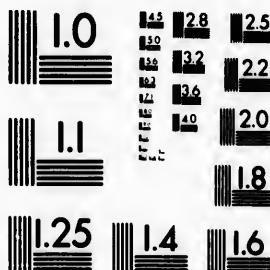
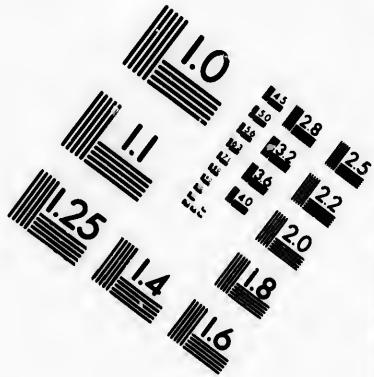
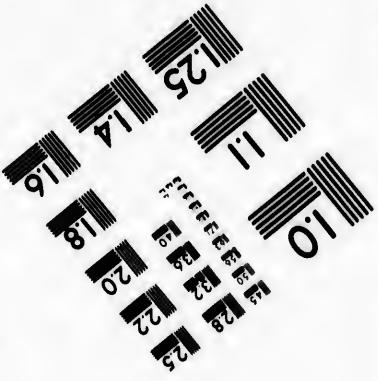
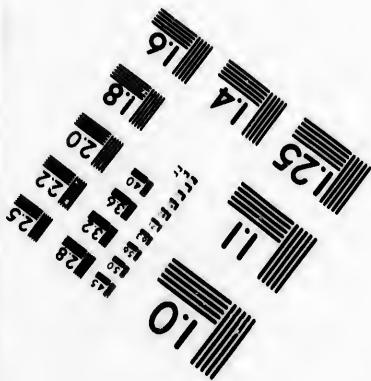


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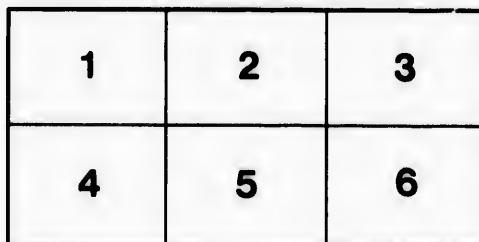
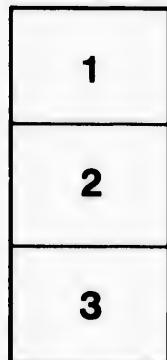
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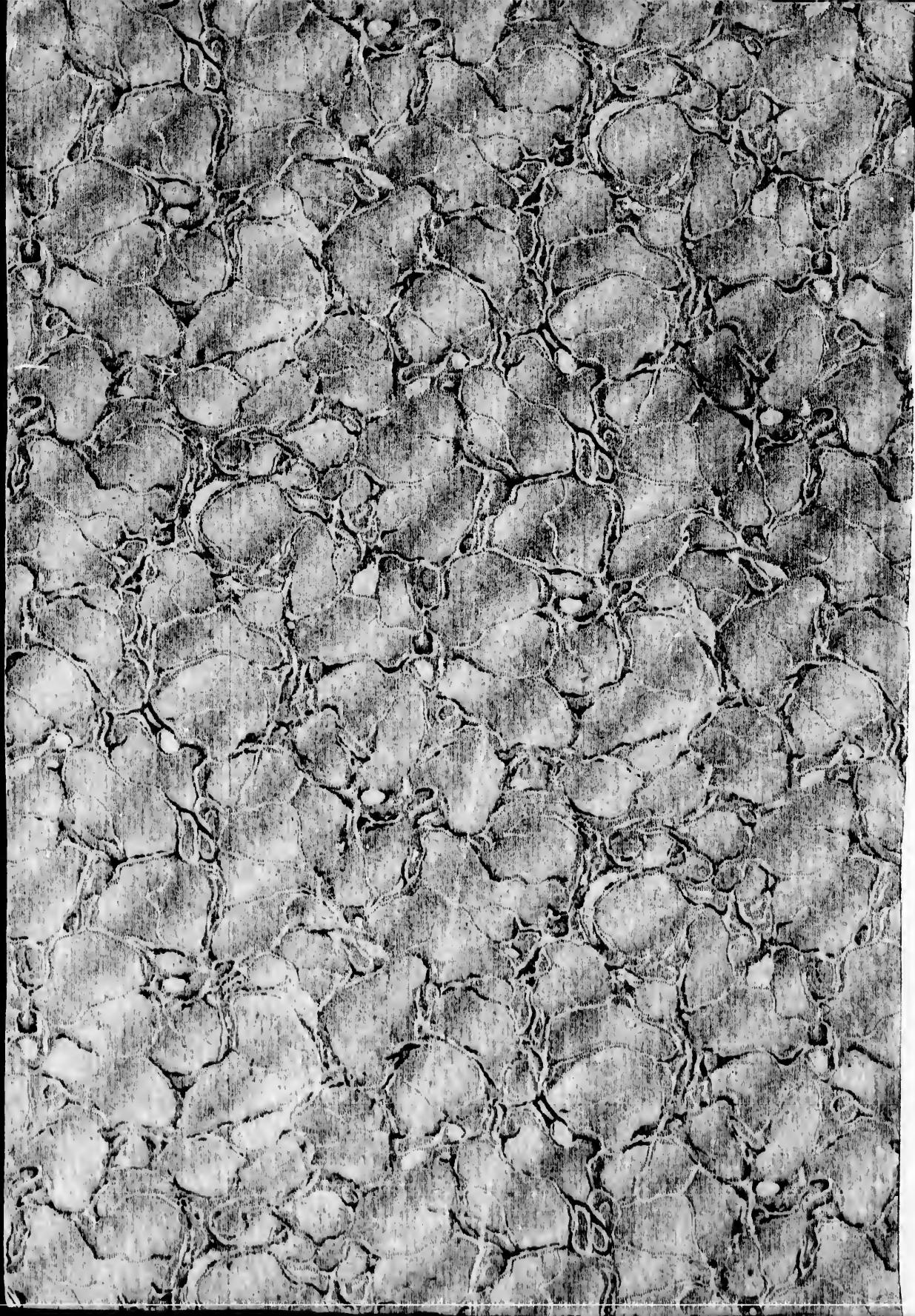
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NOVA SCOTIA.

No. III.

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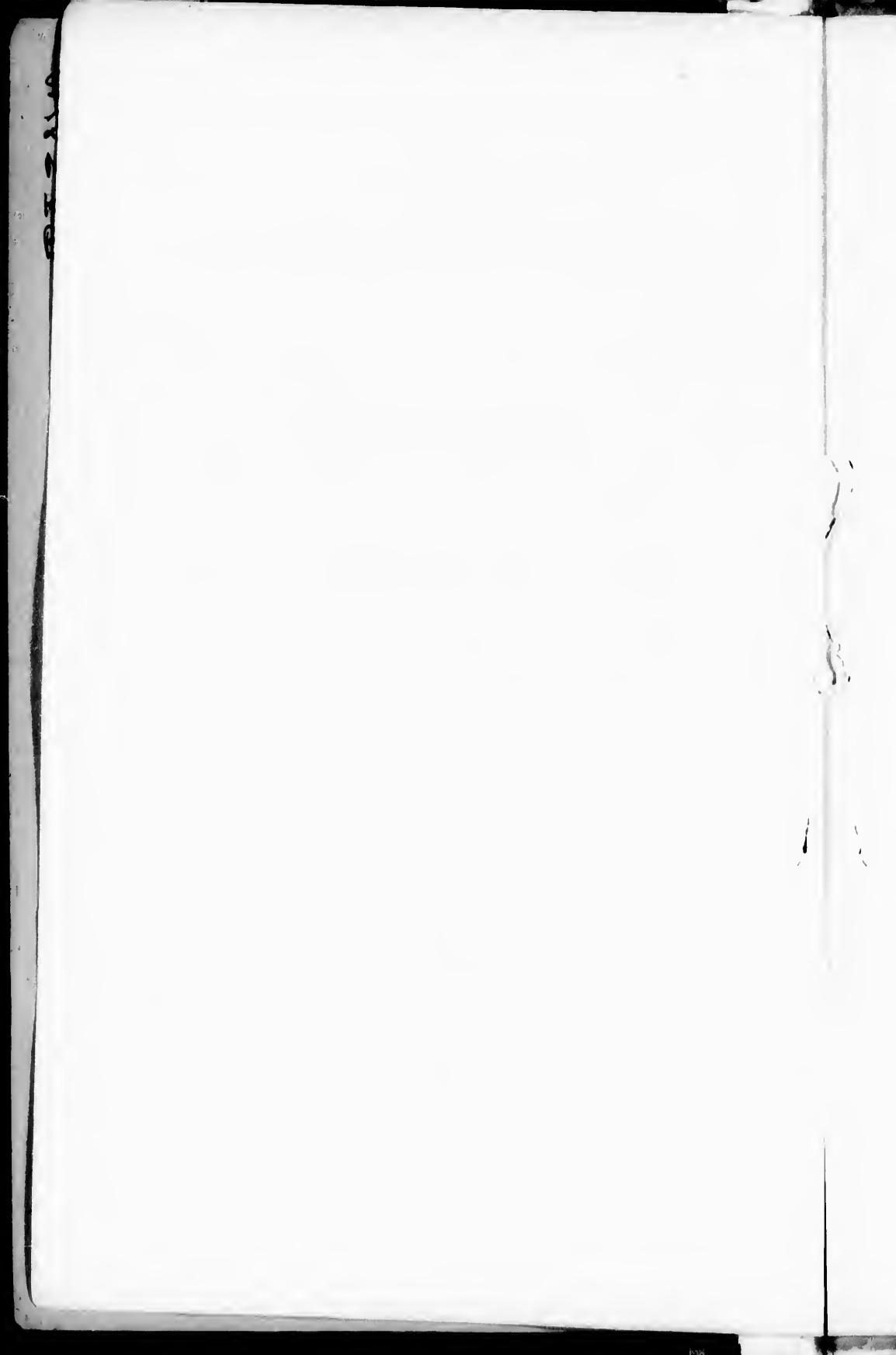
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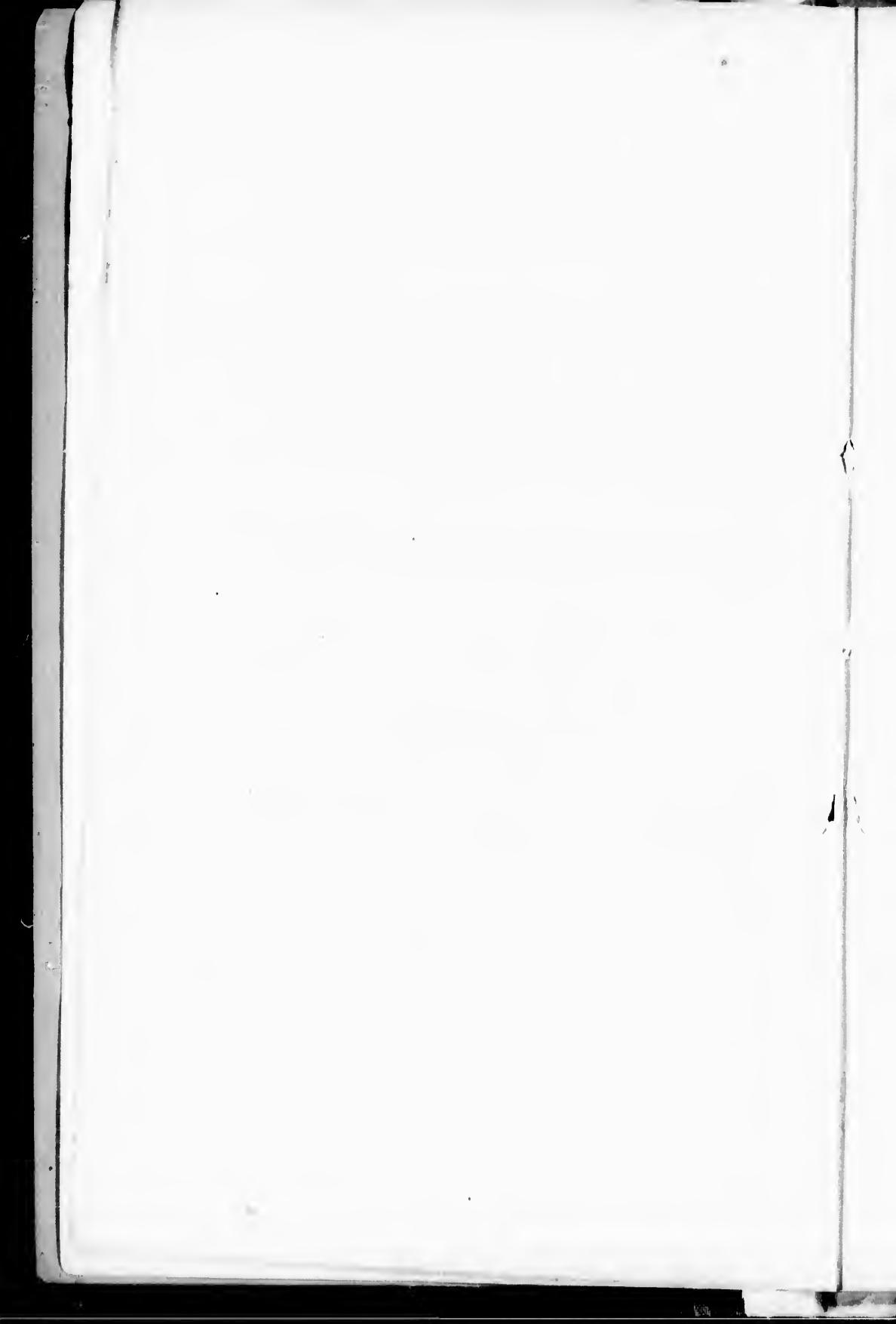
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HERO OF KARS,

LIEUTENANT-GOVERNOR AND COMMANDER-IN-CHIEF IN AND OVER HER
MAJESTY'S PROVINCE OF NOVA SCOTIA AND ITS
DEPENDENCIES, &c.

THIS PAMPHLET,
ON THE
RIVER FISHERIES OF HIS NATIVE COLONY,
IS RESPECTFULLY INSCRIBED
BY HIS OBEDIENT SERVANT,

THE AUTHOR.

A 19176



*Extract from Report of Committee of House of Assembly on
Fisheries, 1867.*

"They beg also to acknowledge the valuable services rendered the fishing interests of this Province by Mr. T. F. Knight, in the publication, within the last year, of his two able pamphlets on the Fishes and Fisheries of Nova Scotia. The clear and comprehensive description furnished by Mr. Knight, of the nature, localities, and extent of our varied fisheries, must lead to the awakening, both at home and abroad, of a more accurate knowledge of, and active interest in this vast field of the natural resources of this Province."

*Extract from Official Letter of the Commissioner of Nova Scotia at
the Paris Exhibition.*

"The Grand Prize—the Gold Medal—was awarded by the jury of Group VII. Articles of Food. This medal was gained by Messrs. Townsend, Hamblin & Baker, Barber, Christian, Dickson, and Hardy—taken in connection with Mr. Jones' Natural History illustration, and Mr. Knight's treatise on the Fisheries of Nova Scotia—so that it may be considered as gained, more or less, by eight exhibitors. . . . Knight's treatise, Part II., supplied the information necessary to secure the medal of the more precious metal."—*Halifax Reporter*, July 16, 1867.

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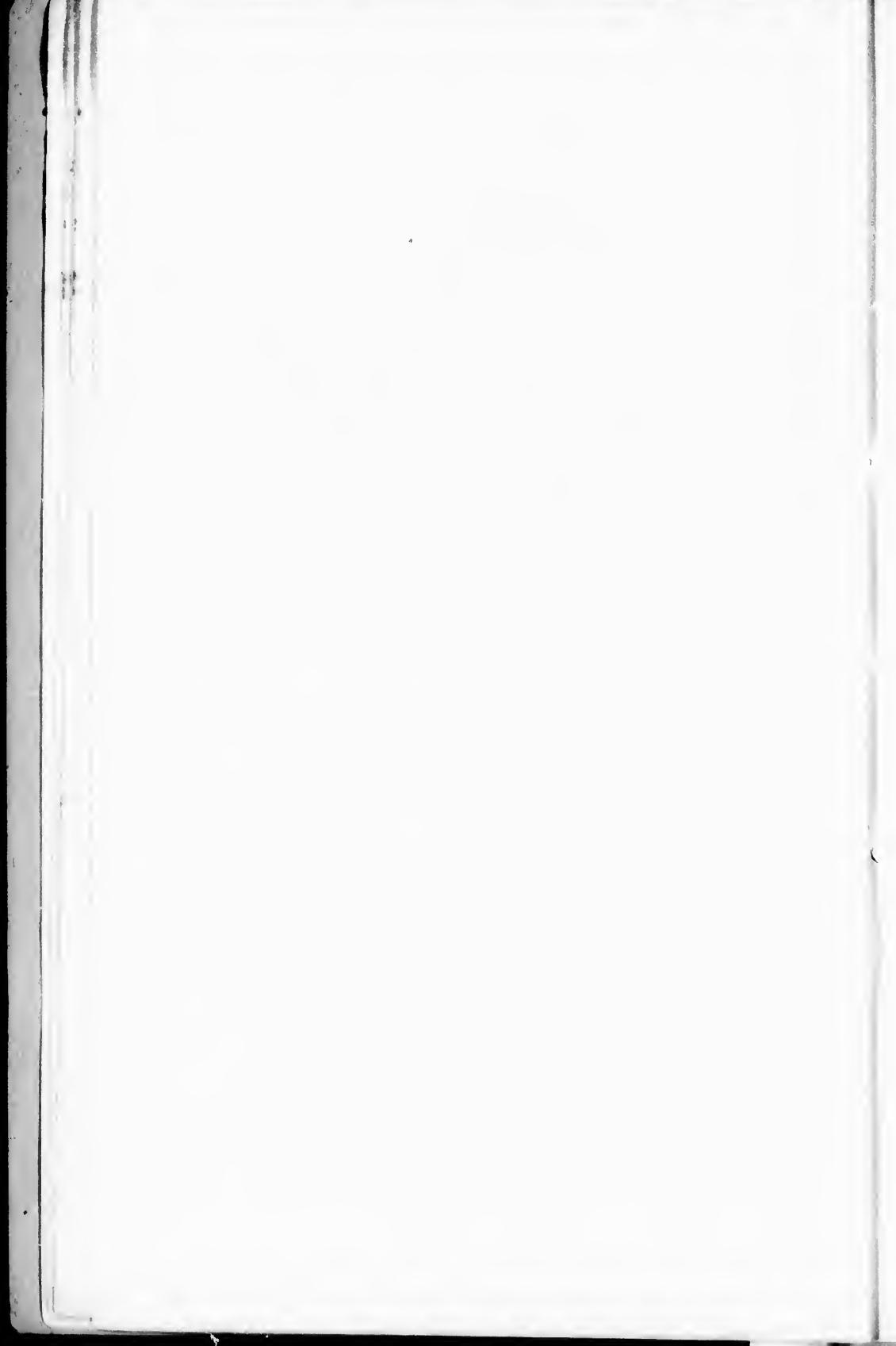
FISHERIES IN THE BAY OF FUNDY. BY M. H. PERLEY, Esq.

ARTIFICIAL FISH BREEDING. BY W. H. FRY.

MISCELLANEOUS REPORTS AND PAPERS.

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RIVER FISHERIES.

Not less important than the Sea Fisheries, though more limited in their extent, are the valuable fisheries which pertain to our rivers and estuaries. As regards the kinds of fish which, in the propagation of their species, do not resort to fresh water, it has been shewn that but few artificial means are necessary to preserve them from destruction or diminution. The limitless ocean, which forms their habitation, is also their protection, and the hand of man is almost powerless to diminish the vast masses which are diffused over a space so enormous. But those fish whose instincts compel them to seek fresh waters for the propagation of their species, are, for a certain period in each year, confined within narrow limits, are at the mercy of man, and may be diminished or exterminated at his will. For such fish it has been found necessary to interpose legislative protection, and to preserve the true interests of a country by restraining its inhabitants from pursuing an immediate and direct good, at the expense of future and immeasurably greater loss. But the immediate benefit is very much lessened, from the injudicious capture of them, when out of season, at which the fish are of little value for food.

