Canada. Dept. of Fisheries
Report on fish culture

1888

REPORT

ON

FISH-BREEDING

IN THE

DOMINION OF CANADA

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REPORT

OF MR. S. WILMOT, SUPERINTENDENT OF FISH CULTURE FOR THE DOMINION OF CANADA, FOR THE YEAR 1888.

The Honorable CHARLES H. TUPPER,
Minister of Marine and Fisheries,
Ottawa.

SIR,—I have the honor to submit herewith the annual report of fish-breeding operations in the Dominion of Canada for the year 1888, together with a general summary of the work carried on at each of the twelve hatcheries under my superintendency.

Appended will be found the individual reports containing the transactions in detail, as given by the several officers in charge of each local hatchery in the several Provinces. In these are related the methods pursued for procuring the suppiles of parent fish, from which the eggs are obtained to stock the nurseries. In them will also be found remarks relating to subjects connected with the general interests of the fisheries, and fish culture, which no doubt will entitle them to a perusal and consideration.

The several fish-breeding institutions being wide apart in the performance of their work, reaching from the waters of the Atlantic to the Pacific, and located in all the Provinces of the Dominion save one, have such an unlimited water area in which to operate that, it is found very difficult, indeed almost impossible, to supply the demands that are annually made upon your Department by numerous applicants, for young fish of various kinds, to replenish waters that have become almost denuded of the better kinds of fish which formerly inhabited them; and in other cases to introduce better species into lakes, rivers and streams, to which they were not originally indigenous.

With the general increase of population, and improvements of all kinds in many parts of the Dominion, which are continually going on, it has been found that the fish, especially of the better descriptions are correspondingly decreasing, until at last it has become a necessity to institute remedial measures to restore them by the enforcement of judicious laws, for the preservation of the reduced supplies which are in some cases yet to be found; and by introducing the most approved methods for recovering this valuable source of food, and wealth to the country, ere it be wholly lost.

This desideratum has in a large degree been reached by the greater portion of the civilized governments of the world, by adopting the science of artificial fish culture, an industry which thus far wherever introduced, and extensively carried on, has produced most satisfactory results by restoring many waters to their original standard of fish wealth; and replenishing others with the higher orders of fishes by the acclimatisation of young fish reared in public fish-breeding institutions.

Whilst nearly all the countries of the Old World are actively engaged in the art of artificial fish culture, it is found that in America also, the industry has been entered into with more vigor than elsewhere, and nowhere has the same amount of effort been put forth to utilize the science of fish culture for resuscitating declining fisheries in the general interests of its inhabitants, than is shown to be the case in the United States of America, where by the almost unbounded liberality of the Federal Government, and by the larger proportion of the individual States of the Union, this work is generously supported and extensively carried on; and large sums of money are annually granted from the public treasury for the erection and maintenance of Federal and States Fish Hatcheries, and for employing professional experts, who are well versed in ichthyology, and also appointing persons having a practical knowledge of the wants in each State as Fishery Commissioners, whose

duty it is to look after the fisheries and fish-culture, and husband the work to its fullest extent. Over and above this Government patronage and support, fish culture is now being extensively carried on by private enterprise in many parts of the Union; this is shown by the fact of the numerous advertisements of proprietors of fish farms, so to speak, offering for sale fish eggs, and young fish of various kinds, bred in their private nurseries.

In the Dominion of Canada fish culture is also carried on by the Government somewhat liberally and extensively, and may be fairly classed as only second in the magnitude of its operations to the United States as a whole, but when compared with the individual States most prominent in the work, and where the population and wealth is upon a somewhat similar standard with Canada, it will be found that the latter is considerably in advance, when the quantities of young fish of the better kinds which are annually put out from the nurseries, and their cost of production, are taken into consideration.

Unfortunately, however, there are found in Canada, as well as elsewhere, illiberal, unpatriotic individuals who are inclined to find fault with any enterprise, if in the slightest degree it conflicts with their long practised selfish views, although it may be productive of the most beneficial results to the community at large. Among these are found some fishermen, many skeptics, and also ignorant persons, all of whom take pleasure in disseminating erroneous statements regarding the utility of artificial fish culture as a means of improving the fisheries of the country; and also endeavoring to put forth the idea that the expenditure on fish-breeding in Canada is both extravagant and unproductive.

It will not therefore, be considered out of place to give a few illustrations by way of comparison, with regard to the working and expenditure connected with fish-breeding institutions elsewhere than in Canada, in order that any misapprehensions which may have arisen in the minds of some portions of the community, as to extravagence and unproductiveness in the Canadian hatcheries, may be fairly overcome.

For this purpose the premier State of the adjoining Republic will be selected, as being analogous in wealth and population to the Dominion of Canada, and being the pioneer State also, where fish culture was originally introduced into the United States, contemporaneously with the origin of the work in Canada. This New York State, is still at the head of all others in the Union, in the pursuit of artificial fish-breeding, and in it are the famous Caledonia fish nurseries, originated and presided over until his death in 1887, by the late lamented Seth Green, of world-wide reputation as a leading fish culturist.

It becomes unavoidable at times to make comparisons on subjects in which the general public are concerned; and is a necessity also, in some cases in order that, the actual merits of a public industry in a country may be fairly upheld, and that any erroneous views entertained by any portion of the public on that industry may be openly dispelled. The alleged want of productiveness; and over expenditure in the Canadian hatcheries being referred to, has caused comparison to be made with the work in other countries, but in no wise intended to disparage, or underrate the mode of operations elsewhere, but simply to vindicate, and establish the economic working of, and substantial results from, artificial fish culture in Canada.

In the Annual Report of 1887, submitted by the five Fishery Commissioners of the State of New York to the Legislature, it is shown that $27,851.75 was expended for fish-breeding purposes in that year. This sum was laid out by these commissioners in the support and maintenance of the public fish hatcheries belonging to that State as follows:—

Caledonia Hatchery	$15,435 94
Cold Spring do	4,951 43
Adirondac do	4,534 51
Contingent expenditure	2,929 87
Total	$27,851 75

The gross number of fry put out of the above hatcheries for the benefit of the State was 20,879,531 as follows :—

Whitefish	1,977,000
Salmon trout	3,227,000
Salmon (*salar*)	457,150
Brook trout	1,620,000
Tom-cods, shad, smelts, &c	13,598,381
Total	20,879,531

N.B.—Tom-cods, shad, smelts, &c., are not bred in any of the Canadian hatcheries.

The average cost of running the above hatcheries each was $9,283.

The average cost of the fry put out from the above hatcheries in 1887 was $1.33⅓ per thousand.

There are twelve fish hatcheries in Canada ; they were all run and maintained in 1887 for the sum of $35,114, and the output of young fish from them was 77,673,000, principally all of the salmon family. But in order to make a proper comparison with the fish-breeding operations in the State of New York, as to expenditure, and productiveness, nine of the Canadian nurseries will have to be taken, whose aggregate expenditure for 1887 will amount to the same as in the American State. These nine hatcheries are all working in the general interests of the inland and Atlantic waters of the Dominion ; in the same manner as the New York State nurseries are operating for the Union.

The following are the nine Canadian hatcheries with their cost of maintenance each in 1887 :—

1. Newcastle Hatchery	$5,367
2. Sandwich do	3,513
3. Ristigouche do	3,768
4. Sydney do	2,796
5. Tadoussac do	1,971
6. Miramichi do	1,347
7. Bedford do	3,904
8. Gaspé do	2,164
9. Dunk River do	1,260
Add proportion of Superintendent's salary	1,760
Total	$27,850

The average annual cost of running each of these nine Canadian hatcheries was $3,095, being $6,188 less than the average cost of running each of the New York State hatcheries.

The average cost of the fry put out from these nine Canadian hatcheries in 1887 was 39¾ cents per thousand, being about 94 cents less than the average cost per thousand in the American hatcheries.

The gross number of young fish put out of these nine Canadian hatcheries in the public waters of the Dominion in 1887 was 70,105,000, as follows :—

Salmon (*Salar*)	7,195,000
Salmon trout	2,120,000
Brook trout	70,000
Whitefish	35,720,000
Lake pickerel (*Lucioperca*)	25,000,000
Total	70,105,000

Being 49,225,469 more young fish put out of the Canadian nurseries than from the New York State hatcheries in 1887.

A recapitulation of the expenditure and productiveness of fish breeding operations in the two countries is thus:—

New York State with three hatcheries spends	$27,851
Canada with nine hatcheries spends	27,850
New York State, average cost at each hatchery	$9,283
Canada do do	3,095
New York State, number of fry put out in 1887	20,879,530
Canada do do	70,105,000
New York State, cost of fry per thousand	$1.33⅓
Canada do do	0.39¾

EMPLOYÉS AND MAINTENANCE.

New York State—	
1 superintendent's salary, three hatcheries	$ 3,000
1 assistant and four other officers, average salary each $1,000	5,095
Other employés	2,482
Miscellaneous expenditure	17,274
Total	$27,851
Canada—	
1 superintendent's salary, nine hatcheries	$ 1,760
9 officers in charge, average salaries each $575	5,175
Other employés	3,070
Miscellaneous expenditure	17,845
Total	$27,850

Numerous illustrations of a like character are at hand regarding the work of artificial fish-culture in other parts of the neighboring Union, and in the Old World; and in the majority of cases it would be found that, for the amount of money expended for its maintenance—fish-breeding as carried on in Canada—will show less outlay, with greater returns than elsewhere.

From the above comparison in relation to fish-breeding operations it must appear that the industry in Canada is not expensively carried on, but on the contrary should receive the most favorable consideration from Parliament and the country for its economic working, and its great productiveness as a means for benefitting the community at large in replenishing the great water areas, with the most highly prized descriptions of fish at such small cost.

In connection with the successes which have attended fish-cultural operations in the Dominion, many evidences of a gratifying nature will be found inserted later on in this report. But it may not be inappropriate to give here in advance, an extract from an address delivered at a conference meeting of the Fishery Commissioners of the Great International Fisheries Exhibition, in London, by Prof. G. Browne Goode, of the Smithsonian Institution, Washington, and Fishery Commissioner for the United States; when speaking of fish-cultural work in America, he said:—"It seemed to him that the Canadian Department of Marine and Fisheries was one of the most valuable organization in the world, and that their system of gathering statistics was one which other countries ought to study with a great deal of care. Another matter which he looked upon with admiration was the great progress Canada had made in fish-culture during the past number of years, and more especially under the direction of Mr. Wilmot, who was one of the pioneers of fish-culture in America."

GROSS NUMBER AND DESCRIPTION OF FRY PUT OUT OF THE CANADIAN HATCHERIES IN 1888.

The following statement will show the numbers of young fish of all kinds that were hatched, and turned out from the several fish hatcheries in the Dominion of Canada during the year 1888. The quantity will be found to be in excess of any previous year. The classification and species were as follows:—

Atlantic salmon (*salmo salar*)	8,156,000
Pacific salmon (*quinnat and saw-quai*)	5,807,000
Salmon trout (Great Lake) (*Namaycush*)	7,320,000
Brook trout (*salmo fontinalis*)	176,000
Pickerel (doré) (*lucioperca*)	25,000,000
Black bass (small mouth)	1,000,000
Whitefish (*Coregonus albus*)	40,650,000
Grand total	88,109,000

The reports from the several officers in charge of the hatcheries give the most satisfactory accounts of the healthy and active state of the fry when planted in the several waters selected for them; the losses in transportation were so very trifling as to be almost unworthy of mention, although in a great many instances the places where they had to be carried to were at long distances from the hatcheries, and many difficulties on the journeys had to be overcome.

SCHEDULE OF FRY AND SEMI-HATCHED EGGS PUT OUT OF EACH HATCHERY IN 1888.

A statement is here given of the numbers, and kinds of fry, and eyed-eggs far advanced in development, that were distributed from the individual hatcheries into various waters, and transferred to other hatcheries; the particular waters in which the young fish were planted will be more particularly described in the several reports of the officers in charge of the individual hatcheries, in the Appendices hereto attached.

SCHEDULE of **Fry** and Eyed-eggs, 1888.

No.	Hatchery.	Province.	Fry put out.	Eyed-eggs transferred to other Hatcheries.	Species.
1	Fraser River	British Columbia	5,370,000	.....	Salmon (*Nerka*).
	do	do	437,000	.....	do (*Chouicha*).
2	Sydney	Nova Scotia	1,559,000	.....	do (*Salar*).
3	Bedford	do	1,400,000	.....	do do
	do	do	190,000	.....	Salmon-trout (*Namaycush*).
	do	do	2,800,000	.....	Whitefish (*Coregonus*).
4	Dunk River	P. E. Island	.....	750,000	Salmon (*Salar*).
5	St. John River	New Brunswick	537,000	.....	do do
	do	do	805,000	.....	Salmon-trout (*Namaycush*).
	do	do	2,800,000	.....	Whitefish (*Coregonus*).
6	Miramichi	do	1,290,000	.....	Salmon (*Salar*).
7	Ristigouche	Quebec	1,720,000	50,000	do do
8	Gaspé	do	800,000	.....	do do
9	Tadoussac	do	850,000	.....	do do
10	Magog	do	2,125,000	.....	Salmon-trout (*Namaycush*).
	do	do	1,350,000	.....	Whitefish (*Coregonus*).
11	Newcastle	Ontario	4,260,000	4,040,000	Salmon-trout (*Namaycush*).
	do	do	176,000	.....	Brook-trout (*Fontinalis*).
	do	do	2,700,000	.....	Whitefish (*Coregonus*).
	do	do	1,000,000	.....	Black Bass (Small Mouth).
12	Sandwich	do	31,000,000	11,000,000	Whitefish (*Coregonus*).
	do	do	25,000,000	.....	Pickerel, Doré (*Lucioperca*).
	Total Fry put out.	.....	88,109,000		

In the "eyed egg" column of the above schedule the following explanations are to be given:—

The 11,000,000 eyed whitefish eggs (just previous to their final development) were transferred from the Sandwich Hatchery to the following nurseries to be hatched and then distributed in the waters of the several Maritime Provinces named:—

Bedford Hatchery, Nova Scotia	3,000,000
St. John River Hatchery, New Brunswich	3,000,000
Magog Hatchery, Quebec	2,000,000
Newcastle Hatchery, Ontario	3,000,000
	11,000,000

The 4,040,000 eyed salmon trout eggs, were transferred in like manner from the Newcastle Hatchery in Ontario, to the following nurseries for hatching and distributing:—

Magog Hatchery, Quebec	2,500,000
St. John do New Brunswick	1,000,000
Bedford do Nova Scotia	500,000
Ottawa do Ottawa	44,000
	4,040,000

The 50,000 eyed salmon eggs were transferred in like manner from the Ristigouche Hatchery to the Miramichi Nursery for distribution, viz.:—

Miramichi Hatchery, New Brunswick	50,000

The 750,000 eyed salmon eggs were transferred from the Dunk River Hatchery, in Prince Edward Island, to the Bedford Hatchery, by reason of the breakage of the dam, and shutting off the water supply to the Dunk River Hatchery.

Bedford Hatchery, Nova Scotia	750,000

FISH EGGS COLLECTED FOR THE HATCHERIES DURING THE YEAR 1888.

A statement is here given of the quantities of fish eggs of all kinds that were collected and laid in the hatching troughs of the several nurseries during the year 1888. The number in the gross amounting to 98,214,000. Their general appearance at the present time as reported by the several officers in charge is very satisfactory. The following table will give the names of the hatcheries, their location, the number of eggs in each, and their species.

It will be noticed that no supplies of eggs were procured at the St. John River, Dunk River, and Magog Hatcheries during the past season for reasons hereafter mentioned. Quota of eyed eggs will however, be forwarded to these nurseries and to others also in the Maritime Provinces, at the proper time for transhipment from the Newcastle and Sandwich hatcheries in Ontario.

The following is the schedule of eggs collected in 1888:—

No.	Name of Hatchery.	Province.	No. of Eggs.	Species.
1	Fraser River	British Columbia	4,424,000	Salmon (*Saw-quai*).
	do	do	497,000	Salmon (*Quinnat*).
2	Sydney	Nova Scotia, (C. B.)	2,678,000	Salmon (*Salar*).
3	Bedford	do do	1,100,000	do do
4	Dunk River	Prince Edward Island		
5	St. John River	New Brunswick		
6	Miramichi	do	830,000	do do
7	Ristigouche	Quebec	1,500,000	do do
8	Gaspé	do	350,000	do do
9	Tadoussac	do	1,685,000	do do
10	Magog	do		
11	Newcastle	Ontario	5,800,000	Salmon trout (*Namaycush*).
	do	do	150,000	Brook trout (*Fontinalis*).
	do	do	3,000,000	Whitefish (*Coregonus*).
	do	do	1,200,000	Black bass (*Small Mouth*).
12	Sandwich	do	40,000,000	Whitefish (*Coregonus*).
	do	do	35,000,000	Pickerel, doré (*Lucioperca*).
			98,214,000	

GRAND TOTAL OF FRY PUT OUT OF THE HATCHERIES SINCE THE INDUSTRY OF FISH BREEDING COMMENCED IN CANADA.

The following schedule will show the gross number of all kinds of fry which have been turned out of each hatchery in the Dominion since their commencement; the table will give the year in which each nursery began operations; also the Province, and the local name by which each hatchery is designated, and the output of fry from each of them annually. The grand total of young fish as shown in the table is *six hundred and thirty-six millions eight hundred and forty-four thousand nine hundred.* They were comprised of the best known commercial fishes in the country; 463,709,000 were of the salmonoid family; such as salmon of the sea, salmon-trout of the great lakes, speckled trout of the streams, and famous whitefish (*coregoni*); the balance, or 173,135,900, were of the percidæ family; such as the lake pickerel, doré or wall-eyed pike, and small mouth black bass.

STATEMENT showing the Places where, and the Years in which the several Fish Hatcheries have been erected; also the number of Fry distributed from each Establishment, annually, since they were built.

Year.	Ontario.		Quebec.				New Brunswick.		Nova Scotia.		Prince Edward Island.	British Columbia.	Totals.
	Newcastle.	Sandwich.	Magog.	Tadoussac.	Gaspé.	Bisigouche	Miramichi.	St. John River.	Bedford.	Sydney.	Dunk River.	Fraser River	
	Fry.	Fry.	Fry.	Fry.	Fry.	Fry.	Fry.	Fry.	Fry.	Fry.	Fry.	Fry.	Fry.
1868-1873.	1,070,000	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1,070,000
1874.....	350 000	.....	.....	.....	.....	100,000	60,000	.....	.....	.....	.....	.....	510,000
1875.....	650,000	.....	.....	60,000	110,000	600,000	150,000	.....	.....	.....	.....	.....	1,570,000
1876.....	700,000	8,000,000	.....	150,000	50,000	300,000	60,000	.....	395,000	.....	.....	.....	9,655,000
1877.....	1,300,000	8,000,000	.....	1,180,000	1,051,000	600,000	320,000	.....	1,000,000	.....	.....	.....	13,451,000
1878.....	2,605,000	20,000,000	.....	707,000	650,000	1,015,000	665,000	.....	1,400,000	.....	.....	.....	27,042,000
1879	2,602,700	12,000,000	.....	1,250,000	1,597,000	1,470,000	1,025,000	.....	1,740,000	.....	.....	.....	21,684,700
1880.....	1,923,000	13,500,000	.....	1,155,000	730,000	1,500,000	805,000	170,600	730,000	.....	500,000	.....	21,013,600
1881.....	3,300,000	16,000,000	200,000	334,000	500,000	740,000	770,000	50,000	680,000	.....	375,000	.....	22,919,000
1882.....	4,841,000	44,000,000	975,000	600,000	530,000	1,400,000	640,000	588,000	850,000	315,000	1,060,000	.....	55,799,000
1883.....	6,053,000	72,000,000	250,000	995,000	530,000	300,000	925,000	72,600	800,000	659,000	1,210,000	.....	83,784,600
1884.....	8,800,000	37,000,000	100,000	935,000	859,000	940,000	795,000	811,000	1,000,000	853,000	1,000,000	.....	53,143,000
1885.....	5,700,000	68,000,000	300,000	720,000	290,000	660,000	900,000	155,000	670,000	772,000	1,100,000	1,800,000	81,067,000
1886.....	6,451,000	57,000,000	1,400,000	1,627,000	576,000	1,380,000	945,000	2,181,000	960,000	1,179,000	400,000	2,625,000	76,724,000
1887.....	5,130,000	56,500,000	675,000	900,000	630,000	1,500,000	900,000	2,479,000	4,230,000	1,415,000	500,000	4,414,000	79,273,000
1888.....	8,076,000	56,000,000	3,475,000	850,000	800,000	1,720,000	1,290,000	4,142,000	4,390,000	1,559,000	.....	5,807,000	88,109,000
Totals..	59,551,700	468,000,000	7,375,000	11,513,000	8,893,000	14,225,000	10,250,000	10,649,200	18,845,000	6,752,000	6,145,000	14,646,000	636,844,900

NOTE.—The particular descriptions of Fry above enumerated were as follows:—

Salmonidae—Atlantic and Pacific salmon, salmon trout of the Great Lakes, and speckled trout of the Streams...	159,059,000
do Whitefish (*Coregonus*) of the Great Lake region	304,650,000
Percidae—Pickerel, or Doré (*Lucioperca*) and Black Bass (1,000,000)	173,135,900
Grand Total of all kinds	636,844,900

SUMMARY OF PROCEEDINGS AT EACH OF THE HATCHERIES IN THE DOMINION DURING 1888.

In the following condensation of the transactions at the several fish hatcheries in Canada during the past year, a statement of the number of fry put out from each, and the quantity of eggs collected in 1888 will be given, together with brief statements regarding the conditions, wants and results obtained from their operation, with other remarks.

Details in full will, however, be found more particularly described in the individual reports of the several officiers in charge of each hatchery, in the Appendices of the general Report.

Fraser River Hatchery, British Columbia. This nursery hatched and put out 5,807,000 salmon fry native to the Pacific Coast. They consisted of the "Nerka," and "Chouicha" species. The former is the most important in the Fraser River, and generally known as the "Saw-quai." The latter also frequent the Fraser, but not so numerously as the "Nerka," the chouicha is the largest, and is known as the "Quinnat," or King Salmon. By far the greater number raised at the Fraser River Hatchery is the "Saw-quai" or red salmon of commerce. From the unavoidable necessity for employing unskilled men to handle and impregnate the eggs, many of the ova collected in the fall of 1887, were not fertilized and turned bad on the trays.

The hatching period on the Pacific Coast is much earlier than on the Atlantic side. At the Fraser River Hatchery, a large proportion of the fry hatch in January, whilst in the Atlantic Province nurseries the fry are not produced until April and May and in some instances June is reached before the young fish emerge from the eggs; the period of incubation being wholly dependent upon temperature accounts for the earlier hatching on the Pacific side. There has been put out of the Fraser River Hatchery during its four years existence, about 14,600,000 fry. They have been planted in rivers selected upon the judgment of the resident officer in charge of that institution. It is now ascertained from certain certificates attached to this report that some saw-quai salmon are now found in the rivers of Vancouver Island, where they were planted from this hatchery, but in which this species were never known before.

