



FIVE AMERICAN SALMONIDÆ IN GERMANY.

BY HERR VON BEHR.

[From Circular No. 8, 1882, of the German Fishery Association, Berlin, December 2, 1882.*]

Since it became my honorable and highly appreciated duty, seven years ago, to attend to the current business of the German Fishery Association, I have given my undivided attention to the question of benefiting our waters by introducing valuable fish from abroad. It was evident from the very beginning that this would have to be done cautiously. Fish-of-prey—if I may use this expression—were, at least in North Germany, found in sufficient number, and there was therefore no necessity for introducing such as the *Salmo hutchi*. Such a foreigner might spread too easily and rapidly, and injure those fish which we prize highly. My endeavors to introduce foreign fish have frequently been criticised. Shall I simply pass these attacks in silence? I prefer to give, in brief outline, the causes of my endeavors and the thoughts which have guided me.

The principal consideration has been the great benefit which has accrued to our country from the introduction of other foreign animals and plants. I simply refer to the two well-known books, "K. W. Volz, *Beitrag zur Kulturgeschichte*" (contributions to the history of culture), and "V. Hehn, *Kulturpflanzen und Hausthiere, &c.*" (cultivated plants and domestic animals, &c.). Both these works report a long series of highly valuable plants and animals introduced into Germany from foreign countries, and when reviewing the material gathered in these two works, it may well be said that the majority of our cultivated plants and domestic animals have been introduced from foreign countries, either by ourselves or by our ancestors. This process of introducing foreign plants and animals was much slower and more difficult in olden times than now, when, thanks to steam and electricity, time and space offer no obstacles.

Let us briefly enumerate a few of these introductions.

Our present improved breed of horses is said to have come originally from the Kirgisè steppes and the vast pasture lands of Central Asia; the history of the introduction of the merino sheep is well known; the goat comes from Asia; the chickens from India; the turkey has been introduced from America at no very distant time, for in 1561 a member of the wealthy family of Fugger for the first time had a roast turkey grace his festive board; the pheasant is said to come from Mingrelia, and the rabbit from Spain. And can it be said that Germany has any

* "Fünf Amerikanische Salmoniden in Deutschland." Translated from the German by HERMAN JACOBSON.

reason to complain of having these animals introduced from foreign countries?

All that has been said applies still more to the vegetable kingdom. It is doubtful whether rye and oats are indigenous in Germany; but wheat and barley have certainly been introduced from abroad; the lupine was probably introduced into Greece from Media at the time of Alexander the Great; pease and lentils are assuredly of foreign origin; but instead of enumerating all these plants it would simply have sufficed to utter the single word "potato."

Here—where we speak specially of useful plants—would not be the place to mention the innumerable beautiful flowers which our gardens have received from foreign countries; but we cannot dismiss this subject without mentioning the number of magnificent trees which we have introduced from abroad; thus quite recently from the Caucasus: *Pinus nordmanniana*; from America: The *Wellingtonia*, *Abies Douglasii*, *Abies nobilis*, &c. We have even gone so far as to work out an elaborate plan for planting and cultivating foreign trees in the Prussian Government forests; there has also been some talk of a history of plants, which is to give, in systematized shape, the changes which plants have undergone in their local conditions.

And should fish be excluded from being artificially transported to and acclimatized in countries far from their home, at a time when we have learned how to safely transport the tender fish-eggs great distances?

In Germany fish have for a long time been transported from one province to the other. During the middle ages this was frequently done by the monks, who never failed to make exceedingly practical fish-ponds near their beautifully and favorably situated monasteries; these ponds were so well arranged that even in our days their work has still been used. In South Germany especially the history of the spreading of many choice fish, such as the Saibling and the Zander (*Amaul*), is closely interwoven with the history of the monasteries.

As far as I know, no fish have of late years been introduced from any great distance into foreign countries.

If, as I expect to show in the following, I was successful in introducing five new kinds of fish, I shall at once give the honor to whom it belongs, my excellent friend *in piscibus*, Prof. Spencer F. Baird, of Washington. He is not only at the head of the United States Fish Commission, but also presides over the noble Smithsonian Institution, whose grand object is to increase and diffuse knowledge among men. Truly Professor Baird has fulfilled the duties of his two great offices with this object in view, and our heartiest gratitude is herewith expressed. I am also under great obligations to the North German Lloyd, in Bremen, which has never refused its aid, and which, in the most liberal manner, has gratuitously carried numerous fish and fish-eggs between New York and Bremen. Who, finally, does not know from the circulars of the German

Fishery Association in what an incomparable manner our friend, Fred. Mather, has packed all these fish-eggs?