In the early history of this country our rivers teemed with fish. The narratives of the first adventurers to Nova Scotia, respecting the abundance of fish, are almost incredible; and in later years, it has been somewhat humorously asserted, it was customary to make it a condition of engagement with farm "helps," that they should not be required to partake of a salmon dinner more than twice in a week. The fish had at that early period no enemy but the spear of the native hunter, who killed only what he wanted for his own use, and who raised no physical obstacle to their return every year to the spot dictated by instinct for the preservation and propagation of their kind. To a much later period the salmon and gaspereaux abounded in, and gave name to many of our rivers, where they are

now almost unknown ; but the great decrease has taken place since the growth of our lumber trade, which has blocked our rivers with numerous dams, that have been erected in reference only to the immediate interest of the proprietors. There has been an increasing war between the axe of the settler and the noble fish, who, if unmolested, generously pours forth from her body life-germs in untold myriads, to mature for the provision of man.

The important connection which subsists between the fisheries in the rivers and those in the ocean must not be forgotten, since certain kinds of fish that propagate in the rivers form a large share of the food of the cod, the haddock, and the mackerel, which abound on the coast. Mr. Perley has remarked, regarding the gaspereau :—

" The gaspereau fishery is valuable in itself, and it must also be borne in mind that the care and preservation of that fishery is most important as regards the cod-fishery on the coast. The mouths of all the rivers, frequented by gaspereaux, are resorted to by cod at the proper season, thus affording profitable occupation to the coast fishermen ; and wherever the gaspereaux have been allowed to be exterminated, (as I am sorry to say they have been in several rivers of these Colonies,) the cod-fishery has ceased to exist in that vicinity. No fish that ascends rivers from the sea in order to spawn, is of so much consequence to the cod-fishermen as the gaspereau."

And not only the gaspereaux, but unhappily the young of the salmonidae, contribute to the sustenance of the more voracious denizens of the sea.

The fish which resort to our rivers are the salmon, the trout, the gaspereau or alewife, the shad, the bass, and the smelt. The annual migration of these fishes is a wonderful provision of God's providence. The marvellous instinct which impels them, if there be no obstructions, to return to their native streams, and after propagation, to seek the sea again, is one of the most interesting phenomena in the domain of animated nature. From the abundance and great nutritive quality of their food, when they regain the sea they recuperate and grow rapidly. The young fry that go sea-ward, diminutive in size, return the following spring or summer adult fish, perfect in their power of reproduction. The time required for hatching out the spawn is various with the different orders and families. In the same genera, or even in the same species, the time may vary. Much depends on climate and the temperature of

the water ; the warmer streams hatching out the eggs before those of a lower temperature. Fish that spawn in still water generally deposit their ova on plants, which give out sufficient oxygen to promote fecundation.

It is to be feared that unless a vigorous legislation is interposed, the once abundant salmon, the gaspereau, the shad, and the sea-trout, will become exterminated. It is the unanimous testimony from every county in the Province that the numbers of these valuable fish are rapidly decreasing ; and notwithstanding that there are legal enactments against these obstructions, mill dams are continually being constructed without the least chance for the passage of salmon. Often abandoned for want of work, their mills block up many a fine stream without any effort to help the fish in passing to their haunts. The tidal netters, whenever an opportunity offers, place their nets entirely from bank to bank ; the same practice is pursued at every available station of the river ; gaspereaux weirs, and the shameful use of the spear on the spawning grounds, complete the list of destructive agents. Much praise is due to the gentlemen comprising the "Society for the Protection of the Inland Fisheries and Game of Nova Scotia," for their patriotic efforts to prompt the public to an interest in the preservation of the River Fisheries. This society was founded in 1853, and has at different times published a report of its labors. Its indefatigable president, Capt. Chearnley, is known to have been engaged for a brief period by the Provincial Government as Commissioner for the protection of the Inland Fisheries. All the efforts of this Association are, however, rendered abortive, so long as County Inspectors are wholly negligent in the discharge of their duties, and the Magistrates of the country permit the laws to be violated almost before their eyes.

In treating of this subject, I purpose to consider :—1. The River Fishes, giving a brief account of their several characteristics. 2. The Rivers on the Atlantic, in the Gulf of Saint Lawrence, and in the Bay of Fundy. 3. Obstructions in Rivers, &c. 4. Observations on the Artificial Propagation of Fish ; concluding with some general remarks and hints.

CHAPTER I.

RIVER FISHES.

THE SALMON.—*Salmo Salar*.

This magnificent fish has been the exalted theme of all lovers of fish and fishing, from the time of Walton to the present. Its exceeding beauty, and its marvellous strength and agility, render it the delight of the sportsman ; and its delicious flesh places it at once in the first rank of food-fishes. Its form is an elongated ellipse, its greatest breadth in front of the dorsal fin. Its color—back, of greenish blue ; sides, light silvery gray ; belly white ; and there are angular but irregular markings, sometimes like the letter X, dispersed along the back and above the lateral line, about an inch or two apart. The brilliancy of a fresh-run fish is unsurpassed, its sides gleaming in the sun-light like burnished silver, as it leaps above the water. There is a great difference in the proportions of a male and female salmon, which is more perceptible as the summer advances ; the head of a male fish is nearly one-fourth of its length, exclusive of the caudal, that of a female is not much more than a fifth, while the head of a female grilse is not more than a sixth. There is a cartilaginous projection on the tip of the lower jaw, in the male fish, which closes into a cavity in the snout ; it becomes harder and larger, and has more of an inward curve as the time of spawning approaches ; it is supposed by some persons that it is used by the fish in removing the gravel when preparing the spawning bed in the autumn.

Salmon enter the rivers of Nova Scotia from the middle of March to the middle of September. They swim along the coast from southward and westward, entering first the rivers of Shelburne, Queens, and Lunenburg ; later, the rivers of Halifax and Guysboro', and still later, the rivers and streams of the Gulf of Saint Lawrence. But this eastwardly course is not always preserved with respect to contiguous rivers, as they sometimes revers

the usual order by appearing first in the eastern rivers. The female salmon first enters, the male follows about a month after; and lastly come the grilse or young salmon. On the passage up they take the fly of the sportsman, and are seen leaping over the natural obstacles or artificial barriers that arrest their progress, sometimes to a height of six or eight feet. They often linger in the deep holes of the streams which they are ascending. They become lean and thin almost immediately on entering the fresh waters. Their flesh loses the lively red tint and exquisite flavour, their silvery sides turn yellow, their steel-blue backs a dingy black, and reddish diffused patches their sides, head, and cheeks.

In the autumn the male salmon is seen frequenting the shallow, sandy-bottomed running streams. He is busy furrowing up the gravelly bottom with his lower jaw, in water so shallow that his tail flaps upon the surface. The loitering sportsman often perceives him working up stream so as not to foul his water, and sedulously conducting his mate into the furrow, where he impregnates the ova streaming from her teeming sides, or rushing out upon the shoals of young males in clouds about him, each a miniature salmon, with hook and bill, though barely six or seven inches long. The lumberman, too, is sometimes tempted from his toil by suddenly coming upon a shallow lake literally covered by hundreds if not thousands. Serious encounters are sometimes instanced between two rival males, the wounds taken and given are often frightful. At the end of the season, an old male, thoroughly emaciated, lean, dingy yellow, his jaws literally worn to the bone or hanging in fragments, his body torn into gaping wounds, with his pale blue gleaming eyes, is truly a ghastly form, flitting dark and dull, and half seen through his watery home. They are now said to return to the sea, principally because we find them there in early spring. Some say they remain in the rivers or lakes all winter, and no doubt many do. Capt. Chearnley is of opinion that this is caused by debility, and that in the spring they are found in an exhausted state. It may be said that the salmon in Nova Scotia have their principal run from the ocean to the lakes in April, May, and June; that they spawn in November, and immediately return to the ocean. But this is only generally true.

"From a number of facts, (writes Dr. Gilpin), I am led to conclude that there is a perpetual passing up and down during the whole summer. On the 20th of May, 1865, I procured from the tide-way at Bedford Bridge, five young salmon from six to eight inches long; these I suppose were fry of the last year, fifteen or sixteen months old, going to the sea for the first time. With the exception of a few vermillion spots upon them, and that the nose was rounded and short, they were true salmon, teeth perfect, and some with ova. It is now admitted (from the numerous and conclusive experiments of marking fish) that they visit the ocean and return in a few weeks weighing six or seven pounds, and spawn in November. Successive runs of these fish must be perpetually passing up and down our rivers. In September, female spawning fish, entirely discoloured, and filled with spawn of the size of buck shot, which escapes readily, are exposed in market from the Shubenacadie river, and one would never think they could retain their spawn till November. The year just passed was unusually dry and the lakes and streams low. Thus Bedford river, near Halifax, was thronged with fish unable to get up. In November thirty were counted from Flat rock in one deep hole. Our markets have always a run of November salmon taken outside on the ocean, in the highest condition, and which, according to Col. Hardy, have the ova very small and undeveloped. Thus at one point of time we have three sets of fish, one spawning or spawned in the lakes, one running up, and a third ranging the ocean unimpregnated. From these facts we must deduce that there are modifications perpetually occurring to vary within certain limits any general law. On his passage he readily takes the fly, during his sojourn in the lakes; but though of these facts I am not quite certain. In the ocean we find him a deep feeder, his food being said to be the spawn of various fish, and he is often taken by bait-fishing on our coast some distance from shore, and at about sixty or seventy fathoms. There can be little doubt that he also feeds upon smaller living fishes as well as flies and larva."

To give a minute description of the manner of propagation would occupy several pages, and is unnecessary in a treatise so general in its aim. The ova of all the salmonidae require water highly aerated, much oxygen being needed in the incubation. They select the gentle current of streams, but if this is not accessible, as is the case in sluggish trout rivers and lakelets, they find some pool with gravelly bottom where a cool spring enters. The spawning season in the American rivers is brief. Instead of extending over a period of six months, as it does in the British rivers, it hardly embraces as many weeks, for by the end of the year the rivers are often closed by ice, and the spawning beds

sealed against the fecundating influence of the air. After the salmon have passed the necessary time in the fresh water to mature the spawn and milt, they leave the pools and rapids, and collect on the shallows and in the tributaries of the rivers by the middle of October or the beginning of November to deposit their spawn ; but it is supposed that incubation is arrested for months by the spawn being encased in ice, so that even a much longer period (perhaps even double the time) is required for the ova to hatch than is necessary in the temperate waters of Scotland and Ireland. In about three months (some say six months) after the deposit of the spawn, the eggs are hatched ; in two months more the young fish attain the length of $1\frac{1}{2}$ inches ; and at the age of six months it has grown to the length of $3\frac{1}{2}$ inches. In this state the young salmon are called *parr*. They do not go down to the sea till they are a year old. When the fry has obtained this age it is about 7 inches long and 6 or 7 ounces in weight, and is called a *smolt* ; but after remaining two or three months absent in the sea, it returns a *grilse* of four or five pounds weight, and when returning a second year is sometimes found to have grown to 12 or 15 pounds. A careful observer will have no hesitation in distinguishing the fry of the salmon from the small trout. The salmon-fry have scales which are much more perceptible, and easily detached ; they are also more brilliant, and generally with a single row of red spots ; the eyes are larger and more prominent. The usual manner of designating the different stages of growth and changes in the condition of the salmon is thus :—As long as it bears the red spots and finger marks, it is known as *pink*, *salmon-fry*, *samlet*, and is sometimes yet called *parr*. When it puts on the bright coat, preparatory to going to the sea for the first time, it is called a *smolt*. After its return it is a *grilse*. After its second migration it is a *salmon*, and is ever after so called. A salmon just from the sea is called a fresh-run fish. After it has been long enough in fresh water to lose its silvery appearance, it is called a *black-fish*. After spawning it is a *kelt* or *foul* fish.

The following facts with regard to the habits of the salmon, are from a work by the late Mr. H. C. Ffennel, Inspector of British Fisheries. Though they are the result of observations of the habits of the salmon in the rivers of Great Britain and Ireland,

they are generally confirmatory of what has been related respecting the salmon in the rivers of Nova Scotia :—

“ 1. Salmon and grilse invariably spawn in fresh water if possible ; both the eggs and the young fry, whilst in the parr state, being destroyed by contact with salt water.

“ 2. The eggs are usually deposited on gravelly shallows, where they hatch in from 80 to 140 days, according to the temperature of the water. Eggs remaining unhatched beyond the latter period will seldom hatch at all, possibly from having been destroyed by the low temperature.

“ 3. The eggs deposited by the female will not hatch under any circumstances unless vivified, after exclusion, by the milt of the mate ; and, at least up to the period of migration, there is no difference whatever in fry bred between salmon only, between grilse only, between salmon and grilse, between salmon and parr, or between grilse and parr.

“ 4. The fry remain one, two, and, in some cases three years in the rivers as parr before going down to the sea ; about half taking their departure at one year, nearly all the others at two years, and the remainder (which are exceptional) at three years old.

“ 5. All young salmon fry are marked with bluish bars on their sides until shortly before their migration, up to which period they are parrs ; they then invariably assume a more or less complete coating of silvery scales, and become smolts—the bars, or parr marks, however, being still clearly discernible on rubbing off the new scales.”

A few observations on *the food of the salmon* will not be out of place in this brief account of this noble fish. The natural food of the young fish, in its native stream, consists no doubt of small insects, the larvae of flies, and the flies themselves that deposit their eggs in pools and running water to pass through the process of incubation. It is supposed that the feeding ground of the salmon at sea is not very remote from the mouth of the river at which it migrates. Regarding its food while at sea, the tint of its flesh, its superior flavor, and its wonderful growth, is owing to its feeding on the eggs of various *echinodermata* and *crustacea*. Sir Humphrey Davy supposes the sand-eel to be one of its chief means of subsistence. It is certain, however, that it does not exclude small fish, such as capelin and smelt, from its bill of fare. It is supposed that the salmon also feeds on the spawn deposited by the alewife, and that the preservation of the latter fish in our rivers is closely connected with the continuance of the salmon.

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THE SEA TROUT.—*Salmo Canadensis*.

The sea trout which frequents our rivers had been improperly described as the *salmo trutta*, or European species. Frank Forrester (Mr. Herbert) doubted whether it was not a grilse, or salmon of the third year. Mr. Norris, who has written a valuable book on the fishes of the North American rivers, and on the art of taking them, has proved the sea-trout of New Brunswick and Nova Scotia to be the *Salmo Canadensis* of Colonel Hamilton Smith. Fresh from the sea, compared with a brook trout, the sea-trout has larger and more distinct scales ; the form is not so much compressed ; the markings on the back are lighter, and not so vermiculate in form, but resemble more the broken segments of a circle ; it has fewer spots, which are also less distinct. It is more slender until it reaches two pounds, a fish of seventeen inches (including the caudal), after it has been some time in fresh water, weighing only a pound and three-quarters ; while a brook trout of the same length, in good condition, would weigh three-quarters of a pound more. They become more robust, however, as they increase in weight. In color, when fresh run from the sea, this fish is of a light bluish green on the back, light silvery gray on the sides, and brilliant white on the belly ; the ventrals and anal fin entirely white ; the pectorals brownish blue in front, and the posterior rays roseate white. The tail is quite forked in the young fish, as in all the salmonidæ, but where fully grown it is slightly lunate.

The tide water mouths of the various rivers are the favorite resorts of this beautiful fish. In these waters he remains till August, sometimes running up the rivers with the tide a few miles, then again running seaward. A very gaudy fly will tempt him out of cover, in the thick tangled kelpy marine forests. He is taken in our tide waters from May till August, both in the Bay of Fundy and along our Atlantic sea-board, and at Cape Breton. After August he is found in the lakes and streams. In winter they are occasionally taken through the ice with bait, from one to twenty miles from the salt water, and they have been seen returning to the sea in March. W. C. Silver, Esq., of Halifax, who has studied their habits for years, and in waters running through his

own lands, is of opinion that they remain all winter in the fresh water, leaving the tideway in August, that they rapidly change their color and shape in fresh water, approximate to the brook trout in both, but are always distinguishable. The weight of this fish goes as high as seven pounds; their general average is about two pounds. The flavor of its flesh is thought to exceed salmon.

The food of this sea-trout, when in the sea, consists of small fishes and crustacea; in fresh water he seeks the same food as his congeners. He is a much more voracious fish than the salmon, and is seldom found with an empty stomach.

The rivers eastward from Halifax abound in this description of trout. They are frequently taken in nets and preserved in pickle. To the sportsman these rivers furnish capital fishing. One party of sportsman not very long since hired a schooner and sailed along the coast, stopping at the mouths of the rivers, where they found the sea-trout in great abundance. In Tangier River, three of the party caught twenty-one dozen in the space of three hours, frequently hooking two at a time. This occurred before Tangier became a gold-mining settlement; but the river still abounds with these fine trout.

THE SMELT.—*Osmerus Viridescens.*

This savoury little fish, though found in the greatest abundance in the smaller streams that flow into the sea, has never been deemed of sufficient worth as to become an article of exportation. They are very extensively used by the inhabitants who reside near their *habitats*, and are very generally sold by hawkers in the city of Halifax. It seems almost an offence to claim for the smelt a relationship with the *elite* family of the salmonidæ; nevertheless naturalists persist in calling it a *salmon*.

The smelt is a beautiful, symmetrically formed, bright little fish, silvery steel above, with light greenish reflections; sides silvery; belly brilliantly white. They come up the river to spawn, as far as the head of the tide. When the ice disappears in the spring they ascend the small streams and rivers in large schules to spawn, and are taken in great quantities from the shores by means of dip-nets, or by weirs built of spruce boughs and twigs. In the month of May, just above the tide-water, immense schules of them are

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directed in their course so as to pass through a narrow opening, formed by piling stones in two oblique rows, nearly together at the upper ends. As the smelts rush through in a continuous stream, they are dipped up with scoop nets.

The smelt may be caught with the hook; and in Massachusetts, where the trout has been driven away by the hum of factories and water-wheels, it furnishes sport for the angler. M. H. Perley, in his remarks on the smelt, says:—

“The writer has frequently taken the smelt with a small scarlet fly, while fishing for sea-trout in the Gulf of Saint Lawrence, and they would undoubtedly furnish very pretty light sport, if other and nobler game did not exist in the same locality.”

It is in season during the winter months, when it is taken through holes in the ice.

The smelt feeds principally on the shrimp. It is often used as bait for cod, and is sometimes spread upon the land as manure. It is unaccountable why it is not exported, as when spiced, or salted and dried in the sun, it might be shipped to any part of the globe. To those who cannot obtain the more delicious trout, a recipe for the best way of cooking them will be acceptable:—

“After having drawn the entrails out by clipping them at the gills and vent with a pair of scissors, is to roll them in coarse corn-meal or grated cracker, and fry them in salad oil or fresh sweet lard. There should be sufficient lard or oil to keep the fish from the bottom of the pan. When served up, open a smelt while hot, and spread a little butter on the inside to melt; pepper and salt it, and lay a piece of the fish on a slice of buttered bread, and take a mouthful of each at the same time.”

This is a sportman’s recipe, and is worthy of a trial.

THE STRIPED BASS.—*Labrax Lineatus*.

Although other species of the *percidae*, or perch family, are found in our rivers, the striped bass is the most important, not only from its excellence as an article of food, but from its large size, sometimes obtaining a length of three feet. It is not abundant in Nova Scotia, and for this reason its preservation and increase should become a matter of solicitude by the promoters of our River Fisheries.

The bass is a salt water fish, but ascends tidal creeks and rivers to breed in the spring, and for shelter during the winter. Mr. Perley describes it as follows :—

" The upper part of the body is silvery brown ; lower part of sides and abdomen a beautiful clear silver color ; eight or more longitudinal black bands running the whole length of the fish, the lower ones terminating above the anal fin. Length, one to three feet. The body of the bass is cylindrical and tapering, covered with large adhesive scales ; lateral line obvious, running through the fourth stripe, and nearly straight. Altogether it is very beautiful ; and besides being one of the most sporting of American game fish, it is excellent food, the flesh being very firm, white, and well flavored."

Along the shore of the Gulf of Saint Lawrence, the bass make their appearance in large schools, in the early part of September. They keep around the islands, and between the outer bar and the beach of the lagoons, where they are often taken in nets, and also at night with torch and spear. As the season advances, and the weather becomes colder, they penetrate into bays and arms of the sea, and ascend the rivers at some distance, where they spend the winter resting on the mud in a half torpid state. The bass which are brought to Halifax for sale are generally taken in the rivers or estuaries of the Bay of Fundy. Where the shad spawns is the natural feeding ground of the bass or rock-fish, and this capacious Bay is the famed rendezvous of the shad.

