he did in Miramichi, and he considers the water of the latter house just as good as that of the former. All the facts contained in the *resumé* above given bear out the conclusion at which I have arrived from my experience of the Miramichi House, and my observa-

tions of the Bedford House strengthen it. When we get the quota of 200,000 from the Restigouche House, there will be 710,000 ova in our troughs, which number, although not so large as I could wish for a rigid test, will give me the means of either verifying the correctness of my conclusion, or proving it erroneous. I am, of course, very anxious about the result, and yet I have confidence enough in Mr. Sheasgreen to leave the care of the house in his hands. If the result is a success, I think no doubt can remain as to the cause of past failures, and no fears need be entertained as to future success. But yet, in my humble opinion, it will be necessary to increase the flow from the supply dam, before it will be prudent to lay down a million and a half or two million ova. With a sufficient flow of water, I see no reason why this house, with its great amount of trough room, cannot just as safely hatch 2,000,000, as I feel sanguine it will, this winter hatch 710,000.

The interest I feel in the success of this house must be my excuse for the length of this letter, and I hope when Mr. Samuel Wilmot considers all the facts that I have stated, he will agree with me in the opinion I have already expressed in a previous letter,—that we have all been looking for a remote and hidden cause of failure, while the real cause has been plainly before our eyes, but has been overlooked.

Recent advices from Mr. Sheasgreen inform me that the ova are doing well, with very small loss. About the 10th instant, I purpose going to Restigouche, to get the eggs from that house, and see that they are carefully and properly laid down, as I wish this winter's test of the house to be a crucial one.

Respectfully submitting to your consideration my conclusion and the reasons that have led to it,

I have the honour to be, Sir,
Your obedient servant,

W. H. VENNING,
Inspector of Fisheries, N.B.

FISHERIES OFFICE, ST. JOHN, N.B.,
November 6th, 1877.

W. F. WHITCHER, Esq.,
Commissioner of Fisheries,
Halifax.

SIR,—When in Newcastle, on Monday 29th ult., Mr. Hogan informed me that under instructions from Samuel Wilmot, Esq., he commenced fishing for salmon early in September, with the net I had made for catching shad (see my report of 1st August), which I sent to him for the use of the Hatching-House. By the middle of October he had secured over 350 parent fish, a larger number than has ever yet been taken for manipulation on the Miramichi. Part of these were placed in the pond, and part in the reception house, where a good flow of water continually passed over them. In a short time the greater part of these, in both places, began to show marked evidence of disease; large blotches of fungus appeared on their bodies, which spread rapidly and ended in the fish becoming hard and finally dying. On opening several of those that died the ova was found to be congested into a hard mass. As this disease appeared to be spreading rapidly, and affected the healthy fish, Mr. Sheasgreen was obliged to liberate them, retaining only such as gave promise of maturing their ova.

Mr. Hogan continued his efforts to procure a further supply, until all the females taken were spent, when he ceased operations, being satisfied that the fish had all spawned.

These facts I related to you in Chatham, on Tuesday evening, 31st ult., and asked your permission to make another effort, hoping that some later run females might yet be secured.

In accordance with your instructions, I accompanied Mr. Hogan and Mr. Sheasgreen up the main North West, and swept several of the spawning beds on the

31st ult. We took twelve female fish, but every one of them had spawned, and no hope remained of increasing our supply of ova from the Miramichi.

Acting on your telegram of 1st inst., Hogan, Sheasgreen and myself went to Bathurst, where Overseer Hickson met us, he having made all the necessary arrangements for sweeping the spawning beds of the Nepissiguit River; Mr. Nicholson, the lessee, kindly giving his permission to do so. We spent the whole of Friday, 2nd inst., in efforts to capture fish in these pools, but the rough and rocky bottom of this river rendered it impossible to use the sweeping net, the fish enclosed escaping under it in every instance. We made strenuous exertions until late in the evening, when a violent storm of rain and sleet set in and rendered it impossible to continue the labor. We then held a conversation with Overseer Hickson as to the possibility of using a bar-net and pound with any hope of success; but both he and the canoe-men agreed in opinion that as the fish were on their spawning beds and not moving up or down the river, there was no reasonable prospect of succeeding in capturing them by that mode. As the storm continued with increasing violence, we were obliged to return to Bathurst, completely drenched and worn out with our unsuccessful labour. The next morning was very cold, and ice was forming rapidly, which precluded any hope of securing the ova, even if we succeeded in capturing the fish. Under these discouraging circumstances we all concluded that any further efforts would incur only a useless expense.

Mr. Sheasgreen informed me that, out of the large number of fish taken in the Miramichi, he has laid down in the hatching troughs but 310,000 impregnated ova. He was obliged to liberate all but 60 females and about 75 males; of the former, many were small fish, and a number were hard and would not yield their eggs.

I made searching enquiries of the men employed in catching the fish, as to the cause of the fungus growth, and was informed that a great many were thus affected at the time of their capture. I also enquired of old fishermen if they could give any reason for this, and was told that some seasons a great many salmon shew these signs of disease, but they were not agreed as to cause. Some thought it resulted from injuries received in the set nets during their ascent of the river; others were of opinion that the cause was rough handling in capturing them and conveying them to the hatching house, while others thought they were caught too early, and kept too long in confinement. This last opinion is, to some extent, strengthened by Mr. Mowatt's experience last year, when several hundred fish taken by him early in the season, and kept in confinement, showed precisely the same symptoms, and had to be liberated before they were ripe for spawning. Both Mr. Hogan and Mr. Sheasgreen assured me that all care was used to handle and transport the fish as tenderly as possible, and that a very large number of them was affected by the fungus growth at the time of their capture. This statement is borne out by the fact that of the twelve taken by me under your instructions, eight were more or less diseased, and covered by large patches of white fungus.

It is much to be regretted that the quantity of ova laid down is so small, as I am very sanguine that the improvements made this season in the water supply of the hatching house, will effectually remove the difficulties hitherto experienced at this establishment. During the past summer the supply pipes have been laid bare; several extensive leaks have been stopped; the head of water in the feeding dam has been raised over a foot; the hatching troughs have been made tight; and at the time of my visit, on the 29th ult., a much more rapid stream of water was discharged from the reservoir into the several hatching troughs. These improvements will, I think, settle the question whether there is anything in the water unfavorable to the healthy development of salmon ova. If this question is once decided favorably, I see no reason why, with better arrangements for procuring the parent fish, this establishment should not be as successful in its results as any other hatching house now in operation.

During the last summer, Samuel Wilmot, Esq. took the entire control and management of the House, since which time, although I have repeatedly written to him on the subject, I have had no reply. When I was in Newcastle, on the 29th October

last, Overseer Hogan informed me that, under instructions from Mr. Wilmot, he commenced fishing for salmon early in September. By the middle of October he had secured over 350 parent fish, a larger number than has ever yet been taken for manipulation on the Miramichi. Part of these were placed in the pond and part in the reception house, where a good flow of water continually passed over them. In a short time the greater part of these, in both places, began to show marked signs of disease. Large blotches of fungus appeared on their bodies, which spread rapidly, and ended in the fish becoming hard and finally dying. On opening several of those that died, the ova was found to be congested into a hard mass. As this disease appeared to be spreading rapidly, and affected the healthy fish, Mr. Sheasgreen was obliged to liberate them, retaining only such as gave promise of maturing their ova.

Mr. Hogan continued his efforts to procure a further supply until all the females taken were spent, when he ceased operations, being satisfied that the fish had all spawned.

These facts I related to the Commissioner in Chatham, on the 30th October, and I asked his permission to make another effort to procure parent fish, hoping that some later run females might be secured.

In accordance with his instructions, I accompanied Mr. Hogan and Mr. Sheasgreen up the main North-West and swept several of the spawning beds on the 31st of October. We took twelve female fish, but every one of them had spawned, and no hope remained of increasing our supply of ova from the Miramichi.

Acting on the telegram of the Commissioner dated 1st November, Hogan, Sheasgreen and myself went to Bathurst, where Overseer Hickson met us, he having made all necessary arrangements for sweeping the spawning beds of the Nepissiquit River, Mr. Nicholson, the lessee, having kindly given permission to do so. We spent a day in efforts to capture fish in these pools, but the rough and rocky bottom of this river rendered it impossible to use the sweeping net, the fish enclosed escaping under it in every instance. We made strenuous exertions until late in the evening, when a violent storm of rain and sleet set in, and rendered it impossible to continue the labour. We then held a consultation with Overseer Hickson as to the possibility of using a bar net and pound with any hope of success; but both he and the canoe-men, all of whom were old fishermen, well acquainted with the river, agreed in opinion that as the fish were on their spawning beds, and not moving up or down the river, there were no reasonable prospect of capturing them by that mode. As the storm continued with increasing violence we were obliged to return to Bathurst, completely drenched and worn out with our unsuccessful labour. The next morning was very cold and ice was forming rapidly, which precluded any hope of securing the ova, even if we succeeded in capturing the fish. Under these discouraging circumstances we all concluded that any further efforts would incur only a useless expense.

Mr. Sheasgreen informed me that out of the large number of fish taken in the Miramichi, he laid down in the hatching troughs but 310,000 impregnated ova. He was obliged to liberate all but 60 females and about 75 males; of the former, many were small fish and a number were hard and would not yield their ova. As soon as the disease became apparent, both Mr. Sheasgreen and Overseer Hogan wrote and telegraphed to Mr. Samuel Wilmot and required his immediate presence; but he neither went or gave them any advice by letter. I was not informed of the trouble until it was too late to take any measure to ameliorate it; as Mr. Wilmot gave explicit orders that no instructions except his own were to be followed.

It is much to be regretted that Mr. Wilmot did not himself visit the House at the time the fish showed these not unusual signs of disease, as it would have extended his experience and given him the means of forming a judgment in a case that occurs not unfrequently on our rivers. At present he knows, from actual experience and personal observation, nothing about the nature of the disease, the appearances it presents, nor the causes that lead to it, and hasty theorizing from very insufficient data has more than once led Mr. Samuel Wilmot into great errors of fact and judgment. His practical experience has been confined to the House on Wilmot's Creek

in Ontario, where the habits of the fish are so essentially different from those of the fish in our rivers that any general conclusions drawn from the former must necessarily be erroneous when applied to the latter. Our fish enter the rivers as early as May and June and their ova and milt are developed while in the rivers. The Ontario fish do not enter his creek until late in October, and then they are fully ripe for spawning, and as soon as they are captured, or at furthest in a few days after, they are ready to be manipulated. Consequently his fish are but a few days in confinement and rarely or never become diseased. Mr. Wilmot does not appear to possess that caste of mind which enables him to reason abstractly and to take into account all the varied circumstances which are necessary to be considered before a correct judgment can be formed. If, added to this mental defect, he will not take the trouble to acquire a personal knowledge of the ordinary and exceptional difficulties that may arise, it is quite plain that his conclusions are much more likely to be erroneous than correct. I feel it my duty to make these observations because I know that in three or four instances his conclusions, drawn from his experience at Wilmot's Creek and applied to our rivers, have been ludicrously erroneous, while the consequences have been seriously disastrous.