I shall now proceed to give some details relative to the introduction of different kinds of fish, for all of which I am under deep obligation to Professor Baird.

I. First of all he sent, in October, 1877, eggs of the *California salmon*. The United States and Canada have on their Atlantic coasts a salmon which is identical with our Rhine salmon, *Salmo salar*. Nevertheless millions of eggs of the *Salmo quinnat* have, at the suggestion of Professor Baird, been gathered and hatched at the Sacramento River, in California. These fish ascend the rivers of the Pacific coast, even as far as the last branches of their mountain tributaries. This salmon is highly prized in America, on account of its greater vitality and more rapid growth than is possessed by the salmon of the Atlantic coast, and attempts have been made to introduce it in all those rivers of the Eastern States which, on account of the warm temperature of their water, do not agree with the *Salmo salar*. This is not the place to enter fully on the important subject of the conditions of existence of fish as regards the degree of temperature of the water. For the case in hand, it may suffice to state that the *California salmon* can, in the streams of its own country, stand a degree of warmth in the water which would be fatal to our Rhine salmon.

The first batch of California salmon eggs* arrived about the same time that an important aid was given to the German Fishery Association by an annual grant from the imperial treasury. As soon as this grant had been secured, it became our duty to give some attention to South Germany, especially the Danube and its tributaries. It was a tempting thought to introduce into this great river, which possesses no migratory salmon, California salmon, and thus to bring the vast fish food of the Black Sea to the beautiful Danube country changed to delicious salmon. The journey which the salmon would have to make, as far as Sigmaringen, would not be much longer than that of the California salmon in its home, not to mention the numerous tributaries of the Danube. If the Lower Danube is, during summer, as "hot as hell," as we are told, the California streams, where they flow into the sea, are certainly not much cooler. As the Rhine salmon is not suited to the Danube, it was worth while to attempt the introduction of the California salmon.

Some five years ago, about 350,000 or 400,000 young California salmon were placed in the Danube and its tributaries from Sigmaringen to Hungary. Quite recently a well developed California salmon has been caught in the river Isar. So far, however, we have not heard that any salmon returning from the Black Sea has been caught; nor is this to be expected for the present, as this would require from four to five years, as during the first years when these attempts were made there were but few fish at our disposal, and as very probably the strange

* See detailed account in circulars 1877, p. 200.

fish would hardly attract any attention in the regions of the Lower Danube. Is this a reason why we should be discouraged or discontinue these attempts? As long as our faithful friend across the water lends us a helping hand, and as long as I am privileged to serve the German Fishery Association, my motto shall be "Persevere!" It may here be stated that the California salmon in the piscicultural establishment of Mr. Schuster, at Radolfszell, thrived so well, that he succeeded in obtaining from them many thousands of young fish; and Mr. Schuster speaks very highly of the healthy and rapid growth of these young fish. Why should we then discuss the question whether the California salmon has been definitely acclimatized in Germany. Its value to us, I must repeat it, is principally based on the hope to supply thereby the Danube and its tributaries with a migratory salmon.

II. We may, without the shadow of a doubt, state that the second fish which has been introduced from the United States, the *Salmo fontinalis*, has been thoroughly and permanently acclimatized in Germany. Eggs of this fish I have received at different times and from different sources. The eggs, with which Mr. Livingston Stone surprised me in January, 1879, developed very successfully, as I stated in circular 1879, pp. 24, 25; as also a quantity of eggs which were sent to me last winter by Professor Baird. As regards these last-mentioned eggs Counselor Bruhns, of Eutin, Director Haack, of Hünigen, Messrs. Schuster, Freiburg, and Staudinger, of Munich, can testify; and they cannot speak too highly of the young fish obtained from these eggs. Mr. Schuster—and if anybody is an authority in these matters, it is he—writes me: "The young of the *Salmo fontinalis* thrive very well, and grow even more rapidly than the California salmon; and we shall be eminently successful with these fish." Similar results can also be reported of the first-mentioned batch of eggs which were hatched in Von dem Borne's establishment. Several hundred of these young fish were placed in the establishment of Count Arnim, of Boitzenburg, and developed so successfully in that favorably located and well-conducted establishment, that as early as the autumn of 1881 several thousand eggs were obtained and impregnated. A short time ago I had the great pleasure of seeing thousands of these young fish at Boitzenburg; as also a large number of large fish, almost four years old, which for this coming autumn promise such a rich harvest of eggs that, thanks to the liberality of Count Arnim, I shall be able to supply a considerable number of piscicultural establishments with such eggs. I may, therefore, well say that *Salmo fontinalis* has been permanently acclimatized in Germany.