The quantity of ova laid down last fall is considerably less than the previous year. They amount to 4,921,000 as compared with about double that number in 1887. Unusually heavy freshets in the rivers interfered with the capture of parent fish and consequent diminution in the number of eggs. Of the number of spawning fish captured, only about one-fourth were females, and some of these had shed portions of their eggs before being caught. A great difficulty is experienced in conveying the eggs to the hatchery from where they are taken far up river in remote places.

Mr. Mowat, the officer in charge, quotes the first appearance of shad in the Fraser River this year and that some were taken there in the salmon nets. Last year information was given that these fish were around Vancouver Island. This indicates the migration of these fish up the coast northward from where they were first planted as fry in the Sacramento River, by the United States Fish Commission, by whom the young shad were brought across the continent from the Eastern States of the Union. An appeal is made that on account of this successful transportation and acclimatization of shad to the Pacific coast, the Canadian Department of Fisheries should in like manner undertake the planting of quantities of young shad in the rivers of British Columbia, and thus give additional importance to the fisheries of that Province. A request is renewed this year to have the whitefish also introduced into some of the inland lakes of British Columbia, which it is stated are well adapted for them.

The hatchery is said to be in good repair, the only immediate requirement is a new flume to conduct the water into the building, the old one has become decayed and leaky.

Some interesting letters will be found in the Frazer River reports regarding the great improvement made in certain rivers in Oregon, by means of supplying them with fry from hatcheries established upon them. See general report under heading "practical results from artificial fish-breeding."

(2.) *Sydney Hatchery, Cape Breton,* reports a distribution of 1,559,000 salmon fry in some eighteen of the most important rivers of Cape Breton. They were put out in the best possible condition, without accident, or loss worthy of mention. During the past autumn 554 parent salmon were captured and confined in pens, at the fishing stations on the Margaree, Sydney, Salmon, Middle and Lower Middle Rivers; 401 were females and gave 2,678,000 eggs, or an average of 6,695 to each female; these parent fish were returned to the river again in a lively condition; a fence was built on the water line at the hatchery, and a new scow for transporting salmon. The building will require painting, and a new floor laid in the hatching room, next year.

(3.) *Bedford Hatchery, Nova Scotia,* From this nursery were put out 4,390,000 young fish as follows: 1,400,000 sea salmon, 190,000 salmon trout and 2,800,000 whitefish; the two last named fishes were produced from eyed-eggs transferred from the Ontario hatcheries. These were planted in ten of the lakes of the Province well adapted for their future growth. The Atlantic salmon were distributed in no less than twenty-six of the most prominent rivers, in twelve of the Counties of Nova Scotia. The most satisfactory results attended the hatching and distributing of the salmon and whitefish. The same success was not experienced with the salmon-trout, these when about to emerge from the ova died in very large numbers; their loss is attributed to the unsuitability of the water which supplies this hatchery (for the growth of salmon-trout) as it appears that a portion of these eggs were sent to temporary hatcheries at Lochaber, and Sheet Harbor, where the most perfect success was met with. In this latter view of the matter, the officer in charge urges the importance of obtaining further supplies of trout and whitefish from Ontario, to stock the many lakes which abound in the Province of Nova Scotia.

One hundred and eighty-four parent salmon in all were obtained during last fall to supply this nursery with eggs—104 were females and gave 1,100,000 ova, making an average of about 10,575 eggs each: much disappointment was felt at not getting a larger number of salmon at the Musquodoboit River, where full arrangements were made to secure them. The interference of a fishery warden allowed a number of the salmon to escape—and other rivers had to be resorted to. To ensure greater economy and certainty for securing parent salmon in the future, arrangements of a permanent nature should be made at the Musquodoboit River by the establishment of a Government station, with an extensive reservoir alongside, in which a full supply of fish could be safely kept until spawning time. This plan should be completed early next spring in order to take advantage of the early runs of fish. Necessary improvements were made during the past season in the taking up, re-fitting and otherwise improving the conductor pipe, for supplying the hatchery with a better run of water. The establishment having been renewed throughout will require little expenditure upon it for some time.

A very lucid description of the benefits which have been experienced from the operations at this hatchery in the increase of salmon in many rivers in Nova Scotia, will be found in the Bedford report hereto atttached; and will also be referred to under the heading:—"Practical Results from Fish Breeding."

(4.) *Dunk River Hatchery, in Prince Edward Island.* From the breakage of the dam at this hatchery the supply of water was stopped, and the establishment has been closed up since. A large supply of salmon eggs were laid down in this nursery in the autumn of 1887, and were progressing satisfactorily until the dam gave way from the effects of a freshet in the river in March last; as the dam could not be repaired at this time, it was necessary to transfer the eggs remaining uninjured elsewhere. The Beford Hatchery being most convenient, and after delays and difficulties, the sound eggs, some 750,000 were safely conveyed to the Nova Scotia hatchery, where in due course they were hatched and distributed along with the Bedford complement in the waters of that Province. There are indications of a con

siderable increase in the catch of salmon around the coast of Prince Edward Island and particularly in the rivers where fry have been planted from the hatchery. The officer in charge estimates the cost for repairing the dam at $300. A further supply of breeding troughs and trays will be required to put the hatchery in proper working condition.

(5.) *St. John River Hatchery, Province of New Brunswick.* This nursery turned out a large number of young fish during the past season, consisting of salmon, salmon-trout and whitefish, principally the two latter kinds, the eggs of which were transferred from the Newcastle and Sandwich hatcheries in Ontario; of these 2,800,000 were whitefish, 805,000 were salmon-trout, and 537,000 salmon—total output was 4,142,000. The young whitefish and salmon-trout were planted in twelve lakes in the Counties of York, Carleton, Charlotte and Victoria; the salmon fry were put in the St. Croix, Utopia, Magaguadavic, Tobique and St. John Rivers. Numerous applications have already been made for salmon, and salmon-trout fry for distribution the coming spring. Much dissatisfaction is expressed by the people, regarding the apparent difficulty in procuring parent salmon to fully stock the hatchery with eggs. From the serious difficulties and expense which have hitherto attended the capture of parent salmon in the St. John and Tobique Rivers this part of the work was abandoned this year, and consequently no eggs were obtained for this nursery this season. It is proposed, however, to transfer from the Ristigouche Hatchery eyed salmon eggs, and from the Newcastle and Sandwich hatcheries in Ontario, eyed eggs of the salmon-trout, and whitefish, in order that the St. John nursery may have a partial stock of young fish for distribution in New Brunswick waters next season. The officer in charge expresses a preference for procuring supplies of eggs from the salmon to be captured at the St. John Harbor, where it would be more convenient, and also under his immediate supervision, and be more economical after the system was properly established. Much regret is expressed at the temporary cessation of work at the hatchery, by reason of the difficulties which have attended the capture of parent salmon up the Tobique, more especially as the usefulness of the institution for stocking the rivers and lakes with fish is begining to be felt and acknowledged by the public, who highly appreciate the work, and manifest great interest in the artificial culture of fish. The numerous applications which are made for fry to replenish over-fished waters are strong evidences of the popularity of this fish-breeding institution. It is, therefore, of the greatest importance that measures should be instituted at once, by which a large supply of parent salmon should be obtained next season, from which this hatchery could be stocked with its necessary quota eggs.

Evidences of the benefits from planting salmon:trout and whitefish fry in some of the lakes are to hand, as immature fish of these species have already been taken in waters where they were never before known, but in which these fry were planted from this hatchery; and it is also admitted on all hands by fishermen and others that the run of salmon in the Tobique had improved by one-half more within the last two or three years. A further evidence is the fact of the river being leased by the Local Government to American anglers for fly-fishing purposes, and that a large number of salmon were so taken, which is a circumstance not hitherto known.

(6.) *Miramichi Hatchery, Province of New Brunswick*, gives a return of 1,240,000 salmon fry, natives of that river, and 50,000 from the Ristigouche River eggs. These were planted far up the branches of the Miramichi, even beyond the settlements where the best places are invariably found for the growth of the fry. These points, though at present very difficult to reach, will be more easily overcome in the future, as private parties are interested in opening out the roads to the upper reaches of the river for its better development. Extreme high water in the river prevented the capture of parent fish during a fortnight of the usual period in the fall for netting them. This freshet allowed the salmon to pass far up the river, and consequently only 290 parent fish were secured for the uses of the hatchery, which reduced the number of eggs collected much below that of former years. One hundred and fifty of the salmon were females; they gave a total of 830,000 eggs or an average of

5,550 each. These are reported as being in a very healthy condition. The heavy freshet referred to caused a breakage in the supply pond, which was at once repaired, and the hatchery with all its requirements inside and outside, except a new towing scow, which must be built to replace the old one, are in good condition.

Some very satisfactory letters from leading persons regarding the benefits which have resulted from the artificial breeding of salmon in this hatchery, are sent in by the officer in charge and are inserted in the general report under the heading of "Practical Results from Fish-breeding.

(7.) *Ristigouche River Hatchery, Province of Quebec.* The officer in charge of this establishment reports the distribution of 1,720,000 salmon fry in the Ristigouche River, and its three principal branches, the Matapedia, the Upsalquitch and the Kedgewick, and also in the Jacquet and Nipissiguit Rivers, which empty into the Bay des Chaleurs a long distance below the mouth of the Ristigouche. There were also 50,000 semi-hatched eggs transferred to the Miramichi Hatchery in the month of April. The fry planted in the Ristigouche and its branches, and those conveyed to the Jacquet and Nipissiguit were put out in a strong, healthy and active condition. The fruits of the former plantings of Ristigouche fry in the Nipissiguit River are being experienced by anglers, who are strong in the belief that salmon of the Ristigouche family are now caught in the Nipissiguit. Their larger size, different shape and general appearance go to show that they are the product of the fry brought from the Ristigouche Hatchery in former years.

Owing to the unusually heavy freshet which prevailed in the Ristigouche River in the early part of June the first run of salmon passed by before the nets were set at the head of the tide-way; and the anticipated numbers of parent salmon for the uses of the hatchery were not obtained. The two departmental nets gave only 246 fish, these with 107 purchased from fishermen, made a total of 353. This number was reduced to 315 when taken from the reservoir in the month of November for spawning operations. Fungoid growth from the effects of wounds in capturing them, and the escape of others caused a loss of 38 from the original number put in the reservoir. One hundred and fifty-five females gave 1,500,000 sound eggs, with an average of 9,675 each. These fish after spawning were liberated in the tide way in better condition than the ordinary spent salmon far up river.

The severe freshets during the past season have very materially injured the banks of the reservoir or retaining pond in which the parent salmon are kept; considerable repairs will require to be made to make it safe for the retention of fish next season. The necessity for this is shown when some hundreds of salmon are kept in it, which if lost by any imperfection in the construction of the water pen would allow the salmon to escape and thus shut off the supply of eggs for the hatchery for the season. A small building was erected alongside the reservoir for the convenience of the watchmen, and prevention of injury by frost to the eggs during the time of their manipulation. The hatchery and its outworks are, generally speaking, in very good condition.

It is most desirable that another departmental station should be selected near the head of the tide way in order to ensure a full supply of salmon to fill the hatchery with eggs, as constant demands are now generally made upon this institution from other parts of the country for the introduction of the more famous family of Ristigouche salmon into other rivers where the native fish are smaller. The great benefit derivable from having fishing stations absolutely under departmental control, and worked by our own men and nets, is that greater certainty in procuring full supplies of salmon would be the result, and the chances of injury to the fish would be almost wholly overcome, thereby reducing the loss from fungoid disease to the minimum. Experience has shown that the salmon taken in the departmental nets are kept in the reservoir through the whole season, escaping fungoid disease and losses of any kind comparatively speaking, whilst those purchased from the ordinary fishermen are subject to fungus (*saprolegnia ferax*) and many die. With the working of a third station and net, both money and the loss of salmon would be saved, as the third stand of nets could be operated at a very trifling cost over the two now in use, and

thus do away with the purchase altogether from fishermen and give a more healthy class of parent salmon to procure eggs from. A conviction has set in with the large majority of fishermen, causing them to advocate the usefulness of artificial fish-culture as a sure means of supplementing the natural laid ova, by which the Restigouche River and its estuary fisheries have now become so prominent with anglers and fish-dealers in Canada and the United States.

(8.) *Gaspé Hatchery, Province of Quebec.*—This nursery distributed in the Dartmouth, St. John, and York Rivers 800,000 salmon fry. They were deposited in these waters in good condition. The number of parent salmon secured in the retaining pond was only 49, being much less than usual. Owing to very high water in the Dartmouth the nets could not be set until the middle of June, when the principal run had passed. To obviate a like occurrence in the future it is recommended that the stock of salmon for this nursery be netted in Gaspé Basin, where greater reliance could be placed for getting increased numbers from the earlier and larger runs of salmon, and where the heavy freshets from the river would not affect the nets. Some better method than the present is necessary in order to give certainty for stocking the hatchery with eggs beyond the small quota of the past years. Of the 49 fish obtained last season 36 were females; they gave 35,000 eggs, with an average of 9,700 to each. These eggs are reported as progressing quite favorably. The building is in fair repair, but is sadly in want of a coat of paint to preserve it.

The anglers and canoemen report a heavier description of salmon taken on the St. John River during the past few years—the former average being about 15 lbs., whilst of late they have reached a general average of some 18 lbs. This is attributed to the putting of large numbers of Dartmouth River fry, from the Gaspé Hatchery into the St. John River. The Dartmouth family of salmon have always been known to be larger than the St. John River fish, and differing somewhat in their resemblance.

(9). *Tadoussac Hatchery, Province of Quebec.* There were successfully hatched and distributed from this hatchery in 1888, fry to the number of 850,000, the greater proportion of these were put in the rivers and small lakes which empty into the Saguenay; and 15,000 were carried to the St. Ann River, below Quebec, without the loss of a single fish, to the great astonishment of the proprietor of that river and several witnesses who saw them. There were laid down in this hatchery last fall 1,685,000 healthy salmon eggs; they were taken from 160 females, each averaging 10,000 ova. Total number of males and females captured in the government net and safely kept in the salt water pond, at Tadoussac, from May till November, was 244. Only one salmon was lost of this number by accident, in being caught in the iron gate of the reservoir. After spawning these salmon, they were turned out in the Saguenay River in a strong and active condition. Some evil-disposed persons made attempts to let the salmon out of the pond by cutting the ropes; and on two occasions the nets were cut. The watchmen discovered them in time to prevent serious loss.

The lower part of the building needs repairing, the superstructure is sound, but the foundation part being exposed to moisture has become decayed; other repairs about the wharf are required, some flooring and shingling is absolutely necessary. The estimated cost for full repairs is $500. The smolts (*young salmon*) grown from the fry put into the Tadoussac Lake, above the hatchery, are seen in great numbers; likewise at the Mowats Lake, where it empties into the St. Lawrence, great numbers of young salmon have been seen and caught there. This small lake gives the most indubitable evidence of the rapid growth of hatchery bred fry to the smolt stage. It is a mountain lake wholly inaccessible by parent salmon, it was prospected and recommended by the gentlemen whose name it bears as a suitable depository for the growth of the salmon fry, and was largely stocked with them from the Tadoussac Hatchery in 1886, and with additional annual supplies since. The little lake just above the hatchery is another positive evidence of the certain and healthy growth of hatchery bred fry during the transitory periods in their life as parrs, as smolts, and grilse, prior to their reaching maturity in the ocean. This

hatchery lake, like the Mowat's lake, is also inaccessible by adult salmon; the little streamlet which runs from it only a short distance, drops almost perpendicularly about 100 feet into the tidal water of the Saguenay. The lake has been supplied regularly with thousands of salmon fry from the Tadoussac Hatchery since 1876, and as regularly since large numbers of smolts have been seen passing down from it to the salt water. The following quotation from the report of a gentleman whose whole lifetime has been given to the care and study of salmon and speaking of this Tadoussac Lake, where he was on duty for many months, he says: "Many thousands of fine full grown smolts went from this lake to sea last October and November, as well as young salmon weighing from three-quarters of a pound up to six pounds. There may have been probably 100 fish of the latter size. Seven of them were retained by the caretaker, the balance were allowed to escape."

These illustrations regarding the growth of artificially bred salmon fry are given in refutation of the statements which are put forth by ignorant and prejudiced persons that, "all artificially bred fry die, as the work is contrary to nature." A perusal of the report on the Tadoussac Hatchery, No. 9 in the Appendices hereto, will give further information on the subject.

(10.) *Magog Hatchery, Province of Quebec.* This nursery was wholly supplied the past year with salmon-trout, and whitefish eggs in a semi-hatched state, they were transferred from the Newcastle and Sandwich hatcheries in Ontario; the former sending 2,500,000 salmon-trout eggs, and the latter 1,500,000 whitefish eggs. From the salmon-trout eggs 2,125,000 fry were hatched, and in like manner 1,350,000 young whitefish were produced. Both species were distributed liberally in the principal lakes in the Eastern Townships of Quebec. Some of the lakes were very distant from the hatchery, the fry nevertheless in all cases were put into their future homes to all appearances in a strong and healthy condition. Lake Memphramagog being the larger lake received the greater supply of fry. It has been found to be more convenient and economical to supply the Magog Hatchery with eyed-eggs from the Newcastle Hatchery, than to procure them from fish as formerly taken from the Eastern Township lakes. The hatchery with its appliances are reported to be in good condition and not requiring repairs of any kind for the present: Evidence of the benefits which have arisen from the work done at the Magog nursery is shown by a certificate numerously signed by fishermen and others, and will be found included in the general report under "Practical results from Artificial Fish-breeding."

(11.) *Newcastle Hatchery Province of Ontario.* The distribution of fry and semi-hatched eggs from this establishment was larger than usual. Both fry and eggs were largely distributed in the Provinces of Ontario, Quebec, New Brunswick, and Nova Scotia. On account of the unusually late spring the hatching of the eggs, and distributing of the fry, was also later. The final put-out of the fry reached the 12th July, at which time, and for some time previous, the temperature ran very high, causing additional care and attention to be given to the young fish during their transportation.

There were 12,116,000 young fish and eyed-eggs put out of this hatchery in 1888. 8,076,000 of these were fry of the salmon-trout, whitefish, speckled-trout and bass; they were wide spread throughout the Province of Ontario. The balance, or 4,040,000 were the eggs of the salmon-trout, which were transferred to hatcheries in Quebec, New Brunswick, and Nova Scotia, just before the ova were ready to hatch. The particular quantities that were distributed in the several localities of the Provinces, will be found minutely described in the individual hatchery reports in the Appendices. In brief it may be stated that the salmon-trout, and whitefish fry, were put in some thirty of the greater, and smaller lakes, and other public waters of Ontario. The speckled-trout were apportioned to numerous applicants for stocking streams in various localities in the Province.

The demands for brook-trout are annually increasing, and are quite beyond the present means of supplying unless additional grants are given to purchase the eggs from American trout breeders, or some systematic method be instituted to gather ova from the native trout in our own waters. An experiment on a small scale was

tried during the past season to grow these fish in a pond connected with this hatchery. So far it has proved fairly well; some speckled and California trout have now been in it about a year and have thriven very well, but, from the high temperature of the water in the summer months, it is a question, as the trout grow older, whether they will obtain a sufficiently healthy development to produce sound, fruitful eggs. Another year will solve the question.

The several fish ponds, since their deepening and cleansing, give marked evidence of their greater purity of water and adaptability for growing certain kinds of fish, like bass and carp, and some of them may prove suitable for the growth of trout, as the latter, in some instances, have, during the past season, reached some ten inches in length. The ponds are well adapted for rearing black bass, as a very large number of fry were bred in them the past summer and a fair stock of adult bass are in them at present.

The main dam, enclosing the water supply for the hatchery as well as the raceway, is in a very safe condition; its present appearance for strength and durability would indicate no expenditure being required upon it for some time to come.

The supplies of ova collected last autumn for the wants of this parent institution and for sending quota of eyed eggs from it to the Maritime Province hatcheries are considerably short of other years, the gross number amounting to some 5,800,000 as against 9,000,000 and upward in 1887. The severity of the weather experienced in collecting eggs at Pigeon Island in Lake Ontario and in the Georgian Bay, together with a reduced number of parent fish being captured at these points, caused this short crop of eggs. A diary of the proceedings at Wiarton in collecting eggs will be found in the Newcastle report, and will also show the comparative falling off, as between 2,940 mother fish in 1887 and only 1,690 in 1888, a decrease of 1,250 females to get eggs from in 1888.

It is most desirable that some first class fishing station should be taken possession of by the Department for the exclusive purpose of capturing parent fish to stock the hatcheries with full supplies of eggs. The experience of the last year has shown that a fishing station occupied by pound-nets during the whole (open) season will have so thinned out the numbers of mother fish that would otherwise be found on the spawning grounds during the (close) season of November that such a fishing station is made inadequate to supply the necessary quota of eggs for the now extended operations at Newcastle, or by which this hatchery can possibly transfer to the Maritime Province nurseries the quantities of eyed eggs necessary to fill their wants. This want will be felt in a larger degree the coming season, and as this demand for introducing the more important commercial fishes, inhabitants of the great lake region of the west, into the numerous fresh water areas of the Lower Provinces, is greatly on the increase, it is essentially necessary that timely efforts should be put forth to accomplish this most desirable end.

In view of this growing demand for supplies of salmon-trout eggs, and finding that the Colpoy's Bay fishery had proved to be too limited to furnish adequate numbers of ova, Mr. Charles Wilmot, whose special work has been, for years past, to collect these eggs, was directed to look out for more capacious limits on which salmon-trout congregate for spawning purposes, and he reports that extensive breeding grounds of these fish are to be found around Hay, White Cloud and Griffith Islands, just outside the entrance to Colpoy's Bay. The fisheries about these islands are occupied, more or less, by the Indians and are regulated by the Indian Department at Ottawa, with which satisfactory arrangements, no doubt, could be made. Chief McGregor, of the Indian tribe on the above-named islands, has already expressed his willingness to allow the work of gathering fish-eggs to be carried out there.

The condition of the eggs in this hatchery has given great anxiety and caused much additional labor and attention to be given to them, by reason of the unusually open and rainy weather which has prevailed from the time of laying them down, and all through the month of December, causing large quantities of sedimentary matter to settle upon the eggs, which is very injurious to the ova. This must be removed, and in the constant cleansing of the eggs from this filthy matter, numbers

get injured and die. Notwithstanding this serious drawback to the healthiness of the eggs, it is confidently expected that a fair percentage of fry will be produced for next season's distributions.

A number of very satisfactory letters regarding the success attending the planting of fry from this hatchery in many waters in Ontario have been received by the officer in charge of the hatchery. These will be found inserted in the general report under the heading of " Practical Results from Artificial Fish Breeding."