I made searching enquiries of the men employed in catching the fish, as to the cause of the fungus growth, and was informed that a great many were thus affected at the time of their capture. I also enquired of old fishermen if they could give any reason for this, and was told that some seasons a great many salmon show these signs of disease, but they were not agreed as to the cause. Some thought it resulted from injuries received in the set nets during their ascent of the river; others were of opinion that the cause was rough handling in capturing them and conveying them to the Hatching House; while others thought they were caught too early and kept too long in confinement. This last is my own opinion. I cautioned Mr. Wilmot against this error, because Mr. Mowat's experience, the previous season, went to show that long confinement will result in a growth of fungus and the same hardening of the body and congestion of the ova as was experienced last season on the Miramichi.

As there were but 310,000 ova in the House, and as I was very desirous of testing my conviction that want of sufficient water was the cause of our former losses, I telegraphed the Commissioner to be allowed to get 200,000 ova from Bedford, and the same quantity from Restigouche, these Houses having each a surplus of ova, their managers having followed their own experience as to the proper time of capturing the parent fish, unembarrassed by the erroneous opinions of Mr. Samuel Wilmot. Having obtained his permission, I communicated with Mr. A. B. Wilmot, of the Bedford House, and by arrangement met him at Moncton Station on the night of the 15th November. He accompanied me to Newcastle, to assist in carefully handling the ova, which were carefully packed in four boxes provided for the purpose. We were met at Newcastle Station by Overseer Hogan, with a good spring waggon, and immediately left for the Hatching House, where we arrived on the morning of Friday, the 16th. Mr. Wilmot assisted in laying down the ova, which looked well and gave every indication of being healthy and in good condition.

Mr. A. B. Wilmot inspected the feeding dam, measured the height of water in the tank, and found that a much better head and flow of water had been obtained, in consequence of changes made by order of Mr. Samuel Wilmot, during the last summer. The supply pipes had been laid bare; several extensive leaks had been stopped; the head of water in the feeding dam had been raised over a foot; the hatching troughs had been made tight, and a much more rapid stream of water was discharged into the several hatching troughs. Indeed, there was every reason to believe that Mr. Samuel Wilmot had, at last, become convinced that the carelessness and incompetency which he had charged upon Mr. A. B. Wilmot and Mr. Sheasgreen, were due to himself in the original arrangement of the works. But, of course, he can hardly be expected to admit so damaging a fact, which, however, the following true statement will demonstrate. When first laid down, according to the directions of Mr. Samuel Wilmot, the pipes leading from the supply-pond to the reservoir in the

hatching room, consisted of only two pipes of three inches each in diameter. To expect to keep up a head of water in a tank, into which only two streams of three inches diameter each, flowed, while sixteen streams, of one inch each, flowed out, displays a total ignorance of the first principles of hydraulics and hydrostatics. So great was this original error, that Mr. A. B. Wilmot was compelled to lay down two additional pipes of three inches each, which he did in spite of Mr. Samuel Wilmot's protestations that "there was water enough." Even with these additional pipes, the supply was not sufficient, and this last summer the supply dam was raised, as above stated, over a foot, which improvement, however, does not give much more than half the supply Bedford House has, and not much more than one-fourth of that which the Restigouche House has. In the former tank there is a waste-pipe which discharges a surplus of nearly half as much as the whole supply of the Miramichi House, while at Bedford, pipes of $\frac{3}{8}$ -inch diameter supply the troughs with more water than inch pipes do in Miramichi. This we proved by actual measurement; while it took thirty seconds for one of our inch streams to fill a bucket of twelve quarts, one of the Bedford $\frac{3}{8}$ inch streams filled the same bucket in nineteen seconds; a fact that shows, beyond a doubt, that whatever other defects the Miramichi establishment may labour under, want of water is the radical and most serious one.

Mr. Samuel Wilmot gave strict orders that the ova from Restigouche should not be moved until the motions of the embryos were plainly visible. Though I thought, and still think this another error of judgment from Mr. Wilmot's limited experience in moving ova, I strictly followed his orders, and when Mr. Mowat informed me that the embryos moved, I left St. John on the night train and arrived at Dee Side on Saturday, 19th January, with proper boxes for conveying the ova to Miramichi. On the afternoon of Monday we packed 204,000 ova, conveyed them by sled to Metapedia Station, went by the night express to Newcastle, were met by Overseer Hogan with a suitable conveyance, and reached the Hatching House by 4:30 a.m. on the morning of Tuesday, 22nd January. We immediately transferred the ova to the hatching troughs; they turned out exceedingly well, having stood the journey and the double operation of packing and unpacking much better than I expected. Not over 2,000 had died, and when I left the House on Tuesday morning, all looked well and promising. The ova from Bedford had done quite as well as those previously laid down, and the percentage of loss had been, according to Mr. Sheasgreen's memoranda, quite small. Subsequent advices from him informed me that he has since lost about 2,000 more of the Restigouche eggs, which I attribute entirely to Mr. Samuel Wilmot's error in judgment in delaying their removal to a time when the greatest danger of loss was to be apprehended. However, on the whole, the operation has been successful, and the loss not more than might have been expected.

There are now in the House 710,000 healthy ova. The embryos are visible in all the eggs, and most of them show signs of life and motion. From present appearances I confidently anticipate a successful issue. If anything should happen, I have no hesitation in saying it will be mainly in consequence of the limited supply of water flowing over the ova at the time when they burst the shell, and will require plenty of aerated water to enable them to breathe. Although the supply is now nearly double what it was when the last great loss occurred, still it is not sufficient, in my opinion, to ensure perfect safety to so large a mass of breathing fish. I am in hopes, however, that it may prove sufficient to hatch and nurse the number now in the troughs; but I must again repeat my conviction that, before it will be safe to lay down a million ova in this house, the supply of water must be largely increased. I have expressed this conviction to Mr. Samuel Wilmot, and, though he has not even acknowledged the receipt of my communication, I trust he will see the necessity of having the requisite alterations made before next season passes. And I also trust he will now see the necessity of paying more personal attention to this House, which has some other important and serious drawbacks to its success. I am of opinion that the stream is not the best that could have been selected, but the works being there, it is of the very first importance that no efforts should now be spared to overcome, by close personal attention, the errors in judgment originally made, and not to shirk the

responsibility of his own errors by throwing the blame of "carelessness and incompetency" upon men who have shown much more solicitude for the success of the House than he appears to have done.

In thus stating my convictions with perfect frankness and plainness, I wish to observe that no ill-feeling towards Mr. S. Wilmot has any share in dictating my remarks. That gentleman possesses much ability and perseverance, and deserves the highest praise for his efforts and success in bringing pisciculture to its present successful and promising state in Canada; but somewhat different habits of thought, and a more extended acquaintance with the habits of our *Salmo Salar*, are necessary to enable him to be as successful in their artificial propagation as he has been with the *Salmo Wilmoti*, a variety very different in its habits and requiring a different mode of treatment, especially in the management of the parent fish.

As Mr. Wilmot has assumed the "whole and absolute management of the works," and is rather jealous of any interference with, or departure from, his stereotyped ideas, gained from his experience with the inland establishment at which the *Salmo Wilmoti* is propagated, I shall, in future, take no action in fish-breeding without clear and explicit orders from the Department, as I do not care to be held responsible for Mr. Wilmot's theories, nor for his neglect of a duty which devolves upon him, and for the proper performance of which he is paid, while hitherto all my labour and anxiety and best efforts for the success of this house have been gratuitous, except, indeed, liberal payment in slander and abuse.

Respectfully submitted,

W. H. VENNING,
Inspector of Fisheries, N.B.

P.S.—Copy of this Report has been sent to Mr. Wilmot, and I think it would be advisable for him to visit the House as soon as possible, in order that he may see for himself the truth of it, so that no malicious falsehoods may mislead the Minister in the future, as has been done in the past, with regard to the veracity of my statements in connection with this establishment.

W. H. V.

SAINT JOHN, N.B., 31st Dec., 1877.

Hon. A. J. SMITH,
Minister of Marine and Fisheries,
Ottawa.

SIR,—I have the honour to submit the following report of proceedings in connection with the Miramichi Fish-Breeding Establishment, from 31st December, 1876, to middle of June, 1877, when Samuel Wilmot, Esq., assumed its entire control and supervision.

The ova laid down in the fall of 1876 continued to progress favourably with very small loss, until the latter part of March, 1877, when a heavy freshet set in; large deposits of black sediment covered the eggs, and a very serious loss by adding occurred. On being informed of these facts by Mr. Sheasgreen, the care taker of the establishment, I supposed that this loss was occasioned by some substance in the water, which acted on the zinc of which the trays were made, and I immediately instructed him to transfer all the eggs from zinc trays to earthen ones, obtained from Mr. A. B. Wilmot of Bedford House, and to reduce the number on these, so as to give them more room, thinking they would do better if but a single layer of eggs was on the bottom of each tray, as this would prevent so much sediment from adhering. He did this, but an alarming loss still continued, and on the 7th April I went to Miramichi to see if anything could be done to remedy this serious and unexpected misfortune. On arriving at the Hatching-House, I found the freshet still very high, and the water loaded with an amount of sediment that completely covered the

eggs, rendering it necessary to wash them every day. This had continued for ten days, and the loss in that time had more than trebled the total loss since the eggs were placed in the troughs. The deaths had been greatest on the zinc trays, next on the gravelled ones, and was very serious indeed. I carefully measured the trays and found as follows :—

217 earthen trays, each containing 1,500	325,500
106 saucers, each 350	37,100
3 double zinc, each 3,000	9,000
2 wire, each 3,000	6,000
	<hr/>
	377,600

Showing that 40 per cent of the whole number laid down had perished, while the daily loss still going on was very considerable.

I immediately apprised you of all these facts in my report, dated 11th April, and Samuel Wilmot, Esq., was sent from Ontario to ascertain the causes that had led to this disastrous loss. I met Mr. Wilmot at Newcastle, on the 16th April, and with him visited the House. The freshet was then subsiding and the water running much clearer than when I saw it on the 7th.

All the facts above recorded were stated to Mr. Wilmot and every occurrence known to me was fully detailed, to enable him to form a correct opinion as to the cause of this unfortunate calamity. He measured the trays and found as follows :—

217 earthen trays, each 1,400.....	303,800
4 zinc do do 1,400.....	5,600
2 wire do do 850.....	1,700
106 earthen saucers do 180.....	19,080
	<hr/>
	330,180
Deduct some scant trays.....	4,180
	<hr/>
	226,000

Showing a loss between the 8th and 16th April, of 51,600 eggs.

As the freshet fell and the water ran clearer the daily loss grew smaller, until about the last of April, up to which date only about 7,500 more were lost, and from that time until the fish emerged from the shell early in May, the loss did not exceed 500, leaving 318,000 healthy young fish in the troughs.

These were nursed without further loss, and early in June were distributed as follows :—

North-West Miramichi.....	50,000
South-West do	50,000
Little South-West.....	58,000
Sevogle	20,000
Bartibog	20,000
Tabusintac	20,000
Burnt Church.....	20,000
Napan River.....	20,000
Black River.....	20,000
Salmon River, Kent Co.....	20,000
Shediac River West'd Co.....	20,000
	<hr/>
	318,000

The transportation, principally by horse and waggon, was made without any appreciable loss as the weather was cool and favourable to the purpose.