The striped bass is called the *rock-fish* in the United States. It is abundant along the whole coast, from Georgia to the St. Croix. It is considered, as far as game qualities are concerned, the finest fish the American angler meets with south of the region of the salmon. Mr. Norris thus describes the motions of the rock-fish when hooked :—

" The first dash of a rock-fish is terrific to a novice. Thirty yards are frequently spun off the reel before a large fish can be checked. At the falls of the Potomac, or in the rapids of the Susquehanna, his play is not less vigorous than a salmon ; his runs are much longer, and he frequently escapes by chafing or cutting the line or leader against the sharp edges of rocks, being assisted in his desperate struggles by the strong current. Still, though sturdy, he is a fair fighter, and where there are no such obstructions, a gentle hand, a taut line, and a steady pull, secures him."

Some fine specimens of the bass of Nova Scotia have been exhibited in the Nova Scotian collection at the London and Dublin Exhibitions, and uncommonly fine ones were procured by Mr. Townsend for the Paris Exhibition collection.

THE SHAD.—*Alosa Sapidissima*.

The "king" of the herrings is rarely seen on the Atlantic coast of Nova Scotia. Occasionally it is taken in the nets that are set for salmon. Its favorite resort is in the muddy waters of the Bay of Fundy, where it attains its highest perfection.

The body of the shad is deep and compressed. Its width across the body, from the commencement of the dorsal fin to the anal, is nearly equal to one-fifth its length. Its abdominal ridge is serrated throughout; and the whole body is covered with large deciduous scales, except the head, which is naked. Its length varies from one to two feet, and its usual weight is from one to four pounds. It is said by the fishermen of the Bay of Fundy that there are two species or varieties—one species, pursued by dog-fish, sharks, and other fish of prey, appear in the Bay of Fundy about the month of June, never go into the fresh water, and are never found with spawn; the other species, called river shad, on the contrary, are usually replete with spawn, and are distinguished from the sea shad by their brightness of color. This opinion is not confirmed by any description of the shad by naturalists; they know of but one species. (See evidence before Fishery Committee—Journals 1845.)

"They arrive," writes a reliable informant, "from the 20th June to the 10th or 15th of July, and the fishing continues from four to eight weeks, when they leave the Cobequid Bay and the Basin of Minas, going down through the Gut, between Parrsborough and Blomidon." My informant entertains the opinion that the shad caught in June, July, and August, are the same that frequent the American coast early in the spring, in the bays and rivers of Virginia, later at New York, continuing along the coast of Maine and New Brunswick. He adds that they feed on a vegetable substance which grows along the shores; on the flats they never take the bait; and the farther east they are taken the better their quality. This notion of their southern origin seems to have been

accepted by Mr. Perley, whom I have quoted in the Descriptive Catalogue of Fishes; but, Mr. Norris, an American writer on Fishes, discards it. Mr. Norris, after referring to the theory, which had obtained general credence, remarks :—

" It has since been pretty clearly ascertained that this is not the case; and it is now thought, with much show of reason, that they do not wander far from the mouths of the bays and rivers from which they migrated the preceding summer or autumn. In more than one respect, (adds the same author,) there is a close analogy between the shad and the salmon; both are anadromous fishes, changing their habitat annually from salt to fresh water to spawn; both present the same phenomenon of never having any food—in whatever process of digestion—in their stomachs, after reaching fresh water; and both are not only fish of extremely rapid growth in salt water, but present the same peculiarity of proportions, that is, a remarkably small head and deep fleshy body."

The shad ascend the rivers in the spring to deposit their spawn. In spawning they lose nearly half their weight; they then find their way to the sea. On regaining the sea they undergo, in many instances, a change in color and general appearance, similar to that of the alewife. Mr. Perley, who had carefully studied the habits of the fishes of the Bay of Fundy, was of opinion that they remained in the fresh water no longer than is necessary to deposit their ova, and then proceed up the Bay of Fundy to their favorite feeding grounds, there to fatten upon the shrimp and shad-worm, until they attain that degree of excellence which render them so much sought after. Because the shad is never found in fresh water with any food in its stomach or intestines, it is supposed that it retains animalcules and microscopic animals contained in the water as it passes through its gills in breathing, and appropriates such food to its sustenance.

This rare fish is less plentiful than in former years. Sixty years ago, women and children, and even the house-dog, (in many instances an excellent fisherman,) could go at low water and catch as many as they could carry home. There were two ways of capturing them next in vogue: first, by spearing them in the holes or gullies made by the swift current on the sand flats; second, by setting seines across the mouths of the creeks and rivers. Next were introduced the weirs built of strong stakes, interlaced with brush. The drift-net is the latest and best

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appliance for shad-fishing, and is adopted on both sides of the Bay. The drift-net allows the small fish to escape, which are captured in large numbers in the weirs to the destruction of the fishery. These nets are 45 meshes deep, and many of them 300 fathoms long. On the Colchester side of the Bay there are about one hundred boats and nets. The shad are caught in the night, as they will not mesh in the day time. The boats go out in the evening and return in the morning with from sixty or a hundred to ten or twelve hundred fish.

The shad is of some importance as an export, although it cannot be ascertained what quantity is actually exported in each year. In 1860 the census gives 7,649 barrels as the quantity cured in the Province, of which Colchester contributed 3,691 barrels; Kings, 1,274 barrels; Hants, 1,078 barrels, and Cumberland 652 barrels. The writer is unable to ascertain whether its increase is within the compass of human aid or foresight; its habits being so little known, differing in many respects from those of the *salmonidae*, and from its congener the alewife.

THE ALEWIFE OR GASPEREAU.—*Alosa Tyrannus*.

This excellent fish, it is to be regretted, is fast disappearing in Nova Scotia. The mills erected on our numerous streams have either stopped his progress to the upper waters, which his instinct has taught him to choose for his spawning ground, or the saw-dust and litter from the mills has frightened him backwards in his course, and the process of procreation has thus been arrested.

The usual length of the alewife is from 8 to 20 inches; the back a blue-green, approaching to purple; sides silvery. The head dark green above, and the tip of the lower jaw of the same color; opercles, yellow. The scales are so deciduous that they fall off in handling. In general appearance the fish is rounder and shorter than the herring; the head shorter and smaller; the belly strongly serrated, about thirty-five points from gill-ray to anus.

Dr. Gilpin graphically describes these active fish, as he watches them moving in a multitudinous army quickly up-stream. They are running the rivers to reach the lakes to spawn. At some distance up, the river breaks over a smooth plane of slate stones too shallow for his depth. Arrived at this place, the gaspereau

throws himself up as far as he can, and then commences a series of spasmodic flaps with his tail. Slowly and painfully he passes over and drops exhausted into the tranquil pool above. Utterly exhausted, they lie heads and tails in a confused mass ; presently recruiting, their heads pointing up stream, they again commence their march. In countless hordes they sweep through lonely, still waters, the home of the trout, cool and pellucid enough to tempt a weary way wanderer, but on and on his irresistib'l instinct drives him. A natural dam, some two or three feet elevation, and over which the waters fall with a perpendicular rush, now arrests his progress. He throws himself (no doubt with a vigorous sweep of tail) directly at it. Not above two and a half to three feet is his utmost range, the many failures he makes before he drops into the pool above, attest. Dr. Gilpin, in a foot note, accords to it the power, like the trout, of running up perpendicular sheets of water as high as six feet. He has now gained his lake, often a very small one, in the heart of the forest, and perhaps six hundred feet elevation from high water mark. And now commences his brief courtship, for, unlike the lordly salmon who dallies until November, he has little time to delay. Although the salmon and trout are often seen spawning, no one has been known to have seen the gaspereau in the act of spawning. For this reason he is supposed to spawn in deep water, and the supposition is strengthened from the knowledge of his love for deep lakes with clear sandy margins. As hatching is a much shorter process than with the *salmonidae*, (remarks Dr. Gilpin,) there seems to be less need of a current of aerated water constantly flowing over the eggs, and thus the deep waters of the lake may be chosen.

The ascent to the lakes is made in the latter end of April or beginning of May. The moment the spawning is over, the instinct of the gaspereau teaches him to return to salt water ; but there seems to be some difficulty in determining the exact time. Some observers put it at twenty-one days, in which time, from leaving the sea, the gaspereau has spawned and commenced his return, allowing that he has met with no obstruction. Others say that they have met them during July on the lakes ; and others, that they have seen them passing down in August. But all agree that the young fry go down to the sea in September and October, at which time they are over four inches in length.

Unnerved by the exhausting toil of reproduction, by the absence of food, and perchance by the warming summer waters, he addresses himself to the perils and dangers of descent. Too poor for an object of capture, save for the greedy eel, or the hungry bear, he slips down unnoticed by man, where, a few weeks before, a whole population watched his ascent. Those which are seen in July, or passing down in August, we must consider fish that have left the sea late in May, or that are caught by the dry season, and go down during the August freshets. October seems to be the last date for even the fry to be seen in fresh water. The ascent to the lakes, and return to the deep water, have occupied some three months. The other nine months they are hid from us. They are taken in small numbers, generally with herring, sometimes with the mackerel, as late as the 24th November, on our coast, but they are only stragglers; the great body that swarmed our rivers must leave our coast to return in spring. They return either to deep soundings or to the south. After gaining the salt water the lean, weak fish rapidly recruit, become silvery, very fat, and a few individuals have a deep blue band of one inch and a quarter extending along the back. Our fishermen call them blue-backs, readily distinguish them, and maintain them to be a separate fish; but this is only conjecture.

As an article of food when eaten fresh, it is not held in great estimation. When slightly struck with salt and smoke-dried, it is called a "kiack," and is very palatable. Many are cured in this way about Lunenburg and the Atlantic sea-board. The Indians dry them in the sun about their wigwams, but the usual way is to salt them in barrels like herring, and use them in each family for home consumption. Their leanness makes them a good export for the West Indies, as the fat herring becomes completely decomposed into oil by the climate.

The causes of the disappearance of the alewife from many of our rivers has been adverted to. Dr. Gilpin states that all fish which perform annual migrations to spawn in fresh water, gradually desert cultivated countries. This, he intimates, may be occasioned not by obstructions of mills and accumulation of sawdust only, but by the bustle attending the several employments of the inhabitants who reside about the river. Be the causes what they may, the fact is much to be deplored, and it may explain the

assertion that in our large bays, in which numerous navigable rivers debouch, the mackerel and the cod have greatly diminished in abundance, and have changed their haunts to the shores and bays of the broad Gulf of St. Lawrence.

By the Government returns for 1861, the total number cured is put down at 12,565 barrels. Since that date they are not returned separately, but classed with common herring.

THE EEL.—*Anguilla Vulgaris.*

The eel, although in reality an excellent food-fish, is not much esteemed in Nova Scotia. It is very abundant in our rivers and estuaries. It is not, according to our definition, a river fish, "as is generally supposed, it spawns in salt water, and migrates to fresh water; the very reverse of shad, herring, and salmon. It finds its way into many of the lakes, and will shift its quarters from one creek or lake to another, by crawling through the grass. Isaak Walton affirms that eels that are bred near to the sea, never return to the fresh water. Young eels may be found in myriads all along shore in tide-water streams, in the spring, by turning over a stone, when they shoot out and seek another hiding place. At this season of the year they are not larger than a darning needle, and quite transparent, showing their vital organs plainly. At this early period of their existence, or soon after, their migration to fresh water streams and ponds commences. Those that are taken in the salt water descend the rivers in the fall. The eel is very voracious, feeding on aquatic insects, small fishes, and all dead animal substances that come in its way. It is caught in a variety of ways, but seldom with the hook and line, except when he brings the youthful angler to grief, twisting his line into a Gordian knot, that compels a resort to the jack-knife. In summer it is caught in long round Indian baskets, called eel-pots; it is also taken by torch-light with the spear. In winter it is taken through holes in the ice by spearing it in the mud, where it there lies torpid.

The eel, though of little repute in America, has always been greatly esteemed in Europe. It was held to be a great delicacy by the Romans, and graced their most notable feasts. Their marvellous fecundity caused them to be called the offspring of Jove. In

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France, at the present day, they are largely propagated by transporting the young eels in baskets filled with aquatic plants, to localities where it is designed to naturalize them.

There are other species and varieties of fishes that abound in the lakes of Nova Scotia, that must have been included had the writer adopted for his pamphlet the more comprehensive title of Inland Fisheries ; but he has not intended his pamphlet to be a manual for the sportsman, to whom the lake fishes are important ; indeed, he would not have ventured upon such a task unless he were himself skilful in the use of the angle. The restriction to the fishes which frequent the rivers, meets the full design of the whole work—to treat upon the fisheries of Nova Scotia, as they affect the industry and wealth of the people ; and from a purely economic point of view. The salmon and the sea-trout offer, however, the noblest sport to the disciples of Cotton and Walton.

Among the fishes referred to as frequenting our numerous lakes, I might enumerate the common brook-trout, the *salmo Gloverii*, a very beautiful dark brown trout, misnamed a grayling ; the *salmo confinis*, a large blackish fish found in our interior lakes, of coarse flesh, and not abundant. There are two species of the *percidae*, and several species of the *cyprinidae* or carp family, but none of the "white fishes," (as they are called by pisciculturists,) are esteemed where the trout can be obtained with but little difficulty. The trout is, however, fast disappearing from lakes near the metropolis, which formerly teemed with them. The trout seeker must now repair to more distant waters with any hope of success ; and the farmer or woodman who was wont to repair to the neighboring lake for his impromptu meal, no longer enjoys so cheap and rich a fare. But in the interior lakes trout are still abundant, and in many remote places leap and sparkle in the sunlight, and pursue their gambols unmolested by the sportsman ; startled only by some falling tree or loosened stone rudely plashing the glassy lake, or where their quiet retreat is invaded by the prow of the Indian's canoe.

CHAPTER II.

RIVERS.

The want of topographical information relating to Nova Scotia, will render this chapter very imperfect in fulness of description, though in general correct. Haliburton's instructive history has been followed in the description of the rivers in the several counties. To render full justice, however, to the beautiful rivers and picturesque streamlets of our country requires more than fidelity of outline, it requires the *coup d'œil* of the artist and the enthusiastic lover of nature.

Thirty years of progress must have produced many changes ; but the rivers that were familiar thirty years ago, still contain their delicious stores, though in diminished numbers.

THE ATLANTIC COAST.

Commencing at St. Mary's Bay, the whole Atlantic coast of Nova Scotia is marked by the mouths of navigable rivers, extending to a greater or less distance into the interior. These rivers formerly contained the fishes that have been described in the preceding chapter, in the greatest abundance ; and were proper protection afforded to the procreative instinct of these denizens of our waters, they might still be retained in sufficient quantities for the wants of the inhabitants, if not to furnish an article of considerable importance as an export.

Flowing into St. Mary's Bay is a river of considerable size, called the Sissiboo, which is navigable at a distance of four miles from its mouth. Thence about midway between Cape St. Mary's and Cape Fourchu, is Beaver River, connecting with Lake George, the second largest lake in the province. Next is Chebogue River, east of Cape Fourchu, which expands at its mouth into the harbor of Yarmouth, and then Tusket River, which is one of the largest rivers in the Province. Salmon formerly resorted to the Tusket River in large numbers, but the erection of traps in the rapids above the tideway

have well nigh destroyed the fishery. Alewives are caught in this river in considerable numbers, and a few shad are taken in season. Alewives were once so abundant that 2,000 barrels were taken every year. The main branch of the Tusket is called Salmon River. From the mouth of the Tusket River to the bridge, a distance of eight miles, the river is easily navigable. Three miles above the bridge it passes through Lake Vaughan, and then branches off both east and west. The latter has been explored in boats as far as four miles beyond the north-east boundary of Yarmouth, and thirty miles from the ocean. The north-east stream rises in the highlands lying between Annapolis, Liverpool, and Shelburne ; the western branch rises at no great distance from Sissiboo. Salmon River falls into the Tusket about a mile below the bridge. These streams often, in their course, expand into magnificent lakes, of which there are not less than thirty or forty, many of them being nine or ten miles in length.

In Shelburne County there are the Barrington, Clyde, Shelburne, or Roseway, and Jordan Rivers, of which the Clyde and Roseway are the most important. Those rivers all take their rise far in the interior, and debouch into spacious bays or harbors. The Roseway or Shelburne River is very extensive, but interrupted by several rapids ; about twelve or fourteen miles from the town a chain of lake commences, which extends to the northwards, and reaches to within a short distance of those that feed the river Imbert, in the County of Annapolis ; the shores of the river and lakes once abounded with timber of oak and juniper, of the largest dimensions, and it exists still in sufficient abundance to enable the inhabitants to prosecute ship-building with great advantage. There are two large rivers in Queens County, the Liverpool and the Medway. The first of these is one of the largest in Nova Scotia, and is connected with numerous lakes, one of which, Lake Rossignol, is the most extensive in the Province. This magnificent lake is said to be thirty miles in length. The Medway is also a large river, and receives the surplus waters of many considerable lakes. The fishery on the Liverpool river, before the erection of the numerous mills which now span the stream, was one of its principal attractions. The salmon fishery was so important that 2,000 barrels were taken in a single season ; and the alewives were so abundant that 3,000 barrels were sometimes taken for successive

seasons. The salmon fishery is now reduced to small dimensions, and the alewife fishery is very greatly diminished. In 1860, according to the census, the whole quantity of alewives cured in the year was only 458 barrels, and only 6 barrels of salmon. The great bulk of the salmon now taken is, however, exported fresh, packed in ice.

The river fisheries of the County of Lunenburg exceed those of any of the other of the western Counties. From the last census we learn that Lunenburg cured 1,177 barrels of alewives, and 46 barrels of salmon, besides 2,738 smoked salmon. The principal rivers are the LaHave, Petite, and Gold Rivers. The entrance of the LaHave is very capacious, and the river is navigable for 15 miles. From this point, where there is an ancient bridge, and now the town of Bridgewater, it runs a northwesterly course for five miles, where it separates into two branches; one of which runs in the direction of Annapolis thirty miles, and the other, passing through the settlement of New Germany, communicates with an extensive chain of lakes, and may be traced to the same spring that feeds the Gasperaux river, that falls into the Basin of Minas. There are two water-falls on this river, one called LaHave falls, situated three miles above the bridge, where the body of water contained in the main river rushes, with inconceivable rapidity, over a precipice of twenty feet. The other, called the Indian falls, situated six miles higher on one of its branches, though discharging only half the quantity of water, present a cataract of much greater height and beauty. This river is the most remarkable in the Province for natural beauty. Its great width for some distance above its mouth, and the primeval character of the scenery on either side impart to it a beauty the most enchanting.

This river formerly abounded with cod, sturgeon, halibut, salmon, shad, alewives, herrings, &c., but the saw-mill, the scourge of the funny inhabitants of our streams, has almost exterminated the lordly salmon and the agile alewife. Gold River, a much smaller stream, is a favorite resort of the sportsman. This river takes its rise in the heights that divide the waters that fall into the Bay of Fundy, from those which run towards the Atlantic; and after passing through the settlement of Sherbrooke, and spreading occasionally into lakes of various sizes, empties itself into Mahone Bay, about six miles from the town of Chester.

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Separated from Mahone Bay by a small peninsula, is the capacious Margaret's Bay, within the County of Halifax. Into this Bay flow several rivers that once abounded with salmon, trout, and alewives. The principal streams are Ingraham's River, Indian River, East River, Hosier's River, and Nine Mile River. Near the sources of these rivers are numerous and extensive lakes, many of them well stocked with trout. The gentlemen who compose the Society for the Protection of the Inland Fisheries, have, within two or three years past, adopted measures to arrest the decay of the fisheries in these rivers. They have employed parties to see that the law for preserving an unobstructed passage to the fish is observed, and with encouraging success. The warden for Margaret's Bay district, reports all the rivers clear, with the exception of Ingraham's River, where still, as formerly, great opposition is shown to the enforcement of the law; in consequence whereof few if any fish were taken last season. Sackville River, flowing into Bedford Basin, is likely to prove a productive salmon river, if the intention of the society respecting it is fully carried out. This river, within view of the city of Halifax, had become wholly closed by mill-dams and other obstructions.