(12.) *Sandwich Hatchery, Province of Ontario.* This nursery, unlike the others, is wholly devoted to the breeding of whitefish and lake pickerel, and its machinery and appliances are worked by steam power, which pumps the river water to an elevation from which it feeds the numerous automatic glass incubators. The institution gives two crops of fry in the season. One whitefish, the eggs of which are laid down in the late autumn and hatch in the following spring. The other is the lake pickerel (otherwise known as doré, wall-eyed-pike or pike-perch), the eggs of which are collected in April and May, and hatch in about four or five weeks after. The average output of these two species has been about 60,000,000 of fry for the past ten years. The capacity of the hatching room, when fully supplied with apparatus which is in contemplation of being provided for the coming season, will then accommodate upwards of 100,000,000 of the above-named eggs.

The success which has attended the operation of this hatchery for benefitting the white-fish fisheries on the Detroit River and Lake Erie, and elsewhere where the fry have been planted, has quite passed beyond the region of doubt by the verification of fishermen and fish dealers, who have voluntarily given their written statements to that effect. The work of this hatchery, coupled with the nurseries on the American side, has produced such a decided increase in the take of whitefish in Lake Erie, as to cause a spontaneous demand to be made by the principal fishermen and fish dealers to their separate Governments, to enlarge the present hatcheries and increase their numbers, so that this valuable description of fish may be more bountifully supplied to the inhabitants of these countries for domestic use and commercial traffic. By a reference to the annual reports of the Fishery Commissioners of the Federal Government and of the States of Ohio, Michigan and other States, and to the fisheries reports of Canada also, it will be found that the numerous certificates which are therein given by the fishermen themselves go to prove most conclusively the statements above made.

From the Sandwich hatchery there were put out last year 42,000,000 of whitefish fry; and 25,000,000 of pickerel, (wall-eyed-pike), in all 67,000,000. These were freely distributed in Lakes Huron, Erie, Ontario and St. Clair; and some millions of these in the " eyed " state, were transferred to Quebec, New Brunswick and Nova Scotia. The fry in all cases were reported to be distributed in the several waters in splendid condition.

The method adopted to procure supplies of whitefish eggs for this hatchery is precarious, having to rely largely upon the humour, or avarice of the fishermen, who occupy fishing stations on the Detroit River. By the action of the Department in exercising its rights to the Bois Blanc Island Fishery, the difficulties hitherto experienced in getting ova, will be in part overcome by operating it wholly by the employes of the hatchery. This one station will not, however, suffice for the full wants of the hatchery, and it becomes a necessity that some of the other stations on the river now licensed by individuals should be so controlled by the Department, as to make it compulsory upon the licensees to allow the fish taken by them at the spawning season, to be manipulated for the benefit of the Government hatcheries exclusively. Failing such arrangement a " close season " of the month of November should be established, in which no whitefish should be taken, except through the medium of the hatchery employes and for Government purposes only. At present no " close season " is set aside, or, at any rate, enforced on this river; the consequence is whitefish are netted all through their spawning season without let or hindrance of any kind, and the fishermen who are permitted to carry on this unnatural and destructive work for our Canadian fisheries, multiply the baneful effects of this un-

patriotic work from sordid motives, by selling the eggs from the mother fish, (which nature in her wisdom destined for their own waters,) to be carried to a foreign country to enrich waters there with this valuable fish from which Canada can derive no benefit whatever, but rather decimating her own waters of a rich source of wealth, by satisfying the greed of a few fishermen, only for self-aggrandizement, and entailing upon this country great loss to her fisheries for the present and the future.

The number of whitefish eggs collected for this hatchery the past autumn was about 40,000,000. Many of these have since died from the effect of fungoil growth, and absence of fertilization. The warm weather at the spawning time created disease amongst the parent fish that were penned up, and many died; great quantities of eggs were thrown away, being incapable of receiving impregnation.

It is feared the usual number of fry will not be forthcoming next spring.

Considerable repairs and improvements will be necessary to make this hatchery reach the standard it ought to be in. The whole of the lower flat should be utilized for hatching purposes, by removing from it the quarters now occupied by the officer in charge and his family. A comfortable dwelling should be built for them close to the hatchery, where perfect supervision could at all times be had of the building, and machinery connected with it. An estimate of the cost of these improvements has been given.

PRACTICAL RESULTS FROM ARTIFICIAL FISH BREEDING.

The following letters and extracts from various sources are here given as evidences of the benefits which are being experienced from the planting of fry of various kinds in the waters of Canada, from the fish-breeding establishments of the country:—

BENEFITS FROM NEWCASTLE HATCHERY, ONT.

BELLEVILLE, 8th December, 1888.

Mr. CHAS. WILMOT,
Government Fishery Hatchery,
Newcastle.

DEAR SIR,—In answer to your enquiry as to the result of planting whitefish fry in the Bay of Quinté for some five years past by yourself, under instructions from the Fisheries Department, it gives me great pleasure to report to you that in my opinion the work has been very successful as far as my experience shows. During the past year the catch of whitefish has been greater than during the past fifteen years. I have been a fisherman on the bay for thirty years, and, strange to say, the whitefish taken in this section are mostly all under size, averaging a little more than a pound in weight. This small run of fish is undoubtedly the result of the placing of young fry in this vicinity during the past five or six years.

Yours respectfully,
SAMUEL GEDDES.

BAY OF QUINTÉ, 14th December, 1888.

Mr. C. WILMOT,
Newcastle Fish Hatchery.

SIR,—I have been fishing in the Bay of Quinté and the lower part of Lake Ontario for the last thirty years, and can testify that the whitefish taken during last October have been far in excess, as regards numbers, than in any previous year in my recollection, and it affords me great pleasure to attribute the increase to the action of the Government in planting large numbers of young fry in the locality during the last five years.

Yours very truly,
W. BLACH.

BAY OF QUINTÉ DISTRICT, 8th December, 1888.

Mr. C. WILMOT,
Government Hatchery, Newcastle.

SIR,—We, as old resident fishermen on the Bay of Quinté, beg to report to you that the placing of large numbers of young whitefish and salmon-trout in this vicinity by the Government for some years past has proved most successful.

During the last year we have shipped 12,500 pounds of whitefish, which in weight varied from one to two and a half pounds each.

We can also safely say that the large catch for the past year or two was undoubtedly owing to the placing of the fry in these waters.

Yours respectfully,

AARON M. WEISE,
ALLAN W. WEISE.

BAY OF QUINTÉ, GERRY POINT, 9th December, 1888.

Mr. C. WILMOT,
Newcastle Hatchery.

DEAR SIR,—I am now sixty-two years of age and have been fishing in this locality since I was sixteen, and can certify that the catch of whitefish during the past two years has been greater than for years, and I attribute the large increase of these small sized whitefish to the fact of your having planted such large quantities of the young fry in this section of Lake Ontario during the past six or seven years. The fish, so far as I can judge, weigh from one to three pounds each.

Yours truly,
DAVID GERRY.

AMELIASBURG, BAY OF QUINTÉ, 8th December, 1888.

Mr. C. WILMOT,
Government Fishery, Newcastle.

DEAR SIR,—I have great pleasure in stating that the whitefish and salmon-trout placed in the Bay of Quinté and Lake Ontario by the action of the Government for some years past has been specially successful. From my own knowledge and from what I hear other fishermen say, I am quite satisfied that the large catches which have been taken in the lower sections of the lake and the Bay of Quinté lately are wholly due to the stocking of fry from the Newcastle hatchery for some years past. The fish, though small in size, are plentiful, which speaks well for the work of the hatchery.

Yours very truly,
WM. PEEK.

I have read over the above statement of Mr. Wm. Peek's and can fully corroborate all he has said. We hope the Government will continue this work.

PETER NURSE.

BELLEVILLE, 14th December, 1888.

Mr. C. WILMOT,
Fish Hatchery, Newcastle, Ont.

SIR,—It gives me great pleasure to send you the accompanying certificates from some of the fishermen as to the efforts and results of the planting of whitefish and salmon-trout in this district. Dozens of complimentary proofs of the work of planting fish could be obtained from interested parties who would voluntarily certify to the great work which has been done towards the increase of the fish in the Bay of Quinté and surrounding districts.

In so far as I am personally concerned as fishery officer, I can testify from my own personal knowledge and from what many fishermen report to me, that there has been no better year for whitefish than this and the past year. It is true that most of the catches of fish are small in size, but that, no doubt, is owing to the age of the

fish. They appear to be about one and two pounds in weight, and I should judge about three years old.

I would recommend that another lot of whitefish fry be deposited in the Bay of Quinté and in Lake Ontario in the vicinity of Picton during next spring. In my opinion it is necessary to stock the waters annually with fry in order to keep up the supply, as the demand is becoming greater every year, and the appliances for their capture are also increasing.

I am, yours truly,

CHAS. WILKINS,
Fishery Offieer.

BANCROFT, NORTH RIDING HASTINGS, 27th May, 1888.

Mr. S. WILMOT,
Superintendent, &c.,
Newcastle, Ont.

SIR,—I have much pleasure in making the following statement for the information of the Fisheries Department and yourself, viz.:—

Mr. C. Wilmot gave me about 5,000 salmon-trout fry in 1883, which I deposited in Little Island Lake, three miles from Bancroft, in good condition.

I have since caught four of these fish in the above-named lake, weighing about two pounds each, average length 16 inches. There is not the slightest doubt but that these are the fish deposited by me, as there were no fish of any kind in this lake previous to my putting them in in 1883.

Yours respectfully,

W. H. SWEET,
Constable for Hastings Co.

I can also state that I caught over a dozen of these salmon trout planted in 1883, last spring in the North Riding of Hastings. They were all of a uniform size weighing about two pounds each, several of which I sent to the Deputy Minister of Fisheries at Ottawa, and others I brought home for the Superintendent's inspection. There is not the slightest doubt but that the planting of fry in North Hastings has proved to be most successful.

Yours truly,
C. WILMOT.

(*Copy.*)

To SAMUEL WILMOT, Esq.,
Superintendent Fish Culture,
Dominion of Canada.

SIR,—We take this opportunity of expressing to you our thanks for the benefits we have derived from the salmon-trout fry deposited by you in the Charleston Lake waters, in the year 1883. There was evidently every prospect of that species of fish becoming extinct in the said lake, but judging from the time and the size of the salmon trout taken now and during the past two years in those waters, leave it beyond a doubt that the attempt has proved a decided success and a great source of pleasure to sportsmen resorting to Charleston Lake during the fishing season. Very little or no netting is indulged in, in the same lake, the fish being mostly taken by means of bait or troll.

Knowing as we do that the foregoing statements are correct and true, we would suggest that a repetition of your former attempts be repeated from year to year, and would humbly ask that you memorialize the Government in that behalf.

We also notice that black bass are getting very scarce in these waters, and consider it very advisable that some of that species be also deposited at an early date to prevent entire depletion.

W. H. Johnston, Overseer of Fisheries, Charlotte.
I. B. Saunders, Reeve of the Township.
A. Armstrong.
W G. Tarient, Postmaster.
L. H. Arnold, Merchant.
Sand & Davidson, Merchants.
R. K. Addison, M.D.
Stanley S. Connell, M.D.
I. B. Lamb, Druggist.
H. C. Phillips, Constable.
Geo. Bedford, Merchant.
A. M. Chassels, Merchant.
Harry Whartens, Merchant.
W. H. Jones, Barrister.
John C. Brown, Hotel-keeper.
Alex. R. Allan, Gentleman.
Neal McLean, Mgr. Bank of Montreal.
I. G. Leslie, Accountant.
D. Renney, Inspector of Schools.
J. F. Schofield, Barrister.
D. Mansell, County Treasurer.
R. B. Alguire, Clerk Division Court,

And others.

Brockville, April, 1888.

BENEFITS FROM MIRAMICHI HATCHERY, N.B.

Hon. M. Adams, one of our most prominent public men and a leading sportsman, says: "The fly-fishing on the North-West Miramichi was better this season than it has been for the past fifteen years." Speaking of the hatchery he says: "I am a firm believer in artificial fish hatching, and I look for great results from the young fry which have been planted in the head waters of our streams, provided that those streams are properly protected, and I sincerely believe, if it had not been for the hatchery the salmon would now be nearly exterminated from our rivers.

"Take the marked increase on the main North-West River—season after season the fly-fishing was *nil;* but in 1887 there was a record of eighty-seven salmon and grilse,—this year 1888, 300 salmon and grilse were caught, and the river teeming with young fish. If, in former years the young salmon had been planted away up the rivers and in brooks, a short distance from the main rivers, as they have been for the past two years,—who could estimate the results? It was a blessing that the fish hatchery was established, for if it had not been, in my opinion, few salmon would be found in our river. The fish house is a credit to you."

Jared Tozer, of the firm of Tozer & McDonald, says: "I believe that the fish hatchery is a great benefit to our rivers, and think, that if it had not been for the fry planted from it, the supply of fish would now be nearly exhausted, as the almost total destruction of salmon in non-tidal waters, previous to the past two years, would have caused our rivers to be destitute of fish, if the supply had not been kept up from some other source besides the natural one. In regard to the catch of fish by my own nets, I may say it has been steadily on the increase for the last three years."

M. Sutherland, overseer for the upper section of the North-West and its tributaries, says: "I am a strong believer in artificial fish hatching, and I think that the hatchery on this river is the only means by which the supply of salmon has been kept up in our streams when the destruction of parent salmon on the spawning grounds, by poachers, previous to the past two years, is taken into consideration. I also approve of the method of capturing parent fish for this house, contrary to the statement published last year under my name, by the New Brunswick Inspector of Fisheries in the Report on the Fisheries," page 146.

John Ferguson, Esq., a noted fly fisherman, says: "The catch of fish on the North-West was better this season than for any season during the past twelve or fifteen years. I believe that artificial fish hatching is a great benefit to our streams in keeping up the supply of this important fish."

James Lawlor, a net fisherman, states: "I have taken more salmon this year than for any season during the past five years. I believe that the hatchery is a great help towards keeping up the supply."

BENEFITS FROM BEDFORD HATCHERY, N.S.

Value of the Salmon Fisheries of Nova Scotia enhanced by fish culture.—(From Mr. A. B. Wilmot's Report.)

"Two large rivers, the Indian and Ingraham, enter St. Margaret's Bay, into each of which a quota of young salmon has been planted from this hatchery since 1876. Now, by one who had not given the conditions as stated above proper consideration, and comparing the catch in this bay and its rivers with that of the seasons before any stocking was done, an inference unfavorable to the effects of the artificial culture would be drawn. That such a conclusion would be erroneous is shown by the statistics given by the overseers of the district and found in the returns furnished the Department of Fisheries by the Inspector of Fisheries for Nova Scotia. By referring to the report of 1881 it will be found that from the four stations included within this bay a return of 6,150 lbs. is given as the catch of salmon for that season. From these same stations the return for 1887 shows a catch of 21,425 pounds, an increase of 15,275 pounds, or over 250 per cent. larger than that of 1881. The intervening years show considerable fluctuations in the catches, due, no doubt, to adverse winds and unfavorable circumstances, yet the increase has been continuous. The catch of 1882 in this bay is given as 18,000 lbs., being an increase of nearly 12,000 lbs. over that of 1881, and appears to furnish a most striking evidence of the good results from artificial stocking. 1882 was the first year when any increase from this work could be expected from the first hatching of 1876 and 1877, as up to this date these fish would not be caught in nets of six inch mesh, as are used on our coast, and the returns show a most prompt and generous response to the efforts put forth by your Department in the work of fish breeding.

"By referring to the returns for the county of Halifax obtained from the same sources as the above, a marked increase is shown in the catch of 1887 over that of 1881, being for 1887 79,835 lbs. as against 28,376 lbs. in 1881, an increase of 51,459, or, in other words, 5,150 salmon of about 10 pounds weight each, which is about the average weight of the salmon caught on the southern coast of this Province. This increase would represent in value for this county $10,000. It may be of interest to your Department to learn at about what cost this result has been obtained, and I may be excused for endeavoring to show how far this speculation, if it may be so termed, is paying.

"In order to do this work justice it must be remembered that against the increase in value, as shown above, only the expenditure at this hatchery from the years 1876 to 1881, inclusive, should be charged. In 1876 the first hatching was distributed. These fish would become marketable in six years, in 1882. Those hatched in 1877, in 1883, and so on, so that the return from the hatching of 1881 was due last year, and this is the best official statement we have regarding the condition of our salmon fisheries. By referring to the expenditure for the years 1876 to 1881 it will be seen that about $2,500 per year is the average annual cost of this work, with an output averaging 1,500,000 fry per year. During these years there were planted in the rivers of this county about 200,000 fry for each year, or a total in the six years of 1,200,000 which, as per above calculation, cost $2,000. There has then been an outlay of $2,000 for which we have received a return of $10,000, or $5 for each $1 expended.

"In this calculation, I am assuming that the whole of this increase is due to artificial culture. This assumption may be open to objection, and for my purpose I am willing to claim but one-half of this increase; still we have a return of $2 50 for each $1 invested; this would be equal to about 20 per cent. compound interest for the six years and should satisfy the most avaricious speculator.

"I feel that we would be justified in claiming the greater part of this increase as the result of fish breeding, which was the only special and determined effort made between the year 1876 and 1881 to increase or maintain the fisheries of the county. As far as I am aware, no mill dams were torn down; no obstructions of any consequence removed; the throwing of sawdust into the rivers was not prevented, and I think I am correct in saying no fish-ladders were built; in fact, during that period the conditions existed, which, if the opinion of almost every writer on salmon fisheries can be considered authority, were most unfavourable to the natural reproduction of salmon, and which had caused the gradual decline in that fishery in the past.

"While on this subject I will take the liberty of drawing your attention to the returns from another portion of this province, viz., that from the counties bordering on the Straits of Canso and Northumberland. It very probably is the fact that all the salmon frequenting that coast enter through the Straits of Canso, and in their passage along the shore in search of their native streams are liable to capture by the nets met with. The several rivers discharging their waters into these straits are certainly tributary to the salmon fishery of this coast, and any effort made on any one or more of these rivers would in its results be observable on this particular fishery. These rivers, unaided by any special effort and without receiving any assistance from artificial culture, appear to have been unable to sustain the drain upon them, and the statistics show that from these sources the fishery was not being maintained, but that, in sympathy with the whole coast a gradual decline was taking place. This decline had been continuous, with some slight fluctuations from 1870 to 1881 when it had reached its lowest stage, and had no assistance been rendered we have every reason to believe a still further decline would have taken place. Just at this stage the first effects of a well directed effort to assist and maintain this fishery were in the course of nature due, i.e., the first return from the young fry planted in east, west and middle rivers of Pictou County, and in River Philip, and Wallace River in Cumberland County, in the spring of 1876, and the next official return that of 1882, shows a marked increase in the aggragate catch of the four counties, being about 50,000 lbs greater than that of 1881, and amounting to an increase in 1887 over 1882, of over 79,000 lbs. or 53 per cent. in five years. The money value of this increase, allowing the market price to be 20 cents per pound (and I have Inspector Roger's authority for this price), would be $15,800. The number of young salmon artificially bred and placed in the above-named rivers during the period from 1876 to 1881, was in the agregate about 1,500,000. This was effected at a cost of about $2,500; consequently we have an expenditure by your Department of the above amount on a project introduced for the special purpose of increasing our salmon fisheries and from which there has been received from the above counties a return of $15,800, or over $6 for each $1 expended; by allowing the reduction of 50 per cent. as I did in the calculations for Halifax County, we have still $3 for the $1 invested, a return more satisfactory than that from the last named county.

"In attempting to trace this increase back to some cause or origin, we find that very few, if any of the conditions unfavourable to the natural reproduction of salmon, and which the continuous decline in the catch clearly indicates to have existed on these rivers previous to 1881, had been ameliorated.

"Poaching in these rivers was practiced largely, notwithstanding the efforts of the fishery overseers and wardens to put a stop to it. In River Philip it was wholesale slaughter of all fish not secured for artificial breeding purposes, and no attempt was made to prevent the depositing of sawdust and mill rubbish in the streams. In addition to all these injurious agencies an unusual drain upon the resources of River Philip and West River was made for the purposes of this hatchery which amounted to an average of 1,000,000 ova per year. To this extent there was the natural production, upon which the salmon fishery of the straits depended curtailed.

"Notwithstanding all these detrimental influences the catch on this coast has increased 53 per cent. in five years. I have endeavored to show a cause for this and think fish culture is justly entitled to the credit of the effects. It must be noted that

the returns from which I have obtained these facts show only the catch taken during the lawful fishing season and to this must be added the large increase in the late fall run of fish entering our rivers and which can safely be put at 50 per cent.

"Inspector Rogers, in his report for 1887, shows this increase in the Wallace River to be from 800 to 1,000 salmon, and we can fairly infer that the increase in the other rivers has been correspondingly great."

"In examining the effects of this work upon the salmon fisheries of the whole Province of Nova Scotia it will be found that results equally favorable with those in the localities I have referred to have been obtained. By referring to the statistics furnished your Department it will be seen that the average catch per year for the five years from 1875 to 1879, was about 12½ per cent. less than the average for the preceding five years from 1870 to 1874 inclusive. The catch during those periods fluctuated to a considerable extent, but the tendency was downward over the whole period and continued in this direction until 1881 when the returns show a falling off as compared with 1870 of 515,000 pounds, or a decrease of 65 per cent. Considering the condition of this fishery in 1881 and noting its annual decline previous to this date, the conclusion would be reasonably come to, that the total exhaustion of this wealth was at that period but a question of time and that this fishery would have soon been a thing of the past. Fortunately, however, the results of artificial breeding instituted in 1876 were at hand, and in 1882 a most marked increase was obtained, being 300,000 pounds, and the continual increase from that date shows this not to have been the result of accident or the existence of more favorable natural conditions, but that of some well advised and determined effort towards the attainment of the desired object.

"As stated above, this increase amounted to in 1887 over 500,000 pounds, representing a money value of $100,000, towards the production of which your Department expended on fish breeding from 1876 to 1881, a sum not exceeding $16,000, or a return of over $6 for each $1 expended, allowing a reduction of 50 per cent. as before, we still have $3 for the investment of $1.

"In all the above calculations which have been made in reference to the condition of the salmon fisheries as compared with that of 1881, it will be noticed that credit only has been taken for the increase shown to have taken place in 1887 over 1881, and its money value pointed out. Now as the increase commenced in 1882 and continued with some fluctations up to 1887, the increase of each year over the preceding one, should be taken into account and added to the profits derived from fish culture. Taking the average of years 1880 and 1881 when, as has been shown, this fishery had been reduced 60 per cent. from the catch of 1870, it would be only fair to claim that this was about the yearly value of the fishery then, and again assuming that this average would have been maintained up to 1887, the total catch for the six years from 1882 to 1887, inclusive, would have been 2,000,000 pounds, while our returns show it to have actually been over 4,000,000 pounds, or an aggregate increase of 2,000,000 pounds, representing an enhanced money value of $400,000. Giving fish breeding credit for 50 per cent. of this increase, we have a gross return of $200,000 for the expenditure of $16,000."

"Reviewing the facts which have here been given, the conviction must prevail that some cause, other than nature's, has been instrumental in bringing about this very promising condition of the salmon fisheries in Nova Scotia.

