

**73.—THE INJURIOUS EFFECTS OF RAFTING ON THE LAKE AND RIVER FISHERIES OF SWEDEN.\***

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**FRESHWATER FISHERIES.**—In those parts of our country where these fisheries have been carried on with proper care, they have on the whole not undergone any great changes, and have even in some places become more productive. From most places, however, it is reported that the freshwater fisheries, even in localities where formerly they were very productive and furnished profitable employment to a large class of our people, have declined to such a degree as to make them unprofitable. The causes of this state of affairs vary very considerably. Through the sinking and draining of lakes the fisheries have in some places undergone considerable changes; the area of fishing waters has decreased, while the area of cultivated ground, and with it the population, has increased. In several localities the fisheries have become less productive through the constantly increasing rafting, as thereby it has become difficult and even sometimes impossible for the fish to go to their accustomed spawning places. Saw-mills and other industrial establishments have also had an injurious influence on the fisheries, both by the construction of dikes and by the refuse which is thrown into the water and renders it uninhabitable for fish.

Many complaints come from the district of Gefleborg that both the sea and river fisheries have decreased, especially the salmon fisheries, owing to the increased rafting in the rivers. The same applies to the sea fisheries in the districts of Westernorrland, Westerbotten, and Norrbotten. From all the northern districts it is reported that the fisheries have decreased, and among the causes is mentioned the increased number of saw-mills, which, especially the smaller ones, throw considerable quantities of sawdust into the water, so as sometimes to cover the bottom entirely.

At Atran (in the district of Halland) the salmon fisheries, which in 1875, according to a report made by Maj. M. Kilman, yielded an income of \$6,595.77, have now declined to such a degree as only to yield \$2,282.50 in 1880. As the cause of this there is assigned the disturbing of the spawning places by excessive quantities of bark from lumber which is rafted down the river, which rafting has been going on for years and is on the increase.

**THE LAKE FISHERIES OF THE KALMAR DISTRICT.**—It is reported from Jareda, in the county of Aspeland, that in the river Em, which flows through the Jam Lake, many salmon were caught in former times,

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\* *Om timmerflottningens skadlighet på insjö- och flodfisket.* From Report of the Swedish Fish Commission, March 3, 1883. Translated from the Swedish by HERMAN ACCASSON.

some weighing as much as 33 pounds, while of late years scarcely any salmon are caught, and those of less weight. In 1880 the heaviest salmon weighed 14½ pounds; and since rafting has begun, the fisheries, and more especially the salmon fisheries, have decreased still further.

**THE LAKE FISHERIES OF THE GEFLEBORG DISTRICT.**—The Gefleborg district is rich in lakes and streams, and has in former years had very productive freshwater fisheries. It is reported that these fisheries have decreased very much during the last thirty years. Thus the eel fisheries in the Voxna River about the year 1840 annually yielded from 6,000 to 10,000 pounds of eels of the very finest quality, while now the income derived from these fisheries does not pay the expense of carrying them on. The same applies to the salmon fisheries in the Voxna River in its course through the township of Alfta. Formerly these fisheries yielded a good income, but now they hardly pay expenses. In the Delanger River, in the township of Idenor, the whitefish fisheries twenty or thirty years ago annually yielded 600 pounds of fish, while scarcely any are caught now. In this same river many salmon were caught in former years, but now, since rafting is carried on, these fisheries have almost entirely ceased. Rafting has an injurious influence on the fisheries in various ways. The refuse from the rafting gathers on the shores of the lakes, whereby the water becomes polluted to such a degree as to kill the young fish. Schools of fish congregate underneath the large rafts and are killed by the turpentine exuding from the lumber. During the spawning season rafting injures the fisheries in lakes and rivers by large masses of lumber driving the water high up on the shores; the fish deposit their spawn in this water, but before it is hatched the water recedes and the spawn, or occasionally young fry, is left on dry land.

Reports also come from the district of Kopparberg [Falun] that the fisheries have decreased, owing to the same causes as in Gefleborg.

**DISTRICT OF JEMTLAND.**—The district of Jemtland abounds in large and small lakes, rivers, streams, and brooks. Among the lakes the more important are the Stor Lake, the Kalln Lake, and the Strom Lake. The rivers Ljusnan, Ljungan, and Indal in their upper course flow through this district. In those lakes through which no rivers or streams flow the fisheries have not, as a general rule, undergone any change; but the case is very different with those lakes through which flow rivers on which rafting is done, for here the fisheries have decreased from this cause, and have actually ceased in some places. The salmon fisheries, which are the most important and which have been carried on with special care, have suffered especially from rafting. Thus it is stated that the salmon fisheries in the Ragunda River, which formerly were very productive, have of late years decreased to such a degree as to render them entirely unprofitable. The cause is stated to be the vast quantity of lumber rafted down the river, which rafting is going on from the beginning of spring till the end of summer, while formerly rafting ended toward the end of June. Masses of lumber are often

piled up in great heaps near the banks, causing great damage to the banks and the bottom of the river; and as it often happens that these piles, when once they get in motion, float down the river very swiftly, they drive back the salmon which have sought shelter near the waterfalls. After several futile attempts the salmon become tired and remain below the lower falls; but even there they are often killed, for it is stated that dead salmon are frequently found among the lumber of the rafts.

The loss occasioned by the decrease of these formerly very productive fisheries is felt all the more keenly as the shore owners on the Ragunda Lake are obliged to pay annually  $7\frac{1}{2}$  barrels of salmon to the district of Forssa to indemnify them for the loss of their fisheries in the Gedung River. This obligation dates from the year 1796, when the Ragunda owners received permission from the King to open a canal running past the Gedung River, and to drain the Ragunda Lake, which was 2 miles long. The accumulation of lumber which occurs frequently near the place where the Indal River flows into the sea, often covering the entire breadth of the river and sometimes extending even down to the bottom, of course proves a serious hindrance to the salmon in their going up the river. The consequence is that both the river and the lakes connected with it are gradually being deserted by the fish. Urgent requests have been addressed to the commission from Ragunda to have rafting limited to the time when the water is highest, and to have all lumber which is to be rafted completely barked before it is placed in the water, as the bark pollutes the water, and sometimes entirely covers and destroys the spawning places.

DISTRICT OF WESTERNORRLAND.—The fisheries in the lakes and rivers of this district are reported to have decreased considerably from the same causes as in Jemtland, and it is stated that the dams built for saw-mills and other mills and for rafting are constructed in such a manner as to make it impossible for the fish to ascend and descend the watercourses. From Fjellsjö it is reported that the fisheries have decreased to such a degree as to render them entirely unprofitable, and it is stated that no one cares to set nets which are in constant danger of being disturbed by rafting.

DISTRICT OF WESTERBOTTEN.—In some parts of this district the freshwater fisheries are said to have decreased, while in others they have remained the same as in former times. This applies particularly to the smaller lakes, through which no rivers flow in which rafting is going on; while the fisheries have decreased in all those streams where lumber is rafted, and where dams have been constructed.

DISTRICT OF NORRBOTTEN.—The decline of the fisheries in this district is more general than in the more northerly districts. All the reports agree in this with the exception of Lake Storafvan, where the fisheries are the same as in former times.

HELSINGFORS, FINLAND, RUSSIA, *November 30, 1884.*