Professor Verrill pointed out that a cataclysm might effect such changes, in what he called the 'warm bolt' of water, as to reduce the temperature and fatally affect the fish. A return of the favourable conditions would bring the tile-fish back, and during the months of August and September last between 300 and 400 of these fish were taken on their old ground during the investigation of the Government steamer *Grampus*, thus indicating that the favourable conditions once more existed there.

It is notorious that chemical works affect not merely the waters adjacent to them, but the atmosphere, and often work great harm upon the health of communities. Factories for the manufacture of bi-carbonate of soda (usually known as alkali) and of ammonia, chlorine and bleaching powders, pour into the rivers sulphuret of calcium in quantity, also chloride of maganese, and many other refuse substances. All these are injurious. The manufacture of soap involves the production of glycerine and saline matters, with oily, resinous and fibrous particles in suspension, and the preparation of hides for tanning, also produces as waste discharges, lime, dissolved gelatine and offensive animal compounds, which have the character of a dense slime of a yellowish colour. Indeed every stage in the process of treating the skins as they come from the slaughter house, results in polluting substances, which are as a rule poured into the nearest rivers. The drainage from the scraping and washing operations and the effluvium from the lime-pits and tan-pits in the shape of lime-water and tan-liquor, are a means of serious and widespread pollution.

It cannot be denied that the most extensive and pernicious pollutions from factories of the various kinds, referred to above, occur in great centres of industry, where the rivers are also largely polluted and poisoned from other sources, especially sewage. Chemical and textile works, tan-yards on an extensive scale, and similar industries are rarely situated in what may be termed the 'upper country,' amongst the mountains and hills, where the most noted and productive trout and salmon reaches are found. It is true that Dundee and Aberdeen are on famous salmon rivers, and reference will be made to these special cases on a subsequent page; but rivers like the Aire, the Calder and other tributaries of the Ouse in Yorkshire, the rivers of the black country, and indeed of the manufacturing districts generally where chemicals, metals, and textile fabrics are worked, are in areas densely populated and destitute of the most important conditions favourable to fish-life in the local rivers and streams. There are, however, many industries which are carried on in remoter and less populous regions. Tin and lead mines are located, usually in mountainous regions near watersheds and the sources and upper portions of trout and salmon rivers. Reference has been made to the 'slime' or washings from these mining operations, the effect of which upon the fish, parents and young, and upon the spawning beds, must be inimical in the extreme. 'It is, I believe, generally understood,' reports one authority, 'that if quantities of slime or solid matter from a mine are run into a river, it gets into the gills of the fish and destroys them:' but such slime contains also highly poisonous matters in solution and in suspension. This 'slime', as it is usually styled, washed from the crushed ore after being repeatedly subjected to running water in order to extract every particle of metal except such as is of the nature of impalpable powder, contains barytes and other poisonous mineral matters. The particles of lead are insoluble and not directly poisonous: but the out-pouring of mine water, where lead-ore is being crushed is found to gradually and surely depopulate all the streams adjacent. The fry as well as the parent fish suffer from the contamination. The construction of 'slime-pits' is not difficult or costly where the refuse cannot be conveyed into the sea directly by conduits: and the abuse is capable of ready remedy. Copper mines are even more deadly in their effects than lead mines, as copper is so readily soluble. In one of the Devonshire mines, the waste water from the mine, and the washing floors, passes through a series of pits filled with old iron. One metal precipitates upon the other and the water finally passes out purified from metal pollution. Indeed it is stated in one report in reference to this mine. 'From these pits the water is conveyed to some catch-pits constructed so as to allow such matter from the matrix as may be deleterious to subside, and strange to say the largest