THE NATURAL REPRODUCTION OF SALMON LESSENED FROM VARIOUS CAUSES.

As to the present condition of the rivers in this Province it will be borne out by all who are thoroughly acquainted with them, and have had opportunities for comparing their present with their past condition by saying that they do not offer any better facilities for the natural reproduction of salmon at this date than were found in 1870; the same gradual changes in the physical condition of the country are and have been taking place. Dams and other obstructions to the entrance of the breeding fish to the rivers are rather increasing than otherwise; poaching and slaughtering

of the mother fish while on the spawning grounds is still carried on to a large extent, and the nursing and feeding capacities of the rivers are being seriously injured by the wholesale deposition of sawdust in them. To these objectionable features must be added the more vigorous efforts put forth by the fishermen to capture these fish while on the coast; nets are becoming more numerously set, and of a form and description much more destructive than formerly used. The ready cash market found for the sale of these fish offers inducements for larger numbers to engage in this fishery, and as the catch continues to increase and become more remunerative, still greater efforts will be put forth to gather in these treasures from the sea. To maintain this fishery in its present condition and to continue the satisfactory increase of the past few years, more hatcheries will be necessary and the number of young salmon distributed should be at least 2,000,000 per year. The results would soon become apparent and the return would bear even more favorable proportion to the outlay than has been shown to exist at the present time. The nursing and feeding capacities of our rivers, while no doubt seriously impaired by the many detrimental influences brought to bear upon them, are still capable of furnishing food for many more young salmon than are hatched in them under the natural process. It perhaps will be unnecessary to attempt to show why the natural reproductive powers of our salmon are less now than formerly as it will be readily admitted by all intelligent minds that sawdust, mill-dams, mill rubbish and other obstructions, and the pollution of the spawning and feeding grounds in the rivers have been largely instrumental in bringing this about. The settlement of the country and the clearing away the timber and forests has had a tendency towards reducing the quantity, as well as increasing the temperature of the waters in most rivers; this again has produced a change in the migratory habits of the salmon, causing them to remain in the cool salt waters of the bays and harbors until late in the season, and only enter the streams when compelled to do so by the exigencies of nature. Having entered the river, being then heavy and sluggish, they in many cases are unable to surmount the obstructions met with and are prevented from reaching the upper portions of the streams where only are the proper spawning grounds found, consequently the greater portion of the ova is deposited in unnatural, and unsuitable beds, and is ultimately destroyed either by freshets or eaten up by eels, and other predaceous fish. The small number of young salmon that may hatch cannot reach the heads of the rivers where food abounds, owing to the obstructions referred to, and the result is almost total loss of the whole production. Now, by artificial process, the mother fish are caught in the estuaries and spawned and liberated again uninjured, the ova gathered from them are kept in safety in the hatcheries until hatched, and young fry when distributed are placed in the extreme upper parts of the rivers from whence, during the time of their growth to smolts, they work their way down to the sea, partaking of the food found throughout the whole length of the streams, and the intervening lakes. It may be truly said that the ova deposited by one mother fish at the head waters of a river, will have more effect in maintaining the stock belonging to that stream, than the product of ten or more salmon, whose ova are deposited at or near the mouth of the river. If the system of fish breeding was applied only to the enabling of the mother fish to reach the natural and proper spawning grounds at the head of the rivers, a wonderful effect would be produced. But how much more effective, and beneficial must this artificial process be, when the many safe-guards with it surrounds the embryos from the time the mother fish are taken until the young have attained the fry stage. The simple fact that well provided hatchery rooms remove the production of the mother fish from the destructive provisions of nature, which to be understood must be considered in all its bearings upon the young, from the period when first deposited by the parent fish, through all the different stages, until it becomes a fully developed fry and capable of taking care of itself, is probably the whole secret in the success which attends the industry of fish culture, which has been so zealously worked out in this country.

Before the settlement of the country, and while it was yet in a state of nature, each river contained a given supply of the different kinds of fish. That these preyed

upon one another was, no doubt, a provision of nature. The various kinds were given powers of reproduction and by the devouring of the young of one by the matured of another kind a natural equilibrium was maintained, and so this would have continued as long as a state of nature continued. But a change took place ; as the country became settled and civilization advanced, then the equilibrium was disturbed to the injury of the better kinds.

In illustration of this, take the case of the salmon and trout *vs.* eel and perch ; the early settler preferred a salmon or trout to an eel or perch, as an article of diet, consequently greater efforts were put forth to catch the former than the latter; as the population increased the demand for the better fish grew far faster than that for the inferior article and an unnatural drain was made upon the supplies of salmon and trout. The obstructing of the rivers by mill dams and other introductions of man rendered the reproductive powers of these fish less vigorous, while it did not so affect the eels and perch. In this way, while the better fish had decreased in numbers, the poorer have increased, so that at this time the destruction of the young of the salmon families by eels and perch is far in excess of the destruction of eels and other fish in the same water. It is a well known fact that eels and perch are becoming more numerous in our lakes and rivers than formerly, and, as they are not much sought after, they must continue to increase and ultimately all other fish will be destroyed by them ; this is the history of the lakes in the older settled portions of the neighboring states, and must be repeated here unless some determined effort is made to restore our salmon and trout to their past strength. We have, then, at this time, the following conditions as regards salmon and trout and eels and perch. The reproductive powers of the salmon and trout are seriously impaired by the demands for these fish for food, while the reproductive powers of eels and perch, which are immensely greater, are increased by their having almost absolute possession of our lakes and rivers ; the destructive powers of the young salmon (if it can be applied at all against eels or perch) is lessened in proportion to their reduced numbers, while the destructive powers of the eels and perch are becoming greater as their numbers increase. This, then, may be fairly stated as an unnatural condition of things as regards the salmon family and calls for extensive and vigorous action on the part of the Government, if it be the desire to maintain even the present supply of these valuable fish.

Sufficient evidence has already been afforded by the returns which have been quoted to prove the powerful influence which artificial fish breeding, even on the small scale now in operation in Nova Scotia, has brought to bear upon the salmon fisheries and should warrant the extension of those operations to the fullest degree.

In endeavoring to show to the Department of Fisheries the good effects of artificial culture upon the fisheries, I am responding to a demand upon the part of the public for some evidence of a pecuniary return for the expenditure incurred upon this work in the past, and I hope my feeble efforts to comply with their requests will convince them that satisfactory returns have already been received, and induce further studying of the statistics on their part before condemning a scheme which so far has hardly gone beyond an experiment.

EVIDENCE OF THE BENEFIT FORM MAGOG HATCHERY, QUEBEC.

" Regarding the quantity of fish in Lake Memphremagog and the effect which the hatchery at Magog has had upon their increase, the undersigned beg leave to say that we are old residents and have fished more or less of our time for many years in the waters of said lake. Previous to the erection of fish breeding establishments, there were no whitefish or bass in Lake Memphremagog. They are now found in large numbers and are rapidly increasing. There have always been lunge or salmon trout in this lake, consequently the evidence of increase is not so marked. We know that there are more salmon trout than formerly, and believe that the increase is due to artificial propagation and protection. We are also of the opinion that a greater appropriation should be made to pay for more guardians during the

close season, thereby rendering the protection more efficient, and resulting in showing a rapid increase of fish in this lake.

"The introduction of Georgian Bay salmon-trout has not effected the character of the so-called lunge, as they are both one and the same fish. Minnows and small fish which were plentiful for bait until the Magog hatchery commenced operations have almost disappeared, having, undoubtedly, become food for the salmon trout and bass which now exist here in great numbers.

N. A. Beach, Fishery Overseer at Georgeville.
W. T. Talbot.
L. F. Walsh.
H. M. Quinby.
A. Hand.
E. J. Tuck.
R. B. Heriot.
C. S. Copp, P.M.
M. P. Browley.
R. L. Ayer.
Wm. McGowan, jun., Customs Officer.
H. N. Bigalow.
J. E. Davidson.
B. A. Bullock.
George Diamond.
Charles Achilles.
W. M. Pease, M.D.
John Taylor.
C. H. McGowan.
Joseph Hewes.
M. C. Achilles.
C. O. Busbank.
A. G. Bolloff.
Stephen Potvin.
Daniel E. Peters, Light House Keeper.
E. A. Donegan.
William Jamieson.

Magog, 1888.

BENEFITS FROM FRASER RIVER HATCHERY, B. C.

"Thomas Mowat, Esq.,
"Inspector of Fisheries, B. C.

"Quamichan, B. C., 15th December, 1888.

"Dear Sir,—I have much pleasure in informing you that quite a number of saw-quais have been seen in the Cowichan this season. The Indians reported having killed several dozen, and the licensed seine men said they met with several dozens in their nets.

"The fish the Indians caught they brought to me as a curiosity, as they had never seen the saw-quai in the river before. What I saw would be between four and six pounds weight.

"I do not know what saw-quai ought to average, but I am satisfied these are some of the returns from the first fry put in this river.

"I have the honor to be, Sir,
"Your obedient servant,
"W. H. Lomas,
"*Fishery Guardian.*

On making enquiry of Guardian York of the Nanaimo River, I received the following letter:—

"Thomas Mowat, Esq.,
"Inspector of Fisheries, B. C.

"Nanaimo, B. C., 17th December, 1888.

"Sir,—Your letter of the 11th instant received and contents noted. I beg to state that I have made enquiry relative to the fry put in this river.

"The Indians say they have taken a number of saw-quoi salmon half grown, but are afraid to admit such, thinking they have done wrong by catching them. Several of the Indians saw the saw-quais this season and are satisfied they are the result of what you planted. They state there will be plenty next year.

"I am, Sir,
"Your obedient servant,
Chas. York,
"*Fishery Guardian.*

Mr. Mowat also adds: I take the following from the *Weekly Astorian* of Oregon, dated July the 28th, simply to show the success of fish culture on this coast, where hatcheries have been in operation a sufficient length of time to prove results. The Rogue River is small, its average pack being about 8,000 cases per season. It is, therefore, natural to suppose that the output of fry would be more noticeable there than in the Fraser River which yields from 90,000 to 150,000 cases per year.

" State Fish Commissioner E. P. Thompson has returned from a three weeks' trip along the Rogue, Coquille, Umpqua and Sinslow Rivers and Coose Bay. He tells the *Oregonian* that all the canners on those waters are making preparations to operate their canneries to full capacity in anticipation of a good run. The cannery men and fishermen operating on all the rivers except Rogue want hatcheries.

" Rogue River has a hatchery which has been operated off and on since 1877, and this artificial propagation is accountable for the three-fold increase in the run. Rogue River is the only stream on the Pacific coast which has been fished continuously for a number of years and can show an increased run. I think we will be able to furnish each of the streams with 500,000 eggs annually, which will be taken from the Sacramento River. It will require ten days to ship the eggs from Sacramento to either of the rivers, and upon arrival there the fishermen and cannery men will take care of them, and turn the young fish in the river when the hatching is complete. Sacramento salmon rank next to Columbia River salmon and are superior to the fall fish of Coose Bay, or Rogue, Coquille, Umpqua and Sinslow Rivers. All want hatcheries, but if we can supply them with eggs right along hatcheries will not be necessary. It would cost about $2,500 per year to operate a small hatchery on each stream."—*Weekly Astorian*, 22nd December, 1888.

E. P. Thompson, one of the Fish Commissioners, of Oregon, speaking of the prospective scarcity of salmon says: " Such cannot be the case so long as the present success in hatching them continues. The Clackamas will within a few months turn out 6,000,000 young salmon. At R. D. Hume's hatchery, at Ellensburg, on the Rogue River, there are about 400 salmon in the basin. These will yield enough eggs to hatch out at least 1,500,000 young salmon. The eggs are placed in the hatching troughs, at the rate of from 80,000 to 100,000 per day. This hatchery is owned by Mr. Hume, but the State appropriates $2,000 to help him in his good work."

In the report of the Oregon Fish Commission, for 1888 the following statement is made:—

" We will give a short history of the fishing industry on Rogue River to show what artificial propagation will do towards keeping up and even increasing the supply of fish in a stream."

" In the summer of 1876, Mr. R. D. Hume, prospected this river to some extent for salmon, and in the spring of 1887 located here and built a cannery at Ellensburg, about one mile above the mouth of the river. He packed during the spring run of that year 3,500 cases and at this time the supply of fish was abundant in all our streams.

" During the summer he erected a small hatchery in connection with the cannery and secured about 100,000 salmon eggs; but, being an amateur in the business, did not have the best of success in hatching them. However, he succeeded in turning out about 50,000 young salmon. He has continued with one or two exceptions, to operate the hatchery each year, putting out annually from 50,000 to 150,000 young fish and has a fair prospect of putting out 1,500,000 this year. In consequence his pack has increased from year to year, and for the year 1888 his spring pack amounted to nearly 12,000 cases. You will plainly see that the increase has been quite large on this stream during the past ten years, while on all the other streams of the coast the salmon have decreased largely in numbers during the same period."

" At the last session of the Legislature the appropriation of $2,000 was made for the enlargement and support of the Rogue River hatchery. The money was spent economically and well under the supervision of Mr. Hume, in constructing another pond, in connection with the one already there. This was done by digging and blasting out a cavity 40 by 60 feet and 9 feet deep. After the earth and rock were

removed the sides and bottom were lined with a solid wall and floor of concrete twelve inches thick; the pond was then covered with a substantial wooden building. This work cost $1,000 more than the sum appropriated."

EVIDENCES OF THE INCREASE OF FISH BY MEANS OF THE SANDWICH HATCHERY, ONT.

The following letters from practical fishermen throughout the country, have been given to Mr. Parker as strong evidence of the fact that the great increase of the whitefish now taken, is mainly due to the operations at the Sandwich Hatchery:—

Remi Laframboise, River Canard, a fisherman of twenty-one years' experience, in a letter says:—"During my first years, fish were plentiful but were declining rapidly until the establishment of your hatchery. It is generally admitted by fishermen of experience that the hatchery has greatly contributed to our success, as for instance, Lake St. Clair was considered heretofore a poor place, but this year was fair."

Capt. Joseph Allen, Petite Côte, says:—"I have been on this (Detroit) River fishing for the last fifteen years, and as far as I am concerned, can say that if it wasn't for the fish hatchery we would be obliged to stop all fishing here, but after the good catch this season, I give your hatchery credit for the increase. Take Lake St. Clair, where we never catch but a few whitefish, the catch was extra good, as was also Detroit River this season."

C. W. Gauthier, writing from Detroit, Mich., says:—"I take pleasure in informing you that my catch of whitefish on the Detroit River this season, will amount to one hundred per cent. more than last year and that from information I have obtained from the largest fish dealers in Toledo and Sandusky, on the south side of Lake Erie, the catch of whitefish is quite one third larger than last year. This is without doubt a gain caused by the young fish hatched at your fish breeding establishment at Sandwich, and I would like to see it enlarged, as the result would be an increased benefit to the fishermen on Lake Erie and Detroit River."

Mr. Payne, Port Stanley, says:—"When I commenced fishing here some nine years ago it was very seldom we caught any yellow pickerel (a very valuable fish) and when we did get any they were generally very large, in fact many of them too large for marketable fish. Now they get the same kind of fish right along and of a smaller size and a far better marketable fish and I can account for it in no other way than the planting of the fish here. The same may be said of whitefish, they are now smaller fish but more plentiful. I also can say that the fish are more numerous."

E. B. Paxton, writing from Fighting Island, says:—"I have been in the fish trade for some years; have noticed the sudden decrease of fish from 1874 to 1884. Since 1884 they have steadily increased year by year, so that now we on Detroit River and Lake Erie are catching fairly."

Jos. Boismier, fishery overseer, says:—"I take pleasure in noticing the large increase in whitefish this year. The increase is about from thirty to thirty-five per cent. larger than last year. By the report of the fishermen they are convinced that the hatchery is the cause of the great increase. Also, the catch of pickerel is greatly increased all owing to the hatchery. I think it would be a great benefit to the Government to enlarge the hatchery."

WHITEFISH INDUSTRY.

In connection with the very satisfactory evidences which have just been related regarding the increased catches of whitefish in the Detroit River and Lake Erie, resulting from the operations of fish breeding at the Sandwich Hatchery here I also add the views expressed by portions of the press and inhabitants of the adjoining States of the Union, on the wonderful increase of whitefish taken by American fishermen, which is attributed to the output of young whitefish from the fish-breeding

establishments. Whilst their accounts are most gratifying, it must, nevertheless, be borne in mind that a very great proportion of this increase must be credited to the work carried on at the Sandwich Hatchery, on the Canadian side of the Detroit River, as the Sandwich whitefish nursery was the first of the kind established in America, and was actively engaged in putting out whitefish fry by the million in the Detroit River and Lake Erie, some time prior to the erection of any whitefish hatchery in the United States; and it would appear from the published reports of the United States Fish Commission that, up to the year 1883, the one Canadian establishment at Sandwich had actually planted in the Detroit River and Lake Erie, upwards of *sixteen millions and a-half more fry* more than were put out of the United States and Ohio and Michigan States Fish Commission nurseries all combined; and that in addition there have been put out from this Canadian hatchery into the above named waters annually, since 1883, whitefish fry numbering in the gross upwards of 220,000,000. It is, therefore, only fair to conclude that a large share of the increase in the catch of whitefish in the Detroit River and Lake Erie, must be credited to the large output of young whitefish bred in the Sandwich nursery.

RESULTS OF HATCHING WHITEFISH.

(*From "Forest and Stream."*)

"Whitefish were reported to be so plentiful in Lake Erie last year that the fishermen scarcely knew what to do with them. Seven hundred and fifty tons (1,500,000 pounds) were frozen for shipments by a single firm in Huron, Ohio. Sandusky is fast becoming one of the great fresh fish markets of the world. Mr. E. D. Carter, one of the most prominent of fish dealers in Erie, attributes the present prosperity of the whitefish industry to *artificial propagation.* Some seasons ago fishing for whitefish had become so improfitable that he, with others, concluded to abandon it entirely. In 1886 a slight improvement was noticed, but now the catch is double what it was in 1886. This result, Mr. Carter states, is *due to the work of the hatcheries*, for the fish are almost without exception young, weighing about two pounds. The increased catch, and the unmistakable character of the fish is admitted also by many fishermen of experience. And the establishments at Erie, as well as others in Michigan and Ohio now receive the credit which fairly belongs to them. The prices of fish now are about two-thirds of what they were in 1885. The catch of whitefish at Erie in 1888 was 2,200,000 pounds, an increase of a third over that of 1887."

IMMENSE CATCH LAST SEASON, THE RESULT OF ARTIFICAL PROPAGATION.

DETROIT, 17th October, 1888.—Mr. George D. Mussey, Secretary of the Michigan Fish Commission, has just returned from a trip along the American shores of Lake Erie. The trip was ordered by the Commission for the purpose of finding out the size of the catch of whitefish in the lakes. Mr. Mussey says: "The dealers told me it was the largest catch they had taken for fifteen years. The catch is due, according to them, almost entirely to *State propagation*, and planting of the fish. The catch from Lake Erie is the largest taken from any lake in the United States, and we say it is so, because there are more fish planted there. Pennsylvania plants there from her hatchery at Erie, Ohio from Sandusky, the United States from Northville hatchery, and Michigan from the Detroit hatchery. To show the value of propagation by the hatcheries, a gentleman of Erie gave me a few figures: The fishing industry is valued at $400,000 a year in that part, and one-fourth of that is whitefish. About $15,000 is expended on whitefish by the Fish Commission of Pennsylvania, for the whole State (three hatcheries), and they say the whole industry is due to artificial propagation, or at an expenditure of $7,000, they erect a business of *one hundred thousand dollars a year.*"

FROM PENNSYLVANIA STATE COMMISSION ADDRESS TO THE HOUSE OF REPRESENTATIVES.

"It is the intention of the Commission to continue the stocking of the rivers yearly with shad and game fish; but, to do this, fish protection must go hand in hand with fish propagation, and for this we must have suitable laws.

"The method of fish production is no longer an experiment, but a well established fact. The efforts of the Commission in restocking Lake Erie with whitefish have resulted in the largest catch known there in twenty years, and the price of whitefish has been reduced 30 per cent. The same result will be seen in the Delaware with good legislation and proper protection. The Pennsylvania Fish Commission has been greatly encouraged by the growth of public sentiment in its favor. It is an indication that the public recognizes the wisdom existing to protect the propagation of good fishes, which not only aid the community now, but will also secure an endless source of benefit in the future."

OPINIONS OF AUTHORITIES ON FISH CULTURE IN THE UNITED STATES

The following extracts are taken from addresses delivered by Prof. G. Browne Goode, M.A., of the United States Fish Commission:—

"In 1871 the United States Fish Commission was established. Arrangements were at once made for a thorough scientific investigation of the fisheries, and a little later the work of artificial propagation was begun. The operations of this Commission have increased from year to year, and much has been done in extending the range of important food-fish, and in restocking depleted waters.

"Up to 1878 the work of the Commission was confined wholly to fresh water and anadromous species. In this year, however, a station was established for the propagation of marine fishes, and cod, herring and haddock were successfully hatched.

"Besides the improvement of apparatus, radical changes have been made in the methods of fish culture. The most important of these is the building of movable floating hatcheries in the form of barges and steamers by the United States Fish Commission. By means of these, different spawning grounds may be visited during the same season, and the result of the work enormously increased with a comparatively small increase in its cost. The application of steam for pumping the water and for working the apparatus is also of great value. Equally important with these is the improvement in the method of transportation. Formerly the young fish were carried in small quantities in the baggage cars of the passenger trains, but refrigerator cars built expressly for this purpose are now almost exclusively used. Trained experts are placed in charge of these cars, and immense numbers of fish are now distributed with small loss, and at a great reduction in cost as compared with the old method.

"The salmon fishery of the Pacific is an industry peculiar in its methods and extent. The quinnat or king salmon, as often called the California salmon, is the principal object of capture, though other related species are also taken. Though the capture is enormous, it has been demonstrated that the supply can be easily kept up by a small outlay in artificial culture.

"The principal activity of the Fish Commission has been directed to the wholesale replenishment of our depleted waters. The success of fish culture is well recognized in the United States.

"In connection with the work of fish culture, much attention has been paid to embryology. The breeding times and habits of nearly all the fishes have been studied, and their relations to water temperature. The embryological history of a number of species, such as the cod, shad, alewive, salmon, smelt, Spanish mackerel, striped bass, white perch, the silver gars, the clam and the oyster have been obtained under the auspices of the Commission.

"The preservation of the oyster beds is a matter of vital importance to the United States, for oyster fishing unsupported by oyster culture, will, within a short period of time destroy the employment of tens of thousands, and the cheap and favorite food of tens of millions of our people."

"Fishes in ponds, lakes, or streams, are quickly exterminated unless the young fish are protected and the spawning season is undisturbed, and wholesale methods of capture are prohibited.

"A river may quickly be emptied of its anadromous fishes, salmon, shad, and alewives, by over fishing in the spawning season, as well as by dams which cut off the fish from spawning grounds. Examples of this may be found in dozens of American rivers.