The report made by Mr. Wilmot attributes the loss to want of judgment and carelessness on the part of Mr. Sheasgreen. In my remarks on this report submitted

to you, I have given my reasons for dissenting from the conclusions arrived at by Mr. Wilmot, and have also given you my opinion of the real cause of the two disasters that have befallen this house. The first occurred when it was under the care of Mr. A. B. Wilmot and the superintendence of Samuel Wilmot, Esq.; the second one occurred under the care of Mr. Sheasgreen and my superintendence, undertaken at the earnest wish of the Commissioner of Fisheries, while Mr. Samuel Wilmot was busily engaged at Sandwich, and Mr. A. B. Wilmot at Bedford.

Of course, it is an easy solution of the difficulty to attribute it, in both cases, to incompetence and negligence, as Mr. Wilmot has done. Neither of the accused parties has had any opportunity given him of rebutting this charge, nor has Mr. Wilmot given any proof of its truth, further than to state that such is his opinion, based upon a very limited induction. As I have had much better opportunities of judging in this matter, and a much more intimate knowledge of the stream that supplied the house, and its peculiarities, I am forced to a conclusion entirely different from the one expressed by Mr. Wilmot, and I have given you my reasons for believing that carelessness and want of judgment were shown in the original arrangement of the house, and not in the subsequent management of it.

In my opinion, based upon a careful consideration of the facts recorded and detailed to you in my special letter on this subject, the real cause of all the trouble has been an inadequate flow of water from the tank into the hatching troughs, owing to the insufficient head in the supply pond, or to the incapacity of the supplying pipes to keep the water at a sufficient height in the tank. I have stated this opinion to Samuel Wilmot, Esq., and expressed my belief that, in order to make this establishment successful, it will be necessary to largely increase the supply of water, either by raising the head in the pond or by increasing the capacity of the pipes that lead from the pond to the reservoir, in the hatching-room. I think it my duty to record my conviction that, until this is done, the same loss will occur in future whenever a large number of ova are laid down, because the flow through the hatching troughs is not sufficient to supply the requisite aerated water to a large number of ova in an advanced stage of development. If this defect is remedied, I see no reason why this house should not succeed as well as any other now in operation.

During last summer, Samuel Wilmot, Esq., took the entire control and management of the house, and I trust that, with his superior knowledge and experience, and with the change I have pointed out as absolutely necessary, the difficulties that have beset this establishment will be overcome.

I have the honour to be, Sir,

Your obedient servant,

W. H. VENNING,

Inspector of Fisheries, N.B.

NOTE.—As a local paper in Miramichi has charged me by name with "fraud" and "dishonesty" in my official reports in connection with this establishment, and has stated that Mr. Wilmot's report would substantiate these charges, I beg to be allowed here to give an indignant and unqualified denial to them, and to state that not one word in Mr. Wilmot's report can, by any possibility, be construed to reflect upon my official integrity in this or any other connection. All my reports have been true and correct, so far as the facts were made known to me. They were made without loss of time, as soon as I had become aware of them. They were detailed with all the circumstances attending them, with strict fidelity and in all good faith. They are now on record in the Department and speak for themselves, or are open to the severest scrutiny. I may mention that I have always taken the greatest interest in the success of this House, because I know that the salmon fisheries of the river sadly need its assistance to neutralize the many causes that are at work to reduce its stock. This interest in the House, and this desire to see it succeed, induced me to

undertake its superintendency at a time when no one better qualified was available for the work. This did not belong to my legitimate duties, but was undertaken as a "labour of love," at the earnest request of the Commissioner. It added very much to my onerous duties, both physical and mental, for which I have never asked nor received one cent of additional remuneration; but I have received, instead, much slander and abuse from those who were entirely ignorant of all the facts connected with the Establishment, and all the difficulties that have hitherto beset its successful operation. This much I feel it due to myself to say in denial of charges that have not even the semblance of probability to sustain them, but are calculated and intended to do me great injustice. All these facts are known to you, and I trust that this plain statement will receive the *imprimatur* of the Department.

W. H. V.

FISHERIES OFFICE, ST. JOHN, N.B.,
31st December, 1877.

To the HON. A. J. SMITH,
Minister of Marine and Fisheries,
Ottawa.

SIR.—I have the honour to acknowledge the receipt of a copy of Mr. Samuel Wilmot's report on the great loss of eggs in the Miramichi Hatching-House, between the last of March and the first of May, 1877, on which I beg to make the following remarks.

I respectfully ask your consideration of these, as I have had much better opportunities than Mr. Wilmot has had of knowing the peculiarities of the stream which feeds the hatching troughs, and am better acquainted with Mr. Sheasgreen, the caretaker of the house, who bears a high character among his neighbours.

1st. Mr. Wilmot bears witness to the excellent state of the establishment, both internal and external, and in this he corroborates all my reports.

2nd. I must express my very decided dissent from Mr. Wilmot's opinion that "the breeding troughs and hatching troughs were well supplied with good living water." In my opinion, based on comparison with the houses at Dee Side, Mata-pedia and Bedford, Nova Scotia, I consider the flow of water through the troughs of the Miramichi House quite insufficient, and, this, I am fully persuaded, was the radical cause of the trouble. While the flow from one of the troughs in the Bedford House filled a bucket in 17 seconds, and from one in the Dee Side House in 19 seconds, that from one of the Miramichi troughs required 30 seconds to fill the same bucket, showing that the supply of water in the latter house is not much more than one-half that in the former two.

3rd. Mr. Wilmot errs in saying that "he was enabled to see the state of the water during the time of a freshet." At the time he considers so opportune for this purpose the freshet had greatly subsided, and the stream was comparatively clear and pure. Had he seen it on the 9th April, and previously, instead of on the 16th, he would scarcely have written his remarks on its purity and freedom from sedimentary matter. Even on the 16th April, six days after the water had fallen several feet, he described it as "dark or porter coloured." How pure or free from sedimentary matter such water could be, you are as well able to judge as either Mr. Wilmot or myself. I positively affirm that when I saw the water on the 9th April, it was as described in my report of the 11th, most foul and dirty, and very different from the appearance it presented on the 16th. Therefore, I submit that Mr. Wilmot was sadly in error when he says he "satisfied himself with regard to the unexceptionable character of the water," and pronounced it for fish-breeding purposes equal to any other where similar establishments are now being carried on successfully.

4th. Mr. Wilmot's method of measuring the trays on the 16th April was precisely the same I adopted on the 9th when I reported 377,600 ova. He found but 326,000, showing that between the 9th and 16th the loss had been 51,600, a fact that ought, in my opinion, to have made him less hasty in attributing it to carelessness and deception on the part of Mr. Sheasgreen.

5th. The difference between the number of eggs laid down in the autumn of 1876 and the actual quantity on hand at the time of Mr. Wilmot's visit on 16th April, 1877, was fully reported by me in my letters dated 11th and 13th April, and no attempt was made, so far as I am aware, to keep back any facts, or make any false statements to cover up facts.

6th. The opinion I then held as to the cause of this disaster was honestly given in the letters above referred to, and this opinion was strengthened by the testimony of Mr. A. B. Wilmot, who had met with a similar loss in the spring of 1875. I have since then had reason to change that opinion, and to form another, which with the causes and reasoning that led to it, will be fully given ere I conclude these remarks. Mr. Wilmot has striven much more ingeniously to suggest his assumption of carelessness and deception, than to ascertain the real cause of the disaster.

7th. In saying that the loss was of an "extraordinary nature," and that the statements of the number of eggs on the trays were conflicting, Mr. Wilmot displays more disingenuousness than I like to see in a candid searcher after truth. He knew that just such a loss had before occurred in this house, under precisely similar circumstances when it was under the care of his nephew, and he knew that the only statement of the number of eggs that conflicted with mine and Mr. Sheasgreen's was one made by Messrs. Snowball and Smith, who could not possibly have made a correct one by their mode of counting. Knowing these things, it seems to me that he was more bent on supporting his foregone conclusion of carelessness or incompetency than on discovering and removing the real cause of the catastrophe that had now, for the second time, befallen this house.

8th. I entirely differ from Mr. Wilmot in his conclusion "that the true cause of the difficulty and loss was incompetency or neglect, or both, on the part of the officer in charge of the building," and I am fully persuaded that no deception was resorted to by him to cover up the actual state of affairs. I respectfully submit that nothing Mr. Wilmot states bears out this conclusion, nor when the facts are fairly considered, even points to it. Before Mr. Wilmot made such grave charges against one who has always borne the character of an honest and truthful man, I think he should have taken evidence under oath.

Overseer Hogan, Mr. Sheasgreen and myself were present, and could all have testified to the entire truth of all the statements made, either to Mr. Wilmot or to the Department. In regard to Mr. Sheasgreen's incompetency to count the eggs when laid down, I may state that he followed precisely the same method as Mr. Wilmot himself did. In impregnating the ova, he did precisely as he was taught to do by Mr. Wilmot himself, and he did a large portion of the work in the presence of Mr. Mowat and myself. I thought he was exceptionally careful in doing it well, and Mr. Mowat expressed the same opinion. Whether neglect was afterwards practised or not, of course I cannot positively say, but I have the very strongest reasons for believing the contrary. Mr. Sheasgreen was particularly anxious to succeed, as his prospect of being continued in charge depended on his successful management of the establishment. He was never absent from his post, and, at the time of the freshet, was in the House day and night. Mr. Wilmot, however, thinks neglect must have been practised, "as it would be almost impossible, even with ordinary care, that the enormous loss of fifty per cent of the whole should take place in so short a time, and at this advanced period of incubation, when the embryos had become almost perfect fry." It is very surprising to me that Mr. Wilmot's active mind and large experience could suggest no more rational and fair conclusion. But, not content with charging this man with incompetency and neglect, Mr. Wilmot concludes that, in addition to these, deception has been resorted to to cover them up. On this subject I think I can speak positively, and I have no hesitation in expressing my unqualified disbelief of this grave charge, because it could not possibly have been practised without my knowledge, except with the connivance of Overseer John Hogan, and this man, at least, is quite incapable of such conduct, as the whole record of his life proves.

9th. Mr. Wilmot alludes to the previous loss sustained by this House, when under his nephew, and attributes it also to "negligence and want of attention to the work." As I had no official connection with the House at that time, I can say nothing positively on this loss. Mr. A. B. Wilmot's reports of his management are on record, and give his opinions as to its cause. But I think Mr. Samuel Wilmot here shows how much easier it is to support a foregone conclusion, than to reason on facts presented. Here were two instances in which the "almost perfect fry" had died by hundreds of thousands in a few days, and yet Mr. Wilmot can think of no other cause than "incompetency and neglect." If he did think of one, he has not been sufficiently ingenuous to admit it. Does it not seem a very curious coincidence that, in both these cases, the "incompetency and negligence" occurred just at the time when the embryos had become almost perfect fry?

