

justice to settle the question whether he has used the "best practicable means," and it is not hard to guess what, on such a question, the bias of jurymen in a manufacturing country is likely to be."

Briefly stated, pollutions, so far as rivers, lakes and tidal waters are concerned, may, in their nature and effects, be physically or mechanically deleterious, like sawdust or the mud and gravel resulting from hydraulic mining, or they may be chemically injurious, and in a larger or less degree poisonous, like lime, drugs, waste of dye works, pulp and paper mills, etc., or they may be physiologically deleterious, but not toxic in the gravest sense, inducing unhealthy conditions in the fish, such as appears to result from putrescent matter, sewage, decaying animal and vegetable substances, etc. The Canadian Fisheries Act aims to include all these, and subjects to specified penalties every person who causes or knowingly permits to pass into, or puts or knowingly permits to be put lime, chemical substances or drugs, poisonous matter, dead or decaying fish, or remnants thereof, mill rubbish or sawdust or any other deleterious substance, in any water frequented by any of the kinds of fish mentioned in the Act, Chap. 95, 1886, s. 15, ss. 2, amended by chap. 51, 57-58 Vict., s. 6.

It is not necessary to prove the deadly character of the polluting substances. The provision does not, however, apply if it can be shown that the fish inhabiting polluted waters are of inferior kinds, not mentioned in the Act or regulations under it. Thus, injury to eels or fresh-water ling is not included, but the prohibition applies in waters inhabited by salmon, trout, etc., and it is interesting to note that it embraces the triple division of injurious substances, to which I have alluded, for lime, chemical substances and drugs belong to the essentially toxic or poisonous group, sawdust is really a physically deleterious agent, and the other undesirable substances may be said to include pollutions which affect fish life in ways differing from those directly destructive to life, or physically noxious and morbid in effect.

For many years it was thought that the deadly fungus, commonly called salmon disease (*Saprolegnia*), was due to river pollutions, which were supposed to encourage if not to originate the aquatic saprophyte. Researches have shown that this is not the case, and outbreaks of salmon disease have repeatedly occurred in waters in which there was no special pollution whatever. Not only so, but the detested fungus frequently appears first in the upper waters, and it is indisputable that salmon on entering rivers from the sea are without exception in a healthy condition. Water in which lime is present in appreciable quantities appears very favourable to the growth and development of fish fungus, but the plant cannot originate unless the spores are there either as minute oospores, or as zoospores, which are really a very early stage of the fungus growth. The spore germs multiply and disperse so rapidly that the infection of every fish in a salmon river may be effected in a comparatively short period—healthy fish as well as weakly and injured fish, though the latter are attacked more readily.

But deleterious substances differ not only in themselves, so far as their direct influence upon fish life is concerned, they also vary in their injurious potency according to the circumstances and the places where introduced. Substances may be seriously harmful in a slow-running river, which are comparatively harmless in a swift stream, and I cannot fully agree with the view of certain eminent authorities that it is little or no advantage to keep pure and free from pollution the upper waters if the lower waters and estuaries are allowed to be filled with impurities. Indeed there is force in the contention of Boccus that 'the true cause of the depletion of rivers originated and begun in the destruction of the egg, and not in the fish, when once brought into being.' The experiments of Mr. A. Hansen, on the Norwegian River Soli, in 1872, prove that unfavourable conditions in the lower waters are of far less moment than they are in the shallow headwaters, as Prof. Rasch has pointed out in his paper entitled 'Is sawdust an obstacle to the ascent of fish?' The estuaries of certain rivers on this continent are polluted with saw-mill waste, etc., yet the injury done does not compare with that which would follow the pouring of saw dust, edgings, etc., from the mills into the upper waters. Such waste would cover the spawning areas, where the eggs are deposited and where the fry pass their first days. The Fraser River, B.C., has for twenty years been polluted to a frightful extent with