"In the same way sea fish approaching the coasts to spawn upon the shoals, or in the bays, may be embarrassed, and the numbers of each school decimated, particularly if, as in the case of the herring, the eggs are adhesive and heavy.

"Sea fishes spawning in the estuaries are affected by wholesale capture with stake nets, much in the same manner, though in a less degree, than salmon in the rivers.

"Almost any piece of water, be it a bay, or a sound, or be it the covering of a ledge or shoal at sea, may be over.fished to such a degree that fishing becomes unprofitable, especially if fishing be carried on in the spawning season."

"The proper function of public fish culture is the stocking of the public waters with fish in which no individual can claim the right of property. This is being done in our rivers with salmon, shad, and alewives, and in our lakes with whitefish.

"Public fish culture is only useful when conducted upon a gigantic scale, its statistical tables must be footed up in tens of millions. To count young fish by the thousand is the task of the private propagator.

"The use of steamships and steam machinery, the construction of refrigerating cars for the transportation of fish and fish eggs, and the maintenance of permanent hatchery stations in the different parts of the continent, are forms of activity only attainable by Government aid. It has been demonstrated beyond possibility of challenge that our great fisheries, producing millions of pounds of alewives, shad, salmon, besides bass, sturgeon and smelt, and worth, at first hand, millions upon millions of dollars, are entirely under the control of the fish culturist to sustain or destroy, and capable of immense extension.

"The same is true of (*coregonus*) whitefish fisheries of the great lakes, and there is every reason to believe, from experiments in part completed, that the dominion of fish culture may be extended in like manner for certain of the great sea productions, such as cod, haddock, herring, mackerel and Spanish mackerel fisheries. The immense influence upon the sea fisheries of the maintenance of the abundance of anadromous fish in the rivers has already been indicated.

"The hatchery on the McLeod River, in California, was established in 1872. Large quantities of the eggs of the California salmon are collected there annually About 15,000,000 have been hatched at this station, and the young fish placed in the McLeod, and other tributaries of the Sacramento River. So great have been the benefits of this restocking of the Sacramento that the statistics of the annual salmon catch of the river has increased 5,000,000 pounds during the last few years.

"The propagation work has increased from year to year, as may be seen by the constant increase in the amount of the annual appropriations. A review of the results of the labors of the Commission in increasing the food supply of the country may be found in the annual reports. The rude appliances of fish culture in use years ago have given way to scientifically devised apparatus, by which millions of eggs are hatched where thousands were, and the demonstration of the possibility of stocking rivers and lakes to any desired extent has been greatly strengthened. This work is now carried on with machinery for propagation on a gigantic scale by the aid of steam.

"The work of the Commission in fish culture has been that of stimulation and co-operation. The efforts of individuals have been encouraged in every way; indeed there is hardly a fish culturist in the United States who is not, or has not been attached to its staff."

At one of the fishery conferences held in England, Prof. Browne Goode then spoke with reference to fish culture in America:

"He desired to say a few words which were, perhaps, invited by the closing sentences of the address concerning what America had been doing in the way of salmon culture. He was led to do that by the fact that certain documents had been

distributed from Canada, which had a tendency to depreciate what had been done in fish culture, not only in Europe, but in the United States. It has been said that fish culture was only an experiment, and had not been attended with commercial success; he, however, wished to say that it was in no sense an experiment, but that in the United States and in Canada it had been a decided success, and was so recognized by everyone. It was not likely that the American Congress or Canadian Government would, for a period of twelve years, keep on making annual appropriations for fish culture if they were not satisfied that it was not only a success from a scientific standpoint, but a success from a commercial point of view. In the United States the general government had appropriated up to 1883 more than a $1,000,000, and the individual states a sum almost as great. Up to 1798 large numbers of salmon were caught in the Connecticut River, but until 1870 the fish disappeared entirely from the river; and until 1875 no salmon whatever were seen in the river. In 1875, however, the salmon began to appear and this was the direct result of the planting of a large number of young fry in that river some years previously. Then again, in the case of the Sacramento River in California, where about two million young fish were planted yearly, the catch had increased in five years from five million pounds to fifteen million pounds, and in 1881 there were more fish than could be utilized by all the canning establishments on the river. He would not proceed with the multiplication of examples, but would refer to the fact that the fish in the Detroit River, where the United States and Canada had estabtished hatcheries, had been increased, and the supply immensely improved * * * * * Shad, which four or five years before were selling for $1.00 a pair, and beyond the reach of the poor people, became so cheap and common that they could be bought for 25 cents a pair, which was entirely the result of fish culture.

"Prof. Baird was not an enthusiast, but a man possessing the widest general knowledge of natural laws, whose sound judgment and experience had enabled him to take up the work of fish culture, and carry it on, on an immense scale in the United States. People were sometimes dissatisfied because fish were sometimes planted in streams, and nothing was heard of them afterwards; but it was the theory of the Commission and of the Government that it was a proper thing to make experiments, and if they happened to be unsuccessful there was so much ground eliminated over which it was unnecessary to go again. He thought the experiments which had been successful, ought to be allowed to balance those which had not. Experiments in fish culture in Europe, especially in Holland and Germany, had yielded exceedingly promising results * * * * *

"It seemed to him that the Canadian Department of Marine and Fisheries was one of the most valuable organizations in the world, and that their system of gathering statistics was one which other countries ought to study with a great deal of care. In the United States they had nothing of the kind * * * * Another matter which he looked upon with admiration was the great progress Canada had made in fish culture during the past number of years, and more especially under the direction of Mr. Wilmot, who was one of the pioneers of fish culture in America."

CONCLUSION.

In concluding this report upon fish cultural operations as carried on during the past year under the authority of your Department of Fisheries, in the Government of Canada, it is gratifying for me as your superintendent of the work, to state that the several hatchery establishments with their apparatus, and general appliances are in a good working condition; that the out-put of young fish from them during the past season has been very large, and their distribution in the many waters of the country has been performed with safety and satisfaction; and that the present crop of eggs now undergoing incubation in the several hatcheries present a healthy and vigorous appearance. This state of affairs, together with the numerous evidences of success which have been voluntarily given by many parties engaged in the fishing

industry of the country, whose certificates will be found inserted in this report—all indicate that fish culture as pursued in Canada is active, progressive and successful up to the limit which it has reached. Yet I am fully convinced the enterprise has not yet become sufficiently expanded, nor is it placed upon such a broad and satisfactory basis, as its importance demands, or it is destined to perform in replenishing the many waters of the country which have become so greatly exhausted by many years of improvidence. I, therefore, fully endorse the sentiments of the leading fish culturists of the United States, and the policy of that country when it is said that: "Public fish culture is most useful when conducted upon a gigantic scale—its statistical tables must be footed up by tens of millions. To count young fish by the thousand is the task of the private propagator; and that the prosperity and wealth of the fisheries of the present day, are entirely under the control of the fish culturist to sustain, or to destroy, and capable of immense extension."

The reports of the several officers in charge of hatcheries will be found appended hereto.

This report is respectfully submitted by

SAMUEL WILMOT,

Superintendent of Fish Culture for the Dominion of Canada.

FISH CULTURE,

1888.

APPENDICES.

REPORTS FROM THE SEVERAL OFFICERS IN CHARGE OF FISH-BREEDING ESTABLISHMENTS IN THE SEVERAL PROVINCES OF CANADA FOR 1888.

1.—FRASER RIVER HATCHERY.

PROVINCE OF BRITISH COLUMBIA.

Report of the Officer in Charge of the Fraser River Hatchery for 1888.

I have the honor to submit my fifth annual report for this hatchery together with a statement of the distribution of fry and collection of ova during 1888

From the quantity of salmon eggs laid in the hatchery during the fall of 1887, the following number of semi-hatched ova and fry of the salmon (Chouicha) and (Nerka) were distributed in the several rivers and lakes of Vancouver's Island and the mainland as follows :—

Saw-quai (Nerka.)

Cowichan River, Nov. 28th, 1887	800,000
Nanaimo River, Dec. 20th do	700,000
Pitt Lake do 26th do	500,000
do March 3rd, 1888	700,000
Sumos River do 17th do	385,000
Stare River, April 4th, 1888	1,170,000
Pitt Lake do 6th do	575,000
Sumas Rapids, April 10th, 1888	400,000
Coquitlam River, April 13th, 1888	125,000
Total	5,370,000

Quinnat (Chouicha.)

Pitt Lake, March 3rd, 1888	79,000
Sumas Rapids, March 17th, 1888	88,000
Stare River, April 4th, 1888	28,000
Pitt Lake, do 6th, do	88,000
Sumas Rapids, April 10th, 1888	80,000
Coquitlan River, April 13th, 1888	74,000
Total	437,000

Grand total distributed 1888.

Saw-quai species (Nerka)	5,370,000
Quinnat do (Chouicha)	437,000
Grand total	5,807,000

The above figures show that the rate of mortality with the eggs during the hatching season of 1888, was large, which is accounted for principally by the necessary employment of inexperienced men, who had to be engaged to manipulate the fish and handle the ova.

By this reason many of the eggs were improperly taken from the fish in a premature state, and were not susceptible to impregnation. The enormous quantity of salmon which it takes to furnish 10,000,000 eggs, cannot be handled properly by only two or three experienced men, as we found out when the eggs began to hatch.

Lack of facility in conveying the ova from the spawning grounds to the hatchery, was another drawback, as the steamer which ran on the route often passed without calling, leaving a shipment of eggs to be conveyed fifty miles by canoes.

As the capacity of the house was over estimated, the large number of eggs crowded the troughs to such an extent, that it was almost impossible to handle them on the trays, and we were unable to get a further supply of hatching baskets during the early part of the season.

But taking all things into consideration with the small staff we had in the hatchery during the early part of the season, the output of fry is fully as large as I expected.

There has been turned out from the hatchery, since it commenced operations, up to the present date, the following number of fry :—

The year 1885	1,800,000
do 1886	2,625,000
do 1887	4,414,000
do 1888	5,807,000
Grand total	14,646,000

As shown by the table in my last year's report, the salmon run on the Fraser River again fluctuated, and there was one of the biennial poor runs, but not worse than any of the former off years, for the canneries on the Fraser averaged 6,381 cases each.

Owing to the unexceptional good run in 1887, they expected the same results again this season, and made preparations accordingly; but were, however, disappointed.

In keeping with my prediction in last year's report, I am strongly of the opinion that the influence of the hatchery has been beneficially felt on the Fraser River. From the careful examination instituted last season in the headquarters of the Thompson, Shuswap, Nicola, Kamloops, Okanagan, Stuarts and many other streams where the saw-quai salmon spawn, it is clearly shown by the officer who made the examination, that very few salmon were seen ; while on the Harrison River and all its tributaries, such as the Morris Creek, Chaholis Creek, Silver Creek, Lillooet River and other branches, I am informed by reliable authority that the saw-quai salmon were so plentiful they could be pulled out of the water in places with a hooked stick, and after the spawning season were found dead along the shores in immense quantities.

As the ova were taken from the fish caught on the Harrison River, and the majority of the fry returned to that stream, many of the cannery men, fishermen and others, agree with me that the influx of salmon there, was due to the artificial stocking from this hatchery. It will be noticed in former reports that saw-quai salmon fry have been turned in the Cowichan and Nanaimo Rivers, in Vancouver's

Island, where they were not known to exist. In making enquiry from the Fishery Guardian in the Cowichan River relative to the fry planted there, I have received the following letters:—

(See General Report under "practical results from fish-breeding." page 20.)

Collection of Ova in 1888.

We have laid in the hatchery this season 4,921,000 eggs, which have been more successful thus far than in any previous season. I am of opinion we will turn out fully 90 per cent. of fry from the number laid in. The men employed last season naturally saw their mistakes, and were much more careful this season, but it is impossible for the men to thoroughly understand the business until they have some length of practical experience. Had the freshets not kept so high all through the spawning season, we would have captured a much larger number of fish and consequently secured a larger number of eggs; but anyone acquainted with the sudden rising and falling of the various mountain streams in the province (especially where our work is carried on) will readily understand the difficulties to be contended with.

We were not troubled with fungoid growth on the eggs this season, as they were all laid in the hatching baskets immediately after arriving from the spawning grounds.

Appended is the caretaker's report of operations on the Harrison spawning ground this season, which explains itself.

In last year's report it was mentioned that shad had been captured along the British Columbia coast at several points on Vancouver's Island, and in the Straits, but had not reached the Fraser. It is now gratifying to state that shad have been caught in the salmon nets in the Fraser River this season, these were no doubt the offspring of those planted by the United States Fish Commission, a few years ago, and they are now seeking more suitable spawning grounds in the Lower Fraser River; which it is believed is a better stream than that selected for the first fry turned in the Sacramento River.

I beg to again renew my suggestion that the Department have planted here a few hundred thousand shad, as the limited quantity which made their appearance last season may take years to stock this river; and during this lapse of time the people of the Province will derive no direct benefit, whereas if a few hundred thousand were planted this coming season, the results would be felt in the course of three or four years.

Whitefish have been asked for by the people of the interior, to stock the large lakes, and it is the opinion, if these fish are once introduced in these waters, the increase would be rapid, and a large trade with the people of the interior would spring up, as the growing towns in Oregon, Washington Territory, and British Columbia would consume large quantities of them.

The only repairs this hatchery will require for another season is a new flume to lead the water from the dam to the retaining tank in the building, the old one has been in use for six years and is becoming unsafe. New nets, and boats, and baskets were supplied last season. The ground was enclosed with a wire fence and the building is in thorough repair.

THOMAS MOWAT,
Officer in charge of Hatchery, Fraser River, B. C.

REPORT OF THE CARETAKER OF THE FRASER RIVER HATCHERY.

I herewith submit the following report of the work done at the Fraser River hatchery for the fall of 1888.

As you are aware I did not get down from the interior where I was employed as fishery guardian until the latter part of September. Upon arriving at the spawn-

ing grounds on the Harrison I found the work well under way, the men had the trap set, and the gates all repaired and put down. I find, by referring to the notes of A. E. Pettindrigh, who had charge in my absence, that the first eggs were taken on the 18th September, and that about 350 saw-quai salmon were in the trap. I also found the water had been very high when the men first went to the Harrison, as the pen had to be covered to prevent the fish from jumping out. Owing to the continuance of high water the whole season, it was difficult to proceed with the work, but the fish were very plentiful. On the 30th of September I started men fishing for spring or quinnat salmon, I did not let them fish sooner as it is difficult to keep the fish alive on account of the fungoid growth that attacks their gills, or wherever the mesh of the net takes the scales off. I found the quinnat salmon very plentiful on the bars; the first night's fishing we caught fifty-three fish in three short drifts which fitted the boxes, and they had to be emptied in the pens the next morning. On the 1st October I took a shipment of 404,000 eggs to the hatchery where I left one man in charge; on my return I found the water falling fast, and fish very plentiful below the trap, but very few going in, as they did not appear to be ready to spawn. On the 11th October the first quinnat ova were taken and I fully expected to lay in a million of these eggs but only managed to get 497,000, as we experienced great difficulty in keeping the fish in pens. I also expected to lay in about six millions of the sawquai ova this fall, but owing to the heavy rains and high water was prevented, as the trap we caught our sawquai salmon in was carried away with the freshet, and we could not replace it again before the fish had all gone up the creek, and once there we could do nothing with them. But I am pleased to state that the eggs that are now in the hatchery are doing better than in any previous year, and if no accident occurs, we will turn out nearly 90 per cent. of the whole number laid in. We have now about two million of young fish hatched out; they are in fine condition and will be ready to turn out in a few weeks.

The number of fish caught for spawning purposes was 4,684, but of this number 3,010 were males which leaves 1,674 females for stripping and a number of these were partly spawned before they were caught. The number of eggs laid in the hatchery this season was 4,921,000 so the fish scarcely averaged 4,000 eggs each this year. This is the reason so many fish have to be handled to get the required number of ova and necessitates so much work.

The first eggs were taken on the 18th September and the last on the 5th of November, making the time a little longer than in previous seasons owing to the continuous high freshets in those creeks.

I also experienced great difficulty in making connection with the river steamer, sometimes it would call for us but oftentimes we had to take the eggs down to Chilliwack in canoes which caused a great deal of inconvenience as it would take two men a whole day to make the trip.

I would recommend that a new flume be put in the hatchery the coming summer as the present one is getting leaky and I doubt if it would be safe for another season if the flow of the water was to stop at this season of the year the loss of fish would be very heavy. The hatchery otherwise is in good condition and will need no other repairs this season. The hatching trough, trays and baskets will require varnishing after the fish are put out as was done in former years.

MAX. M. MOWAT,

Caretaker F. R. Hatchery, B.C.

NEW WESTMINISTER, B.C., 31st December, 1888.

2.—SYDNEY HATCHERY.

PROVINCE OF NOVA SCOTIA.

Report of the Officer in Charge of the Sydney Hatchery for 1888.

I have the honor to submit herewith my annual report upon the work done at this hatchery during the past year.

Distribution of Fry.

As stated in a former report, I laid down in the hatching troughs 1,780,000 ova from which 1,559,000 fry were hatched and distributed in the following streams, viz.:—

Margaree River (Inverness Co.)	150,000
Sydney do (Cape Breton Co.)	250,000
Ball's Creek do	100,000
Trout Brook do	100,000
Black Brook do	50,000
Grand Lake do	50,000
Estrasonia do	50,000
Salmon River do	100,000
Georges River do	50,000
McLean's Brook do	50,000
Benecadia River do	50,000
Big Pond and Rottle's Lake (Inverness Co.)	50,000
Middle River (Victoria Co.)	150,000
Baddeck River do	100,000
Clyburn's Brook do	50,000
Grand River (Richmond Co.)	50,000
Lear River do	50,000
Hatchery Brook (Cape Breton Co.)	9,000
Total	1,559,000

All these were distributed in the best possible condition, every stream receiving its complement without accident or mishap worthy of mention.

Collecting Parent Salmon and Egg.

This fall I succeeded in securing 554 parent salmon. These, I am pleased to say, were caught and kept in good condition at the fishing stations till they were ready to spawn. There was one exception, I refer to the Lower Middle River and I would recommend that this station be discontinued because the expense is too great for the yield and the man employed there is not a suitable person for work of this kind.

The following table shows the number of salmon caught and the streams in which they were taken :—

Rivers.	Males.	Females.	Total.	No. of Ova.
Margaree River	44	132	176	928,000
Middle do	50	160	210	992,000
Lower Middle River	25	30	55	96,000
Sydney River	14	65	79	566,000
Salmon do	20	14	34	96,000
Totals	153	401	554	2,678,000

The ova are at present in a most healthy condition and promise a larger yield than usual.

Repairs to Hatchery.

No repairs were done to the hatchery or grounds this year except some patching on the floor of the hatching room. I may here add that this floor must be thoroughly repaired next season, the old one must be taken out and a new one put in. A new fence was built along the water line 250 feet in length; this, with all the other fencing and outhouses, were whitewashed. A new scow was built and it works well.

The outside of the main building was not painted as suggested in my last report. It is in a deplorable condition and should be attended to as soon as possible.

Increase of Salmon.

Indications of improvement in the salmon fishing of this island are very encouraging. So far very little can be traced directly to the operations of this hatchery; still I am satisfied, and so are all those who take an interest in the island fishery, that this hatchery is doing its work satisfactorily. I am not in a position just now to compare the coast fishery of this season with that of other seasons, but I have been informed on good authority that this season's fishing compares favorably with other years and in many cases better than any of the past five years. The Margaree River was well stocked with salmon during the fly fishing season and sportsmen tell me that this season was ahead of any of the ten years previous. Owing to continual freshets the fishermen on this river were unable to catch any for the hatchery, although the river was literally teeming with salmon during the months of September and October.

The Middle River was also well supplied, the catch there being nearly double that of any previous year.

The same may be said of all the other rivers, showing that there is an increase.

C. A. FARQUHARSON;
Officer in Charge, Sydney Hatchery.

3.—BEDFORD HATCHERY.

PROVINCE OF NOVA SCOTIA.

Report of the Officer in Charge of the Bedford Hatchery for 1888.

I have the honor herewith to submit my report upon the operations at this hatchery during the past year.

The total number of eggs obtained from the rivers of this Province and laid down in the hatching troughs of this establishment last autumn was, as per my last annual report, 900,000.

In addition to these I received from the hatcheries in Ontario 3,000,000 whitefish and 500,000 salmon trout ova. This stock was further increased through an accident having occurred at the Dunk River Hatchery by which it was rendered impossible to continue the incubation of the salmon ova gathered at that point. I was instructed by the Superintendent to remove those eggs to this hatchery, which was successfully done to the number of 750,000 ova, making my total supply 5,150,000 eggs.

I was most fortunate in hatching this large number of salmon and whitefish, but I regret to be compelled to again report the loss of the greater portion of the salmon trout ova. This loss was of precisely the same nature as was met during the two previous years. The eggs when placed in the hatching troughs were apparently strong and healthy, and continued in this favorable condition until about to burst from the shell, when fully 90 per cent. of them died. Shortly after these eggs

arrived here I took one lot of 60,000 to Lochaber, Antigonish County, and a second lot of 50,000 to Sheet Harbor; these were placed in the troughs of the temporary hatcheries erected there and with these the most perfect success was met with in hatching them. These hatcheries, being used only for a few weeks in the spring of the year, while well and conveniently arranged for the purpose, have not the numerous appliances for carrying out the work that the main or central establishment is provided with, and in consequence large quantities of filth and sedimentary matter are at times carried in to the troughs and deposited upon the ova. This occurred at these points on several occasions and necessitated severe handling of the ova, in order to cleanse them, but notwithstanding this, almost every egg hatched and the young fish, after emerging from the shell, was stronger and more lively than were the salmon ova hatched under similar circumstances, and I am informed by the parties in charge of them, that, when turned into the lakes they were in perfect condition and had outgrown the salmon. The reverse was the case with those retained in this hatchery; as stated before, nearly all died when bursting from the shell, and the few that survived I found almost impossible to save until the proper time for distribution. Fearing the supply of water to the troughs set aside for the hatching of these fish was insufficient, I procured four large galvanized tanks, which were placed on a foundation outside of the hatching room, and the young fish put in them, and a bountiful supply of water turned on, but in spite of every effort they continued dying, so that when at the proper age for distribution, but a small percentage of them was left.

These eggs, from the time they were placed in the troughs here until hatched, received the closest attention, and no sediment or fungoid matter permitted to remain upon them for a moment. Having failed in past years with this particular kind of fish, I was determined to succeed this season if possible, yet I was doomed to disappointment. I have now concluded that the water with which this hatchery is supplied is of such a nature as to be injurious and detrimental to the growth of the young salmon trout, and that it will be useless to make any further attempt here. Should the department contemplate continuing the effort to stock the lakes of this Province with salmon trout, the little hatcheries erected throughout the more remote counties can be utilized for that purpose, and to this end I would respectfully suggest that they be enlarged so that room may be provided for the usual number of salmon ova, in addition to the numbers of trout ova, that may be sent them.