Between Halifax and Cape Canso there are several rivers, some of large size. To all these rivers salmon and alewives resort; and sea trout are taken in season in large numbers. The first of note is the Lawrence River; next the Musquodoboit, a fine river, rising in a locality producing oak and other timber, suitable for ship building, and for masts and spars. Beyond the Musquodoboit are Middle River, Liscomb River, and St. Mary's River, all of which rise far in the interior. St. Mary's River is navigable for eight or nine miles from its mouth, and for small vessels two miles further, where it is improved by extensive rapids. At this place (where the tide ceases to flow) is situated the village of Sherbrooke, ten miles above which the river branches into two considerable streams, denominated the east and west branch. The former rises in the high lands between Pictou and Merigomish, and after traversing a superior tract of country, receives in its course the waters of the Antigonish stream. The west branch rises in the mountainous County of Pictou, and runs a rapid course of nearly fifty miles before it unites with the river. "In former years," writes Haliburton, "there was a most extensive salmon fishery on this river;

to secure the exclusive monopoly of which was probably the chief inducement to the late Jonathan Binney, Esq., and several other gentlemen of Halifax, to obtain a grant of 150,000 acres of land here, as early as 1765." This tract of land has since been distributed, in great part, to successive settlers, who have sought their fortunes in the more prosaic interests of farming and lumbering, and in consequence, St. Mary's River is in like manner with other rivers, denuded of her finny treasures. The quantity of river fish cured in the County of Guysboro' in 1860 was as follows : alewives, 2,700 barrels ; shad, 81 barrels ; salmon, 829 barrels. Between St. Mary's River and Cape Canso there is a considerable river, called Country Harbor River. The harbor is navigable for the largest ships more than ten miles above its entrance, and forms the most extensive inlet from Halifax to Canso. The town of Stormont is beautifully situated on its eastern side, about six miles from its mouth, where there is a capacious inlet. Numerous lakes occur at the head of this river abounding with trout, and surrounded by a tract of superior wood land.

Crossing the entrance of Chedabucto Bay, we pursue the line of the Atlantic coast around the Island of Cape Breton. This Island does not possess many rivers, as much of the land, especially in the northern section, is elevated, and presents a bold rugged front to the sea. In the southern division the land is of moderate elevation, and is diversified with lakes and rivers. Half way between Isle Madame and Canso Strait lies the mouth of the River Inhabitants, in a recess of the coast termed the Basin of Inhabitants. The river descends in a parallel direction with the Strait of Canso fifteen miles, nearly equally dividing the tract of country between the Gulf Shore and the River St. Deny's, falling into the Bras d'Or Lake. About twenty miles east of River Inhabitants the Grand River empties itself into the sea on the southern coast. The upper waters of this river, in a north-easterly direction, approach the source of the Mirè River, which debouches into Mirè Bay on the extreme east coast of the Island. Mirè River is a remarkable river, resembling a long and narrow lake, prolonged into the sea. The part usually called Mirè Lake, is eight miles in length, and half a mile wide. It is fed by Salmon River, a stream that takes its rise near the lakes that empty themselves in the direction of Grand River. Salmon and alewives are taken in considerable

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numbers in all these rivers, but are rapidly diminishing owing to the lawless practices that prevail in the capture of these fish. In Mirè River, the Collector informs me, the unrestricted use of nets has almost exterminated the alewife.

The only rivers of note in the northern division of the Island of Cape Breton are Middle River and Baddeck River, flowing into the Bras d'Or, and the Marguerite, which issues from Ainslie or Marguerite Lake, and runs into the Gulf of Saint Lawrence. The southwestern branch of the Marguerite flows from the lake. This lake is the largest body of fresh water in the Island, being twelve miles long and six broad. About eight miles from the sea the southwestern branch is met by the northeastern branch, descending in an opposite direction from the northern hills of the interior, flowing with a winding course through hills of woodland and glades of intervals, offering pleasing views of park-like scenery; the cultivated intervals adorned by graceful elms, appearing with striking effect at the various turns of the river. This branch converges towards the sources of the Middle and Baddeck Rivers, which flow into the Bras d'Or. This fine river was once so famed for its salmon, that in the old charts it was styled Salmon River. Trout, salmon, and alewives are still abundant in the Marguerite. The Ainslie or Marguerite Lake, is a famous resort for trout; and salmon are still taken in the Middle and Baddeck Rivers; but the Collector at Baddeck writes that they are rapidly becoming exterminated "in consequence of their being caught when coming up the rivers to spawn, and spears and nets being mostly used for their capture."

GULF OF SAINT LAWRENCE.

The river last described flows into the Gulf on the western side of Cape Breton; there are, besides, several rivers of considerable volume that indent the northern coast of Nova Scotia. Of these Pomket River, which runs into the harbor of the same name, and South, West, and Right's Rivers, running into Antigonish harbor, are in the County of Antigonish. Next are Barney's River and French River, flowing into Merigomish Harbor, and East, Middle, and West Rivers, flowing into Pietou Harbor. River John is also in this County. The fisheries in these rivers are of little extent, being allowed to decline as the country has become settled.

All the rivers that have their outlet in the Gulf, west of Pictou, are short, and most of them rapid, varying in length from three to five miles, from the head of the tide to the base of the mountains from which they spring. After a rain the streams swell sometimes to a depth of from two to five feet, and after the rain ceases subside rapidly. There is no steady current of water supplied from distant lakes, and it becomes necessary, therefore, to preserve, with great care, all the water after the first rush of a freshet is past. For this reason little or no passage is afforded to fish who are seeking their spawning haunts. On some of these rivers there are a great number of mills, so that the complete destruction of the fisheries is certain unless the laws that are in force are allowed to interpose. The Cumberland Rivers flowing into the Gulf are, Waugh, Wallace, Pugwash, Philip, Shinimicas, LaPlanche, and Missiguish. The Missiguish is part of the northwest boundary of Cumberland, separating it from the Province of New Brunswick.

River Philip is the most noted for its size as well as its fisheries. It is closely connected with the River Pugwash, both discharging their waters into one channel. About eighteen miles from its confluence with the latter, it is divided into two branches, one of which rises in West Chester mountain ; and the other from the vicinity of the Maccan. About a mile and a half above the head of the tide, it receives the waters of Black River, which is eighteen miles in length. The River Philip, though not navigable for any extent, is extremely beautiful, and is remarkable for its excellent salmon fishery, and the abundance and size of its trout. Alewives and shad are also abundant, but very inferior to those of the Bay of Fundy.

BAY OF FUNDY.

The Bay of Fundy Rivers are those which flow into the Bay of Chiegnecto, and into Minas and Annapolis Basins. Cumberland Basin, the eastern arm of Chiegnecto Bay, receives the Hebert, Maccan, and Nappan Rivers ; Apple River flows into the Chiegnecto Channel ; Ratchford's River and Partridge River into the Minas Channel ; Minas Basin receives the Economy and Folly Rivers, the Chiganois, North, Salmon, Shubenacadie with its tributaries, Kennebeck, Avon, Gaspereaux, and Cornwallis. Annapolis River and Moose River flow into the Annapolis Basin.

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The rivers in the Bay of Fundy are remarkable for the length of their tidal estuaries, which in most places form the only harbors. The principal fishery is the shad fishery ; salmon are taken in small numbers ; alewives are often taken in considerable quantity ; and the bass fishery is confined to these waters.

Some description of the principal fisheries on the Nova Scotian shore of the Bay of Fundy occurs in Mr. Perley's volume of reports. The County of Cumberland has long enjoyed a pre-eminence in the shad fishery. Some ten or twelve years ago the catch of shad in this County was larger than in recent years. Five to six thousand barrels were sometimes taken and cured in a single season. At first standing weirs were much used in the capture of shad ; but owing to the circumstance of large quantities of inferior and small fish being caught, the raising of the flats, and other undefinable causes, this mode has for some years been discontinued. There are no weirs now used on the Nova Scotian side of Cumberland Bay. The common mode of fishing for shad is by stake nets on the mud flats. Each net is 12 fathoms long, from 28 to 40 inches deep, according to situation ; the mesh is from $4\frac{1}{2}$ to 5 inches. Shad have been taken here as early as the 8th of June ; but the fishery usually commences on the first of July and continues until the first of October. Mr. Perley writes in 1851 :—

" From the Misaguash to the LaPlanche Rivers, there are 12 nets, which, on the average, take five barrels each during the season. From the LaPlanche to Barron's Point there are 60 nets, the average catch of which is ten barrels each annually. It was stated by all the fishermen that the fishing was falling off very much of late, and the average catch the last two seasons was only half of which it was seven years previously. This they attributed to the great increase of drift-nets used in the Bay by the inhabitants of New Brunswick ; observing that where the winds is so high that the boats cannot go out to drift, they always get twice as many as when the drifting is taking place."

There are three distinct runs of fish during the season, the first and last being the best. Confirmatory of the fact stated in the description of the shad, the fishermen here say that it is very rare to find a shad with roe ; the shad-worm and shrimps are frequently found in the stomachs of the shad, which leaves no doubt as to the nature of their food.

At Minudie, on the River Hebert, there is a valuable shad fishery; and it is asserted that the fish caught here are fatter and much finer than any others in the Bay of Fundy. The drift-net is used here as well as the set-net. Around the shores of Minudie numerous boats may be seen, which have drifted down the Bay with the ebb-tide, from the place of rendezvous, to meet the flood, and to return with it to the place from whence they started. With favorable tides each boat will secure from 100 to 150 shad, with 80 to 100 fathoms of net. The fishing commences in June and terminates in September.

From Minudie down the coast towards Apple River, the shad fishery extends as far as Mill Creek, below which the waters of the Bay become perfectly clear, and shad are not taken. On the northern shore of the Basin of Minas, the shad fishery begins at Hetherington's River, to the eastward of Parrsboro' River, and extends along the coast to Port-a-Pique, a distance of twenty-one miles. The fishery is carried on both by weirs and drifting; in the whole distance there are about twenty brush-weirs. Between Graham's Head and Economy Point, the flats for about four miles have an almost unbroken continuance of these weirs, crescent shaped, the ends of the weirs touching each other. Many salmon are taken in Economy River, but they are of small size, rarely exceeding the weight of 4 lbs; all the rivers in this locality are frequented by these small salmon in greater or less numbers.

Shad fishing is prosecuted in the Shubenacadie River, up which the spring shad ascend to the Shubenacadie lakes for the purpose of spawning. On the wide-spread flats in front of Cheverie, the shad fishing is carried on partly by drifting but chiefly by stake-nets. Great numbers of alewives every spring ascend the Shubenacadie. Salmon and bass are taken, but are by no means abundant.

Shad are taken by drift-nets in the Windsor river. The fishing begins in each season about the 25th June, and continues until about the 10th of August, after which it begins to fail, and is not followed later, the number of fish being too few to be profitable. The fishermen drift from Avon bridge down to Cape Blomidon, dropping down with the ebb, and returning with the flood; they drift both by night and by day, the water being excessively muddy, but as Blomidon is approached, the fishing is only by night, as the water there is clearer. At Windsor the "shad-worm" is found

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upon the mud flats, but the shad are supposed to feed chiefly on shrimps, which are of great abundance and of fine quality ; they are often found hanging upon the shad nets, of large size, nearly as large as prawns. The shrimps leave the river in August, and the shad depart at the same time ; it is thence inferred that the shad follow the shrimps to some other locality. On the flats below Boot Island, in Windsor River, and thence down to Flat Island, there are standing nets in which shad are taken later in the season than by drifting. The quantity taken between the town of Windsor and Horton Bluff is estimated at 1000 barrels annually.

Salmon ascend the Avon and its tributaries in considerable numbers ; many of the smaller sizes are taken in the shad-nets, but the larger fish break directly through, the thread not being sufficient to retain them. The spring shad do not go up the Avon to spawn, nor has any roe been found in the shad caught there. Great numbers of alewives every spring ascend the Avon, the Horton, and Cornwallis Rivers, to spawn. Those taken in the Avon are large but poor ; in the other rivers they are much smaller, but thicker and fatter. In the weirs, on the flats below Windsor, small fish, called "shiners," are frequently taken. These are little fish, shaped like the alewife, very silvery on the belly, and very fat ; they are only used as a pan-fish, and are excellent when eaten fresh.

Smelts ascend all the rivers in this locality at the close of the winter, in almost miraculous abundance. Bass were very plentiful formerly, but are seldom taken now, having been thinned off by the weirs and other contrivances. Tons of eels may be taken at any time during the season ; a stream of eels, each as thick as a man's arm, has been seen to pass through a gap in a weir during half an hour.

At Scotch Bay, to the south of Cape Split, the shad fishery ceases. Considerable quantities of shad are taken on the mud-flats at the upper extremity of this Bay. At this point on the circuit of the Bay of Fundy, the geological character of the coast changes. The south shore consists chiefly of bold and rugged cliffs of trap rocks, and not a river debouches until we reach the Annapolis Basin, into which the noble Annapolis River flows out of the valley on the opposite side of the mountain range.

A reference to the rivers flowing into the Annapolis Basin will

complete our description of the river fisheries in the Bay of Fundy. The principal fishery of the Annapolis Basin, it is well known, is the Digby herring fishery. This fishery I have described in the pamphlet on the "Shore and Deep Sea Fisheries." Salmon ascend the Annapolis rivers, although several of them are obstructed by dams; shad are taken in the Basin in July; and smelts are exceedingly abundant in the spring. At Nictaux River, a tributary of the Annapolis river, so abundant were salmon thirty years ago that twenty or thirty could be taken in an afternoon. Besides the Annapolis and its branches, the spacious Basin receives the waters of Moose River, Bear River, and Allen's River, all of which might become, by needed attention to the removal of obstructions, salmon-yielding rivers of priceless value.

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CHAPTER III.

OBSTRUCTIONS IN RIVERS — FISHERY PROTECTION SOCIETY — LAWS RELATING TO RIVER FISHERIES — FISH LADDERS.

OBSTRUCTIONS IN RIVERS.

This topic is the most important of all in treating of the River Fisheries. The obstructions to the preservation of River Fisheries are felt to be an evil of great magnitude in every civilized country, and are of a similar kind, viz., mill-dams without fish-ways, fixed engines for capturing fish, the use of the spear, and taking the fish out of season.

So rapid was the decline of the River Fisheries of Nova Scotia that the Legislature passed an act in the session of 1853 to arrest their destruction by stringent laws. This act contained more rigorous penalties; established the system of close time; and included the appointment of Wardens in every County to see that the provisions of this act were carried out; to appoint deputies, and to institute a general oversight of the fisheries.

A circular was sent to each County Warden in the following year by command of the Lieutenant-Governor, Sir Gaspard Mactavish, to ascertain whether this act had effected a beneficial change in the condition of the fisheries. It appears from these circulars that in Halifax County out of twenty-seven rivers enumerated only five were not totally obstructed, and in such a manner that unless in case of high water, fish, even of the smallest size, could not pass and repass. The Warden of Queens County stated that the fishery in Liverpool River was nearly destroyed. Hitherto the overseers of the River Fishery had been chiefly chosen from the mill-owners, whose interest it was to keep the sluices in the dams closed up, in order to have more water for sawing. In the County of Colchester the streams that flow into the Gulf of Saint Lawrence were obstructed with mill-dams, the proprietors of which

viewed, with much jealousy, the new act of the Legislature. In the County of Guysborough, besides the mill-dams, the Warden found five weirs obstructing the fish, and reported that in St. Mary's River parties were extensively engaged in spearing salmon. In Pictou County the rivers were completely obstructed by dams, built completely across the stream, and varying in height from five to thirteen feet, so as to preclude the possibility of fish of any kind ascending beyond the first dam. On some of the rivers there were accumulations of refuse lumber and slabs, which blocked up the bed of the river in some instances to the height of twenty feet. The rivers in all the other Counties were in a similar manner obstructed, and as in some localities the peculiarity of the stream rendered a fish-way destructive to the mill privileges, the Wardens failed in carrying out the law. Another important injury to the salmon fishery was adverted to in one of these returns, was the use of the small mesh net, which proved destructive to the run of salmon the ensuing season by taking the grilse or young salmon which had not attained more than one quarter of their growth. A nefarious practice was discovered in one locality of setting eel-pots at the tail of the mill-flooms, in which *bushels of young salmon were destroyed and given to the pigs.* The erection of brush-weirs completely spanning the river, and the setting of nets entirely across the stream, were practiced in many places without any dread of the law.

Such a deplorable condition of the valuable rivers of Nova Scotia which had a few years before teemed with the choicest fish, does the documents furnished to the Government in this year reveal, that no language can adequately describe it. The examination of every important river and stream in the Province by the wardens and their deputies, and the enforcement of the law, even partially, could not fail to initiate a new era in the history of our River Fisheries. A gentleman whose name has long been associated with our Inland Fisheries, was at this time appointed Supervisor for the County of Halifax. His suggestions to the Government were considered to be of great practical importance, and he was subsequently employed in several visits of inspection of the River Fisheries throughout different sections of the Province. We owe to the enthusiastic labor, in no small degree, of Captain William Charnley that our valuable river fishes have not ere this been utterly exterminated.

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The committee of the Legislature to whom were referred the eports of the Fishery Wardens, report to the house in the following year : " We are inclined to believe that this subject has hitherto occupied too small a share of public attention ; that its importance has been undervalued, and that the policy of the Legislature in the aws it has passed on the subject, has been little understood or ppreciated." This committee manifested so deep an interest in he subject before them, that they gathered from authentic sources much valuable information concerning the habits of the salmon and the manner of artificial propagation, and the answers to questions submitted to experienced persons, all of which was embodied in a pamphlet and published by the Government. They referred particularly to the answers of Captain Cheadle, as comprising information on the subject of our own fisheries not hitherto submitted to the public. As their data are still authentic and valuable, though twelve years have elapsed, I have deemed it important to reproduce the greater part of them in the Appendix (No. 1.) These facts are valuable because they are the result of personal observation of the rivers of Nova Scotia and their fisheries. I have before me a report of one of Capt. Cheadle's inspection tours, dated January 3rd, 1855, addressed to the Hon. the Provincial Secretary. He visited LaHave River, and found that a dam had been erected entirely across the navigable part, which was a complete barrier to the passage of the fish. In Pictou County he found the rivers to have been greatly benefited by the supervision of the Warden. In the County of Colchester, in Waugh's river, he found the river choked with slabs and edging, and the fishery nearly destroyed. French river, extending a considerable distance inland, was filled with rubbish of all descriptions. Both of these streams formerly abounded in fish of the finest quality. The rivers in the County of Cumberland were in a deplorable state. The river flowing into Pugwash harbor, formerly famed for its gaspereaux fishery, had for years been blockaded by a dam at the head of the tide-way. On River Philip, seventeen miles from the mouth, a dam extended entirely across. " Until of late years," he writes, " no stream in the world was more prolific in fish ; and the tales I heard of the multitudes frequenting it, appear almost fabulous. Words cannot describe the condition in which I found this river." Without attempting to justify the

criminal indifference to the preservation of the river fisheries, which the foregoing facts indicate, it may be remarked that the milling interest in the Cumberland river is justly deemed of the highest importance, and the peculiar conformation of the country causing great irregularity in the volume of water in these rivers, openings in the dams for the passage of fish are attended with more inconvenience than in other sections of the Province.

I find in the Journals of the House of Assembly another report of Captain Chearnley's in the same year, in which he relates the result of his inspection of the rivers in the County of Halifax. At Sheet Harbor, the North River had for years been blockaded; at Ship Harbor a weir had been erected across one of the streams flowing out of it; Charles River was completely stopped; Tangier River had a brush weir upon it, so as totally to intercept the passing and repassing of fish. Although Sackville River had been recently opened at its mouth, the fish that ascended the river were destroyed in a weir placed some distance up, and at Heffler's mill a dam obstructed the passage. The rivers flowing into St. Margaret's Bay were in a very unsatisfactory state, netting being carried on to an alarming extent. In some instances the fish had been wholly exterminated by excessive netting. In some rivers, however, as in the Musquodoboit, the Chezetcook, and the Preston rivers, that had been cleared of obstructions, the fish were beginning to increase greatly.