Does it not seem strange that this incompetency and negligence did not cause any unusual loss when only a small number of ova were in the troughs? Is it not remarkable that the same incompetency and negligence should meet with unusual success all through the period of incubation that is most difficult and critical, viz.: the first months after laying down the ova in the troughs, and fail only when the least care and attention were required, viz.: "when the embryos had become almost perfect fry, and possessed great power of endurance and vitality?" Had Mr. Wilmot not been so intent on ingeniously fitting facts to his hasty assumption, these things would probably have received more attention than he has given them. But the fact is that Mr. Wilmot has given very little attention to this House; since its completion he has paid but three or four flying visits to Miramichi, and these at times when none of the difficulties that have beset the House were observable. Originally the dams of the supply and retaining ponds were wholly inadequate to resist the great freshets which occur on the stream both in spring and fall. The head of water in the tank was quite insufficient to supply the troughs with the requisite flow of water, and though Mr. A. B. Wilmot made a considerable improvement in this respect, still the supply is very much less than that of either the Dee Side or Bedford Houses.

With these remarks on Mr. Wilmot's report, I will now state my present opinion of the cause that has led to the ill-success of this Hatching-House, and my reasons for believing that this cause has already been partially and can be entirely removed. As this opinion has been arrived at after much careful observation and anxious thought, I submit it as worthy of consideration.

I will premise by a short *résumé* of the facts as shown by the records of the Department. Late in the fall of 1873, the House was only partially finished, and many of the ova laid down that fall were lost, from exposure to cold and want of proper conveniences for caring for them. During the summer of 1874, the House was completed, and means provided to keep up a certain temperature. That fall Mr. A. B. Wilmot laid down in the troughs 1,500,000 ova, which continued to progress favourably until the month of April, 1875, just as the young fish were bursting the shell. At that time a sudden and great fatality befel them, so great that only 150,000 young fish were produced. In the fall of 1875, owing to extensive freshets, the dams of the supply and retaining ponds gave way and all the parent fish stored in the latter escaped before they were ripe for spawning. By great exertions Mr. A. B. Wilmot succeeded in getting some 65,000 ova by going far up one of the tributaries of the South-West. After having laid these down in the troughs, Mr. Wilmot was removed to Bedford, and at the request of Mr. Whitcher, I consented to do the best I could to supply his place; Mr. Sheasgreen having the immediate care of the House. This superintendence was really Mr. Wilmot's work which he was paid for not doing. The ova then in the troughs were hatched out with very small loss, and in the spring of 1876, the young fish were successfully planted according to your directions. In the summer of that year the dams were rebuilt (still without any assistance from Mr. Wilmot, on whom the work properly devolved), and in the fall 610,000 ova were laid down, which continued to do exceptionally well until the latter part of March, 1877. Between that time and the 16th of April, a loss occurred, amounting to nearly 50 per cent of the whole number. This loss

occurred during a heavy freshet, which deposited a great quantity of black sediment on the eggs, just at the time when the embryos had almost become perfect fry. Only 318,000 fry were hatched and distributed. Now, in all this time, from 1873 to 1877, Mr. Wilmot paid but three or four flying visits to the House, and had no sufficient opportunity of investigating facts or making careful observations. He never gave me any notice of his visits, consequently I had no opportunity of advising with him, or even of taking his instructions. Neither did he communicate with me by letter. Bearing all these facts in mind, I now crave your close attention to the following:

When the first great loss occurred in 1874-75, Mr. A. B. Wilmot attributed it to the foul water, and its action on the zinc trays. From certain facts stated in his report to you, there were strong grounds in support of his opinion. So firmly convinced was he of the truth of his opinion that, when he found the same character of water at Bedford, he urged your Department to furnish him with earthen trays, and he also applied filters that intercepted the sediment before it reached the ova. He was very successful with these appliances, and, consequently, more firmly convinced that zinc trays were not suitable for the Miramichi House. But, from the above *résumé*, you will observe a fact that operates even more strongly against his conclusion. This fact is that, in 1876-77, the loss occurred on both zinc and earthen trays, although less on the latter. You will also observe another fact that operates strongly against his conclusion, that is: when only a small number of eggs were in the troughs, they did well, and no unusual loss occurred. Now, these two facts struck me with great force, and I could not but see that Mr. A. B. Wilmot's theory did not meet these facts. If the peculiar nature of the water was the cause of this loss, why did it not kill all the eggs, why did a portion of the large crops of ova escape, and why did all the small crops escape? These questions caused me much anxious thought. Mr. Samuel Wilmot not having had my opportunities for observation, hastily concluded that neglect was the cause of loss, but I had strong reasons for believing otherwise. In the course of my thinking over all the circumstances, a third fact in the *résumé* struck me very forcibly, and that fact is: that the great losses in the large crops of ova occurred just before the young fish were ready to emerge from the shell! Here a new direction was given to my thoughts, and I was led to suppose that at this particular time the sediment did the mischief. This was my belief up to April last, when I accompanied Mr. Samuel Wilmot on his visit to the Bedford House. The first thing that struck me there was the greater body of water flowing out of this tank over the eggs. I called Mr. S. Wilmot's attention to this, and asked him if the small supply of water might not have had something to do with our trouble. He replied that our pipes ought to supply all the water needed. When next I saw our House I was still more forcibly struck with the difference; our streams were weak and the water flowed sluggishly over the eggs. Suddenly, as if by inspiration, it became clear to me, that at the time when our large crops of ova were near bursting the shell and the embryos had become almost perfect fry, the pipes did not supply water enough to give them the air they needed. Previous to this, and before the act of breeding, the embryos did not need so highly aerated water, and consequently the ova would do well until the time came when more air was wanted. Now, a weak sluggish stream flowing over the ova, would give only a limited quantity of air, and that want was not enough to supply the wants of hundreds of thousands of embryos struggling in their shells. The consequence would be that suffocation would commence and continue until enough had died to give the remainder the air they needed to sustain them. This is precisely what the natural process suggests. While the eggs are developing under the ice in the winter, they need but slightly aerated water, but when they are nearly hatched and need more air, in the month of April or May, the ice breaks up, the streams rise, the flow of water is greatly increased and becomes much more highly aerated, and so supplies the wants of the now breathing embryos. This want of sufficient water flowing from the supply tanks into the troughs was, I am now persuaded, the radical trouble with our House, and another consequence of this deficient supply was that the small flow of water

would not carry off the sediment, and hence the great accumulation on the ova which at this particular time would also help to suffocate them.

Had Mr. Samuel Wilmot not been so bent on supporting his hasty conclusion of incompetence and neglect, he would probably have reasoned out this same conclusion. Indeed, I cannot help thinking that he had an inkling of it, and must have had doubts of the correctness of his theory of incompetency and neglect; else why did he this season order the supply dam to be raised over a foot; why did he have the pipes overhauled and made tight, the result of which is that nearly double the quantity of water is now flowing over the eggs, but still not in as full and rapid streams as the Bedford House has, which, in my opinion, are the cause of Mr. A. B. Wilmot's great success in that establishment. He has treated his eggs just as he did in Miramichi, and he considers the water of the latter House just as good as that of the former.

All these facts contained in the *résumé* above given bear out the conclusion at which I have arrived, from my experience of the Miramichi House; and my observation of the Bedford House strengthen it. When we get the quota from Restigouche of 200,000, there will be 710,000 ova in our troughs, which number, although not so large as I could wish for a rigid test, will give me the means of either verifying the correctness of my conclusion, or proving it erroneous. I am, of course, very anxious about the result, and yet I have confidence enough in Mr. Sheasgreen to leave the care of the House in his hands. If the result is a success, I think no doubt can remain as to the cause of the past failures, and no fears need be entertained as to success in future. But yet, in my opinion, it will be necessary to still further increase the flow from the supply dam before it will be safe to lay down a million and a half or two million ova. With a sufficient flow of water, I see no reason why this House, with its great amount of trough room, cannot just as safely hatch 2,000,000, as I feel sanguine it will this winter hatch 10,000.

The interest I feel in the success of this house must be my excuse for the length of this letter; and I hope when Mr. Samuel Wilmot considers all the facts that I have stated, he will agree with me in the opinion I have already expressed in a previous letter, that we have all been looking for a remote and hidden cause of failure, while the real cause has been plainly before our eyes, but has been overlooked. That Mr. A. B. Wilmot, Mr. Sheasgreen and myself should have hitherto overlooked this plain cause of failure, is not strange, but that Mr. Samuel Wilmot, with his large experience has done so, ought to lead him to be more careful in future before blaming others for his own neglect.

Recent advices from Mr. Sheasgreen inform me that the ova are doing well, with small loss; those from Oxford quite as well as the others.

Respectfully submitting my conclusion and the reasons that have led to it, to your consideration,

I have the honour to be, Sir,
Your obedient servant,

W. H. VENNING,
Inspector of Fisheries, N.B.

NEWCASTLE, Ontario, 4th February, 1878.

The Hon. A. J. SMITH,
Minister of Marine and Fisheries,
Ottawa.

SIR,—I beg to acknowledge the receipt of your communication of 29th January, referring to matters in connection with the Miramichi Fish-Breeding Establishment, with an enclosure; also containing an "abstract" from a letter of Mr. Inspector Venning, touching upon certain proceedings at the hatchery, and in its imputing to

me a "want of attention" and "neglect of duty" in the supervision of that institution.

In the Departmental letter I am reminded that it behoves me to keep myself well acquainted with the care of the buildings, &c., until the result of such experience shall be known, and to take every precaution to know the condition of affairs in order that I may judge of the real cause of any further failure, should it occur.

In compliance with the desire expressed in the above paragraph, I will use my best endeavours to carry out the instructions as fully as possible; and it will be my object in this communication to lay before you the true state of things as I found them in relation to the failure in procuring the requisite supply of eggs at the Miramichi Hatchery last autumn, and the precaution that was exercised on my part to prevent that unfortunate occurrence.

With regard to the charge of "neglect and want of attention," as alleged by Mr. Venning against me, I do not desire to enter upon, or importune you with explanations concerning his perversion of the facts, unless required by you. The animus through the whole "extract" gives unmistakable evidence of ill-will and jealousy towards me. This expression of feeling is not confined to this "extract" alone, for it has been frequently shown in that officer's previous correspondence with your Department and with myself.

This envious and quarrelsome disposition on the part of Mr. Venning, has of late become very conspicuous towards me, but as the matter is not of public or official importance, no comment is required. I desire however to express regret that such unpleasantness should exist, as the want of unity of purpose and mutuality of interests between officers must more or less retard the success of any undertaking which you may be desirous of confiding to them.

Your official letter is very explicit that I should take every precaution to know the condition of affairs at Miramichi, &c. I do not think I shall be in error when I state, that in faithfully performing that duty hitherto, and in seconding your strong wishes to have that institution put upon a more satisfactory basis in order to prevent, if possible, a further repetition of the misfortunes that have befallen it, the unpleasant and unwarranted strictures of Mr. Inspector Venning have been passed upon me.

It will be needless for me, in this letter, to touch upon the disasters that have befallen the Miramichi Hatchery previous to last autumn, only to reiterate a still stronger belief in the statements which I made in my report to your Department on the 28th of June last. But it is concerning questions and mishaps which have taken place there since then that I consider necessary for me to refer to now.