This hatchery can be used as a point at which the ova may be received from Ontario and from which the several quota may be sent to the outlying points. Since the first attempt on the part of your department to introduce the whitefish and salmon trout into the inland waters of this Province, a very general desire has arisen amongst fishermen and others interested that these efforts be continued on a liberal scale. Covered, as this Province is to one-fifth its area, by large and deep lakes, it presents a very favorable field for the creation of an extensive inland fishery, which, if once established and properly nurtured thereafter, might attain almost unlimited possibilities. The completion of new lines of railways, now under construction and in contemplation, will open the interior of the Province where the best of these lakes are situated to the markets of the continent, and add materially to the value of the fisheries of Nova Scotia.

Distribution of Fry.

The distribution of the various kinds of young fish hatched in this institution last spring was successfully effected amongst the lakes and rivers as per following schedule:—

Salmon Fry.

Musquodoboit River,	Halifax County			80,000
Sackville	do	do	do	80,000
Nine Mile	do	do	do	80,000
Pennant	do	do	do	40,000
Indian	do	do	do	40,000

Little Salmon	River,	Halifax	County	40,000
Ecum Secum	do	do	do	80,000
Salmon	do	Colchester	do	40,000
North	do	do	do	40,000
Stewiacke	do	do	do	40,000
Wallace	do	Cumberland	do	80,000
Philip	do	do	do	40,000
West	do	Pictou	do	40,000
East	do	do	do	40,000
Middle	do	do	do	40,000
Shubenacadie	do	Hants	do	40,000
Cornwallis	do	King's	do	40,000
Gaspereau	do	do	do	40,000
Gold	do	Lunenburg	do	20,000
Middle	do	do	do	20,000
East	do	do	do	80,000
La Have	do	do	do	40,000
Annapolis	do	Annapolis	do	40,000
Tusket	do	Yarmouth	do	60,000
Liverpool	do	Queen's	do	60,000
Lochaber	do	Antigonish	do	160,000
	Total salmon fry			1,400,000

Salmon Trout Fry.

Sheet Harbor Lakes,		Halifax	County	40,000
Sandy	do	do	do	20,000
Williams	do	do	do	20,000
Governor's	do	King's	do	20,000
Gutridge's	do	do	do	20,000
Fisher's	do	do	do	20,000
Lochaber	do	Antigonish	do	80,000
	Total salmon trout fry			190,000

Whitefish Fry.

Grand Lake,		Halifax	County	1,400,000
Williams Lake		do		700,000
Sandy	do	do		700,000
	Total whitefish fry			2,800,000

Total distribution of	Salmon	1,400,000
do	Salmon trout	190,000
do	Whitefish	2,800,000
	Grand Total	4,390,000

As will appear from the above distribution of salmon fry, the work done by this hatchery is extended over a field, probably as large as by any other hatchery in the Dominion. This Province being almost an island, has a greater extent of sea-coast in proportion to its area than is found in any of the Maritime Provinces. This coast is indented with bays and inlets, some of which extend inland for many miles from the general coast line, and offer innumerable fishing stations for the capture of salmon.

The distribution of the young salmon bred in this hatchery has been performed in the past with the view of endeavoring to improve the fishery of almost the whole of this coast simultaneously; commencing at the Salmon River in Colchester County, whose waters are discharged into the extreme head of the Bay of Fundy on the north and west of the Province, thence among the different rivers met with along the coast of the Bay to the Tusket River in Yarmouth County, thence along the southern coast to the Straits of Canso, thence along the western coast of these Straits and of the Straits of Northumberland to the northern boundry of the Province, giving a coast line of about 600 miles and including twenty-six rivers which have received the several quota of fry.

It is questionable whether this wide spread distribution has operated for the best interest of the work, in the sense of proving the efficiency of the project and enabling the results of the artificial hatching to become readily apparent by comparison of the returns of salmon caught in different localities. The rivers stocked may be said to be tributaries to the whole coast of Nova Scotiain the respect of furnishing, nursing and feeding grounds for the young salmon planted in them, and in maintaining the fisheries of the Province. The work has not been confined to any particular locality but such rivers have been selected as were deemed most suitable for the purpose, consequently in searching for evidences of increase in the salmon frequenting and taken on the coast, it is necessary to take into calculation the catch of the whole Province.

The numbers of salmon seen or known to enter the rivers will furnish no correct data upon which to base a conclusion as to the increase of these fish. In many instances, these streams, during the summer months (when salmon are in proper condition for food and should offer good sport for the angler) do not contain sufficient water to enable salmon to enter or to induce them to remain therein any considerable time.

During a season when unusual quantities of rain have fallen, a much larger number of fish will enter the fresh waters than is the case when a dry season occurs, and in proportion to the number of salmon entering the streams is the catch on the coast and bays either large or small. A dry season when the rivers are low and salmon cannot enter them freely, a greater number will be caught by the nets in tidal waters, and the contrary is the case in a wet season. In my opinion, salmon approach our shores from the south and west. They skirt along the coast, entering the different bays and coves, making for the rivers at the heads of the bays, possibly each particular branch of the family seeking its own nursery. If, upon arriving at the mouth of the river, sufficient water is found to enable them to enter, they do so, and run up as far as possible; if deep pools and cool waters exist, these fish will remain in the river all summer. The result is the net fisherman is but poorly repaid for his labors that season. But if the reverse conditions are met with by these fish and they cannot enter the streams, they drop down again to the outer portions of the bays where they continue hovering around the shores, and a greater number are taken in the nets. Again this influx of salmon is subject to climatic influences and prevailing winds and storms. Instances of the effect of winds upon the courses taken by salmon while passing along our shores are of common occurrence, and fishermen having salmon nets set, observe the force and direction of the winds with considerable interest, and can, with accuracy, predict a good catch or the reverse. An instance of this nature occurred at St. Margaret's Bay, in this county, during the past season. Strong adverse winds which prevailed during the greater portion of the fishing season, prevented salmon from entering that Bay in their usual numbers, while in bays on either side of, and adjacent to it, but not unfavorably affected by the winds, large catches were made by the fishermen. The effect became more noticeable in the fly fishing on the rivers entering that Bay, where but little sport was obtained this season.

Collection of Ova in 1888.

Upon undertaking this part of the work this season, knowing that if the proper appliances for retaining the salmon after being captured, could be obtained at or near

Musquodoboit River, all the parent fish required might be secured there, it was decided to concentrate all efforts upon that point and thus avoid the expense and anxiety attending operations conducted at different points remote from each other. A dam which crosses this river at its mouth presents an insurmountable barrier to the entrance of fish. This is removed by a pass around the end of the dam formed by blasting out the adjacent rock. Up this pass salmon readily go when sufficient water is found in the river.

Having obtained the privilege of using for this season, a very suitable race-way in which to retain the salmon until ready for manipulation, a trap was constructed in this pass and it was confidently expected to secure a full supply of fish there in a few days, unfortunately, though, through the unwarranted interference of one of the wardens of the river, a gate which had been temporarily placed at the head of this pass to keep the fish, was removed by that officer and large numbers of salmon passed up, and the looked for supply of salmon escaped. However, as soon as possible, the work was renewed and in the course of a few weeks, the men succeeded in capturing 112 salmon. This number not being sufficient for the wants of the hatchery, more men were set to work on the West River in Pictou County, from which stream were taken 63 salmon. A further number of 10 salmon, were taken from the Chezzetcook River, a stream about 7 miles distant from the Musquodoboit. The total catch was as follows:—

	Males.	Females.	Ova obtained.
Musquodoboit River.	47	64	700,000
West River.....	29	34	350,000
Chezzetcook River..	4	6	50,000
Total.....	80	104	1,100,000

Making a total of 184 salmon, 104 of these were females and from which 1,100,000 ova were obtained. These were safely deposited in the hatchery troughs of this establishment, and are now in a good and healthy condition, and promise a successful hatching.

An effort is being made to find some suitable place for the capture of a full supply of parent salmon, where they can be taken during the early summer season. By the construction of a reservoir into which the tidal waters would be admitted at every flood tide, there would be no difficulty in retaining the fish until the spawning season arrives. By this plan, the uncertainty, which exists under the present system, owing to heavy freshets preventing the setting of nets in the fall, and at times the low stage of water rendering it impossible for the salmon to enter the river, will be obviated. The proposed plan has been in operation for some years in connection with the hatcheries of the Province of Quebec and has been proved to be very satisfactory. It possesses many advantages over that now in use here, and will materially add to the results of the work by producing an earlier run of fish than can be expected from those hatched heretofore in this Institution, which were the product of the late, or fall run of salmon. A general idea of this proposed plan was laid before the Department in a previous report, and as soon as a suitable locality is found for applying it, details will be given.

There is sufficient room in the hatchery for a large number of salmon-trout and white-fish ova, and it is expected that the usual quota will be obtained this winter from the Newcastle Hatchery in Ontario. I have recently found a locality from which I can obtain large number of sea-trout ova in the spawning months and with your permission, I hope to secure a good supply for next season's operations.

A. B. WILMOT,

Officer in charge of Bedford Hatchery.

4.—DUNK RIVER HATCHERY.

PROVINCE OF PRINCE EDWARD ISLAND.

Report of the Officer in charge of Prince Edward Island Hatchery, 1888.

I beg to submit the following report of proceedings at the Dunk River Hatchery for the past year.

In the fall of 1887, 1,000,000 eggs were laid down in good condition. They did remarkably well up to the 22nd of March, when one of the heaviest freshets ever known on the river carried away our water gate and reception house.

I wired the superintendent to know what was to be done. He answered me back immediately to hire men to carry or pump water on the eggs night and day until further orders. A few days after Mr. A. B. Wilmot, of Bedford Hatchery, was directed to come over from Bedford to assist me. We got the ova into as small a compass as possible, so that we could keep plenty of water running over them all the time, and thus keep them in good condition until they could be carried away. Mr. Wilmot then returned to Bedford and did not come back until the *Northern Light* Steamer was able to cross the straits about the first week in April. Mr. Wilmot brought boxes to pack the eggs in for transportation to the Bedford Hatchery, which was done immediately on his arrival. About 800,000 eggs were so much injured that they were not fit to take away.

As the damages at hatchery were not repaired, there was nothing done here this season.

Increase of Salmon.

Salmon were never so plentiful since the hatchery was built as they were this season. On account of the heavy rain they came up the river earlier than usual. A great deal of trouble was caused by poachers this fall. On account of the dam being broken, the fish could run up several miles further, and there being so much woods along the river, poachers were on the look out day and night to catch the salmon. They would come to the river disguised so that you could not tell who they were. I had to apply to the Inspector of Fisheries of the Island for some special wardens, and they did very good service. Several boats were captured, some of which were claimed by the inhabitants as stolen. We destroyed two of the boats, as they were of no value, except for poaching on the river.

There are reports of large numbers of clean salmon being seen around the coast, and there have been large numbers caught in different places that we get no official account of at all. I have it from good authority that a Mr. Myrick, of Tignish, two years ago, caught a large number of salmon weighing from ten to fifteen pounds in traps, of which we get no official account. One person said he saw 1,000 frozen salmon in his establishment at one time. It is reported generally, and I believe also, that there is a veay marked increase in all the rivers that we have planted fry in, which goes to show that the hatchery has been the means of helping to make this increase.

More Wardens Wanted.

If this hatchery is not repaired before another season there will have to be two wardens appointed for up river, and one below, also, as I cannot protect the whole river properly without these wardens. It took up nearly all my time day and night travelling up and down the river, and I could not prevent them from poaching. Several shots from revolvers were fired at us in the night to frighten us and drive us off the river. There will also have to be one warden appointed for Wilmot River, as there is no one but myself to look after that river and I cannot properly see to both rivers.

With regard to breakage of the dam it was caused principally by trees that were cut and felled across the river above the pond, and they came down with the freshet

and got crosswise of the main part of the dam, and the gate on the other side, so that when the ice came down it had no other place to run only through the reception house, and the consequence was that, a very large quantity got piled up against it, and the gates had to go, as they could not stand the great pressure. This could be prevented in future by prohibiting parties from cutting and falling trees across the river, or by placing a strong boom across the pond. With regard to the cost of repairing the dam it can be done for three hundred dollars ($300) and made stronger than ever. If the dam is repaired again we will require some new troughs and trays for the hatchery.

HENRY CLARK,

Officer in charge, Dunk River Hatchery.

5.—ST. JOHN RIVER HATCHERY.

PROVINCE OF NEW BRUNSWICK.

Report from the Officer in charge of the St. John River Hatchery.

I beg to transmit herewith a report of the operations during 1888, at the St. John River Fish Hatchery, in the Province of New Brunswick, under my charge.

As already reported, on the last day of October, 1888, I collected on the Tobique and Serpentine rivers 625,800 salmon eggs, which were successfully placed upon the trays in the hatching troughs in excellent condition. They continued to do well the entire winter, and hatched out about 85 per cent. of well developed young salmon in the spring. In the month of March a consignment of semi-hatched fish eggs were received from the Newcastle Hatchery, in Ontario. I met them at St. John, and had them conveyed to the hatchery. They were in fair condition, and they did very well for the balance of the season. In the month of May, a more than usual loss occurred in the salmon-trout ova; with this exception the results were very good. At the unpacking of the ova at the nursery I found they had been packed with care and judgment, a fact that fully accounts for the good results that followed.

Distribution of Young Fish.

On the 30th April, I commenced to distribute the whitefish, and continued, with some slight intermission until the work was finished. During the time of planting the whitefish the operation was somewhat interrupted by the instructions from the Department of Fisheries, at Ottawa, to stop any further distribution of fry, until further orders. This delay caused quite a loss in the young fry then on hand, because, as it is well known, the whitefish fry will not suffer to be kept for any length of time in the nursery, after they are hatched out. The consequence was, that I was unable to comply with the order when it came, as the distance to the lake designated in the instructions was too far away, and the fry too old to bear carrying so far with safety; therefore, in order to save the fish, I was compelled to plant them in more convenient places. I beg to suggest, that persons wishing to get fry should be told to make their application earlier in the season, so that the officers would be in a position to fill the orders at the proper time, when the fry would be in the fittest state for removal. I desire to state here, that several persons have already made inquiries about young fry for next spring, more especially salmon, and salmon-trout, and I regret, that from present appearances, I cannot give satisfactory answers. I think this is very unfortunate, as already a great deal of dissatisfaction exists amongst the people in the adjoining and lower counties, particularly the Counties of Carleton, York and Charlotte, regarding the apparent difficulty in getting parent salmon for stocking this hatchery with ova. The universal cry is, why not get them at the St. John harbor. I will refer to this matter further on in this report, and now give a statement of the planting of fry last spring. On the 22nd of July last,

I completed the work of distribution by putting the balance of the young salmon, that were in the house, into the St. John River.

Below is given a tabulated statement of the quantity of fry, and the names of the several lakes, rivers and streams and the counties in which the different kinds of young fish were planted.

Whitefish.

Magaguadavic Lake, York County	466,662
Harvey Lake do	466,662
Oromocto Lake do	622,216
Magaguadavic Lake do	466,662
Lakeville Lake, Carleton County	466,662
Tomlinson Lake, Victoria County	155,554
Rapid des Femmes Pond do	155,582
Total, whitefish	2,800,000

Salmon-Trout.

Lakeville, Carleton County	146,000
Air and Debec Lakes, Carleton County	75,000
Magaguadavic Lake, York County	154,000
Harvey Lake do	100,000
Utopia Lake, Charlotte County	160,000
Long Lake, Victoria County	75,000
Webster Brow Lake, Victoria County	45,000
Tomlinson Lake do	25,000
Quaker Brook Pond do	25,000
Total, salmon-trout	805,000

Salmon.

St. Croix River, Charlotte County	180,000
Utopia River do	30,000
Magaguadavic River, York County	40,000
Tobique River, Victoria County	150,000
Lakeville Lake, Carleton County	12,000
St. John River, Victoria County	125,000
Total, salmon fry	537,000
do salmon-trout fry	805,000
do whitefish fry	2,800,000
Grand total of fry of all species for the year	4,142,000

Repairs, &c., to Hatchery.

Immediately after the distribution of the young fry was completed the work of cleaning up, washing and varnishing the tanks, trays and troughs was done, also the putting away of all the appliances in proper order for the next season's operations. The changes or repairs made in or about the house this year were very small. A portion of the reception dam was removed according to instructions received from the Department. Six small tanks to receive the whitefish fry when hatched out, and a small tank to supply water, and a half dozen tin tubes. These, with some slight repairs to the supply dam constituted, the amount of expense incurred about the establishment the past season, but more extensive repairs will be required another

year. In accordance with the instructions regularly given me by the Superintendent, I kept down the expenses as much as possible.

No Parent Salmon Collected.

In the month of August last I wrote to the Department for instructions about the capturing of parent salmon, and was informed that it was not the intention of the Department to capture any salmon on the Tobique the present season, and that this hatchery would be supplied with ova from the Ristigouche, but up to the present time I have not received a supply of eggs.

Some good results from the Hatchery.

With regard to the progress that has been made in replenishing some of the rivers with salmon and some of the lakes with salmon-trout and whitefish, I beg to say that the good results are very apparent, although the time has been rather too short as yet for the full development of the salmon-trout and white-fish; still a sufficient proof has been obtained to show that these fish are growing and doing well in the places where they have been planted. Mr. John Stewart, Superintendent of the New Brunswick Railroad, has stated that he has caught some very fine specimens of the salmon-trout in Skiff Lake, and he is much pleased with the experiments of stocking these waters, and he has been making inquiries for further supplies of fry. My own sons have caught a few beautiful salmon-trout in the basin below Grand Falls. These are no doubt the growth from fry turned out two years before. Information has been given also by some fishermen that a fine lot of salmon-trout were taken in the Williamstown Lake. Dr. McCrea, of Lakeville, has interested himself very much in getting this lake stocked. As regards the improvement in the salmon fishing in the St. John and Tobique Rivers, and their tributaries, it is admitted on all sides and by every class of fishermen, tourists, and residents that the run of salmon in the Tobique was good the last summer and that it has improved one-half within the last two and three years, and that angling has been excellent. As a proof of this statement the Local Government has leased the Tobique waters for a term of five years to a company for fly fishing. This has caused a great deal of jealousy towards the lessees by the settlers; the latter finding that the salmon were getting more plentiful, and the fishing improving, were not disposed to allow what they considered their rights to be infringed upon by strangers, and serious difficulties arose which resulted in the murder of the wife of an American angler by one of these lawless poachers last season.

A few years ago, before artificially bred salmon were planted in the Tobique, no person would give five cents for the privilege of fly fishing in it, but now a handsome rental is paid for angling in it. All along the St. John River in the Counties of Carleton and York, and the lower sections of Victoria County, net fishing has improved wonderfully within the last few years, or at least since the stocking of them with fry had begun from this hatchery; and a very different kind of salmon is said to be taken. Some say these are the result of the California fry put in the river. All of the above improvements are to be attributed to the artificially raised fish put out from this establishment. The beneficial results arising from the planting of these young fry are visible on every hand. In travelling by canoes on the Tobique and other rivers you can observe great numbers of young salmon on all gravel beds, sand bars and shoals. If it were possible to protect these rivers as they should be against poaching and over-fishing for a few years, until the young fish got a better chance to grow and multiply, I think the salmon fisheries of the St John waters would be second to none other in the Province. It would, therefore, seem to be almost a necessity that, the Fisheries Department should keep this nursery properly filled with ova hereafter.

There are a considerable number of salmon yet caught throughout the whole length of the river every year for home consumption, but no reliable record is ever kept, or rendered officially of the quantity, as the fishermen are opposed to giving any information that can be relied upon. In conclusion, I may state that the neces-

sary supply of fuel for this house, consisting of wood and coal, has been laid in, so that this establishment will be found in readiness to receive whatever quantity of eggs may be sent here from the Newcastle, or Ristigouche Hatchery at a suitable time for their removal, and I beg to suggest that the transfer of ova be made at as early a date as possible.

All of the above is most humbly submitted, but I desire again to respectfully urge upon the Minister of Fisheries the great necessity that exists for providing the proper ways and means for supplying this important hatchery with the requisite number of parent salmon to fill the house abundantly with eggs in the future.

CHARLES McCLUSKEY,

Officer in charge of St John River Hatchery.

6—MIRAMICHI HATCHERY.

PROVINCE OF NEW BRUNSWICK.

Report of the Officer in charge of the Miramichi Hatchery for 1888.

I have the honor to submit herewith my annual report upon the operations connected with this Fish Hatchery under my charge.

As stated in last year's report, I laid down in the hatching troughs of this establishment, 1,300,000 salmon ova from which were successfully hatched 1,240,000 fry. In addition to these I received 50,000 ova from the Ristigouche house. These were brought here about the 1st March when the young fish were well formed in the shell. They were in a very healthy condition, in consequence of which out of the 50,000 ova scarcely an egg was lost after they were placed in our hatching troughs. This gave me a total of 1,290,000 young fry which were successfully planted in the following streams, namely :—

North-West Miramichi	650,000
Little South-West Miramichi	400,000
South West do	50,000
Sevogle River	100,000
Stewart's Brook	40,000
	1,240,000
Fry from Ristigouche planted in head waters of North-West Miramichi,	50,000
Total	1,290,000

According to instructions I planted the fry as far up the streams as possible. I may here state that the work of planting fry in the head waters of these streams is full of difficulties, as the roads, after passing the head settlements, are only portages and are nearly impassible at the proper time for distributing the fry. But after these difficulties are surmounted some of the finest places that could be wished for planting the young salmon in, are reached. Owing to a great deal of labor and expense which certain private parties have expended on the roads along the upper reaches of this river, the work of carrying fry will not be so difficult in future, for the journey will then be made much quicker, thereby lessening the time the young fish will be on the road, and also enabling them to be planted without the same danger as before of loss by delays.

Owing to the better accommodations we now have for planting fry from this hatchery and to the advanced principles on which artificial fish hatching is carried on in Canada, I am certain that the benefits that will accrue from this industry will

be very great. The work in the past is now showing good results, as the net fishing was better this year than it has been for the past three or four seasons. The fly fishing is also reported to be ahead of any other season for the past fifteen years. It is the belief that, if it had not been for the fry which have been distributed from this hatchery from year to year, this valuable game and commercial fish would now be an article almost of the past, just in like manner as the striped bass, which used formerly to swarm in this river, but which now are nearly exterminated simply because the law has not been enforced, and there was no proper protection given to them at the breeding time.

Previous to the past two seasons I have witnessed poachers destroying parent salmon, after the close season had set in, both with set, and sweep nets, by hundreds upon hundreds, until the river would be almost entirely cleared of fish; so much so was it the case that the men engaged by me to procure parent salmon for the hatchery, with all their skill and best appliances, would at times sweep the river from the head of the spawning grounds to the tide-way, and not capture ten fish—and the men appointed by law to protect the streams from those poachers, would be seen looking after other affairs and would perhaps only visit this scene of extermination once a month. Now those persons who may bear no animosity against the artificial hatching should ask themselves where did the supply come from during this time? It certainly was not from the ova naturally deposited, for, in my opinion, during the six or eight years previous to the past two seasons, there were not as many ova naturally deposited, as would be laid down in the hatchery in one season. Therefore, as there has been a fair average catch of fish during the past six or seven years, I am certain that it is the result of planting so many fry in the head waters of the river from this establishment.