The Journals of this year (1855) contain a report of the Committee on Fisheries, which pays the following tribute to Captain Chearnley's zeal :—

"The Committee have carefully read and examined the report of Captain William Chearnley, Warden of the river fisheries for the County of Halifax, and it appears by such report that in many of the rivers under his control obstructions have been removed through his exertions during the past year, which formerly prevented the passage of fish up to their spawning grounds. By a report of a tour of inspection made last year by Captain Chearnley, on the state of the rivers and river fisheries in the Counties of Cumberland, Colchester, and part of Pictou and Lunenburg, it appears that many obstructions to the passage of fish now exist in the rivers in some of these Counties, which ought to be immediately removed; and the Wardens of Counties where such obstructions have not been removed, ought to be compelled to do their duty, or be removed from office. As it is most desirable

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that a reliable report on the position and state of the other rivers of the Province should be obtained, to enable the Legislature to adopt complete and uniform regulations for the protection of the river fisheries of the whole Province, besides affording the House such information relative to this most valuable source of Provincial wealth as cannot be obtained in any other way, the Committee hope the Government may be able to secure the valuable services of Captain Chearnley until this most desirable information is obtained."

The labours of Captain Chearnley were still confined to the County of Halifax, respecting which County he reports to the Hon. Provincial Secretary, February 7th, 1856. He refers to the abundant supply of codfish nearer to the coast, owing to the increased quantity of bait, caused by the opening of the rivers ; and to the increase of mackerel from the same cause. At Tangier River, the head-waters were, in the spawning season, literally swarming with salmon and trout. Salmon and trout, which were formerly abundant in this river, had, through excessive netting, nearly disappeared in 1852, and for years previously. This report contains some valuable hints for improving the laws for the regulation of the river fisheries.

The solicitude which the Legislature had evinced during three successive years, seems now to have abated, since in the short space of two years the whole legislation respecting these fisheries and their supervision, seems to have been referred to the County Sessions. The following is the report of 1858 :—

" The Committee on the Fisheries having carefully considered the subject referred to, beg leave to report as follows : They have examined the reports of the wardens of the river fisheries, and after mature deliberation they are of opinion that the annual grant to those officers of twenty-five pounds each from the public treasury, under Chap. 17 of the Acts of 1853, shall be discontinued, and they therefore report a bill to discontinue such grant, and to authorize the Sessions in the several Counties to make regulations for the preservation of the river fisheries."

The action of the Legislature seems to have created a general discouragement and apathy, and the prospect of a return to the old state of things, as the Sessions were well known to be either unwilling or incompetent to carry out the provisions of the law. The Society for the Protection of the Fisheries seems to have par-

ticipated in the general apathy, as it soon declined and became practically defunct—to be resuscitated in 1865, after six years of inaction.

One looks in vain through the Journals of the Legislature, during the period of six years, for any legislative action regarding the river fisheries. In 1860, the late M. H. Perley, visiting, in the discharge of his duties as Fishery Commissioner, the Marguerite River in Cape Breton, forwarded a communication to His Excellency the Earl of Mulgrave, depicting the lamentable condition of that river, obstructed by weirs and other contrivances. "In general, these fish traps," he remarks, "when in use, appear to have fully occupied one-half the river, and now that the water is low, several extended across the whole channel, obliging my party to cut away portions in order to get through with the canoes. The number of these fish traps was so great as to induce me to believe that, besides being fished in a most improper and unfair manner, the river was greatly over-fished. By the regulations of Sessions in the County of Inverness, it is forbidden to turn the mouths of the fish-traps upwards in order that they may take gaspereaux after spawning, on their return to the sea. About two miles below Lake Ainslie, I met traps with the wings turned upward. The first three were of stakes and brush. The fourth was of heavy stones, the wings extending from bank to bank. It would be difficult for any fish descending to escape this trap, which seemed to have been constructed carefully and with much labor. The fifth weir was of brush and stakes, so obstructing the channel that it had to be cut away. The sixth, seventh, and eighth were not completed, and at these I saw a man at work driving stakes, who fled at my approach. The ninth, tenth, and eleventh, were above a piece of still water; they were nearly or quite finished. The man who was at work at them evidently knew they were against the law, as he left his shoes and stockings in the hurry of his flight. The twelfth weir was at the swift water below the lake, and occupied the breadth of the river, having several channels laid up with stones on either side to lead the fish to two or more traps. But few gaspereaux have been taken in Lake Ainslie this season, and those that did reach the excellent spawning ground at the outlet of the lake could scarcely be able to return to the sea again, owing to the reversed weirs. Besides preventing the return of these useful fish to the sea, the

reversed weirs are said to destroy large quantities of fry on their descent to salt water from the spawning grounds."

The foregoing facts are on the testimony of Mr. Perley, which prove that the oversight of the fisheries by the Quarter Sessions is ineffectual, for there was at this time a Fishery-warden for the southwest branch of the Marguerite, appointed by the Sessions. Mr. Perley remarks with truth, that instead of being paid he ought to have been punished for the non-performance of his duties. The letter concludes with expressing "the full hope that measures will be taken by the Government of Nova Scotia to preserve the valuable fisheries of the River Marguerite, and punish the parties attempting to destroy them." It is not improbable that the members of the Legislature were in some degree guided to their decision to discontinue the payment to wardens from the treasury, because of such neglect of duty as is here exposed.

In the Journals of 1864, I find a valuable paper on the subject of our river fisheries, over the signature of Hon. A. G. Archibald, who was then Chairman of the "Law Amendment Committee." It is concerning a bill submitted to the Legislature with reference to the river fisheries. It treats of the criminal neglect of the fisheries, and urges the employment of the most energetic means for their restoration and protection. It recommends the spreading broad-cast among the people such information as to the habits of the fish, and the necessity of protection, "as will enable them to appreciate the policy on which our legislation is founded." It suggests the adoption of ladders, such as were being used in Great Britain with success, and recommends that private parties should be encouraged to obtain possession of our rivers, with a view to experimenting in matters connected with the conservation of fish and the protection of the river fisheries. The Committee also advised the Government to offer a prize for the best essay on the habits and natural history of the fish resorting to our rivers, their protection, propagation, &c., and to publish and distribute the same extensively in the Province. This report will be found *in extenso* in the Appendix (No. 2.)

In the following year (1865) the suggestions of the Committee respecting fish-ladders were taken up by the "Game and Fisheries Protection Society," when a model of the ladder was prepared and submitted to a Committee of the Legislature, who recommended

that it be adopted, and a similar model sent to the Clerk of the Peace for each County or District in the Province, and that provision be made in the law to make the use of such fish-ladder imperative ; and that a penalty be enforced against any person taking any fish within them, or within a distance of sixty yards from them.

It has been found that the particular ladder selected is not suited to every locality, and the Society at a recent meeting, on discussing the question of ladders, urged the necessity of obtaining more information concerning the various forms of ladders that have been found effectual in other countries where a diversity of topical difficulties precludes the use of ladders of one description only.

Under this section it will suffice to add, that the testimony concerning the continuance of obstructions in many rivers throughout the Province, obtained through " Official Circulars," referred to in the pamphlet on the " Shore and Deep Sea Fisheries," is conclusive of the necessity of the most stringent measures being still required to save our river fisheries from total destruction.

FISHERY PROTECTION SOCIETY.

A Society called the " Provincial Association for the Protection of the Inland Fisheries and Game of Nova Scotia," was founded in Halifax in 1853. This society was initiated in the same year that unusual interest was manifested by the Provincial Legislature in the subject of our river fisheries, which I have already referred to. The institution of this society has had a beneficial effect in urging upon our Legislature from time to time to adopt more active measures for the preservation of the inland fisheries. The early history of the society was marked with singular activity in carrying out its object ; and though it has suffered an interval of inactivity, it has again renewed its vigor, and has, within the last three years, without any legislative assistance, succeeded in restoring certain rivers in the Province, especially in the County of Halifax, to a hopeful condition. If the society languished, it was for want of funds to carry out its schemes. It has throughout enjoyed the knowledge and experience of a gentleman already referred to as its President, and has had other military gentlemen, and some of our most influential citizens as its members and managers.

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Among other efforts, the society has published valuable papers relating to the Inland Fisheries, for general circulation, and at convenient intervals has published a report of its labors. Finding that efforts of this kind were ineffectual in arresting the declension of the fisheries, and that in the community generally the most lamentable apathy existed, its managers resolved to appropriate its limited funds to the employment of overseers in rivers in the County of Halifax, to carry out the laws which the Sessions neglect to enforce. As the result of the activity and determination of these overseers, directed by the Council of the Society, the report of 1865 shows that the fish-ways and mill-dams in Musquodoboit River were opened, and a large number of salmon had ascended the river; on Cole Harbor and Lawrenceetown Rivers, proper gates were made in the dams, and the run of fish was extensive; Indian River had been well attended to, and during the season very many fish ascended the waters. The report of the Society for 1866 will be found in the Appendix (No. 3), which exhibits the improved condition of the principal rivers in the County of Halifax, effected wholly through the exertions of this Society.

During the recent session of the Legislature, a deputation from the Society were granted a conference with the Fisheries Committee, who at their instance, recommended to the House the appointment of an efficient Inspector of Inland Fisheries for the whole Province. This suggestion, though acted upon by the House of Assembly, was defeated in the Council, who deferred the bill on the ground that the Inland Fisheries would in a short time be transferred to the control of the General Government of Canada. Extracts from the report of the Fisheries Committee, recommending the appointment of an Inspector, and eulogizing "the disinterested and useful efforts" of the Society, is produced in the Appendix (No. 4.)

LAWS RELATING TO RIVER FISHERIES.

The following clauses constitute an abridgement of the laws of Nova Scotia for regulating the River Fisheries:—

"Any person taking salmon in fresh water westward of Halifax harbor between the 31st day of July and the 1st of March, or in fresh water eastward of Halifax harbor, or in the rivers of the Bay of Fundy or Cape

Breton, between the 15th day of August and the 1st of March, is liable to a penalty of Forty Dollars.

"Bag nets shall not be used in any river or harbor, nor within a mile from the mouth of any river under a penalty of Forty Dollars.

"No nets shall be set or allowed to remain set between an hour before sunset on Saturday, and an hour after sunrise on Monday, under a penalty of Forty Dollars.

"Any person spearing salmon or sweeping with a net therefor in water, is liable to a penalty of Forty Dollars.

"Nets shall be placed only on one side of a river, shall not extend more than one-third across the same—shall not be placed nearer than an eighth of a mile to each other, nor nearer than an eighth of a mile to any dam.

"Every dam shall have a sufficient fish-way, which shall be kept open during the months of March, May, June, and July. The owner or occupier is liable to a penalty of Forty Dollars for every time he shall close such passage.

"The owner of a mill who, after September, 1865, shall neglect or refuse to construct a fish-way, according to a pattern to be seen in the office of the Clerk of the Peace in each County, is liable to a penalty of One Hundred Dollars, and if within ten days after notice given he does not construct such fish-way, he is liable to have the dam wholly prostrated."

The foregoing clauses are abridged from Chapter 95, Revised Statutes, which contains some additional provisions, defining the power of the Sessions and judicial proceedings in the event of violation of the laws. The last clause, which provides for the construction of a fish-ladder, is from an act passed in 1865, which requires its introduction into all the rivers of the Province, where a third of the main channel is not left open. This clause was, however, repealed by act of the Legislature of 1866, except as regards the County of Halifax, and the Clyde River, in the County of Shelburne. This act of 1866 also conferred more unrestricted powers upon the Sessions throughout the Province, virtually rendering them independent of any control by the existing laws concerning the river fisheries.

Judging from past legislation, and from the opinions of certain members of the Legislature, during the recent discussion of the bill which was presented by the Fisheries Committee, there is a prevailing desire to leave the control of the river fisheries to the County Sessions. Such supervision, facts have too clearly proved, is not effectual to arrest their decline.

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FISH LADDERS.

It is well known, and has been already remarked in treating of the habits of fishes, that fish are endowed with great power, which enables them to leap a perpendicular height to overcome obstructions in their way to the spawning ground. The salmon has been known to leap a perpendicular height of ten or twelve feet. When the obstruction is too high, and by repeated leaps they fail to surmount it, the fish fall away exhausted—perhaps discouraged—among the rocks, and become an easy prey to their enemies.

In England and Scotland the decrease of salmon had become so alarming, owing in a great measure to obstructions in rivers, that remedies were devised to save the streams from total desertion; one of which is the fish-ladder, which has been introduced into our Province with partial success. These ladders are described as rendering the highest dams passable to the fish, and being simple in their construction, present no obstruction which a fish of ordinary ambition would regard as anything. One kind is constructed like a simple stair, presenting a regular ascent by a series of steps. Another form, which is more generally adopted, is an inclined plane, with projecting sides, of a convenient height, to which at regular distances, cross pieces are attached at right angles, reaching rather more than half-way across; spaces, occurring alternately on either side, for the passage of the water, a serpentine direction is given to the stream, which affords more scope to the fish's movement in his efforts to ascend.

In the growing interest which attaches to the protection and culture of fish both in Europe and America, the question of fishways is being thoroughly canvassed. The object sought to be attained is to combine the greatest effectiveness with the least cost. In some localities a wooden ladder is not of sufficient strength to resist the force of the water, especially after a freshet. A gentleman who resides near one of our northern rivers has assured me that he has seen the cross-pieces of one of the ladders recently introduced by authority of the Legislature, fly into the air like an arrow, on the rush of the water at the freshet season. In such a locality it appears that nothing less durable than the more expensive ladder that is used in England will suffice to resist the

impetuous current. The writer is indebted for a description of the English ladder to papers and correspondence kindly furnished by Captain DeWinton, A. D. C., Private Secretary to Your Excellency.

Of this information, I have before me an article from the new periodical entitled "Land and Water," by Mr. Frank Buckland, who succeeds the late Mr. Ffennel in the office of Inspector of the English River Fisheries; and a private letter from that gentleman.

The article in "Land and Water" is rendered more instructive by an admirable engraving of a fish-ladder, such as is used in England, "from which," Mr. Buckland remarks very truly, "more may be learned about a salmon ladder than by reading a dozen columns of print." The writer laments that all our books and treatises intended to excite a more general interest in the resources of our country, must of necessity lack the almost essential adjunct of diagrams and illustrations. To recur to the ladders, and to Mr. Buckland's descriptions and comments:—

"Arriving at the foot of the weir, the fish hunts up and down the edge of it with his nose, till he finds the water coming down at the foot of the ladder. He immediately goes in through the gap into the first chamber, then round the corner into the second, third, fourth, and so on until it arrives at the top opening of the ladder, whence it swims out into the main stream as easily as the cat goes in and out of the hole cut for her accommodation in the granary door. The walls of the ladder should be from eighteen to twenty inches high, and may be made of stone or wood, the cross-pieces, technically called the steps, should be eighteen inches high, and are better made of cast-iron than anything else. Each chamber shall be four feet square at least, and when there is one foot of water in the ladder the fish can go up with ease. The angle of the ladder, from the top of the weir to the water below, should be at the incline of not less than one in five—one in six or seven would be better. If it is steeper than this, and the run a long one, the fish may not be able to stem the torrent of water, and be able to get up. This fault is too often committed by engineers when they erect salmon ladders in too upright a position."

A detailed plan of the Government ladder used in England has been handed me by Captain DeWinton, from which I carefully note the dimensions of the several parts:—Thickness of side walls, 2 feet; width of bed, 5 feet; the cross-pieces extend to within

9 inches of the sides, and are about $5\frac{1}{2}$ feet apart. The openings for the admission and exit of the fish, at the bottom and top, are 12 inches wide, situated in the centre of the uppermost cross-piece; and in the centre of the wall at the foot of the ladder, widening outwards like the loop-hole of a fortress. The ladder thus described is for a weir 30 feet broad and 6 feet high. The slope is one foot in five, the ladder being 6 feet high and 30 feet long. The bed is composed of brick set in concrete; the walls are of solid masonry, the upper end terminating in two tri-angular sides, to serve as an ice-breaker. These ladders seem to embrace everything that could be desired for elegance and durability; but, Mr. Buckland justly observes in a private communication, "These Government ladders are very expensive things," and as a suggestion in adaptation to our resources, he adds, "My own idea, therefore, is to make them, if possible, in a much more rude way, and with material cheap and close at hand. My plan would be to form, if possible, a series of artificial pools alongside, or even in the middle of the weir, by placing down big stones, and fixing in between these stones, boards or rough trees. The water would be collected by the obstruction, and the fish would jump into, and then out of it, so that the fish would go from one pool to the other without any difficulty whatever. These artificial pools need not by any means be in a straight line; the fish would be sure to follow the current from one pool to the other."

This simple contrivance would appear to be admirably adapted to many of our streams where the obstruction is not formidable, though probably not so well suited to those where carefully constructed weirs or dams present a more insurmountable obstacle to the passage of fish.

We cannot, and need not, introduce such expensive ladders as are erected in England; but there is no doubt that much improvement might be made in the construction of our ladders with but little additional expense; as well as the introduction of modifications to suit various localities. The following extract, from the act of 1865, describes the ladder that is in use in certain rivers in Nova Scotia:—

"Such fish-ladder shall have a slope of not more than one foot in seven; shall have an opening of not less than three feet in width at the top of the dam, and shall be so placed that there shall at all times be at least one foot

in depth of water running over the mouth thercof ; the bottom of such ladder to be water-tight and to be covered with stone, and at every six feet, pieces of wood or stone to be fastened at right angles to the sides thereof, and to be secured to each side alternately, so as to make the current of water flow from side to side,—the openings to be not less than one foot in width, and the pieces of wood or stone so jutting out from the sides to be not less than two feet in height ; the lower end of such fish-ladder to be secured to the bottom of the main channel of the river, or otherwise shall be conformable to the model of the fish-ladder now deposited in the office of the Provincial Secretary."

If this ladder has any defect, as compared with the ladder used in England, it must be the want of a more easy approach for the fish to the lower opening. This is a great desideratum, as the fish will beat about the foot of the ladder, vainly seeking ingress if the entrance is not sufficiently inviting.

Before dismissing the subject of fish-ladders, I will add a description of a Norway ladder, to which Capt. DeWinton has directed my attention, invented by a Mr. Hetting, which is spoken of as second to none that have been projected ; and is noticeable from its practicability and cheapness. "There is no country perhaps in the world," remarks the writer who describes this ladder, "where nature has placed so many impediments in the way of the salmon, as it re-ascends its native stream, in the shape of fosses, and rapids, &c." This ladder is professed to be copied from the natural passages which are discovered by the salmon in its instinctive tendency to ascend to the pure waters near a river's source. "Before proceeding to speak of my proposed salmon-ladder," says Mr. Hetting, "I will merely remark that whenever a passage can be made by means of mining, &c., I think it is preferable. But in most cases mining is not feasible. My salmon ladder, then, consists of wooden troughs, and boxes alternately arranged. The topmost trough is so placed as to receive the water from the crest of the fall, or else arranged so as to receive it directly from the river or lake some little distance above it. The course in each trough is even throughout, and is in one unbroken straight line. The troughs and boxes are made of three-inch plank ; and the corners of the latter are bound with iron. Each trough is twelve feet long, three feet wide, and *three feet* deep. The boxes are eight feet long, six broad, and five deep. In order to retard the force of

water in the boxes, the incoming and outgoing troughs are arranged so as not to be directly opposite to each other, but as nearly as possible in the opposite corners." Among the advantages which this ladder possesses, it is thought that the effect of the force of the stream being broken by the boxes, will cause the current in the troughs to be retarded a little distance above where they debouch into the box, by the resistance of the water in the box, and thus it will be easier for the salmon to ascend, and will contribute to the troughs being capable of receiving a greater inclination. Three feet in twelve is considered to be the right inclination. The topmost trough, if above the fall, may be supplied with a trap-door to regulate the supply of water. The lowest trough must always debouch into the river below the fall, in a direction exactly contrary, or at all events at an angle to the current, and never in the same direction as the current. The nearer it is to the foot of the fall the better, and the more readily will the fish seek to run up to it. Another advantage ascribed to this ladder is that it can be easily moved, so that in case it has been set up in a place which is not favorable to the ascent of the fish, it can be moved to a more likely spot with very little difficulty.

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CHAPTER IV.

ARTIFICIAL PROPAGATION OF FISH.