In August last, when in Halifax on a general inspection of the several institutions for artificial fish-culture under my supervision, I had an interview with yourself and your Commissioner of Fisheries regarding the best method to be adopted to make the salmon-breeding works on the Miramichi River more successful, if possible, than had been the case in former years. I was then instructed to proceed at once to the place to inspect it, and to make such improvements as I found necessary, and also report to you the best means for putting the Institution on a proper basis for future operations.

After visiting the premises, and having ordered some improvement, which were only trivial in their nature, as I found almost everything in connection with the establishment in good working order, I reported to you my views in a letter from Gaspé which you acknowledged by instructing me to carry out the suggestion I had made; namely, that in order to prevent further conflicting interests in the supervision of the works, I should be put in the sole control and management of them, subject, however, at all times, to your Departmental instructions.

In taking upon myself this extra responsibility of the direct charge of the Miramichi Breeding-House, it must appear quiet obvious that I was putting upon myself a much greater amount of labour and anxiety of mind in the supervision of a work upwards of a thousand miles distant from my residence, than it was desirable for me to perform; more particularly so was it the case when the multitudinous duties in

connection with the Sandwich and Newcastle Establishments in Ontario demanded my personal oversight and practical application, mentally and mechanically.

The objects that prompted me to take upon myself this additional responsibility were as follows: the great desire to redeem, if possible, the unpopularity into which the institution had run itself; and that Mr. Venning (with whom I had previously had a conversation on the subject) should be relieved from a work in which he absolutely refused to take any further responsibility; and to stay the very bitter and unpleasant newspaper controversy then going on, and the frequent complaints being made to your Department, imputing to Mr. Venning's mismanagement of the institution. In addition to the above, I felt assured that in having the several employes in connection with the establishment under my immediate control, I could so instruct them, and also receive from them such frequent and constant information in relation to all matters, as would enable me to know the exact position of affairs, and to carry on the whole work more satisfactorily.

With this view I gave to Mr. Isaac Sheasgreen, the officer in charge of the buildings, the most particular instructions with regard to his duty, and specially he was ordered to write weekly, and oftener, if found necessary, as to what was transpiring about the premises, and further, should anything of an extraordinary nature take place, he was to give me immediate notice of it by telegram. I also wrote Mr. Hogan, the local Fishery Officer at Newcastle, telling him that the breeding establishment had been put under my control, and that he was to make every preparation for capturing the requisite supply of parent salmon at the proper time. I furthermore notified Mr. Venning that the sole management of the Hatchery had been given to me, asking from him at the same time, his hearty co-operation in all matters where I might require his advice and assistance.

It will be unnecessary to give you in detail the correspondence which took place between Mr. Sheasgreen and myself up to the 24th September, only mentioning that it consisted of circulars and letters of instruction for his guidance. But from that time I will give you extracts from his letters, the originals of which will be found appended hereto marked A.

On Sept. 24, Sheasgreen writes "Establishment in good running order; have now 110 parent fish in the pond, expect another lot down to-morrow; working hard to make all things go right."

Oct. 2nd. He says: "Fish are very plenty; have taken over 200, but have lost some; fish don't seem to do well here this fall; fishermen say they don't look well when taken. Weather very warm, loss amongst females is greatest; will commence spawning about 20th of the month."

Oct. 6th. He says: "We have good luck in getting fish; we have now 277 in the pond, more than half are male fish; expect men down on Monday with more; there is a good run in the river."

Oct. 15th. "Yours of 1st Oct. received; will follow instructions given therein. Freshet very high, but no damage done. I think a few fish may have got out; all danger now over for the season. Fishermen will be down to-day with 100 more salmon; we have now a sufficient number to fill the House."

Oct. 22nd. He writes: "I am going to commence spawning on the 24th; I have a fair share of fish in the reception-house and some in the pond. Fish taken in first part of the season have not done very well; had to let some of them go. I am bound to fill the fish-house this fall if possible. Would like to see you after eggs are laid down, if you would come. Will write again in a few days and let you know how I get along."

From the above date, Sheasgreen's correspondence ceased altogether, until after my visit to the establishment in the beginning of November.

From the foregoing statements, which were communicated to me by the officer in charge, as well as by a confidential friend, I felt safe in my conclusions that everything was progressing most satisfactorily at the Miramichi salmon nursery. These ideas were, however, all at once dispelled by the receipt of a telegram from your Commissioner, Mr. Hitcher, bearing date the 31st October, and received by me the

following day, stating that "Messrs. Venning and Hogan reported salmon sickened and died,—fear water has something to do with it. Something must be done to ascertain cause of repeated failures—look to this."

On the day following I received a letter from my confidential friend at Newcastle, in which it was stated that he had just seen Sheasgreen, who had informed him that he had spawned all the fish, 78 in number, obtaining from them 308,000 ova, and that he, Sheasgreen, had been up river two or three days, endeavouring to catch more fish, but without success; and that Messrs. Sheasgreen, Hogan and Venning were going to Bathurst to seek more eggs there.

Upon receipt of the above (to me) very extraordinary intelligence, I concluded to start for Miramichi at once. Sunday intervening, I started from home the following day, and reached the establishment as quickly as it was possible to get there, and found, as had been stated to me, that only some 300,000 eggs had been laid down in the hatching-troughs, instead of upwards of a million that I had confidently anticipated would have been secured, from the numbers of salmon that were reported to me by Mr. Sheasgreen as having been placed in the pond.

Upon a close examination of everything in connection with the establishment, I found the ponds, buildings, apparatus of every description, and the ova that had been laid down, all in the most perfect, cleanly and satisfactory condition that could be desired. But I could discover no real or apparent cause, just then, why so great a mortality should have befallen the parent salmon, that were reported to have sickened and died previous to their manipulation.

In the investigation that I made with Messrs. Sheasgreen and Hogan, in reference to this unusual and extraordinary loss of parent fish, both of these officers gave it as their opinion that it had resulted from some peculiar disease which had attacked not only the salmon in the ponds, but in the open river as well; that they presented a weakly and sickly appearance when first captured, their bodies being covered in many instances with sores, which when the surface was removed, presented the appearance of proud flesh formed in wounds, and that a growth like fungus rapidly spread over the bodies of the fish, quickly causing them to die. This fungoid growth upon the bodies of fish is of no uncommon occurrence where abrasions of the skin are made either in the netting of them, or in rough, coarse handling. Afterwards a parasitic growth sets in, which in close confined limits, or in small supplies of fresh water, spreads over the body of the fish very rapidly, causing extreme weakness, and finally death. This cutaneous affection is seldom if ever noticeable amongst fish when enjoying freedom in the open waters of their native streams. In my experience, now covering many years, in the capturing and handling of salmon and other fish, I have never detected this disease amongst them in their native open waters; but I have very frequently noticed it upon the fish when injured as above mentioned, and when kept in too close confinement, or in too small a supply of water. When this insidious fungus growth sets in upon the fish, it will be found almost a matter of despair even to attempt to save them.

Another malady is found to prevail amongst fish, particularly when they are far advanced in pregnancy, in the caking and solidification of the ovaries, by the stoppage of the fluids through the small membranes by which the eggs are connected together and fed previous to their maturity. From the observations which I have made as to the cause of this disease, I am of opinion that it is brought about by the close confinement of too many fish within small circumscribed limits, in which they are unable to roam about and partake of sufficient freedom and exercise of body, thus preventing the healthy circulation of the natural functions so requisite at his critical period, or spawning season of the fish.

In connection with the Miramichi salmon-breeding establishment a very large pond was formed, comprising a large surface area, with a depth of water varying from two to ten feet, and fed by a constant flowing stream, quite sufficient for all the requirements of the pond. It is also additionally purified from time to time by heavy spring tides, which back up into it from the Miramichi River, through the sluice-gates. The object of forming this large body of pure living water was that it should

be a receptacle for keeping safely such numbers of parent salmon as might be required for the uses of the breeding-house, until they became perfectly mature and ripe for spawning. This reservoir, or mill-pond, has area and capacity sufficient for fully one thousand salmon.

To supply this pond with the requisite stock of salmon, a means has been devised by which they are captured in small meshed nets in the main river, at the head of the tide-way, about twelve miles from the pond. They are taken from the traps of the set-net by means of a small hand-net, and quickly put into a large scow, which is completely covered in, and is also sub-divided into numerous small compartments, made with round wooden stakes set about two inches apart; the two ends of the scow being open, and it being fastened in mid-river, the water flows through the whole length of the scow and amongst the fish, almost as freely as would be the case in the open river. This vessel is then towed or poled down river to the reception pond, and there emptied of its contents by dipping out the salmon and putting them in the large mill-pond or reservoir; here they find themselves at freedom, and can swim about at pleasure, partaking at will of the deep or shallow portions of the pond, as well as shelter and shade which is afforded them by the high banks and trees which almost encircle it. During their sojourn in the pond, let it be either for a long or short period, they neither take nor require food of any kind for their sustenance. It is now a well-known fact in ichthyology, that salmon eat nothing on their migration up rivers to their spawning grounds after leaving the tidal or salt waters of the sea.

At the head of this pond, for the distance of about thirty yards until the small reception-house is reached, the stream runs quite rapidly over a gravelly bottom, where the salmon must resort to for laying their eggs at the time when their ova has become perfectly ripe for spawning. And it is further arranged that by giving an extra supply of water from the dam above, the fish most eager to rid themselves of their eggs, will follow up this increased flow of water into the reception house, when they become entrapped and are caught and manipulated. By this method of operating, there need not necessarily be a large number of ripe fish in the small reception-house at one time, the spent ones being transferred to the main river almost immediately after the work of artificial spawning has been performed; thus giving plenty of room for the incoming fish.

The reception-house just referred to is a small building expressly built for the purposes above related. It was never intended to accommodate but a small number at one time, and only then for short periods; its size is about thirty feet long by twelve wide; roofed in, floored at the bottom, and so arranged as to be sub-divided into compartments or pens, and with places for fixing weirs for entrapping the fish as they enter the building.

The superficial area for the accommodation of salmon inside the house cannot exceed 300 feet. The allowance of space that would be taken up by an ordinary sized fish would be 3 feet long, by 6 inches wide, or $1\frac{1}{2}$ superficial feet; the building would in this case hold 200 salmon when closely packed together. To allow anything like freedom of movement, this number should be reduced one half, thus giving the extreme limit at 100; and even with this number the period of their confinement should be of short duration.

I obtained from Mr. Overseer Hogan, who had the management in capturing and delivering the salmon, the following statement as to time and place of delivery. The particulars were taken from his diary as follows:—

Sept. 15th.—“Twenty salmon put in pond, (a few sick).”

Sept. 17th.—“Seventy salmon put in small reception house; floated them up through the pond to the house (two or three sickly).”

Sept. 22nd.—“Thirty salmon put in pond (one or two sickly).”

Sept. 26th.—“Fifty salmon put in pond (nothing particular wrong).”

Sept. 29th.—“Seventy salmon put in pond (nothing particular wrong).”