But I am pleased to state that owing to the efforts of our newly-appointed overseer, and the men under his charge, the spawning salmon have been well protected for the past two years from poachers, which I may also state has rendered the work of procuring parent fish for the hatchery much easier, and more certain than in the past.

Not having any means of obtaining statistics of the catch of salmon for the past season I cannot speak positively of the numbers, but all parties say that fish were plentiful. The fall salmon were present in great numbers, and parties say that after the high water which prevailed this fall, the pools on the heads of the rivers were literally alive with fish.

Capture of Parent Salmon.

In this branch of the work this season I have not been as successful as I would wish to have been. This was not due to the scarcity of parent fish, but to the extreme high water which rendered it impossible for the fishermen to do anything, and which, unfortunately, came before I had a full supply, and owing to the continuous rains the water did not fall sufficiently for operations to be resumed for nearly a fortnight. When the men again went to work, the river still being greatly above the general level, thereby rendering the work full of hardship, and very difficult for capturing any parent fish, except a few that had previously spawned, I stopped operations and had to be satisfied with the supply previously obtained. The fish were captured on the North-West Miramichi and its branch the Little South-West.

The number of fish taken from the North-West was 153, and from the South-West we procured 137, making a total of 290, of which 150 were females and 140 males. From this number of salmon I gathered 830,000 ova, which I am pleased to state are in a very healthy condition, having met with a very small loss up to the present date.

In conclusion, I beg to state that this hatchery and all its appliances are in good condition and that no unusual expense need be incurred during the next year, except that a new scow for towing purposes will have to be built, as the old one is completely worn out. The supply dam of the hatchery, which was torn away by

the high freshet this fall, and which was immediately rebuilt, has given perfect satisfaction up to the present time. In addition to this report I have forwarded some statements which have been given me by prominent persons here, who give the most satisfactory accounts of the successes which have been felt by fishermen in the maintenance of the salmon fisheries on the Miramichi waters from the work done at this hatchery.

This and other information which I have received from various sources, leads me to believe that the salmon are increasing in satisfactory numbers.

ISAAC SHAESGREEN,
Officer in charge Miramichi Hatchery.

7.—RISTIGOUCHE HATCHERY.

PROVINCE OF QUEBEC.

Report of the Officer in charge of the Ristigouche Hatchery for 1888.

I beg herewith to submit my annual report on the management of the Ristigouche Hatchery for the past year.

In the fall of 1887, 1,900,000 eggs were deposited in the hatching troughs, from which 1,720,000 fry, and 50,000 eyed eggs were turned out. The fry were successfully planted in the following rivers:—

Kedgewick River	400,000
Upsalquisch do	200,000
Nipisiguit do	150,000
Matapedia do	300,000
Jacquet do	50,000
Main Ristigouche, from hatchery to mouth of Kedgewick.	620,000
Total	1,720,000

The Eyed Eggs for Miramichi and Fry for Nipisiguit.

The 50,000 eyed eggs were conveyed to the Miramichi establishment in the latter part of April. The fry were distributed in the usual manner, the greater portion being towed in cribs far up the river, cans being used when the fry had to be conveyed over the railways. The work of distributing began 15th June and ended 15th July, and was performed without any loss occurring worthy of mention.

The 150,000 fry carried to the Nipisiguit River were planted in very fine condition. J. De Wolf Spurr, Esq., and other anglers that were on the river at the time, saw the fish before they were planted.

Angling on the Nipisiguit at that time was proving very satisfactory. Mr. Kinnear, a lessee at Pavineau Falls, some ten miles from the mouth of the river, had already landed several fine salmon that day, and strongly expressed his belief that many of the fish he caught were of the Ristigouche family of salmon, as they were larger, and differently shaped from those of the Nipisiguit salmon. He felt certain they were from the fry that were brought over some years previous from the Ristigouche Hatchery.

Supply of Parent Salmon.

I regret being unable to report a larger supply of fish for the stocking of the hatchery this season. Owing to the unusual lateness of the spring and the very high freshets extending until the 15th of June, the first run of salmon had entered, and passed up the river, before it was possible to set the nets out, or get the reservoir in working condition.

The Mission Point net was set in fishing order 9th June, capturing some ten fish the first night, proving as above stated, that the fish had been running in the river in large numbers for some time previous. To further corroborate this statement, and to prove that very often numbers of salmon enter and pass up the river in the early part of May, when the rivers are swollen and filled with snow water, and impossible to set out a net, and that in some instances they pass up while the ice is still in the river. In evidence of this theory, a short piece of net was set out between Campbellton and Dalhousie about 20th of May this season, and twelve fine salmon were caught in it the first night. This is pretty good proof that many salmon pass up to the spawning grounds at the head of the rivers before the nets can be safely set out.

The Government net at the camping island, owing to high water and strong currents, was not placed in fishing condition until the 14th of June. This net by special permission was kept set until the 1st of October, but only 13 fish were caught in it during the month of August and three during the month of September.

The statement of parent salmon caught in the Government nets, and of those purchased from neighboring fishermen is as follows:—

Net at Island from June 14th to October 1st	150
Mission Point set from June 9th to July 20th	96
Purchased from W. Pratt	17
do Melvin Adams from 12th June to 12th July	90
Total	353

Some 30 of these fish died from fungus growth in the gills and other parts of their bodies, where they were injured in the nets, and when conveying them to the retaining pond.

Manipulation of Salmon.

The fish were caught in the reservoir and placed in the cribs on the 20th of October, and operations continued until the 10th of November; 315 were found in the pond, 160 males and 155 females, from which were collected 1,500,000 eggs. These ova were conveyed to the hatchery in scows and successfully deposited in the hatching troughs without meeting with any loss, and at the present time they are looking very healthy. I anticipate the hatching of a larger percentage than usual.

A number of the parent fish were retained a few days in the pond after being stripped. They appeared as lively as possible when liberated. No loss occurred in the spawning of the fish or in conveying the ova to the hatchery.

Repairs to Retaining Pond.

Owing to the very high freshets in October, undermining and washing away the banks of the narrow channel, in which the reservoir is built, it will be necessary to construct two small piers or blocks to attach the wire screen net work to, and hold it secure in time of freshets. The trees on the edge of the islands, which form the creek or channel have heretofore supported the timbers, are now tumbling down from the effects of the freshet, and will be unsafe to trust to in the future. The work of building the piers can be done in the spring while the ice is still on the river. In connection with this pond a reception house, 20 by 22 feet, was constructed at the island during the past season for the convenience of the men, and for safety from frost while spawning the fish, and packing the ova.

Condition of the Hatchery.

All the trays and troughs were varnished during the past season and the hatchery with all its appliances is in good working condition, and very little more plant will be required for carrying on the work another season.

As regards the small artificial retaining pond at the hatchery, the heavy freshet in October flooded the pond, and allowed all the young salmon that were in it to escape. The water was so high as to overflow the whole flat, and was up to the floor of the hatchery.

General Remarks.

The catch of salmon in the tide way and bay has not been quite equal to that of 1887. Some of the favorite localities on the bay shore gave good catches. Many others where they were late in setting nets did nothing. The netters from Gaspé to Maria had a good catch, showing that the first run of salmon were more numerous on the north shore of the bay. The angler's catch far exceeded that of last year and compares most favorably with former years, in fact many say it has been the best angling season that has ever been known on the Ristigouche. Statistics show upwards of two thousand salmon taken with the fly. Very good fishing was had on the Upsalquitch River, where it has been poor for a number of years. The officers and guardians and scow men say they never saw so many spawning fish as there were on the beds in the river this fall.

The question may be asked, how can these large numbers of spawning salmon be accounted for. I answer in various ways:—(1) There was a large run of fish passed up the river before the nets were, or could be set out in the early spring. (2) There was a heavy freshet just at the usually best fishing season, which swept away many nets and fishing plant. ( ) The shortening of the fishing season, owing to these late heavy freshets; and also the hot weather in June, which causes the growth of that destructive and so much dreaded green slimy matter in the water, which so soon as it begins to collect on the nets, the fishermen as a rule stop fishing, as the salmon will not enter the nets when the meshes show this filthy appearance. (4) And probably the stricter observance of the weekly close time of Saturday till Monday, some fifty miles lower down in the Bay des Chaleurs, which would allow many more salmon to escape the nets and pass up the river than formerly.

In concluding this report I desire to say that the uniform good catches of salmon, which have been experienced during the past five years in the Ristigouche River and Bay, has at last convinced the large majority of the fishermen to advocate the utility of the work which has beeen carried on, of supplementing the product from the natural laid ova, with the millions of artificially bred fry annually planted in the river from the Ristigouche hatchery, and it is now conceded by the great majority of both anglers and net fishermen that this artificial assistance has been the main factor in placing the salmon fisheries of the Ristigouche River, and its estuary, among the foremost on this continent.

ALEXANDER MOWAT,
Officer in charge Ristigouche Hatchery.

8.—GASPÉ HATCHERY.

PROVINCE OF QUEBEC.

Report of the Officer in Charge of the Fish Hatchery at Gaspé for the Season 1888.

I beg to report briefly operations at the Gaspé Hatchery as follows:—

The repairs made to the reservoir or retaining pen for salmon last year made it tight and safe for keeping the fish in. The ova did well during the winter, and at hatching out time, on the 19th May, the temperature of the water was 38° when I noticed a few fry coming out. On the 5th June the fry were all out and the trays were removed on the 18th June. I commenced putting the young fish into the river and finished the work of distribution on the 14th July.

The following will show the number of fry placed in each river:—

Dartmouth River, above the falls	130,000
do below do	380,000
St. John River	170,000
York River	120,000
Total	800,000

The fry were deposited in the rivers in good condition. It must be noticed here that the estimated number, 750,000, of ova placed in the building in the autumn of 1887 was too small, as the actual quantity was 840,000.

Parent Salmon, 1888.

The number of parent salmon captured and purchased was 49. Owing to high water the net could not be set until the 15th June and it had to be raised twice on account of rain storms, causing heavy freshets in the river. I would recommend the capturing of parent salmon, for the future, in Gaspé Basin by setting the nets in Patrick Mackenzie's station. In this manner a greater supply of parent fish might be secured from the larger and earlier runs of salmon which enter the bay.

Manipulation of Fish.

The salmon were placed in cribs on the 15th October. A very heavy rain came on the 8th and the cribs sank two feet under water on the 9th. I procured extra help and raised and secured the cribs, and found the fish had not suffered. It was fortunate they were caught and put into the cribs, as, had they been left in the brook till the 8th October, they would have been lost to us for spawning purposes by the heavy freshet. As it was four were left, as they could not be netted owing to the continual rainfall.

I commenced taking ova on the 10th October and finished on the 30th. There were 36 females and 8 males; I estimate the number of ova placed in the building at 350,000, or an average of 9,700 eggs to each female.

Painting and Repairs.

The trays and troughs were varnished in the summer, and the building was aired and dried as much as possible.

In last year's report I mentioned the necessity of painting the exterior of the establishment, and the same remark may be made this season again.

The St. John River Salmon increased in size by artificial means.

The canoe men employed by anglers on the St. John, or Douglastown River, at Gaspé, have informed me during the past few years that, the weight of the salmon caught on said river has been much heavier than formerly. The average of the fish was only about 15 pounds, but lately it has reached 18 pounds. During the year 1885 a salmon was taken on the St. John which weighed 30 pounds, and in 1886 another of 29 pounds. The fishermen attribute this increase in the size of the St. John River salmon to the planting of quantities of fry from the Gaspé Hatchery, which were bred from the eggs of the larger kind of salmon, which are natives of the Dartmouth River; they also say that these larger salmon taken in the St. John closely resemble the Dartmouth River fish.

PHILIP VIBERT,

Officer in Charge, Gaspé Hatchery.

9.—TADOUSSAC HATCHERY.

PROVINCE OF QUEBEC.

Report of the Officer in Charge of the Tadoussac Hatchery for 1888.

Herewith is submitted the annual report of the operations carried on in this institution under my charge during the past year. As previously reported, from the 902,400 ova deposited in the hatchery in the fall of 1887, 850,000 fry were successfully hatched and planted in the following rivers and lakes:—

St. John River	200,000
River A Mars	100,000
St. Margaret River, N.-W. Branch	50,000
St. Margaret River, N.-E. Branch	150,000
St. Ann River	15,000
Mowat's Lake	300,000
Hatchery Lake	35,000
Total	850,000

Safe Distribution of Fry.

I am happy to state that the salmon fry hatched last spring were turned out in very good condition. The fry for the St. Margaret River, both branches, St. Ann River, Mowat's and Hatchery Lakes, were planted in these waters under my special charge, and the fry for the Rivers A Mars and St. John were put out by the caretaker, Mr. Plourde. One lot of 50,000 fry, intended for the Little Saguenay River, were put into Mowat's Lake. This was done to prevent any loss, as the weather had become very warm and it was impossible to procure a tow-boat, and there was no good wind to go by sail boat. The 15,000 fry for the St. Ann River, below Quebec, were put in that stream without the loss of a single one, to the great astonishment of the proprietor of the River, Capt. Kane, and other witnesses. The fry were taken a journey of 175 miles by boat and 28 miles by land. I left Tadoussac with the young fish at one o'clock on Saturday, and the next day, Sunday, at three o'clock in the afternoon, the fry were put in the river. I changed the water six times en route.

Large Exhibit of Young Salmon (Smolts).

I believe that all the smolts from the fry put into the hatchery lake, passed down to the salt water during this season, on account of the summer being so continuously wet, which caused the water of the lake to flow all the time over the dams. They were seen in large schools, mixed up with the parent salmon in the salt water pond. I caught some of them with a fly to see what they were eating; I found them full of "chevrettes" by the French name. At the end of October in securing the parent salmon, these smolts were a real nuisance in filling our nets, for we caught hundred and hundreds of them which gave us a good deal of trouble to put them back in the water. I have a great faith in small lakes being used as nurseries for salmon fry. I visited the Mowat's Lake, and sent men to clear the brook running from the lake to the St. Lawrence, to give a good free passage for the smolts to reach the salt water. I have been told by many persons, and especially by the guardians of the salmon rivers, that young salmon are seen in great numbers all along the rivers, of the size of five inches and more. We saw more grilse coming around the hatchery cove than usual. We caught over thirty of them in our Point Rouge Fishery. We caught one day as many as seven. They were all put back in the water, being of no use for the hatchery. There is an increase in the catch of salmon by nets. The best fishing time has been from the 10th to the 25th of June. By the report of the guardians to the Local Government, the salmon rivers are well stocked with fish, only to mention the St. Margaret River, the guardians counted 520 salmon on the spawning grounds.

Capture of Parent Salmon.

We caught for this hatchery 244 parent salmon, 161 females and 83 males. We lost one female by accident, caught by the trap door in the iron gate. That trap door has been very useful in keeping some two feet more of water in the salt water pond between the tides. The door opens by the effect of the tide when coming in, and closes by the pressure of the water when the tide runs down. The 160 female gave 1,685,000 ova, an average of a little over 10,000 for each. The eggs were all laid down in the hatching trays in good condition. The work of spawning

commenced on the 24th of October, and was completed on the 10th of November, and the parent fish were liberated without any loss. During the summer our nets have been cut twice by evil disposed persons during the night, and the rope that holds the two nets for the salt water pond has been cut also. No doubt it was done with the intention to let the parent salmon go. It was found out just in time by the night watchman to prevent a loss. That rope has been replaced by a wire one.

Repairs to the Hatchery.

During the summer I had the building cleaned; twelve new troughs and a new tank were procured to replace old ones in the second flat; and temporary repairs were done all over the building. I had the building inspected by a competent man, who is a good expert in building houses and constructing wharves. He says the upper part of the building is still good; it requires that part of the foundation removed that is exposed to moisture; that part always in the water is still good. There is wanting a new pine floor, shingles to cover a part of the building, and the wall on the side of the wharf must be repaired and filled up with saw-dust. With such repairs the hatchery will be safe for a good many years to come, and the estimated cost for doing the whole work complete amounts to the sum of $500 covering the painting to the inside and outside of the building. We require for next sping a new net for the salt water pond.

Improvements in the Saguenay SalmonF isheries.

It is difficult to give a correct idea of the anglers' catch in the salmon rivers in my district. The anglers always come too late for the best fly fishing season, and do not fish the waters as they ought. The St. John River has only been fished two days by the proprietor, John Price, Esq., who caught 18 salmon in that time. It is the same with the River AMars which also belongs principally to Mr. Price. I said in a former part of my report that there was an increase of salmon in my district. I will now explain it: from 1886, the first year of my taking charge of the Tadoussac hatchery there were 14,790 lbs. of salmon taken in nets; in 1887, last year, the Department issued twenty salmon fishing licenses; their return was 16,720 lbs. of salmon taken. This season of 1888, fifteen licenses were issued but only thirteen of these were fishing and we have a return of 24,000 lbs. for this season. This is certainly a steady increase for the last three years. The great increase of young salmon in the rivers, where salmon fry have been planted for the past number of years, is an unmistakable sign that this benefit is due certainly in part to the Tadoussac hatchery, for the reason that, where the salmon fry are from this hatchery, planted in the streams which empty into the Saguenay, they have a better chance to escape the enormous quantity of trout found elsewhere. I learn from Mr. Napoléon Gauthier, a local guardian, that he often examines the breeding grounds in the St. Margaret River and the spawn beds are covered with trout, he caught some of them and found them full of salmon eggs. It is for that reason that I prefer the planting of fry in lakes were trout are not found. Mr. Jerry Maker, who has a brush fishery, just below the cove where the brook from the Mowat's Lake runs out, told me he caught a great number of young salmon there; he says they must come down from the lake above, because it is the first time this thing has happened. From the very great numbers of young salmon observed by every one going along the lake, a great quantity will go out every year, as long as we continue to plant fry in it. In leaving the lake they are of a good size to care for themselves. Smolts in large numbers have been noticed many times last summer round the wharf in Ha! Ha! Bay, by Capt. Lecours, of the steamer "St. Lawrence," and by Capt. Bareas, of the steamer "Union," and by hundreds of other persons. They were young salmon coming out from the River AMars, in which stream salmon fry have been planted every year. The number of grilse coming around the hatchery cove, and the female salmon which have been seen, by hundreds of people, waiting, during three months, at the iron gate of the pond which is the place where they, no doubt, passed out to the St.

Lawrence when they were smelts, is a good proof that the Tadoussac hatchery is doing some good towards increasing the salmon in this district.

On one occasion I allowed the Professor Raymond Casgrain to fish the little lake just above the hatchery where we plant so many fry every year. He was permitted to take six, and in about twenty minutes he came back, much delighted, with six young salmon. I gave, another day, the same privilege to Mr. I. D. Guay, proprietor of the newspaper, the *Progrès du Saguenay.* He was astonished at the number of young salmon that could be caught in this little lake, It is a splendid fishery. The two parties were allowed to catch these fish in the hatchery lake as an experiment to show how numerous the young salmon were in it.

This report is humbly submitted.

L N. CATELLIER,

Officer in charge Tadoussac Hatchery.

10.—MAGOG HATCHERY.

PROVINCE OF QUEBEC.

Report of the Officer in charge of the Magog Hatchery for 1888.

I beg leave to submit the following annual report of the work of the Magog Hatchery for the past year.

On the 7th day of March last there were received from the Newcastle Hatchery in Ontario and deposited in the Magog Hatchery 2,500,000 salmon trout eggs and 1,500,000 whitefish eggs, all of which were fully eyed and well developed. The water supply here was colder than usual owing to the extreme lateness of the spring, consequently the eggs were nearly one month later in hatching. Notwithstanding this it is very gratifying to state that 1,350,000 whitefish and 2,125,000 salmon trout fry were hatched and safely deposited in a vigorous healthy condition in the following named sheets of water in accordance with the instructions from the superintendent of fish culture:—

SALMON TROUT DISTRIBUTION.

Date.	Lakes.	Counties.	Number.
1888.			
May 23	Massawippi	Stanstead	150,000
do 24	Orford	Brome and Compton	150,000
do 25	Megantic	Megantic	150,000
do 29	Memphremagog	Stanstead and Brome	200,000
do 30	do	do	200,000
do 31	do	do	200,000
June 4	Selby	Missisquoi	75,000
do 5	St. Charles	Beauce	50,000
do 5	Fortin	do	100,000
do 5	Memphremagog	Stanstead and Brome	200,000
do 7	Baldwins	Stanstead	50,000
do 8	Memphremagog	do and Brome	200,000
do 9	Orford	Compton do	100,000
do 9	Memphremagog	Stanstead do	125,000
do 11	William	Megantic	100,000
do 11	Richmond	Richmond	25,000
do 13	Bamston	Stanstead	50,000
		Total	2,125,000

WHITEFISH DISTRIBUTION.

1888.			
May 23	Massawippi	Stanstead	200,000
do 24	Orford	Brome and Compton	200,000
do 25	Megantic	Megantic	100,000
do 29	Memphremagog	Stanstead and Brome	300,000
do 30	do	do	300,000
do 31	do	do	250,000
		Total	1,350,000

Many of these young fish were transported long distances by rail, and on waggons in very warm weather, but by constant agitation of the water in which they were carried, and the use of ice they were all apparently strong and healthy when deposited in their new homes. The above mentioned large number of eggs, and fry had constant attention given them during the unusually long time in hatching, and developing and on the long journeys to the several waters in which the fry were deposited. Some of the lakes which were almost inaccessible caused a greater expenditure than usual, but the instructions given by the superintendent to carry out all work connected with the hatchery as economically as possible were duly attended to, and it will be found that the expenses were not unnecessary or exorbitant.

Increase of Fish.

I have made enquiries regarding the opinions of fishermen as to the result produced in the various waters in which salmon-trout and whitefish fry have been deposited, and from reports which I have received, both written and verbal, the conclusion is that salmon-trout and bass are increasing in the waters of Lakes Memphremagog, Orford and Megantic. The whitefish have been seen in large numbers, and appear to be growing satisfactorily wherever they have been placed, and that within a few years fish food in these Eastern Townships will be much more abundant. To substantiate the foregoing conclusions I have forwarded to your Superintendent the written opinions of a large number of old fishermen residing near the shores of Memphremagog who are good practical judges respecting this matter. I have also received reports from other lakes in which small fish have been placed, and they are all confirmative of the success of this hatchery in its operations. I have, however, confined the certificates to a great extent to the effect that our establishment has had upon Lake Memphremagog, on account of its being the most important body of water in the Eastern Townships, in which fry have been placed, in fact being as large as all the others combined.

From the foregoing it may be safely concluded that the efforts of the Department of Fisheries have been successful in increasing the numbers of salmon-trout, bass, and whitefish in the various waters of this portion of the Province of Quebec, through the work of the Magog Hatchery.