It is very generally supposed that if our rivers were freed from obstructions ; if the proper seasons for fishing were observed ; if no destructive mode of capture were pursued ; and if the laws were universally respected, our rivers would teem with fish, so as to render artificial propagation wholly needless. This is an error. If all the ova deposited were impregnated, and allowed to arrive at maturity, the quantity of fish, it is true, would soon become prodigious. The late Mr. Ffennel, the Inspector of the British River Fisheries, demonstrated that this is not the case. "In the first place," he states, "much of the ova is not impregnated ; another large proportion is lost, the fish fail to cover in the gravel, when the ova are carried away by the current. Again such of the ova as germinated is attractive to trout and wild ducks which feed immensely upon it. So many accidents, too, befall the fry while moving through flood and field in their descent to the sea, and they meet with so much voracity there, that a promising progeny of 10,000 is perhaps decimated, and redecimated almost to extermination."* If this be true, which is supported by abundant testimony, the desirability of propagating fish, which is being so successfully pursued in Great Britain, France, United States, and in Canada, should be considered in Nova Scotia.

It is to Count Von Golstein, a German naturalist, that the scientific world is indebted for this grand conception ; although the ancient Greeks and Romans, and even the Egyptians paid extraordinary attention to the breeding of fish. Von Golstein proved the truth of his discovery by a series of successful experiments. Another German naturalist, Jacobi by name, made, a few years later, similar experiments with a like result ; and going a step further, he actually caused the milt to breed fish from the eggs of a *dead* female. At a later period, experiments were made in Scot-

* Trout will eat one another; a trout of twelve inches will eat one of six and think nothing of it, and this no matter how well he is fed.

land and England with success. The discovery thus far was considered little more than a simple scientific experiment. It never entered the minds of *savans*, that the discovery was of practical and commercial importance, instituting a new branch of commerce, which would add greatly to the national wealth, give employment to thousands, create an inexhaustible supply of cheap, nourishing, and wholesome provisions for all classes of the people, and be to rivers and waters, what agriculture is to land. For this glorious and simple idea, the world is indebted to two humble fishermen, named Gehin and Remy, of an obscure village in the department of Vosges, in France. They conceived the idea from watching the trout during its period of spawning, and were incited to try the experiment because of the gradual decline of the valuable fisheries which formed the principal support of the population. The first experiment was made in 1841, with triumphant success. This was followed up from year to year, until the attention of the Academy of Paris was directed to their operations. The Academy, seeing at once the immense national importance of the two fishermen's proceeding, hastened to call the attention of the Government to it. The Government, on its part, after making proper inquiries and finding all that was said was true, resolved, as was plainly its duty to do, to have the system applied to all the rivers in France, and especially to those in the poorer Provinces. Gehin and Remy were accordingly summoned to Paris, and taken at once into the employment of the Government at good salaries; their duties being first to stock with fish, by their system, such rivers as should be pointed out to them, and next to teach that system to the peasantry. In the course of a very short time, Messrs. Gehin and Remy, by the application of their system, succeeded in introducing several millions of trout into the rivers and streams of the Vosges, and stocked streams and rivers in every part of France.

Gehin and Remy continued to make important improvements in their system, and an eminent French naturalist, M. Coste, devoted much labor in perfecting the system already invented. The publications of M. Coste have attained a wide celebrity amongst fish-breeders in Great Britain and United States. There now are numerous publications both in England and America which fully treat of the subject of fish breeding; and it is now recognized as a

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Desirous to obtain a description of the most improved mode of breeding fish, I requested Mr. Andrew Downs, before leaving for the Paris Exhibition, to obtain for me the latest information upon the subject; and, at the same time, both in England and France, to endeavour to get an insight into the practical operation of the system. Mr. Downs has brought out a valuable chart containing a detailed description of the mode of propagation in France, illustrated by a great number of diagrams, in a progressive series, from the expression of the ova to the perfectly formed fish, including a pictorial representation of the different implements that are used for fecundating the ova, conveying the ova from place to place, &c. The verbal description (which is a brief treatise on pisciculture), I have translated, and inserted it in the Appendix (No. 5). With this chart, and the information which Mr. Downs was privileged to obtain, from conversation with Mr. Buckland the Inspector of British Fisheries, and other gentlemen of knowledge and experience in pisciculture, he will be prepared to try his success in stocking rivers in Nova Scotia, either for enterprising individuals or in conjunction with any Government officer who may superintend this department of our natural resources.

The following extracts will show how pisciculture has succeeded in other countries besides France:—

(The River Tay in Scotland.)

An article taken from the "Field," shows what proper protection and artificial breeding has done for one river in Scotland:—

"What Stormontfield has done is this: It has from 300,000 ova each year, increased the rental of the Tay ten per cent. Before the experiment, the average annual take of salmon and grilse was 70,000; it is now 80,000, and is still on the increase; 10,000 fish, the increase, are worth £3,000. When we consider the very small number of fish from which this great increase is derived, the result can be considered nothing short of wonderful. The number allowed to escape for reproduction in the Tay is calculated at 40,000. Of these only about twenty-five females are required to stock the Stormontfield breeding-boxes. It must indeed be a small river in which you cannot capture 25 salmon, and these, if properly managed, can be made to produce 10,000. This gives us some idea of the dormant wealth of our salmon fisheries."

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(*The River Moy, in Ireland.*)

"The river Moy, in Ireland, on account of a high fall near its mouth, was destitute of salmon. Certain persons obtained a long lease of the river, and immediately cleared the stream of all fish injurious to the salmon. Their leases from the riparian proprietors empowered them to kill all fish that injured the salmon, and people were a little surprised when they saw the pike and trout almost destroyed. These gentlemen made several little brooks and spawning grounds, and placed 200,000 ova in them. The consequence was that the fry went down the fish-way, which had been built at the falls, and came back again the next year to their native waters. The fifth year after the river had been leased to them they cleared £26,700 from the salmon they caught—a sufficient proof that money can be made out of the fishery of almost any river well managed and preserved".—*Report of Game and Fishery Protection Society.*

(*Pisciculture in Canada.*)

"Our attention was on Wednesday called to a subject of no small interest and importance, by a gentleman who brought to our office a number of very lively little animals, which he exhibited in a glass jar partially filled with water, where they disported themselves after a most frolicsome manner, and were evidently in the enjoyment of abundance of vitality and vigour. These little creatures were nothing else than young salmon—which had been artificially hatched by Mr. S. Wilmot, of Newcastle, who has for some time been devoting considerable attention to the propagation of fish, and has at length, after much perseverance and many carefully conducted experiments, met with very gratifying success. The specimens he brought to this office were produced from ova taken in the fall from salmon in a small stream in the township of Clarke, known as Wilmot's Creek, which runs through that gentleman's lands and falls into Lake Ontario. Having obtained from the proper authority permission to capture the salmon, which at that period of the year are out of season, Mr. Wilmot succeeded in hatching the ova of four female salmon. A number of others, which he had also captured and confined in a small house erected for the purpose, were wantonly destroyed by ill-disposed neighbors; but from these four he has obtained between 20,000 and 30,000 young salmon, all of which were hatched in small boxes in Mr. Wilmot's dwelling house. In the present state of their growth (about 12 days old) they exhibit a very singular appearance. They are about an inch long, having the general outline of a fish, with the addition of an appendage to the under part of

their bodies, consisting of a bag filled with an oily-looking fluid, which is, in fact, the store of food for the little creatures during the first six or seven weeks of their existence. This fluid is analogous in some respects to the yolk in a bird's egg. The contents of the sac, as the young fish grow, become generally absorbed, and when the age above mentioned has been attained, it has altogether disappeared. For some time after being hatched, the young salmon have a transparent, jelly-like appearance, and the whole of their organization is extremely beautiful and delicate. So transparent is their structure that the heart and bloodvessels can be distinctly seen. Their budding gills and fins are of the most delicate and fragile texture, yet their motions are extremely quick. Altogether, they present a very curious and interesting study to the naturalist. * * * * *

The subject is one of great importance, and one to which the attention of the Government should be directed, either in taking up the matter themselves, or in affording every encouragement and facility to enterprising individuals who, like Mr. Wilmot, are prepared to turn their skill and experience in this direction, and thus render their countrymen a very important service."—*Toronto Globe*.

The foregoing examples of successful pisciculture might be indefinitely multiplied, as this interesting science has become as practical in its application to national industry and wealth as the breeding of stock. And the breeding of fish might easily be made as productive in money value as the breeding of the animals of the farm. It is estimated that 400 tons of salmon is equal in weight to 15,000 sheep, and in value to three times the number. The Tay yields 800,000 pounds of salmon, of the value of about £60,000 sterling. The yield of the Spey, a kindred river, is greater in weight than that of the mutton of several counties.

In Canada, where the legislation of recent years has framed enlightened and energetic measures for the restoration of the river fisheries, exclusive privileges are granted to private individuals who may be disposed to engage in the artificial propagation of fish; the use of streams or portions of streams being secured to them by legal protection.

It is to be hoped that the general laws which may be created for the regulation of the inland fisheries throughout the Dominion of Canada will contain this provision for our benefit, in common with our fellow-Colonists; and that it may stimulate enterprising Nova Scotians to a laudable zeal in embarking in so profitable an employ-

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ment. The experiment is attended with but little cost, and might at first be tried in the smaller streams, perhaps in a stream on some private estate.

A writer on the breeding of trout, remarks:—"Those who are so fortunate as to have running water through their grounds, may rear trout to be as familiar and fearless as chickens. A few years since, in Dorchester, U. S., a gentleman had a large number in a brook flowing through his garden, that would come at his call to be fed, and manifested what seemed almost human consciousness. They were in the cool shadows, and at the sound of his voice the surface of the water would be agitated by the finny expectants, and when the food was thrown in, they would leap eagerly to catch it." It has been proved by actual test, that a trout will grow the first year from four to seven inches, and at the age of five years, if undisturbed, will be from thirteen to fifteen inches long. It is seen from a perusal of the paper on pisciculture, in the Appendix, how easily the spawn of trout, after impregnation, may be conveyed from one place to another, and the brooks be stocked with healthy fry.

A single extract will suffice to describe the interesting operation of trout raising:—

"A writer in the *New York Times* gives an account of a visit to the trout premises of Seth Green, in Caledonia, Livingston County, N. Y., a few miles South of Rochester. Mr. Green is an old angler—a man who has thrown a fly eighty-four feet, at a State sportsmen convention,—and so takes naturally to the business of breeding fish. He has been fortunate in securing the Caledonia Creek, which is fed by mountain springs, never freezes, and is never affected by either drought or freshet. He began operations in August, 1864. The writer says:—

"Here, in the circuit of a few rods, are his hatching houses, his ponds for the infant trout, his preserves for those of larger growth, and his own residence. Hard by flows the creek, unchangeable in volume and temperature, and still furnishing the rarest sport for the lover of the angle. This creek is now in private hands, and only those who hold a license, procured for a single day for a dollar, can fish in its waters. Time and care have increased the multitude of fish, and now a day's fishing in waters once well nigh exhausted brings a sure reward of the pleasant toil.

"I shall not attempt to describe the "manufactory" or the "preserves" of Mr. Green in detail, but must content myself with a few general remarks.

The hatching house is a small building, roofed over and filled with rows of shallow troughs, lined with gravel. Into these he places the ova of the trout, and over the spawn there constantly passes a fresh supply of water. In a few weeks the ova hatch, and thousands of minute trout appear. These are fed on boiled eggs reduced to fineness, loppered milk, &c., and after a certain time removed to ponds in the open air, where they are fed and grow apace. As they increase in size they are removed to other ponds or reservoirs. Mr. Green has ponds for the infants, ponds for the yearlings, and ponds for those of larger growth and maturer years. In some of these ponds the "speckled beauties" are innumerable. Varying in weight from half a pound to two pounds, they dart through the water, disclose their variegated sides, and leap into the air in pursuit of food, in the very ecstasy of life. The older trout are fed on liver cut up fine. It is a rare spectacle to see them feeding. Cast a few handfuls on the quiet surface of the water. In a moment it is all alive with activity. The surface is lashed to a foam. The sparkling drops fly in every direction, as the eager fish struggle and contend for the food which is so gratefully received by them. It makes one envious to look into these ponds and see the thousands of trout so carefully watched and guarded. Whatever may be their future, they are certain to be kept away from the table for some time at least. Mr. Green catches his trout in the open stream, and leaves these tenderly reared fish unmolested and unharmed. Meantime his profits arise from the sale of young trout for stocking ponds. These he sells at \$50 per thousand—rather a high price—and sends them safely in cans of his own devising to fill orders. The natural increase of trout is very great, and if the spawn and the young run no peril from their numerous enemies, the waters would be soon thick with fish. A two-year old trout will yield from 200 to 400 spawn; a three-year old from 800 to 1200; and a four-year old from 1200 to 2000. In the spawn beds the immature fish are exposed to the ravages of other fish, to freshets, to the deposit of sand or saw dust, and a thousand other "natural ills." After the young fish are born, they are the prey of piscine foes, are killed out of season, are poisoned by the outcome of factories, and lead generally a very uncertain existence, so that not more than ten per cent. reach maturity. Under the artificial system of rearing, about 95 per cent. may be saved. Yet calamities follow these. Only a few days since a hail storm heaped the shores of these little ponds with the cadavers of thousands of these small trout."

The writer, before concluding his account, recommends trout-breeding as a very profitable business, adding, "a few thousand dollars of outlay, two years of watchfulness, and the crop is ready for market."

GENERAL REMARKS AND HINTS.

Fishery Laws of Canada.—In the preceding pages I have given a *résumé* of Provincial legislation on the River Fisheries, with an abstract of the laws at this moment in force. As all our fisheries will soon be placed under the control of the Dominion of Canada, it is most probable that the laws of the several Provinces will be assimilated; and as more vigorous measures have long been adopted by Canada for the protection of her River Fisheries, we may expect to see any more beneficial enactments that Canada may enjoy embodied in any general Act that may emanate from Parliament. Among the enactments that are peculiar to Canada, are in substance the following:—

The Governor in Council may make any regulations that may be found necessary for the better management of the fisheries.

The close time for salmon is between the 31st July and the 1st May.

Fly-fishing is permitted between the 30th April and the 31st August.

The taking of fry, parr, and smolt, is prohibited; and grilse or salmon under three pounds weight, when taken in nets, are to be liberated.

Meshes of nets used for capturing salmon, to be five inches in extension.

The use of nets or other apparatus to be confined to tidal waters, except by special license from the Commissioner of Crown Lands.

No salmon to be captured within two hundred yards of the mouth of any stream which salmon frequent to spawn.

Any person throwing deleterious substances into any river, shall incur a fine not exceeding one hundred dollars; and saw-dust or mill rubbish shall not be thrown into any stream frequented by salmon or trout, under a like penalty.

The owner of a mill-dam is required to bear one-half the expense of constructing a fish-way; and half is borne by the Government.

The Commissioner of Crown Lands may authorize to be set apart, and may grant leases for any river or water for the natural or artificial propagation of fish.

Leases and Licenses.—In Canada, where nearly all the productive rivers in which salmon are to be found run through remote wild lands, and are the property of the Government, fishing leases or licenses are issued by the Commissioner of Crown Lands, for a

term not exceeding nine years, and for a longer term by order of the Governor in Council. In the Lower Provinces, where proprietary rights are largely involved, the license system would in most localities be attended with insurmountable difficulties. There are, nevertheless, two aspects in which the payment of royalty for river privileges is advantageous. However repugnant to our cherished ideas of common right in the property of fish, facts have proven that this right has been shamefully abused ; that the most reckless and even wilful destruction of fish has been pursued ; and that the ignorance or wilfulness of the many has well nigh destroyed the bird, and that we have all but lost the glittering egg. Fishing being confined to fewer persons, who pursue it as a chosen employment, with proper guards against the evils that existed when the rivers were common property, the interests of the whole community are likely to be better promoted. The other aspect is that of revenue ; and it is in all respects as just that the revenue should be augmented from a sovereignty in rivers as from a sovereignty in the lands through which they flow.

Inspectors or Overseers.—The appointment of Overseers in Canada is vested in the Commissioner of Crown Lands. This centralization system is vastly superior to ours, where the wardens are appointed by the Sessions. But even this system does not dispense with the necessity of one active Supervisor of experience, and, if possible, of scientific knowledge, as recommended by the Committee on the Fisheries in their Report to the Legislature.

Fish-ladders.—As to fish-ladders, Mr. Buckland has remarked concerning the United Kingdom :—"The great advantage of these salmon-ladders is, that they have overcome the great difficulty which formerly existed, namely, the non-interference with the mill power of the country, and at the same time allowing the salmon to pass from the upper to the lower parts of the river." We have not yet overcome this difficulty in Nova Scotia. There still exists, and will continue for some time to embarrass our legislation, a contest in many localities between the mill interest and the complete and successful restoration of our valuable rivers. It has been already remarked, that intelligent men who reside in our northern counties affirm that the application of the law to those rivers, owing

to the inequality in the volume of water at various intervals, would compel them to stop their mills wholly. On the Atlantic coast, too, there are said to be some impracticable localities. Hence the importance of an efficient Inspector, who could examine these places, and report to the proper authorities. It would be impolitic to stir up a war between fish and lumber, because both are necessary ; we must build ships and houses, and we must obtain fish in plenty. We can do both.

Propagation of Fish.—I have not discussed the question of acclimatising foreign species of fish, which might be accomplished with advantage to our fisheries ; but the subject of artificial propagation has been considered at more length than, in the estimation of many, it demands in the present condition of our fisheries. The unusual abundance of salmon the present season, owing, it is believed, mainly to the excessive winter's rain that has swelled our rivers, will seem to strengthen the prejudice on the side of the sufficiency of natural increase. The system of pisciculture, however, judiciously prosecuted, would overcome the fluctuation which the natural supply suffers in successive years. It would render our annual returns a certain and an increasing quantity ; never, however, probably, to reach again the point where it was stipulated in the indentures of an apprentice that he should not be fed more than twice a week on salmon. One of the Reports of the Fishery Protection Society indulges, however, in the following prediction :—“The time will soon arrive when the breeding of fish will employ as much capital and labour as the breeding of stock ; when the rivers of this Province will be estimated of more value than the lands they drain, and be as jealously guarded from injury as the dykes that protect the marshes of King's County.”

Statistics.—It is quite impossible to ascertain the progress or decline of the River Fisheries from the annual statistics. Even if the Trade Returns afforded a correct exhibit as to quantity, their arrangement is such that data cannot be obtained concerning each description of fish—alewives being classed with herring, shad with mackerel and halibut, and salmon with trout. This is an oversight that must be remedied, as each of the fisheries that are thus grouped with others are of sufficient importance to be kept apart.

But if thus separated, we could not ascertain the catch of salmon, since a large proportion of the export of salmon is previously imported from different localities in the Gulf of Saint Lawrence. The only data that approximate to accuracy are the Census Returns. Taking the figures in the Census of 1851, and comparing with the Census of 1861, we find the following result:—Salmon cured in 1851, 1369 bbls.; in 1861, 2481 bbls., and 2738 smoked salmon. Shad cured in 1851, 3536 bbls.; in 1861, 7649 bbls. Alewives cured in 1851, 5343 bbls.; in 1861, 12,565 bbls. With respect to salmon and shad, the foregoing figures prove no more than that we have held our own; because the home consumption has decreased, as it has been found profitable to export them. With alewives, the statistics afford a more correct estimate, because they have never been largely consumed at home.

Exportation.—The statistics of exportation, as regards salmon, may serve to show the general decrease in the salmon fisheries of the British Provinces, as all the salmon exported from Nova Scotia that are not taken in its own rivers are captured in the Gulf of Saint Lawrence or the Newfoundland and Labrador coast. In 1860 the value of our total export of salmon was estimated at \$96,184; with slight variations, it decreased in 1865 to \$62,117. From 1860 to 1865, the value of the exports declined about \$34,000. But while salmon to the amount of \$62,117 were exported in 1865, the imports amounted to \$42,588; estimating, therefore, their value as \$20 to each bbl., it would make the *export* of salmon caught in Nova Scotia to be 1,000 barrels—about one-half the whole quantity cured. Large numbers of salmon are exported to the United States, fresh, packed in ice; and many thousands of pounds are put up in tin cases, and exported under the name of “preserved salmon.” The quantity of shad and alewives exported cannot be arrived at, for the reason already stated.

CONCLUSION.