Oct. 5th.—“Forty-nine salmon put in reception house with boat (in good condition).”

Oct. 16th.—“Eighty-five salmon put in reception house (one hundred and ten were brought down; the balance were turned into river, being sickly).”

“Total—Three hundred and seventy-four. Of this number there were put into the reception-house two hundred and four; the balance, one hundred and seventy, were put into the large pond.”

Mr. Sheasgreen's statement, taken from his letters, (appended), with regard to the disposition of fish, is as follows:—

Sept. 24th.—“One hundred and ten salmon in pond.”

Oct. 2nd.—“Two hundred salmon; (lost some).”

Oct. 6th.—“Two hundred and seventy-seven salmon in pond; (more than half males).”

Oct. 22nd.—Reports, “fair share of fish in reception house; some in pond have not come up.”

If we add the eighty-five, the last lot delivered by Hogan, to 277, the number reported by Sheasgreen, 362 will be the total, making a difference of twelve between the tallies.

It will be noticed from the above statements in Mr. Sheasgreen's letters, that no mention of any salmon being put into the reception-house is made until the 22nd October, when he reports (without any numbers) that a “fair share of fish were in the reception-house; some in pond not come up.”

During my visit at the Miramichi establishment on 7th November, Mr. Sheasgreen gave me the following statement, which, he says, is a true and correct one, of the disposition of the salmon received by him, namely:—

Females spawned.....	76
Females died.....	45
Males turned out.....	210
Sickly fish run over dam.....	20
	351
Sheasgreen's total.....	351
Difference not accounted for from delivery made by Hogan....	23
	374
Hogan's total.....	374

The above statement appears to me so extraordinary upon its face, that I am compelled, for the present, to discredit it. But to take the figures as they are here represented, in order to ascertain the amount of mortality, the alleged number of males, 210, and of females, 76; in all 286 living fish, are said to have been turned into the river, out of the gross number of 374. This would leave a balance of 88 for deaths, inclusive of the 20 sickly ones, and the discrepancy between the counts of 23. Now, if these two latter numbers are deducted from the 88, there remains but the 45 dead females as the total loss out of the gross number originally delivered by Hogan, of 374.

Assuming, then, that only 45 females died, it is of importance to ascertain the cause of their death, and why it was that many others of the salmon (as it was stated to me) “had become hard, and no spawn could be got from them.”

Mr. Sheasgreen informed me that he “put in” and “run in” 96 salmon from the pond to the reception house. This number, in addition to the 204 put in by Mr. Hogan, would form a total of 300 fish that were imprisoned within the small limits of the reception-house, when its capacity was barely sufficient to safely keep over 100 at a time.

It also appears that the number of ova taken from the 76 females was only 308,000, making an average of 4,052 eggs from each salmon spawned.

In making a *résumé* of the above statements and matters, and laying before you the conclusions I have come to as to the cause why the salmon “sickened and died,” I feel that I shall again come in conflict with the opinions of Messrs. Venning and Sheasgreen. But whilst I regret that contradictory views should be held by us in

reference to these repeated misfortunes at the Miramichi Fish-Breeding House, I, nevertheless, feel it my duty to express frankly my convictions, borne out, as I trust they will be, by the facts as related, with the application of common sense and reasoning.

Greater detail has been entered into with the whole subject in this letter than might otherwise be considered desirable; but it was essentially necessary to show the nature and the cause of some of the diseases that salmon are liable to, when taken for the uses of artificial propagation, and also of the importance to show clearly that the necessary means were provided and were available for the prevention of sickness and disease in the parent fish, which means, if they had been judiciously used, might, and no doubt would, have prevented the misfortune which took place at the Miramichi establishment last autumn.

It has been shown that 374 parent salmon were captured and conveyed to the establishment during the months of September and October last; that 204 of this number were conveyed directly from the main river into the small reception-house, and that 96 more were also put into it from the pond during the same period, making a total of 300 salmon confined within the narrow limits of 30 by 12 feet. This most serious and fatal want of judgment produced the effect of sickness, disease, fungoid growth and caking or hardening of the ovaries of the fish, and consequent death of the numbers reported; and I fear that many others also met a similar fate; and this view is sustained by Mr. Venning's statement made to your Commissioner when at Chatham, that the eggs were hardened in about 300 salmon that died. Yet, in utter contradiction of this, Mr. Sheasgreen says that he turned out from the Reception House and from the pond 300 living fish, from the total number of 351 received by him from Overseer Hogan.

Small roughly-made crates or open boxes were used for conveying the salmon down the river, instead of the large scow fitted up purposely for the work. It is stated that the small boxes were better for the work than the scow, on account of the greater freedom for the passage of the water through them, and being more easily handled. This to a certain extent may be the case, but the counteracting influences were two-fold worse; as in the boxes, with their rough construction, agged edges and angles, the fish would be almost certain to injure themselves, and more particularly would this be the case from the increased liability to nervousness and fear to which they would be subjected in seeing every movement of the men engaged in towing them down river. In the scow, which was thoroughly decked over, the danger from fright and consequent liability to come in contact with the sides of the small compartments would be almost overcome.

In my judgment, the loss of salmon at Miramichi last fall was brought about by the causes above mentioned, namely: Want of sufficient forethought and care in transporting them to the works, and want of judgment in confining such a large number of parent fish in the small limits of the Reception House for so long a time previous to spawning, when it was quite unnecessary, as immediately alongside was the large reservoir or mill pond, erected for the purpose of retaining the fish, and sufficiently large for the safety and accommodation of at least eight hundred salmon.

The discrepancy in the numbers of ova laid down in comparison with former years, also demands consideration. If the report of Mr. Sheasgreen be a reliable one, he says that 76 females were spawned by him; 210 males were liberated; 45 fish died, and the remainder were sickly fish and ran over the dam. In 1874, some 360 salmon were put into the pond; half of these, as nearly as can be stated, were females; say 180. These gave nearly one and a-half millions of eggs, making an average from each female of between 7,000 and 8,000 ova. In the year 1877, no definite data is at hand to give the average of eggs. But in referring to other establishments for an average of eggs taken from each female during the fall of 1877, the numbers are:—

1 e—5½*

Gaspié—average from each female	12,500
Restigouche do	13,800
Bedford do	9,000
Miramichi do 1874	7,500
do do 1876	10,000
do do 1877	4,000

This extraordinary falling off in the average at the Miramichi, last fall is, to me, quite unaccountable, unless an error in the count of 76 females is assumed as being too great; and if this was the case, then a worse dilemma presents itself in the conclusion that the mortality amongst the salmon was greater than reported.

Again, the unusual preponderancy of males over females in the statement is such as to cause doubts as to its accuracy. 206 living males stand against only 76 living females, but 45 females were reported as having died; making altogether 121 females, whilst the gross number of males was 210 with no losses mentioned whatever. In 1876, there were manipulated at the Miramichi 65 females and 76 males; total 141. This great disproportion in the sexes particularly when captured in ascending the main river, as these were, is quite unprecedented; but when salmon are taken on their spawning grounds, a preponderance will sometimes be noticeable; yet, as a general rule with the adult fish, the sexes are about equal in numbers. It is also worthy of note here with regard to mortality among the sexes, taking Prof. Buckland as an authority, added to my own observations, it is found that greater emaciation and a larger percentage of death takes place with males than with the females, during the spawning season of the salmon.

In connection with this discrepancy in numbers of ova, and the unusual preponderance of males over females, I desire to quote from Mr. Venning's letter of November 6th, 1876, which relates to the operations of catching salmon and gathering eggs for the Miramichi Hatchery for that year.

He says: "On the first of September, the nets were set, and in October, 141 salmon were caught in the river and placed in the pond, without the loss of a single fish. These fish in the pond were conveyed to the Reception House, and on the 30th October were ready for manipulation. There were in the Reception House 141 salmon, sixty-five females and seventy-six males, all in good condition. The ova and milt were well developed and ready for depositing. The females yielded an average of 10,000 ova; 610,000 impregnated ova were laid down without any appreciable loss, not one dead egg in a thousand. In all his experience he had never seen so small a loss in so large a number of manipulated fish. Everything promised a most successful issue, and the supply of water was ample."

From the above extracts it would appear that everything in connection with the Miramichi Hatchery, during the season of 1876, was of the most satisfactory nature, and quite unprecedented, as not one single fish was lost; ten thousand eggs were obtained, and there was not one dead egg in a thousand. From this statement it will be observed that a very great difference existed in the proportion of males and females, as between the seasons of 1876 and 1877. In the former year, the numbers of the sexes were not of an unusually disproportionate character, whilst in the latter they are beyond all precedent.

With regard to the quantity of ova taken from each female salmon in 1876, as compared with the season of 1877, the difference is so unaccountably wide, as to leave no doubts in the minds of any person conversant with the subject that either miscalculation or misrepresentation has been resorted to. The calculation of the numbers of ova procurable from a female salmon is now pretty well established at 500 for every pound weight of her flesh; therefore the Miramichi salmon of 1876, giving 10,000 eggs each, would weigh twenty pounds, whilst, in point of fact, this will be found to be fully double their usual average size. But, with Mr. Sheasgreen's statement of 4,000 eggs each in 1877, the weight of the salmon would be reduced to eight pounds. Here, again, the variance in size of the salmon, from twenty to eight pounds, in two

consecutive years, is such as to give grave doubts concerning the accuracy of the statements reported to your Department in relation to the Miramichi Hatchery.

If the several mishaps which have occurred at the Miramichi establishment had taken place at the same stage of the incubation of the ova, or at the same season of the year, or from the same causes, then the statements of those persons who endeavour to establish certain theories of their own for these misfortunes, might be held as somewhat tenable. With one, for a serious loss which took place just previous to the hatching out of the eggs, a chemical effect brought about by the use of zinc trays coated with paraffine varnish was assigned as the cause; nevertheless, a large number of fry were actually hatched out on the same trays during that winter; and with the same apparatus, and in the same institution, the season following, ninety per cent of the whole of the ova deposited on the hatching-trays were reported to have produced living fish.

Another severe loss also occurred there at an earlier stage of the hatching of the eggs; this was attributed to the sudden deposit of sedimentary matter upon the ova during the existence of a heavy freshet in the stream in the month of March; this substance, it was alleged, quickly caused the eggs to die; yet upwards of 300,000 fry were actually hatched out from the very same lot of ova, laid down in the same troughs that season. This disaster has been attempted to be covered up in the opinion of interested persons, by stating that the stream upon which the establishment is built, is not, from the nature of the water with the sedimentary deposits in it, naturally adapted for the propagation of salmon. This erroneous statement is set aside, from the fact that hundreds of thousands of fry have been reared in this water, and that previous to the building of the establishment there, the stream for a mile or more up, was literally swarming with salmon fry, parrs and smolts; many of these were caught with hook and line by myself and other persons, previous to, and since the erection of the works.

I beg to draw your attention here to an extract from your Inspector's letter to your Department of 31st December last, in which he speaks of the non-injurious effects of this sediment upon the eggs. He says: "The freshet in the stream which supplies the Hatchery, continued several weeks after the eggs were laid down, and caused the water to become very impure. About the 25th November, Mr. Sheasgreen informed me that the quantity of sediment deposited on the ova was so great as to threaten their destruction. I immediately asked and obtained your permission to place filters in connection with the main tank to remove the source of danger."