I may further state that the hatchery, building and machinery are all in good order and condition, and that no repairs are necessary the present season.

All of which is respectfully submitted,

A. H. MOORE,

Officer in charge of Magog Hatchery.

11.—NEWCASTLE FISH HATCHERY.

PROVINCE OF ONTARIO.

Report of the Officer in Charge of the Newcastle Hatchery for the year 1888.

I have the honor herewith to submit my annual report upon the fish breeding operations connected with the Newcastle Hatchery during the past year.

The number of fry and semi-hatched eggs distributed from this establishment throughout Ontario and the Provinces of the Dominion in 1888 was, far in excess of the previous year; and the work was very satisfactorily carried out notwithstanding the unusually warm weather which prevailed last spring and the long distances some of the fish had to be carried.

The eggs hatched later last year than usual, owing to the steady cold weather and the low temperature of the water in the winter months. This necessitated keeping the young fish in the tanks a longer period than usual, the last of them were not put out until about the 12th of July. The weather being very warm then, greater care and attention was required to safely convey them to their destinations.

The following schedule will show the numbers and kinds of fish planted in the lakes and other waters of Ontario last spring, also the quantities of eyed eggs shipped to hatcheries in the Maritime Provinces.

A statement of the number and kinds of fry distributed from the Newcastle Fish Hatchery spring of 1888;

Whitefish Fry.

Belleville, Bay of Quinté	400,000
Toronto, Lake Ontario	300,000
Orillia, Lake Couchiching	300,000
Barrie, Lake Simcoe	200,000
Newcastle, Lake Ontario	500,000
Cobourg do	200,000
North of Gananoque, South Lake	50,000
do Delta Lake	50,000
do Charleston Lake	100,000
Eyed Eggs at the point of hatching sent to Ottawa Museum	600,000
Total	2,700,000

Salmon Trout Fry.

North Riding of Hastings, Lake Coli	25,000
do Lake Long	25,000
do Lake L'Amable	25,000
do Lake Rock	25,000
do Lake Wolf	25,000
do Lake Riddles	25,000
do Lake Eagan	25,000
do Lake Sweets	25,000
Muskoka Township, Lake Clearwater	100,000
Campbellford, Crow Bay	100,000
Toronto, Lake Ontario	600,000
Newcastle do	1,000,000
Whitby do	100,000
Cobourg do	500,000
Barrie, Lake Simcoe	100,000
Orillia, Lake Couchiching	100,000
Belleville, Bay of Quinte	300,000
Farra, Lake Arron	100,000

North of Gananoque, Lake Singleton	75,000
do Lake Charleston	75,000
Picton, Lake Ontario	100,000
Lindsay District, Stoney and Otter Lakes	200,000
Thornberry, Georgian Bay	300,000
Irondale, Devil's Lake	50,000
Almonte, Taylor's Lake	100,000
do Watchorio Lake	100,000
Total trout fry	4,200,000
Semi-hatched eggs sent to Magog Hatchery, Quebec	2,500,000
do do St. John " New Brunswick	1,000,000
do do Bedford " Nova Scotia	500,000
do do Museum " Ottawa	40,000
Total Salmon Trout Fry and Eggs	8,240,000

Distribution of Speckled Trout Fry.

Names and residence of parties who obtained speckled trout fry, spring of 1888:—

	Number of fry received.
Z. A. Lash, Toronto	9,000
Dr. Dean, Brighton	10,000
D. Nichol, Kingston	1,000
J. M. Scully, Berlin	6,000
S. K. Graham, Guelph	5,000
Judge Wood, Stratford	15,000
George Matheson, Sarnia	5,000
W. F. Bullen, London	5,000
Israel Kinny, Brantford	4,000
David Gilmore, Trenton	10,000
L. H. Slaght, Waterford	3,000
P. J. Pilkey, Brantford	5,000
E. J. Burk, Campbellford	3,000
Wm. Henry, Niagara Falls	10,000
J. D. Edgar, Toronto	3,000
K. Kennedy, Hobart	2,000
T. J. Hammond, London	4,000
R. Southam, London	5,000
R. Croft Hulme, Belleville	4,000
J. B. Armstrong, Guelph	10,000
R. Wilkinson, Washington	10.000
S. Saunders, Barrie	2,000
R. H. Fraser, London	10,000
Government Museum, Ottawa	15,000
Ponds at Hatchery, Newcastle	10,000
Wm. McIntosh do	5,000
Mr. James, Clark	5,000
Total	176,000

A very large number of young bass were bred in the ponds connected with the nursery last summer, but as they absorb their sac in a very few day it was found necessary to turn them out before any orders could be received from your Depart-

ment for disposing of them elsewhere. They numbered about one million in the ponds when put out.

The following is the gross output of fry, and semi-hatched eggs of all kinds from the Newcastle hatchery during the year 1888:—

Salmon-trout fry	4,200,000
do eggs semi-hatched	4,040,000
Whitefish fry	2,700,000
Speckled-trout fry	176,000
Black bass fry	1,000,000
Grand total	12,116,000

Demand for Trout Fry this Season.

There are already a large number of applications for trout fry, and as the demand is increasing it would be desirable for the Department to procure fully half a million eggs this winter in order to give the applicants an opportunity of obtaining a supply. Owing to the demand far exceeding the supply in previous years a large number of applications have been held over from last season and unless a supply is obtained almost immediately many persons will be disappointed in their wants.

The trout eggs can be purchased now at a very reasonable figure in the United States, and when the fry are hatched they can be disposed of to the Canadian applicants in such a manner as will recoup the Department for the original outlay. This hatchery would in this way become a very satisfactory medium in the country, through which the numerous urgent requests made by fishing clubs, and private individuals for brook trout to keep their ponds and streams well stocked ; and could be easily accomplished.

Newcastle Fish Ponds.

During the past summer the ponds in connection with this hatchery were thoroughly renovated. The sedimentary matter, which for many years had accumulated in the ponds made them shallow, its removal has both deepened and increased their area. A most satisfactory proof of their adaptability to raise black bass and trout (especially the California Rainbow Trout) has been demonstrated beyond a doubt during the past summer. Early in May last some 300 brook and California trout (yearlings, about 4½ inches in length) were put in one of the ponds on trial, the experiment has proved most satisfactory, as at the present time the trout are fully ten inches long, weighing from 5 to 7 ounces. As these fish will not be two years old until next spring the rapid growth they have attained in this short period gives strong evidence of the capability of these ponds to grow trout in considerable numbers in the future. It would be advisable to obtain a quantity of California trout eggs this winter and when hatched turn them into these ponds where they would find abundance of natural food. These fish are specially adapted for the warmer waters of the more cultivated portions of Ontario, and would thrive in any of the streams running into Lake Ontario, where the native trout have now become almost extinct from the fact that the temperature of the water in these streams rises too high during the summer months.

Black Bass.

A quantity of parent bass have been kept over in the ponds, but whether they will thrive in confinement during the winter cannot be definitely ascertained at present. Air holes are kept open in the ponds and food is put in daily; but they seem to remain in a dormant state and apparently do not take the food. Should this experiment of keeping parent bass through the winter for future manipulation, prove a failure, almost any desired quantity can be obtained from the Bay of Quinté in the spring months at a reasonable figure, from which millions of young fish can be hatched and distributed wherever your Department may require them.

Supply Pond or Main Reservoir.

The main dam which governs the supply of water for running the whole hatchery is in good order; some slight repairs were made upon it this summer at a very small expense, and it now appears durable and permanent for years to come. The raceway leading from the pond to the hatchery, was also strengthened by raising and widening the bank alongside. In fact, everything connected with the running of the hatchery is in a better state of repairs than at any previous season.

Collecting Eggs Fall of 1888.

The work of collecting eggs last fall was not as successful as in the previous year.

The following table will show the number of ova taken at Pigeon Island in Lake Ontario, and at Wiarton on the Georgian Bay, 1887–88:

1887.

Pigeon Island, Lake Ontario	1,500,000
Wiarton, Georgian Bay	7,550,000
Total	9,050,000

1888.

Pigeon Island, Lake Ontario	750,000
Wiarton, Georgian Bay	5,050,000
Total	5,800,000

This falling off in 1888 is partially owing to the rough weather experienced while collecting eggs at Pigeon Island, which did not permit of lifting the nets as often in 1888 as in 1887. This was also more particularly felt with the Wiarton operations in Colpoy's Bay, where the larger supplies of eggs are obtained.

In former years, trap net fishing was not allowed in Colpoy's Bay, but an expert in the working of pound nets was employed by the Department to catch salmon trout during the close season for supplying the Government hatcheries with eggs. Salmon trout come into the bay in search of spawning grounds previous to the 1st November, and the nets if set at this time will take large numbers, which if found to be unripe for spawning can be kept in the pounds till they freely shed their eggs. In this way previous to this year, a considerable supply of ova was easily got in the early part of November, but this year, Capt. Allan obtained a license from the Department to fish trap-nets in Colpoy's Bay during the open season from May to November, consequently the fish coming upon the breeding reefs in the bay up to the 1st November, would be largely taken in the nets, and be disposed of by him in the market. In this way, the quantity of eggs obtained from these early spawning fish, in former years, was lost for fish cultural purposes this year.

A satisfactory proof of the decrease in the run of fish at Wiarton in 1888 as against 1887, from the cause explained above, will be readly seen by examining the "Daily Statements" for the past two years, which shows that in 1887, 2,940 females were spawned, and in 1888 only 1,690; a decrease in 1888 of 1,250 females. This was wholly due to the different agreement made with Capt. Allan this year No reflection, however, can be cast upon him, as he had a perfect right to all the fish entering his nets in the open season, by virtue of his license.

I herewith append a statement showing the daily work of collecting salmon trout eggs at Wiarton on the Georgian Bay, fall of 1888.

A STATEMENT showing the daily operations of Collecting Salmon Trout Eggs at Wiarton, during the Season of 1888.

Date of Lifting Nets.	No. of Nets Lifted.	Number of Fish from which Spawn was collected and liberated.		Number of Fish spawned out before entering nets, and liberated	Number of Fish found injured or dead in nets.		Number of Eggs collected.	GENERAL REMARKS.
		Males.	Females		White Fish	Salmon Trout.		
Nov. 1...	....	.....	.....	.....	....	.....	.....	Arrived at Wiarton, with men, 4.30 p.m. Capt. Allan had not completed 3rd net, owing to rough weather; no fish in nets; blowing hard.
do 2...	.....	.....	.....	.....	.....	.....	.....	Blowing hard and raining all day.
do 3...	.....	.....	.....	.....	....	.....	.....	Fine weather; Capt. drove 15 stakes for net No. 3
do 4...	....	.....	.....	.....	.....	.....	.....	Blowing hard; intended going down to inspect nets, but water too rough to go in tug.
do 5...	2	25	125	12	5	17	400,000	Weather very fine; upwards of 500 fish in nets; Allan will complete No. 3 net this p.m. if weather remains favorable.
do 6...	....	.....	.....	.....	.....	.....	.....	Did not lift; fish not ripe; No. 3 net completed.
do 7...	2	48	186	17	3	19	600,000	Weather fine; guardians saw 3 men about to take fish from nets, but on seeing them they rowed away quickly
do 8...	.....	.....	.....	.....	.....	.....	.....	Blowing a gale and raining all day; could not lift.
do 9...	....	.....	.....	.....	.....	.....	.....	Blowing very fresh; sea too high to attempt to lift nets; raw and cold.
do 10...	3	60	210	23	5	14	700,000	Raining; very few fish in 3rd net; guardians have not seen any poaching.
do 11...	.....	.....	.....	.....	.....	.....	.....	Blowing and raining; slight fall of snow in afternoon.
do 12...	2	47	190	37	2	21	650,000	Guardians report no poaching going on.
do 13...	.....	.....	.....	.....	.....	.....	.....	Fine weather; fish in nets not ripe for spawning.
do 14...	2	37	120	41	.....	17	500,000	Warm, but windy; not nearly as many fish in nets as at this date last fall.
do 15...	1	15	60	27	1	15	200,000	Fine warm day; the "Gravelly" Point net is the only one that is of much account this year.
do 16...	1	35	80	31	.....	12	300,000	Snowing; only a small number of fish in the nets.
do 17...	2	10	30	20	.....	11	100,000	Fish not ripe; 2 inches snow fell; cold and freezing.
do 18...	....	.....	.....	.....	....	.....	.....	Cold and snowing most of day.
do 19...	2	57	187	*69	2	16	500,000	*A large proportion of these spawned fish had previously been liberated, but found their way back into the nets; scarcity of small fish.
do 20...	.....	.....	.....	.....	.....	.....	.....	Cold and clear, 18°; necessary to take extra precautions with eggs, to keep from freezing while lifting nets and spawning fish.
do 21...	3	41	91	37	1	11	200,000	Freezing hard, 2° below zero; men suffered intense cold.
do 22...	.....	.....	.....	.....	.....	.....	.....	Left Newcastle for Wiarton.
do 23...	2	31	112	39	.....	14	250,000	Bad lookout for getting many more eggs; only a few fish in nets; very cold lifting and spawning.
do 24...	.....	.....	.....	.....	.....	.....	.....	Blowing hard and freezing; could not lift on this account.
do 25...	.....	.....	.....	.....	.....	.....	.....	Snowing and freezing.
do 26...	.....	.....	.....	.....	.....	.....	.....	Too rough to lift; blowing a gale of wind.

A STATEMENT showing the daily operations of Collecting Salmon Trout Eggs at Wiarton, during the Season of 1888—*Concluded.*

Date of Lifting Nets.	No. of Nets Lifted.	Number of Fish from which spawn was collected and liberated.		Number of Fish spawned out before entering nets, and liberated.	Number of Fish found injured or dead in nets.		Number of Eggs collected	GENERAL REMARKS.
		Males	Females		White Fish.	Salmon Trout.		
do 27...	2	41	124	31	2	16	250,000	Small run of fresh fish in nets; snowing; could not lift in morning, but got out to nets in afternoon.
do 28...	.....	.....	.....	.....	....	.....	.....	Fish left in nets not ripe.
do 29...	2	47	72	47	4	22	150,000	Snowing; warmer weather.
Dec. 1...	2	41	103	39	10	19	200,000	Freezing; intend leaving for home Monday, a.m.; season for collecting eggs is over.
	.....	535	1,690	470	35	224	5,050,000	

No. of times nets were lifted, fall of 1888, 14.

No. of salmon trout eggs collected,	Pigeon Island, Lake Ontario.....	750,000
do do	Wiarton, Colpoy's Bay, Georgian Bay..	5,050,000
Total number collected, fall of 1888.....		5,800,000

More extensive operations will be required at the Georgian Bay in future, in order to collect a sufficient supply of salmon-trout eggs for the Newcastle Hatchery and establishments in the Lower Provinces. For several years past large supplies of various kinds of fish eggs have been shipped from the parent establishment at Newcastle to the Magog, St. John and Bedford Hatcheries in the Lower Provinces. These consignments are not forwarded from here, until just before hatching time, therefore great care and extra labor and expense is required at Newcastle during the autumn and winter months to keep the eggs in good condition until the time of shipment. In fact, the greater part of the responsibility and success of these hatcheries in the Maritime Provinces now falls upon the Newcastle establishment, and in order to collect a full supply of ova for all these nurseries it will be absolutely necessary to provide all requisite means for procuring the parent fish. The stations, hitherto, fished at Wiarton will be found inadequate. More extensive fishing grounds are to be had in the vicinity of Hay, White Cloud and Griffith Islands, where the salmon-trout are known to spawn in very large numbers. The grounds referred to, I believe, are the property of the Indian Department. I am informed by Chief McGregor, who is the head of the tribe, that no objections would be raised to the setting of three or four pound nets on their reserve for the purpose of collecting eggs for the Government. I would therefore, urge upon the Department the necessity that exists for entering into some negotiations in regard to collecting salmon-trout eggs in the neighborhood of these islands for next year's operations.

Condition of Eggs in Hatchery.

Owing to the unusually open winter, and the many rain storms which prevailed during the month of December, the water has been kept muddy, and the sediment which is so often deposited upon the eggs in the hatchery from the above causes gives a great deal of extra work in the nursery, and has a serious effect upon them at the season of the year just when the embryo is forming. The continuous

washing and sprinkling of the eggs has a tendency to addle and kill them. This, however, is unavoidable, as the action of the mud continually depositing upon the ova would eventually suffocate them, if it were not washed off. I am of the opinion, that the percentage of fry hatched next spring will not be quite as large as during the past two or three years, owing to the reasons given above, but this cannot be definitely decided for some little time yet.

CHAS. WILMOT.
Officer in Charge Newcastle Hatchery.

12.—SANDWICH HATCHERY.

PROVINCE OF ONTARIO.

Report of the Officer in Charge of the Sandwich Hatchery for 1888.

I have the honor to submit a report of the doings connected with the Sandwich Fish Hatchery for the past year.

Whitefish Distribution.

By the report of last year it will be seen that there were gathered and placed in good condition in the hatchery 50,000,000 whitefish eggs, out of which were hatched and placed in the rivers and lakes 42,000,000 young fish. Below will be found the places at which they were placed, together with the numbers :—

Point Edward, Lake Huron	2,000,000
River St. Clair	1,000,000
Lake St. Clair	2,000,000
Peach Island	2,000,000
Fighting Island	2,000,000
Stoney Island	2,000,000
Bois Blanc Island	2,000,000
Pigeon Bay, Lake Erie	2,000,000
Bar Point, Lake Erie	2,000,000
Colchester, Lake Erie	1,000,000
Port Stanley, Lake Erie	1,000,000
Port Dover, Lake Erie	1,000,000
Hamilton, Lake Ontario	1,500,000
Niagara, Lake Ontario	1,500,000
Meaford, Georgian Bay	1,000,000
Thornbury, Georgian Bay	1,000,000
Magog (Advanced eggs)	2,000,000
Newcastle (Advanced eggs)	3,000,000
Bedford (Advanced eggs)	3,000,000
St John's (Advanced eggs)	3,000,000
In river at Hatchery	6,000,000
Total White-fish	42,000,000

Lake Pickerel (Doré) "Lucioperca."

After having completed this part of my work with the white-fish, I made the house ready to receive the eggs of the pickerel or doré, of which I gathered 35,000,000 from four grounds, as follows:—

Wees Bros., Lake Huron	9,000,000
Loiseau's, Lake Huron	8,000,000
Hitchcock & Stead, Lake Huron	12,000,000
Solomon's River, St. Clair	6,000,000
Total	35,000,000

From these eggs we had very good success and hatched out 25,000,000 young pickerel, which were planted in the following places:—

Point Edward, Lake Huron	2,000,000
River St. Clair	1,000,000
Lake St. Clair	2,000,000
Peach Island	1,000,000
Fighting Island	1,000,000
Stoney Island	1,000,000
Bois Blanc Island	1,000,000
Pigeon Bay, Lake Erie	1,000,000
Colchester, Lake Erie	1,000,000
Kingsville, Lake Erie	1,000,000
Leamington, Lake Erie	1,000,000
Pelee Island, Lake Erie	1,000,000
Bar Point, Lake Erie	1,000,000
In River at Hatchery	10,000,000
Total	25,000,000

I might state that at the different fishing stations where I have been, the fishermen are unanimously satisfied that this hatchery has been a principal cause for the greatly increased supplies of pickerel which are now being caught. This yellow pickerel, is a fish that was rarely caught a few years ago in the places where we are now planting them, but they are now caught of very fair size, and are getting quite plentiful, and also more valuable as the demand in the market for them is increasing.

Two years ago, a wind-mill for pumping water, was put up under instructions of the Department, near Leageair's in Lake Huron. The supply of fresh water thus obtained has proved a great help in the preservation and safe-keeping of the parent pickerel during the spawning season. This wind-mill and pump having proved so successful, I would ask from the Department instructions to place another on Wees' ground, as I feel satisfied the results would repay the small expenditure it would cost.

Collecting Whitefish Ova.

The number of whitefish eggs collected this fall was a great deal larger than of any former year, but from unlooked for causes the quantity of sound eggs will be less than usual. The reason of this must be attributed to peculiar causes:—

With the earlier run of whitefieh, from the effects of the continued warm weather last fall, some disease set in among them, which caused a great number of those which had been caught to die in the pens and also made a great quantity of the ova to turn bad, when as many as 15,000,000 had to be thrown away. Notwithstanding this bad luck, there will be a very fair supply of eggs in the hatchery. The following table will show the numbers that were placed in the incubators; and the places where they were got:—

Bois Blanc Island	12,000,000
Stoney Island	12,000,000
Fighting Island	16,000,000
Total	40,000,000

Increased catch of white-fish in 1888.

The catch of whitefish this fall in, and throughout, this section, has been something enormous. The "run" began a good deal earlier than usual and the weather continued very mild, and warm throughout the whole fishing season. The fishermen

all along the whole line of country, where the planting of young fish has been done from this hatchery, some of whom at one time refused to recognize the benefits of fish culture, are all now loud in praising the Sandwich Fish Hatchery for the good work which it has done. To show how very large the catch of whitefish has been this year I will just quote the number of pounds of fish caught at one station in Lake St. Clair, in order to compare it with that of last year. At this station last year with four nets there were caught 5,404 pounds; at the same station this year with three nets 21,835 pounds were taken. At other fishing stations in the same lake the catch was equally as large—in fact the catch was so large that the Detroit fish market was over-stocked with these fish. Last year the market price of whitefish in Detroit was from 7c. to 8c. per pound, whereas this year it is very difficult to get more than 5 cents per pound. I cannot say as much for the catch at the Bois Blanc Island Fishery this season, although it has always been considered a great fishing station. Westerly winds prevailed almost all the time through the season, and the water, in consequence, was shallow and was very much like a low tide. The fish that were caught here were much smaller than those of former years.

Enlargement of the Hatchery.

I might mention in this report the almost absolute necessity of having more hatching room in the hatchery for nearly every branch of the culture of fish. We need a great deal more tank room than we have, but cannot make the room without making use of the private apartments of my family—which is already small enough for any degree of comfort. This fact I have before pointed out in my previous reports and I think it would be highly advisable for the Department to build a dwelling for the officer in charge of this hatchery, and then the whole hatchery could be turned into use for the purpose for which it was built.

Very satisfactory accounts are to be found in a number of letters, hereto appended, from fishermen, and others, showing the undoubted success of this hatchery, and of the greatly increased supplies of whitefish and pickerel in this section of the country. Statements made by the fishermen themselves, clearly show that this improvement in the fisheries is very largely due to the great number of young fry which have been bred and turned out from this Sandwich Hatchery. These evidences in favor of the work performed at this establishment should be sufficient to induce the Fishery Department to enlarge the hatching facilities of the building to its greatest capacity.

This report is respectfully submitted.

WILLIAM PARKER,

Officer in Charge Sandwich Hatchery.

Note.—The letters above referred to from fishermen and others will be found in the general report under "Practical Results from Artificial Fish-Breeding."

Canada. Dept. of Fisheries
Report on fish culture