The time and labor which have been expended on this pamphlet, in endeavoring to depict the real condition of the River Fisheries of Nova Scotia, are not a tithe of what might profitably be devoted to the subject. The advocacy of the industrial interests of a country through the medium of the press, is within the legitimate province of wise government; and the River Fisheries are especially entitled to such advocacy, because their decline is so commonly occasioned through ignorance of their value and the natural laws which ensure their preservation and increase. No country in the world, with the exception of Scotland, possesses so many fine salmon streams as does Nova Scotia; and the salmon amongst fishes, is as the ruby or the diamond amongst the gems; every well-inhabited salmon stream is a true Goleonda. Unlike the mine, you cannot, even by countless drains upon it, if the laws of nature be observed, exhaust its riches. I cannot convey a more impressive idea of the value of the salmon rivers of Nova Scotia, than by inserting the following extracts, even though one of them may appear a little overdrawn, contrasted with their greatest known productiveness. I would hail the day when our salmon rivers would realize a return of \$2,700,000 per annum, but I would have this wealth to be obtained from an exportation of tens of thousands of barrels, and would have the poor man to enjoy the luxury of a salmon, at a price a little beyond that he now pays for his halibut.

"An article appeared in one of our newspapers in which the writer showed the value of salmon rivers in Great Britain, and what an increase of wealth might accrue to this Province under proper management. Let us prove this assertion more clearly. Suppose that in the whole of the rivers of *Halifax County alone* there are about 400 breeding fish, which, escaping net and spear, deposit their spawn in safety, an average of about 15 fish for every salmon river. Now it has been ascertained by Dr. Buckland and others that every fish deposits about 8,000 to 10,000 ova each; say that nine-tenths are destroyed by freshets, enemies of their own kind, &c., leaving only 1000 saved from each fish; on their seeking the salt water, again destruction ensues, perhaps 25 per cent. on the whole is lost before they return to the rivers. Still the 400 fish, *after the destruction*

enumerated above, give 300,000, which, at the absurdly low rate of 2s. 6d. apiece, would make the handsome sum of \$150,000 for this county alone. Taking this as the lowest average value of each county, we find the whole of the salmon rivers in this Province to be worth \$2,700,000. And this is, after all, but a very low estimate, for with the necessary care the numbers and consequently the value would be considerably increased. In Canada the 'Saguenay' and its tributaries are valued at \$52,000; the 'Malbaie' and 'Murray' River, at \$7,500; the 'Jaques Cartier,' at \$20,000. The 'Tartigo,' 'Blanche,' 'Matanne,' and 'Chatte,' together \$52,500. And many others might be enumerated in proof of the great value salmon rivers might become to that country. Again, there are the trout and gasperreaux, the latter forming a large export article, as well as affording a means of subsistence to so many of the poorer inhabitants throughout the Province, besides their young fry being the chief source of attraction to mackerel, codfish, &c., that seek our shores to prey upon them."

"Under proper management there is not a stream in the Province which might not, and would not, yield many tons of salmon and sea trout every year, and this not for a time, but for all time. A ton of salmon is worth, upon an average, \$300, and the river yield of this noble fish might, in the rivers of Nova Scotia alone, be equal to at least \$100,000 per annum. Nor would this be the only gain; the number along our coasts and estuaries would go on increasing in the same proportion. It is easy to state this truth, it is easy also to prove it, both from facts and experience; but the grand difficulty is to make people in general feel it, and act accordingly. One can easily understand what would soon be the result, were every cow and calf in the country shot down, either for their skin or out of pure love of destruction, whenever one or the other could be got at. The supply of beef would speedily come to an end, and everybody would be ready to execrate the wickedness and folly that brought about so great a calamity. But in reality is the folly or the crime less because the creature destroyed lives in the water instead of upon the land? A dozen average salmon will bring as much money as an average cow, with this difference, that the feed of the former costs nothing, while that of the latter comes to a fair sum of money every year. There is not a river in Nova Scotia which, by getting moderately fair play, would not yield during the season at least 500 well grown fish, which would be equal in value to about fifty cows, while the larger rivers would yield ten times the quantity. We can calculate the loss, and can show it upon paper, but still, unless we can bring home in some shape or other the reality of it to the understandings of the dwellers by these rivers, they will be likely to pay little attention to it."

Amongst the enemies of the salmon, next to the obstructive

mill-dam, there is none more pernicious than the spear. Mr. Whitcher, the Superintendent of the Fisheries Department in Canada, thus describes the ruthless butchery of this mode of capturing the salmon :—

"The practice of capturing salmon by torch-light and spears is justly held to be most pernicious. Employed, as it almost invariably is, at a time when the waters of each river are lowest and clearest,—whilst the salmon are balked at the base of steep falls, awaiting the next freshet, and congregate during sultry nights near the mouths of little rivulets, emptying into the main stream, or loiter about the tails of pools,—spear-fishing involves excessive slaughter. Sometimes in the course of *one night* as many salmon will be thus killed and maimed as an ordinary net-fishery along the coast, or in the estuaries, can capture throughout the regular fishing season. Practised during autumn and periods of reproduction, as is still more frequently the case, it becomes indescribably bad,—'tis the crowning act of extirpation. The luckless fish are then killed at a stage which makes the bare feature of destroyal in the highest degree deplorable. They have won their devious way from the luscious pastures of old ocean, through labyrinths of nets and a multitude of watery perils. Urged onwards by strong instincts, they have surmounted incredible difficulties, and achieved marvels of adventurous travel. They are now arrived at Nature's free hospitals of piscary lying-in. The water-way by which they came is in many parts impassably shoal, and no more heavy breeders can reach the same high grounds, or supply their places, for that year at least. And, after all, lean from exertion and thin food; dark and slimy from the physical drain and unhealthy action incident to the procreative state, perhaps sluggish and heavy with thousands of ova, or buried in the exhaustive labour and anxious cares of depositing their prolific burden,—they are ruthlessly slain by the spear. With every dead or wounded fish, there perish in embryo from ten to thirty, forty, fifty—even as high as sixty, thousands. Spawners and melters both suffer. Is it, then, possible to exaggerate the ruinous consequences of such improvidence?"

As to the pernicious practice of fouling our salmon streams with saw-dust and other refuse, and the injury inflicted by fixed nets and weirs, Russell, in his work on the salmon, in substance writes: "Any white object placed in the track of the fish, irrespective of its capturing power, will drive the salmon away." I have stated that the throwing of saw-dust, &c., into the rivers of Canada, is illegal; but in Canada, as in Nova Scotia, fixed nets and fixed

weirs are legalized. There is little doubt that the existence of these fixed engines is the principle cause of the low condition of the salmon fisheries in both Provinces. In 1860 the British salmon fisheries were in a wretched condition, and three commissioners, at the head of whom was Sir W. Jardine, Bart., the eminent naturalist, were appointed to ascertain the cause of their decline. After a great deal of labour these commissioners presented an elaborate report to the Queen, in which they state:—" We are prepared, after a full consideration of the case, to recommend the total suppression of all fixed engines on the estuaries and sea coasts. These engines, with but few exceptions, are of modern invention. Stake nets have been scarcely known in England until within the last fifty years. * * * And they are opposed to the whole aim and spirit of the fishing laws, the object of which, as has been fully shewn, was to secure to the salmon a free passage to and from the sea, and to cause an equitable distribution of them throughout the rivers. These engines are baneful to the fisheries, not only on account of the number of fish which they destroy, but also because they scare and drive them away to the sea when they come in shoals seeking the rivers, thereby exposing them to be injured or destroyed in a variety of ways." The remedial policy which is herein indicated, resulted in raising the money value of the salmon produce of the small rivers of Britain, often polluted by the discharges from the mines and manufactories, to £800,000 sterling, or \$4,000,000 per annum ; while the money value of the salmon fisheries of Canada was, in 1865, on the authority of Commander Fortin, only \$23,000, and of Nova Scotia probably \$40,000. This is a lamentable contrast, when we consider the superiority of the British Provinces in their possession of the most magnificent salmon streams that exist in any country in the world. No later than 1815, 800 tierces of salmon were taken every year in the streams of one river in Nova Scotia. Salmon then swarmed so thickly in rivers of these Provinces, that are now nearly deserted, that they were thrown out with the shovel, and even with the hand ; but the ignorant destructiveness of one class, and the selfish cupidity of another, the erection of mill-dams without fish-ways, the system of choking the streams with saw-dust and refuse from the mills, of spearing by torchlight, of over-netting, and fishing out of season, produced their inevitable results.

It has been suggested to the Fishery Protection Society, that they direct their attention this year mainly to one river, where they may show what can be effected by removing all obstructions, and securing an uninterrupted passage for the fish that frequent it. It is recommended that the stream should not be fished for three years, till it has gathered strength, and then to take from it a limited amount of fish only, that it may retain its procreative power. There is little doubt that the efforts of this society, in opening the rivers of Halifax county, have contributed to the extraordinary run of alewives and salmon this season; though the presence of an unusual number of salmon of uncommon size, is to be referred to these occult causes which puzzle observers of the habits of the funny tribes. As a proof of the beneficial labours of the society, I need cite but one instance. An old inhabitant at Nine Mile River relates that some twelve years ago he never failed in any year to obtain an abundant supply of fish. No sooner were mills erected on the river, than the supply ceased. But the last two years, since the river has been opened, he has again been favored with a sufficiency of alewives, and a few salmon. Such results must certainly serve to dissipate the prejudice which exists in some minds against this society; and should obtain for it increased support, so that its operations may be extended, and its generous purpose imitated by other societies formed in all the counties of the Province.

Under the Act of Confederation of the Canadas, New Brunswick, and Nova Scotia, the Fisheries are consigned to a special *bureau*. It may be confidently expected that a new impulse will be given to the protection and development of the River Fisheries of British North America. The assimilation of the laws relating to them will be one of the most delicate tasks the government will have to undertake, and will in all probability be shaped by the report of a special commission, as was adopted in Great Britain.

The increased facilities for transport which the Intercolonial Railway will secure for the Maritime Provinces must largely assist in the commercial development of the River Fisheries of Nova Scotia. Salmon can be propagated and taken in Nova Scotia with less labour and expense than in any of the Provinces, and in their fresh state will find a ready market from Montreal to Detroit, and

even beyond, while cured salmon will find their way to profitable markets in the far-west.

Whether the rivers of Nova Scotia are to become an increasing source of piscatory wealth, or are to be deserted by its funny inhabitants, so that the presence of the salmon, the trout, the shad, and the alewife, in countless numbers, will constitute only tales of past times, will be rendered no longer doubtful, if there be united the intelligent co-operation of the people throughout the counties with the power that devises the necessary laws for the conservation of the fisheries. The present is a crisis in the history of the River Fisheries of British North America. If they are allowed to enjoy means and efforts for their preservation, that are periodical only, revival must soon yield to retrogression; but if wise and energetic measures are adopted by Parliament, commensurate with their importance as a source of national wealth, nothing that has been predicted concerning their cumulative fertility can possibly be unfulfilled.

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A P P E N D I X.

(No. I.)

ANSWERS OF CAPTAIN CHEARNLEY,

Before a Committee of the House of Assembly, in March, 1854.

1. The fish that resort to our rivers to spawn are :—Salmon, gaspereaux, trout, shad, bass, grayling and some others. The three first named resort to nearly all the rivers in the Province ; the others to some particular streams.

2. They commence running in our rivers to the westward in March, and continue till the end of July. The time is not the same in all rivers, instance in Gold River. Lunenburg, the salmon commence running in March ; and at the Musquodoboit, to the eastward of Halifax, about the first of June, and in the Shubenacadie, River Philip, and perhaps some other at a later period.

3. Salmon deteriorate from the time of their entrance in the fresh water, and are unwholesome during procreation.

4. To my knowledge there is no difference in the habits of salmon.

5. Salmon select the shallow waters at the heads of rivers to deposit their spawn, and are found breeding in tributary streams. This fish generally deposits its spawn in gravelly and sandy beds.

6. Saw-dust is believed to be injurious to salmon, and in spawning they invariably avoid it. It is considered so destructive, that in Scotland millers are, by law, compelled to carry it off by shoots, so that no saw-dust is allowed to enter a river where fish resort ; all writers agree on this point.

7. The mill-dams and other obstructions on the rivers of Nova Scotia have seriously interfered with the quantity of salmon resorting to our rivers.

8. It is essential that a free passage in ascending and descending the rivers, should be afforded to the fish, and any plan which will allow such uninterrupted passage will be sufficient to be inserted in a mill-dam. Among others the following plans have been found effectual, viz., No. 1.—A double inclined plane, at an obtuse angle, with about one foot of water

running over it, with proper breaks to produce a serpentine course. No. 2.—A sufficient opening or aperture, made in the bottom of the dam, with a breakwater situated about ten feet above the sluice, with side pieces to prevent the aperture being closed.

9. An obstruction of two or three feet may not interfere with the ascent of salmon, provided there is a sufficient volume of water, and if there is a sufficiency of water, or a gradually inclined plane with convenient resting places, salmon may ascend to a still greater height.

10. I consider that nets and wiers at the mouth of our rivers and dams, in the upper parts, are obstructions, and destructive to the run, and consequently diminish the quantity of the fish.

11. If any river spanned by a number of dams, in which fish-ways could not be made without great damage to mill property, be exempt from the existing law, the fishery of that river will be totally destroyed. It is for your Honorable House to consider the propriety or impropriety of such exemption.

12. Spearing is decidedly injurious and destructive, and I beg again to refer you to the revised act previously referred to.

13. The food of salmon in the salt water is the sand eel and caplin, and in fresh water they feed on flies, worms, grubs, &c.

15. Occasionally salmon remain in the rivers all winter. This is caused by debility, and in the spring they are found in an exhausted state.

(No. II)

REPORT FROM LAW AMENDMENT COMMITTEE.

The committee to whom was referred the bill in reference to the River Fisheries, beg leave to report the same with some amendments, with their recommendation to the favorable consideration of the House.

The importance of protecting fish, resorting to rivers to spawn, is entirely underrated in this Province. Large numbers of our people look upon any interference with their mills, or with the privilege of taking in any quantities they may choose the fish which Providence sends to their doors, as arbitrary and tyrannical; and their sympathies are more apt to cluster round the violators of the fishery laws than to be on the side of the officers charged with enforcing their provisions.

They do not perceive that obstructions placed in the way of the fish resorting to the spawning grounds, or any considerable catch of fish while

there, or on their way, involves the destruction of the myriads to spring from the spawn of the fish obstructed or destroyed, and tends to extinguish the entire race.

The fisheries of salmon and alewives conducted on our coasts are a lucrative branch of Provincial industry, which year by year is increasing in value and importance, and depends entirely upon the extent of protection afforded to the fish in the nurseries in which they are spawned and bred; and no policy can be more short-sighted than that which allows these invaluable resources to be sacrificed forever to the temporary convenience of the mill-owner, or to the cupidity of the inhabitants of the margins of our rivers.

The countries of the old world deplore with unfeigned regret the destruction which has fallen on many of their fisheries, which a little care might have preserved; and Great Britain is now following in the wake of France and other continental countries of Europe in endeavoring to restore, at enormous expense, salmon and other fisheries in rivers which neglect and mismanagement had destroyed as nurseries. In our own province the names of many of our rivers, where a salmon is now rarely if ever seen, are a standing memorial of the consequences resulting from neglect of the provisions requisite to sustain this important branch of industry. It is not yet too late—but there is no time to lose—to prevent its extinction, not only by securing the spawning grounds by new legislation, but by spreading broadcast among the people such information as to the habits of the fish, and the necessity of protection, as will enable them to appreciate the policy on which our legislation is founded.

Mill-dams and mill-owners are the main enemies of fish resorting to the spawning grounds. Great difficulty exists as to the kind of passages for fish which are sufficient, without at the same time being unnecessarily injurious to mill-owners. This difficulty appears to have been solved in England. It appears by the report of one of the Government Inspectors of River Fisheries, made to His Grace the Duke of Newcastle, and lately communicated by Governor Gordon to the N. B. Assembly, that in Wales ladders for the passage of salmon over a natural fall of 28 feet in height, have been devised, and are in successful operation. In our Province, on the other hand, it would seem there is a difficulty in surmounting by any contrivance now in use a fall of even eight feet.

The committee are of opinion that the Government should procure a model or tracing of the ladders referred to, and also that they should afford every encouragement in their power to any private parties who should be disposed to obtain possession of the waters of any of our rivers, with a view to experimenting in the kind of wasteways and ladders best adapted for the passage of fish, or on any other matters connected with the propagation of fish and the protection of the river fisheries.

The committee would also advise the Government to offer a prize for the best essay on the habits and natural history of the fish resorting to our rivers, and the best modes of protecting them on their way to, and their continuance in, the spawning grounds, and to publish and distribute the same extensively in the Province.

The time will come when we will look back with astonishment at the apathy now prevailing on a subject of vital importance to our best interests.

All which is respectfully submitted.

A. G. ARCHIBALD,

Chairman.

Committee Room, April 27th, 1864.

(No. III.)

REPORT OF COUNCIL OF THE INLAND FISHERIES AND GAME
PRESERVATION SOCIETY, 1866.

St. Margaret's Bay.—The warden for Margaret's Bay District has been very energetic during the past season, and reports all the rivers clear, with the exception of Ingraham's River, where still, as formerly, great opposition is shewn to the enforcement of the law. Your committee press the most serious attention of the society to this fact, with a view of stringent measures being adopted next season. Few, if any, fish have been taken by fishermen on the river during the past season.

The Indian river shewed a great improvement on past years as regards sport.

Owing to a stoppage at Rhino's Mill, the Council have caused a rock to be blasted to create a further enlargement of the channel, and have further closed two tributary brooks that diverge from the main stream, to increase the supply of water.

East River, Chester Bay.—The Council have here rendered the Grand Falls practicable for salmon, thereby opening up the whole of the upper waters of the river. The obstacle now removed was situated about $1\frac{1}{2}$ miles from the salt water, and we are glad to report that fish were observed ascending the falls immediately after the alteration was effected.

Sackville River.—The Secretary was authorized to effect an opening in the dam at this river, but owing to the unusually high freshets which

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prevailed, nothing could at that time be effected to remedy the evil. In the ensuing spring it is intended to remove the obstruction.

Again, with regard to this river, the Council beg to report that Messrs. Piers and Blaiklock, having obtained information that nets were illegally set across the river above the dam, proceeded to the spot and effected a seizure of a net which was found set totally across the stream. From information received, it was understood by these gentlemen that numerous other instances of a similar nature were of frequent occurrence, the nets being set every evening at dusk, and taken up every morning. The Council beg further to report that the overseer, appointed by the Sessions for this river, stated that he had never been sworn in, and was consequently an inefficient officer.

Shubenacadie River.—Mr. Veith's report on this river exhibits this fine stream in a most lamentable condition, the fishways at the various locks being utterly unserviceable, and the passage of salmon, bass and gaspereaux to Grand Lake completely stopped. The most complete obstructions to their ascent appear to be at Horne's Lock, where the fish have been netted and speared in prodigious quantities throughout the season. The gaspereaux were seen in the water in millions, and on the banks, dead and dying, in their attempts to proceed to the spawning ground. Several nets were seized by Mr. King, a very efficient agent of the Society, in the river during the season, brought into town, and are now in possession of the Society.

Sheet Harbor, East Branch.—The fishway placed in the river by Mr. Chisholm some four years since, according to the plan then required by the Government, not having been found effectual, Mr. Veith proceeded this year to inspect the same, and found that the new fish-ladder would not answer in this particular case, owing to the height of the dam, but recommended that advantage be taken of the natural conformation of the bank to make a practicable ascent for fish, in carrying out which scheme both the owners and the Society agree to join.

Little Salmon River, Preston.—The Society is happy to state that a great improvement has taken place in Little Salmon River, owing to the mill-dam having been carried away. Numbers of fish were observed by one of the Council on the spawning grounds of this river.

Petpeswick River still remains totally obstructed, according to the warden's report.

Nine Mile River.—Salmon have ascended, this year, in unusual quantities, and have been seen, in the fall, endeavoring to force their way up to

McKenzie's Brook, to Governor's Lake. Formerly they were enabled to ascend the brook, which is now totally obstructed by fallen timber. The Council beg to state that a small outlay would effect the necessary clearance.

In conclusion, your committee beg to state their conviction that, although the Society has not been idle, but little can be effected in carrying out a proper supervision of the Inland Fisheries, unless an independent and salaried officer be appointed by the Provincial Government, as in Canada.