"On the 27th, I went to Newcastle for this purpose, and, on reaching the Hatchery House, I found the ova so covered with a heavy deposit of black sediment, that they were scarcely visible on the trays, but, I also found, to my great gratification, that, so far, the loss had been almost inappreciable, not more than 1,500 dead eggs having been removed since the ova was laid down. On carefully washing several of the trays, the eggs presented a bright and healthy appearance, the embryo being discernable in all. During the first week in December the whole of the ova was carefully washed, with the most gratifying result, all coming out of the sediment bright and healthy, with the loss of only 700 in this critical operation. I have strong hopes that no further danger from sediment need be apprehended. Before the spring freshets set in the ova will be so far advanced that I do not fear any serious danger from them."

But when it is clearly established that, notwithstanding the alleged unfitness of the site, the impurity of the water, unsafeness of hatching trays and injurious sedimentary matter in the stream, that large numbers of young salmon have been actually reared there, then another idea is put forth to account for the numerous misfortunes, namely: that there has not been a sufficient supply of this peculiar water let into the building for the proper health and aeration of the eggs; and further it is advanced that in order to give a crucial test to the establishment during the coming season, salmon eggs from the Provinces of Nova Scotia and New Brunswick must be procured and laid down in the troughs of the Miramichi breeding house. Surely, if the evil effects from the trays and the water and the sediment

hitherto (said to have been) experienced at this institution have proved so disastrous to the native eggs, greater misfortunes must necessarily be apprehended from the introduction of foreign ones.

There are other anomalies in connection with this Hatchery, concerning the gathering of the ova, which require to be mentioned. During one season, when only a small supply of eggs was procured (although a goodly number of parent fish had been secured) the cause assigned was that the salmon had escaped by the breakage of the dam. During another (the past) season, just when it was reported that a sufficient stock of parent fish was secured to supply the establishment with a million and a half of eggs, all at once it was found that only 300,000 of this quantity is procured and the great diminution is accounted for by a statement that the salmon "sickened and died." In making a contrast of this year with that of 1874, it is found that, with about the same number of parent salmon in the pond, and with an officer (a perfect stranger to the place) being despatched from Ontario to perform the work of spawning, 1,500,000 ova were successfully impregnated and put upon the trays.

After the most careful and unbiased consideration of all the circumstances referred to in this letter, I cannot do otherwise than repeat the conclusions which I arrived at in my report to your Department of 28th June last concerning the conduct of the officer in charge of the Miramichi Fish-Breeding Establishment: I then reported incompetency, neglect and want of veracity. I must now add, an utter want of ability and judgment for the supervision of so important a work as that of artificial fish-culture. Disobedience is also chargeable against him, for had he obeyed the positive instructions for putting the parent salmon in the large pond, the great loss in the death of the fish might have been averted.

In giving my estimate of the abilities of Mr. Sheasgreen for the position he holds, I regret very much that it is in direct opposition to the opinion given by your Inspector of Fisheries for New Brunswick, who in his correspondence with your Department of the 1st December last, writes in the most laudatory manner of the fitness of Mr. Sheasgreen, and of his honesty of purpose for managing the establishment on the Miramichi River. Nothing would be more gratifying to me than to be able to endorse those sentiments were it in my power to do so fairly and honestly, for the interest of that institution and of your Department. In the one case, facts too clearly demonstrate incompetency, coupled with disastrous losses; in the other, mere vague assertions are made to show competency and sophistry to rebut irrefutable facts.

It will, no doubt, be asked, and quite properly too, why it was that under my control of the institution, success did not attend the operations there last season? My reply is that, when I sought the management of the Miramichi Breeding-House, I did it with but a single eye for its success. I was then, and I am still of the belief that, with the careful help of a painstaking and honest care-taker, one having had some previous knowledge in the handling and spawning of fish, success could be achieved. In my effort to accomplish that end, the most clear and positive instructions, both of a verbal and written nature, were given to the then only available officer to be had to carry them out. (This will be seen by copies of correspondence appended marked B.)

Everything was done by me that could be done humanly (without actual presence) to make success certain. I could not be ubiquitous. From correspondence frequently obtained from the scene of action everything appeared to be progressing satisfactorily. Yet, from the want of judgment, and the holding back of a most important fact in relation to the impounding of the parent fish by the officer in charge, another serious misfortune occurred, entailing further discredit upon the establishment and militating most seriously against a work in that section of the Dominion which it has been my greatest ambition to advance, and also retarding the progress

of an industry which your Department has taken such evident pains to foster and encourage.

I have the honour to be,
Your obedient servant,

SAMUEL WILMOT,
Supt. F. C.

P.S.—Herewith will be found a rough sketch of the grounds and buildings at the Miramichi, also a plan showing the large reception pond for safe keeping of parent salmon.

S. W.

APPENDIX A.

NORTH ESK,
September 24th, 1877.

SAMUEL WILMOT, Esq.,

SIR,—Your letter received to-day. Have the establishment in good running order. Have now 110 parent fish in the pond, and expect to have another lot down to-morrow. I am working hard to make things go all right.

I am, Sir,
Yours very respectfully

ISAAC SHEASGREEN.

NORTH ESK,
October 2nd, 1877.

SAMUEL WILMOT, Esq.,

SIR,—The fish are very plenty at present. We have taken over 200, but have lost some out of that number. The fish don't seem to do very well here this fall. We handle them with great care, but still lose some; the fishermen say some of them do not look well when taken. Weather very warm here all this fall; the fishermen think that has something to do in regard to them not doing as well as they done other falls. It's female fish that we lose most of.

I will commence to take eggs about the 20th of the month.

I am, Sir,
Yours very respectfully,

ISAAC SHEASGREEN.

NORTH ESK,
October 6th, 1877.

SAMUEL WILMOT, Esq.,

SIR,—Yours of 1st October just received. We have had very good luck in getting fish. We have now in the pond 277,* but more than half of those are male fish. I expect the men down on Monday with more. There is a good run in the river at present. I saw Mr. Hogan to-day, he said he telegraphed you to know if he would take any more fish. They have not commenced to work up stream yet. Will write soon again.

I am, Sir,
Yours very respectfully,

ISAAC SHEASGREEN.

* NOTE.—Only 170 were put into pond by Hogan's diary.

(Telegram from Newcastle, N. B., Oct. 5th, 1877, to S. Wilmot.)

289 salmon now in house pond. How many should I get? Answer.

JOHN HOGAN.

(Answer.)

Secure well on to four hundred.

S. WILMOT.

NORTH ESK, October 15th, 1877.

SAMUEL WILMOT, Esq.,
Newcastle, Ontario.

SIR,—Your letter of the 1st inst., came duly to hand and contents noted. I will follow the instructions given therein. The freshet has been very high but done no damage, or at least nothing to speak of. The water was running over the lower dam and I had to run a net along the top in order to prevent the fish from going over. I think some have got out. I had to remain at the racks all night in order to keep them clear of leaves, otherwise there would have been a clean sweep; this being the first rise of water this season brought a large amount of leaves and other rubbish. All danger is now past for this season, and I hope we will not have such a sudden rise of water again. The fishermen will be down to-day with one hundred more fish, this will conclude this season's fishing; I think we now have a sufficient number to fill the house.

I remain,
Yours truly,

ISAAC SHEASGREEN.

NORTH ESK, October 22nd, 1877.

SAMUEL WILMOT, Esq.

SIR,—I am going to commence to take spawn on the 24th. I have a fair share of fish in the Reception-House and some in the pond that have not come up yet. The fish taken in the first part of the season has not done very well; had to let some

of them out. I am bound to fill the house, if possible, this fall. Would like to see you after eggs are laid down if you could come. Will write in a few days again and let you know how I get along.

I am, Sir,
Yours very respectfully,

I. SHEASGREEN.

NEWCASTLE, Ont., Sept., 5th, 1877.

Mr. JOHN HOGAN,
Fishery Overseer,
Newcastle, N.B.

SIR,—After leaving you and Mr. Venning at Newcastle, I received instructions from the Minister that the Miramichi Fish-Breeding Establishment had been put wholly under my charge and supervision. When on my way home, at Gaspé, and at Quebec, I telegraphed you to make all necessary preparations for taking a supply of parent fish. On the 1st Sept., whilst at Ottawa, I received a telegram from you, stating that you "had no instructions before, but would then go on at once." With this view then I shall rely upon you using every exertion to procure a large supply of fish. I telegraphed Mr. Venning to forward you the net he spoke of, which was intended for taking shad, and which should be well adapted for netting salmon at the Bridge above, or other portions of the river. I have also caused a letter to be sent to the Minister asking for authority to use Henderson's net should you require it. With these appliances for catching salmon and with the net you have on hand, you should experience no difficulty in securing all the fish we may want this season. I have instructed Mr. Sheasgreen to join you and assist you in taking the fish, and in carrying them safely to the pond at the breeding-house, so that between you both I shall rely upon the necessary quantity of salmon being caught and safely conveyed there. Such assistance as may be required to secure this end you are authorized to get, but there must be no failure in getting the fish; useless expenditure however must be avoided.

Should you find it necessary to get any further supply of nets or apparatus for catching salmon, telegraph or write me immediately upon receipt of this letter. Please keep me regularly acquainted with your doings and the number of salmon you have secured, and let me know your prospects for getting all that may be required.

I am,
Yours, very truly,

SAMUEL WILMOT,
Superintendent of Fish Culture.

NEWCASTLE, Ont., September 7th, 1877,

Mr. ISAAC SHEASGREEN,
Fishery Officer,
Newcastle, N. B.

SIR,—I telegraphed you some time ago from Gaspé to go on with the improvements I ordered when at the Miramichi; this I presume you have done. I wish you to understand the great necessity of having the arrangements safely carried out for the winter's operations. Get everything in such a shape as will prevent the possibility of a stoppage of the water in the pipes during the hatching of the eggs. The painting

of the trays and boxes will no doubt have been done by this time, as well as the floor; if not, do not delay one moment in having it done. Get your boxes and trays well dried and then turn on the water and let it run through the boxes and over the trays until you lay down your eggs. I have written Mr. Hogan to use his best exertions to get a sufficient supply of salmon to fill the house with the eggs, and I have told him that you will render all aid in your power in helping him to get the salmon and in bringing them down to the pond. I want you to have no jealousy with him, or any one else, in relation to the work at Miramichi. Go at the business with zeal, and with a desire to retrieve the establishment from the bad name it has now got. Attend to no instructions from any one except myself, but do all you can to make matters a success this season, and you will find it greatly to your interests. Be civil to everyone, but allow no liberties inside or outside of the premises. Write me immediately upon the receipt of this letter how everything is now getting on; and also the prospects of getting your supply of salmon. Do your best to act harmoniously with Mr. Hogan in getting salmon, and write every two or three days what you are doing and how things are progressing. Should anything special turn up, telegraph me immediately.

I am,
Yours, &c., &c.,
SAMUEL WILMOT,
Superintendent of Fish Culture.

