

The average annual importation into Memel, Königsberg, Danzig, Stettin, and Hamburg, during the period 1879 to 1882, was as follows:

Country.	Tons.	Per cent.
From Norway.....	237,000	25.4
From Sweden.....	12,800	1.4
From Denmark.....	4,500	0.5
From the Netherlands.....	25,800	2.7
From France.....	12,800	1.4
From Scotland.....	630,700	68.2
From the Prussian fisheries.....	8,500	0.4
From America.....	100
Total.....	933,200

Of this quantity there were imported into—

City.	Tons.	Per cent.
Memel.....	24,300	2.6
Königsberg.....	197,200	21.1
Danzig.....	146,300	15.7
Stettin.....	382,200	41.0
Hamburg.....	183,200	19.6
Total.....	933,200

In 1881 France exported the following quantity of dried, salt, and smoked herring:

	Tons.
To Great Britain and Ireland.....	19,500
To Russia.....	1,200
To Germany.....	16,300
To Belgium.....	500
To Algiers.....	600
To other countries.....	1,200
Total.....	29,300

195.—ON THE CONDITIONS UNDER WHICH TROUT EXIST IN THE GERMAN WATERS.*†

By PROFESSOR KUNKEL.

Investigations of this matter revealed the remarkable fact that in Western Franconia, in portions of the country lying in the closest proximity, there is an essential difference in the occurrence of trout in the

* From "Vortrag des Professors Dr. Kunkel in Würzburg über die Existenzbedingungen der Forellen in unsern einheimischen Gewässern." From Circular No. 4, 1884, of the German Fishery Association, Berlin, June 30, 1884. Translated by HERMAN JACOBSON.

† Read at the monthly meeting of April 7, 1884, which was, like former meetings, numerously attended by all classes of the population from far and near. There was an address by Professor Kunkel, of which this is an abstract, a general discussion of various matters relating to the fisheries, and the distribution of fish and fishing apparatus.

various natural watercourses. As all the other external conditions (climate) of these brooks are the same, the reason for this phenomenon can only be found in the difference of the geological strata from which these brooks take their origin; it is a fact that a difference in these geological strata goes hand in hand with the appearance of these brooks and with the varying occurrence of fish. The waters which come from speckled sandstone (in the Spessart and Rhon Mountains) are clear and transparent, and contain trout, without any artificial aid, as far as particles of such sandstone reach, while brooks which spring from shell-lime are invariably void of fish. This fact is all the more remarkable, as those waters which spring from speckled sandstone contain fewer dissolved particles than any other water in Germany. Of dissolved carbonic acid only a faint trace can be chemically discovered, and dissolved lime is found only in very small quantities. These particles, which are found in considerable quantity in shell-lime brooks, form the most important substratum of all organic life. Aquatic plants live on carbonic acid, which is fixed, as it were, by the lime contained in the water. The aquatic flora of the speckled sandstone brooks is also unusually poor in individuals and species compared with the rich flora of the shell-lime brooks. Water-plants, however, are indirectly an essential condition of the well-being of trout, by serving as food for water-snails, the larvæ of various insects, and small crustaceans. This investigation, when extended over a wide area, also showed that in other parts of the country waters containing lime were very rich in fish. Great credit is due to the late Professor Weith, of the University of Zurich, for having shown in the report of the Swiss Department in the International Fishery Exposition of Berlin (1880), that among the Swiss waters (both lakes and brooks) those were always richest in fish, especially salmonoids, which contained relatively the largest quantity of dissolved carbonic acid and lime. For this reason it could safely be predicted that the attempt to introduce young trout into the shell-lime brooks of Franconia would prove successful. The result has proved the correctness of this prediction. In several brooks, which for a period of three or four years were stocked with young trout, the fish flourished to an extraordinary degree; there are more fish than in equally strong watercourses of the sandstone formation, and owing to the abundance of good natural food, the fish grow much more rapidly than in other waters, so much so that, compared with them, trout from the speckled sandstone waters must be termed decided failures. The shell-lime brooks, therefore, fulfil the first condition of the well-being of trout, viz., to supply good and sufficient food for fish of every age. The case is different, however, as regards the second condition, viz., the favoring of propagation. In this respect the trout (and in fact all salmonoids) require very peculiar conditions, because the eggs, after having been laid and become impregnated, need a very long time (a quarter of a year and more) till the little fish are hatched. During all

this time the eggs should be washed by perfectly clear running water of even temperature. The least turbidness of the water will cover the outer shell of the egg with a layer of slime which constantly increases in thickness. The egg, which also has a sort of breathing process (absorption of oxygen and ejection of carbonic acid), is choked thereby and dies. Even a very superficial examination of our shell-lime brooks shows that they do not meet the requirements of the hatching period. They always appear slightly turbid, owing to a fine white sediment, which consists principally of carbonate of lime (with some clay and oxide of iron). The springs of these brooks are generally quite clear and pure, but before they have flowed any considerable distance they become more and more turbid. The aquatic plants withdraw from the carbonated lime dissolved in the water part of its carbonic acid, and thereby make it more difficult to be dissolved in water. This sediment of carbonated lime, together with some clay, which by a mechanical process is carried away from the bed of the brook, produces the unavoidable turbidness of our waters. Another essential condition of the well-being of trout is that they should not have too many other fish to share with them the natural food contained in the brooks. For this reason (besides the requirements of the hatching period), the trout are found only in the higher portion (near the springs) of our natural water-courses. If pike and other fish get in the streams, some fine specimens of trout will still be found, but no longer large numbers. The conclusion to be drawn from the above observations is simply this, that it will amply repay the trouble to place young trout in suitable brooks in our neighborhood (Frauconia) which are not too strongly polluted by refuse from villages, &c. Unfortunately the brooks will have to be stocked every year, if a proper stock of fish is to be obtained, because young fish from naturally laid eggs will not flourish in these brooks. The first and principal point aimed at should be that the young fish are strong and healthy and carefully hatched in suitable water. Neglect in this respect is probably the reason that many an experiment has proved a failure, and that many a willing heart has been sadly discouraged.

106.—MARTIN BRANDT'S METHOD OF PRESERVING FRESH FISH AND OTHER ARTICLES OF FOOD.*

The more the fish trade extends to greater distances from the fishing stations, and the more the improved and enlarged fisheries at times overstock the market, does it become the more necessary, in order to avoid losses, not only to preserve the fresh fish by pickling or some other process, but also to prepare them in such a manner that they may be safely stored away until there is a better market. This object has been

*“*Martin Brandt's Methode zur Konservierung frischer Fische und anderer Nahrungsmittel.*” From the *Deutsche Fischerei-Zeitung*, Vol. vii, No. 28, Stettin, July 8, 1884. Translated from the German by HERMAN JACOBSON.