The difficulties of prosecution, owing to the local partialities of both witnesses and magistrates, would then be overcome, whilst the judgment and advice of such an executive, with regard to the placing of efficient fish-ladders, under the various peculiarities of river banks and mill-dams, would be considered decisive in overcoming all obstructions.

(No. IV.)

EXTRACT FROM REPORT OF FISHERIES COMMITTEE OF
HOUSE OF ASSEMBLY, 1867.

The committee on the subject of the fisheries beg to report as follows : They have had before them various petitions asking for further amendments in the law relative to the protection of the river fisheries.

The committee regret having to report that, notwithstanding the successive legislation of many years on this important subject, the wanton and unwise destruction of the various kinds of fish frequenting the rivers of this Province, has hitherto been but little or none checked.

The adoption of a particular kind of ladder in the year 1865, to afford a passage for salmon and other valuable fish over mill-dams, has not been attended with the desired and anticipated results. Owing to the peculiarities of the different rivers and dams, it is quite evident that no one particular kind of fish-way will suit each. Feeling the great importance to the present, and particularly to the future, interest of this province, of the successful protection of our river fisheries, upon which the continuance and prosperity of our deep sea fisheries largely depend, the committee have invited from "the Inland Fisheries and Game Protection Society," and from other sources whence useful information might likely be obtained, such suggestions as might lead to more successful legislation on this subject. They have decided that the want of success in the efforts hitherto made by the legislature to protect these nurseries of one of the first

resources of the province, is not so much attributable to defective legislation as to failure on the part of those entrusted with carrying such legislation into effect to do their duty.

While many of the Courts of Sessions never fail to make due provision and regulations as required by law for the protection of the river fisheries, there are different counties in which little or no interest is taken in the subject, and consequently the law remains inoperative in those counties. In order, therefore, to obviate the two main and perhaps only difficulties that have hitherto baffled the intention of the legislature to protect these fisheries, viz., in the first place the want of such means of affording practicable fish passages over the various mill-dams and other artificial obstructions, according to the peculiarities of such obstructions, without damage to private interests; and in the second place, the indifference and omission on the part of many of our Courts of Sessions to put the law into effective operation, the committee recommend the appointment of a chief inspector of the river fisheries of the province, whose duty it shall be to from time to time examine the different rivers frequented by fish, and see that the best means for the protection of such fish are adopted, and also to see that none of the Courts of Sessions omit to make the necessary provisions and regulations, and to offer them suggestions on the subject.

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The subject of the obstruction of the passage of fish in the Shubenacadie river, by the canal locks thereon, which was on former occasions under the consideration of the committee, was again brought under their consideration by the petition of a number of the inhabitants of the County of Hants. The committee beg to recommend the passage of a law, providing for the removal of these obstructions.

They have also considered the petition of William Krosser, of Kemptville, in the County of Yarmouth, asking to be reimbursed in the amount of certain expenses to which he had been subjected in connection with prosecutions in which he was engaged, as one of the wardens of river fisheries of that county; and recommend, that, if the Court of Sessions of said County do not, at its next sitting, provide for such reimbursement, the Judge presiding at the next term of the Supreme Court for that county, after such sitting of the Court of Sessions, do amerce the county in such sum as said Judge may consider the said William Krosser entitled to.

The committee cannot close their report without expressing their admiration of the disinterested and useful efforts, involving much outlay of both time and money, on the part of the association in this Province called "The Inland Fisheries and Game Protection Society," in carrying out the laudable objects of the society; and from whom, as already stated, valuable suggestions have been received by this committee.

(No. V.)

PISCICULTURE.

Pisciculture is the art of stocking the waters with their inhabitants, of multiplying, of perfecting, and of acclimating the fishes which serve for the food of man.

The end sought is attained by natural means and by artificial means. Although both these processes are applicable to all fishes, the first are more particularly confined to those called *white fishes*, such as the Carp, the Roach, the Perch, &c.; and the second for Trouts, and the species of that family.

All waters do not suit all kinds. Those which are rapid, clear, cold; which flow or repose over a sandy or rocky bottom, and whose temperature at the greatest warmth does not exceed 16 degrees, are generally favourable to all the salmoïdae; those which offer the contrary conditions, which repose over a muddy bottom or clay rather than gravel, and whose temperature in summer is above 20 degrees, suit more particularly Carp, Perch, Eels, &c. Accordingly as one wishes to breed this or that kind, he must pay regard to the quality and temperature of the water, and the nature of the bottom.

The periods of reproduction are no less necessary to be known, so as to set at the suitable time the artificial breeding beds (*les frayères artificielles*) upon which we wish to attract the fishes, so as to render more easy the gathering the ova they will deposit; and to obtain fishes when incubation is near. Although these periods vary according to climates, nevertheless one can establish one general rule: from October to January for trouts, salmon, and common eel-pont; in February and March for the pike; in April and May for the barbel, the bream, the sandre, the common grayling; and from June to the end of August for carps, fuchs, and chubbs.

Whatever the species, one cannot operate with success if either from the male or the female the milt or spawn (*les produits la génération*) are not perfect and healthy. Whilst the ova are enclosed in the tissue of the ovary, and form in the abdomen two large masses every attempt to accelerate the laying would be fruitless; their expulsion is not possible until they are liberated in the cavity of the belly.

This detachment, which is a sign of maturation, is known from the exterior by perceptible signs, so as to render unnecessary the opening of the fishes.

The circumference of the anus is red, swollen, and protruding. In many cases the ova, fallen by their own weight, are there compacted. The

belly is soft, and yields readily to pressure, and if one feels across the sides, the eggs appear to move about under the fingers: yet, the lighter effort, often even the simple suspension of the animal, suffices to provoke the expulsion of the ova.

These signs of maturation are more visible when the ova are healthy, than when they are addled, and one cannot judge of their condition except by putting some of them in a vessel containing water. The healthy ova, the moment of their fall, have a clear hue, and rather transparent than opaque, and have a slimy coating that does not whiten in contact with the water. The changed ova have a doubtful tint, are sometimes totally or partially opaque; at other times, with an extreme transparency, they have a central core of greater or less size, according to the condensation of their contents, and the mucous coat which envelopes them is generally serous, and discolours and renders turbid the water in the vessel. To attempt fecundation with ova which present such characteristics would be lost labour.

In the male the readiness for reproduction shews itself by the same exterior signs, only the anal protuberance is less prominent, and the belly less extended than in the female. If the seed is ripe, with slight friction along the sides, the struggles of the animal will cause its evacuation; it is in good condition if it has the color, the consistence and fluidity of cream. The milt, which is obtained by means of strong pressure, which issues in thick drops, is difficult to dilute in the water, and then is of yellowish or reddish tint, has less prolific virtue and should never be used except in the absence of the other.

To accomplish quickly and with success artificial fecundation, regard must be had to the size of the fishes; it is also necessary to consider whether the ova which it is intended to impregnate are free or attached to foreign bodies (the difference in the way in which they are placed being a very important one in the mode of operation); it is necessary, last of all, whatever the species, to place them in two tubs of water—the males in one, the females in the other.

This last precaution taken, and after having provided a vessel of earth or porcelain, or wood or tin, &c., with a large and flat bottom, and having filled it half full, or only one-third full, with pure and limpid water, the temperature—supposing it is intended for salmon or trout—of five to ten degrees; then proceed with the artificial impregnation. Ascertaining first that it is a female, let it be taken in both hands, so that, if possible, the left may correspond to the head, and the right to the tail. When one of the actors is a principal, they approach the vessel, and deliver the fish to him (which he holds by the tail), when pressing lightly the sides between the thumb and the other fingers of the right hand, which they make to glide up and down, as long as necessary for the complete evacuation of the ova. It

happens sometimes that the first attempt is without results, from the violent struggles of the animal preventing the passage of the ova; but some moments suffice generally for this spasmodic condition to cease, and the organs, recovering their submission, the laying can then be forced.

After this first operation, they change the water in the vessel if, during the operation, it has been soiled by the mucous matter or the discharges of the female. They now seize a male, when they extract by the same process some drops of milt, and in order that the impregnating molecules may be scattered uniformly everywhere in the vessel, they produce a slight agitation of the water and the ova, either with the hand, or with the tail of the fish, which they still hold.

About one minute of cessation renders impregnation complete. They afterwards wash the ova, renewing many times the water of the vessel which contains them. If their incubation should be not far from the place where these operations are carried on, they transport them without delay, so as they can place them in the apparatus whither they are to go; if, on the contrary, the distance is such as to occupy many hours, they take them dry, in layers one above the other, in a box of wood, or of tin, pierced with holes, between moss, and grass slightly moist. Packed up in this manner, they arrive safely to their destination, and with less loss than if they were left in the water.

All the operations of impregnation, if the fishes are of small size, can be performed by one person only; but with fishes of one to three pounds, they require the help of an assistant, when the additional work consists in holding the tail of the patient, to prevent its struggles. An assistant, and sometimes two, are necessary for fishes of six pound weight, and above. The operator who promotes the expulsion of the ova, cannot do more than the compressing with his two hands—which he moves from the head towards the anus—the sides of the female. A first assistant holds her above the vessel by the gills, while a second seizes the tail firmly, to prevent any sudden movement.

A female trout or salmon produces annually a thousand eggs per pound, though it is not rare, among some species, to meet with subjects of large size which furnish from ten to twenty thousand. In these cases, instead of milting at one time all the ova, it is preferable to distribute them in distinct vases, in lots of from three to five thousand, and to make impregnations of less quantity. It occurs in such species as the carp, the perch, the gudgeon, &c.; when the ova adhere to foreign bodies upon which they fall, they adopt means a little different; a bucket of convenient size, containing water at a temperature of 16 to 20 degrees, aquatic plants, or little bunches of heath, or twigs, or the beard of certain shrubs, are then necessary; and three persons ought to unite together in the operation. One of the operators

seizes the female, and by the process indicated before, relieves her of a part of the ova; at the same time a second takes the male, when he expresses a little of the milt, during which a third receives the two substances upon tufts of grass; then taking bunches of heath and dipping them in the bucket, assisting the intermixture by agitating gently the tufts, and moving them about, the eggs fix themselves everywhere.

Here, impregnations are necessarily partial. When a tuft is sufficiently stored with the ova, after remaining a minute or two, we remove it temporarily to another vessel; then the water which has served for the first impregnation being removed, we take a second tuft, upon which we make again to fall the ova and milt; thus in succession, until our stock of fishes is exhausted.

For these species, the impregnations require more care; if they are not well done, the result will not repay the labour that is bestowed; it is preferable in certain cases to collect the ova upon artificial breeding-beds, (in cases where suitable places do not occur in the streams or basins where the fish resort), prepared and placed beforehand in convenient places.

The breeding-beds may vary in their dimensions, their form and structure. The most simple are those which are constructed with four laths or poles of $1\frac{1}{2}$ to 2 metres long, whereof we make a frame, on which we fasten parallel to one of the sides, and at equal distances, five or six other poles. Tufts of grass or roots, bunches of heath or brushwood, placed close together and compacted, when attached to the transverse poles complete these implements. One can be constructed of a very simple kind with grassy turf or sods, somewhat thick, which are placed side by side, or with aquatic plants lifted up with the soil that contains them, and then grouped in low wooden tubs.

It is about a month before the expected period of laying, that these breeding-beds ought to be deposited. We set them, generally, in places rather shallow, on shores of gentle declivity, in places exposed to the sun, and in an oblique or horizontal position, according as the localities require. A ballast of stone serves to secure them.

Whenever we proceed to procure ova, it is necessary to know whether they are free or adherent, to have them safe beyond causes of destruction which, in their nature, occasion the loss of two-thirds. We speak here of placing them in particular contrivances, where a selection can be made. Those in the composition of which intermixture forms a large part, should be rigorously rejected, if we do not wish to hazard a serious miscalculation. A success, warranted by the experience of many years, has caused generally to be adopted, for the incubation of salmonidae, the apparatus which M. Coste has invented. This apparatus is composed of trays, or troughs of earthenware, of 15 centimetres long by 15 wide and 10 deep, in which is

fitted a screen intended to receive the ova, a screen or sieve of which the bars, formed of rods of glass, are held on either side by a very small plate of lead, at a distance of two or three millimetres asunder. One can, according to his requirements, use a single trough only, supplied with water from a fountain, from a cask, or from any other reservoir; or can multiply the troughs, placing them on an incline alongside of each other, on a tray of wood or stone, in a double row of steps, resembling the steps of a stair, or placing them in parallel series on a support formed like a foot-stool. A little stream of water from a tap to regulate it as required, sustains in the apparatus a flow sufficient for the regular development of the ova.

Another contrivance, which is somewhat like that used by Jacobi, has been also invented by M. Coste, for incubation in running streams. This consists of a chest or box of wood of one metre long by fifteen centimetres wide and deep, opening at its two ends by a single cover, and above by a double cover, in the centre of which is an opening, like the end covers, fitted with galvanized wire-gauze. Brackets, placed at 15 centimetres from the bottom, support the screens placed one above the other, upon which at high water are the ova, instead of placing them, as Jacobi did, upon a bed of gravel, with which he had furnished the box. Stakes driven in the ground, on a floating frame, serve to secure this chest, which should present one of its ends to the current, if it is moderate; one of its angles, if the current is too strong.

In the absence of contrivances of this kind, by a mode which is perfectly safe, one can procure the development of the ova of trout, grayling, salmon, &c., in little natural brooks, with gravelly bottom, under circumstances in which they will be safe from all accident, and where the water is neither very deep nor very rapid, neither too cold nor too warm. The temperature most suitable for the incubation of ova of these species, in whatever place they are deposited, is that which, offering the least variation, remains between six to ten degrees above zero.

In any case, the ova should never be abandoned to risk, in an open river, or in a lake. To withdraw from them the care which they claim, would be to expose them to failure. These precautions consist in keeping them clean, by removing with a brush the sediment which the water, not being filtered, deposits in abundance, and all the small aquatic animals, which disturb them by puncturing them; not to leave them heaped up, but to drain them out carefully, at least every two days, with the help of a pincers, the white or unhealthy ova. These ova, being diseased, become the seat of a parasite growth, which injures the others, when it is neglected to remove them.

The adherent ova require to be protected as much and more than the free ova; for, besides a crowd of minute animals, all fishes, even those that

have produced them, rush upon them for food. We shelter them from their voracity by enclosing the bodies on which they are attached, not in troughs, but in chests as those of Jacobi or M. Coste, and better, in baskets of willow or strips of wood, which are placed in the open water. If these are for ova for which isolation is necessary, floats of cork, suited to the baskets, or to the boxes in which they are placed, keep them on the surface of the water; if, on the contrary, they do not succeed except at certain depths and in the current, ballastings of stone serve as sinkers to attach to the bottom of the baskets or cages which contain them. However, the temperature ought to guide one here, in the choice of places where the machine should be put. The medium cold temperatures which are favorable to the developement of trout and salmon, are unknown to the summer fishes. The ova of the latter do not succeed except in temperate waters; thus it is necessary that from 12 to 15 degrees be found for chub and perch; 20 or less for carp, and from 20 to 25 for tench.

The ova, after their expulsion, and an incubation of some hours, should undergo modifications, which are apparent as well upon those which have received the influence of the seminal fluid, as upon those which have not received it. All, without exception, when they are not the seat of unmistakeable disease, become more transparent. At the same time, there is seen to appear upon a portion of the surface of the globule inside, in the middle of a heap of little drops of oil, a small circular whitish spot, which was supposed, erroneously, to be the sign of impregnation. In the summer fishes, an hour or two suffices for this spot, which represents the germ, to appear; whilst eight to ten are necessary for the salmonidae. If the egg is barren, it remains in some sort motionless, and continues so for some time, but with the surface impaired, up to the time of developement; it goes through important changes if, on the contrary, the egg is impregnated. Now, in effect, the germ is seen to sink down, to diminish in density, but at the same time to enlarge and transform itself into a film or membrane. Its expansion increasing more and more, it invades a third part, the half, at least, the whole of the interior circumference of the egg, which presents now in one place the appearance of a hole. At the same time the embryo becomes visible in the form of a whitish line taking in a quarter of the circumference of the egg.

During this first period of developement, it is necessary to guard against subjecting the ova to frequent handling, or of transporting them to a distance; one ought, on the contrary, to leave them wholly at rest, and not to make them undergo any other displacement than we cannot avoid in removing, with the pincers, the dead ones, which are recognized by their opaque white color. At a later period, when the forms of the young fish are being well delineated, and penetrate through the external membrane;

when their eyes appear as two blackish spots, any motion or disturbance which is given to them is not attended with the same danger. One can now, if it is necessary to cleanse the contrivances, remove them from the water, and transport them from one screen to another, either by pouring them directly, or by means of a little shovel, or a curved pipe. If it is necessary to carry them to a distance, it is also this stage of developement that should be chosen. They can now, without very much loss, bear a journey of ten, fifteen, and even twenty days.

To transport to long distances, and above all when they have cold to contend with, it is necessary to enclose them in a second box more spacious, where the ova are ranged in beds between moss or soft aquatic plants, and the space between the two boxes filled up with moss perfectly dry, bran, saw-dust, hay, or any other substance which protects from the severity of the cold. After unpacking them, the ova, restored to natural action, pursue their developement, and are soon hatched.

The period of change is very different according to the species and the degree of temperature of the surrounding medium. In normal and ordinary conditions, some, as the carp, the barbel, the tench, &c., hatch after a week or two of incubation; others, as the pike, the common grayling, about the twentieth day; yet others, as trout and salmon, do not attain their complete developement until the end of two and sometimes three months.

After birth the young do not exhibit the same instinct. White fishes for the most part wander, dispersing almost immediately in the water, by their littleness and vivacity eluding the most watchful care that can be given. It is not so with the salmonidæ. These, on issuing from the egg, bear an enormous umbilical vesicle which condemns them to inaction, and renders them incapable of escaping by flight, from the voracity of their enemies. The agency of man ought here to intervene, and this can be done in an effectual way, by keeping their valuable species a yet longer time in the apparatus. But they should be absolutely at rest, sheltered from intense light, and without attempting to feed them, for the reason, that during one month after their birth, the aliment contained in their enormous abdominal sac suffices for their wants.

When they have almost lost their umbilical vesicle, or when their vesicle is completely absorbed towards the end of the fifth or sixth week, their appetite being awakened, they can be removed from the troughs either to put them into more spacious receptacles, provided with shelter, or places of retreat (*cachettes en potterie*) where they can be fed, by giving them, in small quantities, two or three times each day, raw meat or liver minced, pounded, and reduced to a sort of paste; or, what is preferable, to throw it into the open water, in ponds, in brooks, &c., when we have previously cleared them from every hurtful animal. By this means we do away with the more

tedious method of artificial breeding, leaving to the young the care of providing for their own subsistence. Moreover, if the fishes are destined to inhabit waters removed from the place where they have been hatched, experience proves that they can be carried with more facility when they are very young. At the moment when they appear to lose their vesicle, they can be carried very great distances in simple glass jars of the capacity of two or three litres, on the one condition of renewing the water every two or three hours, or of aerating it by making use of a glass pipe or tube. These glass jars, which can be transported easily in baskets with compartments, can be increased in number according as is necessary, to enclose about five or six hundred young fish. For stock, of which the size is from 5 to 6 centimetres, the glass jars become insufficient, when their transport should be effected in small casks, a large opening on one of its sides, the roughness removed where the wood has been penetrated, and filled to two-thirds with water of a low temperature, which should be renewed, if possible, during the transit, and which should be aerated from time to time by means of a little pump plunged into the water, throwing back a continuous stream. Fishes of a considerable size can be also conveyed by this means.

Among species much esteemed, and which may be a source of great profit, there is one, the eel, which has not been obtained from the egg, neither by natural nor artificial incubation. They are found only at the new and full moon of April and May, at the embouchures of rivers where the current turns, in a condition for stocking, to which is given the name of *montée*. This *montée*, which it is easy to procure in as great abundance as is desired, is transported, not in jars or casks, but dry, in compactly woven baskets, the bottom of which is covered with old linen or thick paper, and then filled, without being heaped up, with long straw well moistened, to which may be added some aquatic plants. These baskets thus prepared, can receive two and sometimes three pounds of *montée*, that is to say, from four to five thousand eels, and may reach the most distant destination with comparatively trifling loss.

Such is in substance, and as far as confined limits allow of, a description of the usual method to which pisciculture owes its unquestioned success.

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