NEWCASTLE, Ont., September 19th, 1877.

MR. ISAAC SHEASGREEN,
Fishery Officer,
Newcastle, N.B.

SIR,—I am in receipt of your letter of the 15th instant, and am glad to hear that the orders given you have been completed, and that you have got the House in good order for the coming season. The pipes you say are all right; this will be found a great improvement, as you can find out at once if anything goes wrong with the water. Did you fix the dam at the head, and did you put the grating on the entrance to the pipes so that no large matter can possibly enter the holes? If not, have it done at once.

You mention having taken some fish, but that some died, and that others were let go on account of fungus growing upon them; you say hot weather and want of motion in the scow caused this. I should think this loss could not occur if the fish were not kept too long in the scow. Mr. Hogan informs me of the loss of fish, but says that small boxes had been made, which he thinks will do better; I hope they will, but the greatest secret in preventing fungus from growing upon the fish is to handle them carefully. If they are roughly handled in taking them out of the traps or net, and when putting them into the scow, it is quite impossible to save them—they should be dipped out with a very fine meshed net, say not more than one inch mesh, or else with a plain cotton bag on a hoop; it is the nets of the meshes that scrape the scales off. Avoid everything that will scratch the fish or bruise them.

I think you had better let the water in your troughs and put your trays in them so that they will get perfectly clean from all effects of varnish, &c.

Don't fail to let me know every few days, what you are doing, both in the numbers of parent fish you have caught, and if anything is required to make a perfect success at your establishment. Everything must be done to make it a perfect success this year. You and Hogan must work harmoniously together in the taking and carrying of the salmon to the ponds.

Expecting to hear regularly from you,

I am,
Yours, &c., &c.
SAMUEL WILMOT.

NEWCASTLE, Ont., October 1st, 1877.

MR. ISAAC SHEASGREEN,
Fishery Officer,
Newcastle, N.B.

SIR,—Yours of the 24th September just received, and I notice you have 101 parent fish on hand. This is very well, but do your utmost to get 150 or 200 females before season closes. Write or telegraph, me often, how you are succeeding in the catching of the fish; also, let me know immediately when the first of them are ready to spawn; do this by telegraph as I shall be anxious to get the news as quickly as possible, as I may run down to see you then, if in my power. I am glad that you and Hogan are doing so well. Don't send trays or anything else away from the works without my positive orders. Use your best endeavour to make a successful business this fall and winter.

I am,
Yours, &c.,

SAMUEL WILMOT,
Supt. Fish Culture.

NEWCASTLE, Ont., October 6th, 1877.

MR. JOHN HOGAN,
Fishery Officer,
Newcastle, N.B.

SIR,—I am pleased to hear of your success in catching 289 salmon, as given to me in your telegram of yesterday. I think you had better get about 350 salmon, say one-half of these would be females, making 175; these, at say 6,000 eggs each would make one million of eggs and upwards, which would pretty well fill up the establishment. I am told by Sheasgreen that a few salmon have died from the effects of the very hot weather you have had. Of course some few will get injured and die, but with extreme care you should not loose many. Be sure and take all the care you possibly can. I expect the Minister will visit you this fall; and as there has been so much said against the establishment and the Miramichi River generally, I would like that every possible success should attend your work and mine at the Breeding-House. I have instructed Sheasgreen to do everything in his power to carry this out, and I feel assured, with your assistance and with Sheasgreen's close attention, I can make the Breeding-House a success this season; but I shall rely upon your good support in all matters; and you must act in concert with Sheasgreen, because a house divided against itself cannot stand. I am sorry that such a very strong feeling is operating against your old friend, Venning; he will, however, be relieved from any fault-finding this season concerning the Breeding-House, as it has been placed wholly under my control, and I look to you and Sheasgreen to assist me in making it a success. Write me often.

I am,
Yours very truly,

SAMUEL WILMOT,
Supt. F. C.

P.S.—Since writing the within, I have spoken to Parker, who was with you the year so many eggs were laid down, and he says there were that year nearly 400 salmon taken, and that he laid down about one and a half million of ova. If it is convenient, then, you might catch between 350 and 400 salmon; this will give us a good supply. I will write Sheasgreen to take the utmost care of them at the ponds.

Yours, &c.,

S. W.

APPENDIX B.

(Circular.)

NEWCASTLE, Ont., 1st October, 1877.

SIR,—The following instructions are forwarded to you for your guidance in the spawning of salmon and in the impregnation of the eggs, and also in the mode of laying down the ova in the breeding troughs.

1st. No eggs or milt should be taken from the parent fish until they are found perfectly ripe and mature for operating upon. To ascertain this, take a female fish from the water by the tail, care being taken not to pinch the fish too tightly or rub off the scales or skin; hold her up perpendicularly; wrap a piece of factory cotton round the body (about one yard of cotton will answer), then hold her over a large tin pan, so that her vent will be inside of the pan; if she is fit for operating upon and the eggs quite ripe, they will flow easily from her body; in this case you can assist the flow of eggs by gently pressing the belly downwards, until all of the ova are taken from the fish. Use no force whatever, for if the eggs do not come freely they are not ripe and will not receive impregnation. If the eggs do not come freely put the fish back in the water again; before doing so, tie a small white cord or strip of cotton around her tail; by this means you will easily know her again from the rest of the fish in the pen or tank, and you will be enabled to catch her more readily after a day or two, when in all probability she will have become ripe for spawning.

It is wrong to take part of the eggs from a fish one day and the balance upon other days. Let all of the ova in the body become perfectly ripe before you spawn the fish.

2nd. If your fish is found to be perfectly ripe, let the eggs fall gently into a shallow tin pan, in which there should be no water whatever, other than the wet which may remain in it after rinsing it in the water previous to using.

3rd. Then take a male fish in the same manner as you did the female, and also see that he is quite ripe, and that the milt flows freely; gently press the body, and let the creamy substance fall into the pan amongst the eggs. Stir the eggs and milt together with your hand in a gentle manner, until the eggs appear to be thoroughly mixed in the milt. If you are scarce of male fish, one male will impregnate the eggs of two or three females; this may be done by putting the ova of two or more females into one pan, and using one male. It is better and safer, however, to use small portions of milt from two or more males, because it will be sometimes found that the seed of one male may be bad or barren; the chances in using two or more males will therefore prove more certain.

4th. Do not allow the eggs in the pan, after the milt is applied, to stick together as if they were glued; just so soon as you have stirred the eggs and the milt together, dip them out of your pan with your little measure (holding one thousand eggs), and lay them upon the trays; then place the tray with the eggs in the breeding trough, about one-quarter of an inch under water, and shake it with a tremulous motion once or twice, till the eggs are evenly spread over the tray; then sink the tray and eggs to the bottom of the breeding trough, where they are intended to remain till they hatch out. Commence laying your trays at the lower end of the troughs, so that as the next one above is laid down, the milt that flows off will run over the lower ones. By this means you will get all the benefit of the milt over all of the eggs in that trough or succession of troughs.

5th. After you have laid the eggs down, as above, in your hatching troughs, do not disturb the trays by moving them, nor the eggs by washing them, for five or six weeks. All that is necessary to be done is to pick out any white eggs that show themselves, but let it be done without disturbing the other eggs as little as

possible. The most delicate and trying period of the egg is during the first formation of the embryo, or young fish; after about five or six weeks it will have become strong enough to wash and handle without much fear of danger or loss, but the less handling you give the eggs throughout the whole season, the better. Watch your eggs closely, and pick out daily every white one; if the white eggs are left, they will soon decay and throw off a fungus which will poison thousands of the good ones.

6th. Let as large a flow of water pass over the eggs as you can, without moving them or rolling them about on the trays.

7th. Follow these instructions closely, where circumstances will admit of them, and you may rely upon success in your establishment. Some deviations from the rules laid down will necessarily follow in localities where every convenience cannot be had—as, for instance, taking ova up rivers, and carrying them long distances to the breeding-houses. The system of spawning the fish, and of impregnating the eggs, will, however, apply everywhere alike. During the catching, handling, spawning, and liberating of the parent fish, the most careful and gentle means should be used. Great care should be taken not to wound or bruise the fish, neither should they be allowed to become too much exhausted during the operation of spawning. The loss of fish should be avoided, and it need not occur, (only exceptionally) unless rough or improper means are adopted in the prosecution of the work.

8th. Officers in charge, or their assistants, are not allowed to adopt or practise new theories of their own, or of others, in connection with the science of fish-culture in any of the Government Fish-Breeding Establishments in the Dominion. Suggestions, however, of any kind, having for their object the improvement of apparatus, economy of labour, or any other matter or thing for the advancement of the work of fish-culture, will be thankfully received when properly submitted to the Department of Fisheries at Ottawa or to the Chief Superintendent of Fish Culture at Newcastle, Ontario.

(Signed)

SAMUEL WILMOT,

Chief Supt. Fish Culture.

To _____

Officer in charge Fish-breeding Establishment

at _____

P.S.—Up river Spawning.

If the ova are gathered from the fish up river, and where no conveniences are to be had in laying them on the trays, as described within, the most certain plan for success would be to take several pans with you, and, after spawning one or more fish, and impregnating them by mixing the milt as described, then add, say a pint or more of water, mixing all together well; then lay your pan away in some safe place; in about twenty or thirty minutes the eggs will become separated and hard like peas. The mixing of the water with the eggs will cause them to stick together, and they will remain in this way some twenty or thirty minutes, when they will separate and become hard. Do not try to separate the eggs when sticking together, as it will prove fatal to many afterwards.

Mode of carrying Eggs.

After impregnation, as above mentioned, you can carry the eggs short distances in pails of water, but too many eggs should not be put in a pail, nor should they be allowed to splash about in the pail when carrying them; this will be found very injurious. In carrying any distance, and where time will be taken to perform the work, the surest and best method is to carry them in damp moss in boxes. Take a box made of boards, say 15 or 18 inches square; bore a lot of holes through the bottom of it so that it will not hold water, then take some fine moss, which can be easily collected in the woods, and spread a layer of it over the bottom of the box (the moss should be picked fine and washed clean first); then take a piece of common cheap muslin or thin cotton (which you should prepare yourself with beforehand) of twice the size of the bottom of the box, wash it thoroughly clean first, then spread a single layer of the cotton over the moss, then put a layer of eggs evenly spread on top of the cotton; you may put the eggs two deep, but it is better to have them only one deep; then lay the other thickness of your muslin or cotton over the eggs, then put another layer of moss, say one inch thick, then muslin again and eggs again till you fill up your box, say six or eight or ten layers. The object of the muslin is to keep the moss from the eggs, and that you may lift the eggs cleanly out with the muslin or cotton when you get home with them. If it is very cold weather, the boxes, with the eggs in them, should not be allowed to get too cold or chilled; this can be done by covering them with blankets, or perhaps better to pack them all round in the bottom of your canoe or scow with dry moss, leaves or straw. When you get home with the eggs, don't jar them in opening—lift off a layer of moss, then lift out the eggs with the cotton, like a bag, and gently place them on the trays in your hatching troughs. Pursue this course and your losses in gathering eggs up river will be very trifling.

S. W.