Is this to be considered a gain? I am firmly convinced of it, for the *Salmo fontinalis* is a "saibling," and, as I expect to show presently, a "saibling" possessing the ability to spread to an astonishing degree. If I am not mistaken, it is this fish, which we at first took for a kind of brook-trout, and which was found to be a "saibling" by Director

Haack, and that the "saibling" is a most valuable fish will be most enthusiastically affirmed by our South German friends. How much more valuable must be a "saibling" which is not confined to lakes, as is the case with our *Salmo salvelinus*? Mr. Charles G. Atkins, an assistant of Professor Baird, was kind enough to furnish, at my request, the following account of the *Salmo fontinalis*:

"A. NAME.—Our best authorities now count the *Salmo fontinalis* as belonging to the genus *Salvelinus* (Richardson). This fish is, with us, known everywhere by the common designation 'brook-trout.' In some localities, where—in lakes—this fish reaches a large size, it is known by the popular name of 'salmon-trout.' By this last-mentioned name the fish is also known in some parts of Canada, where it goes into the sea, and is often caught in salt water.

"B. LOCALITIES WHERE THIS FISH IS FOUND.—It is very generally found in the Northern States of the Union east of the Rocky Mountains, and in all the streams of British America which flow into the Atlantic Ocean or into the Hudson Bay. Farther south this fish is found in the mountainous regions, as far south as Georgia.

"C. WATERS IN WHICH THIS FISH LIVES.—It is found in all fresh waters which furnish suitable spawning-places, and do not contain too many predaceous fish, such as pike, perch, &c. These last-mentioned fish prevent the occurrence of the *Salmo fontinalis* in most of our rivers and streams, with the exception of their more northerly, and therefore colder, portions; but it is found in nearly all brooks and in the higher parts of the United States, *e. g.*, the Adirondack Mountains in New York, the Rangely Region in Maine, &c., where it is more numerous than any other fish.

"D. HABITS.—The *Salmo fontinalis*—no matter where it lives, in rivers, lakes, ponds, or in the sea, invariably selects for spawning, in autumn, gravel bottom in clear fresh water. In the forty-fourth degree of northern latitude it spawns late in October, about three or four weeks before the small lakes are covered with ice.

"E. FOOD.—Insects, crustaceans, and small fish form its food. It seems to prefer the two former.

"F. SIZE.—In the brooks the *Salmo fontinalis* generally remains small, weighing less than half a pound; in rivers and lakes it often reaches a weight of 3 pounds; in large lakes, where the conditions for its development are particularly favorable, it reaches a weight of 6 to 7 pounds, sometimes even 10 pounds. Fish weighing 10 pounds, however, have only been found in the Rangely Lakes in Maine; and even there they are of rare occurrence. The fish from the Rangely Lakes are, in all the stages of their growth, distinguished by their greater strength above the fish living in brooks; even their eggs and embryos are stronger.

"As a general rule the size of the eggs of the salmon corresponds with that of the fish; only with the comparatively small 'land-locked'

salmon of the Schoodic Lakes we find larger eggs than with the larger migratory salmon (*Salmo salar*), although our ichthyologists maintain that these two fish are identical."

III. The land-locked salmon, which was introduced into Germany about a year ago, is the third American salmonidæ which we possess. Last winter Professor Baird sent us 10,000 eggs of this fish. From all I had heard about the land-locked salmon, I determined to choose deep mountain lakes in Bavaria for this fish; but I also sent 1,500 eggs each to Freiburg and Hünigen for experiments and observations. So far only the healthy development of the young fry has been reported, and further results are still to be looked for.

I meanwhile take the liberty to give the following report of Mr. Atkins, relative to this fish, which, unfortunately, reached me later than the above-mentioned eggs, and which suggests the propriety of scattering the eggs more in future. Mr. Atkins writes:

"I am not able to give you the exact depth and area of the lakes where the land-locked salmon is found; but among them there are certainly lakes which have a depth of less than 100 feet and an area of less than 1,000 acres. The largest lake in which this salmon is found, and after which it is generally called, Lake Sebago, has an extent of 50 square miles. The lakes in which these salmon are found in large number are surrounded by a flat country. Lake Sebago is situated in a flat sandy country, and on the great lake in the Schoodic Hills there is no hill higher than 600 feet over the surface of the lake. None of the lakes in question is located in a mountainous region.

"There are altogether only about twenty lakes, located in four not very extensive river regions in Maine, where this salmon (which does not migrate) is found. Relatively speaking it is, therefore, a rare fish, for Maine has hundreds of lakes.

"In the Schoodic Lakes this salmon reaches a weight of 5 pounds, and in Lake Sebago 12 pounds. In exceptional cases it reaches a weight of 10 pounds in the former lakes, and from 18 to 20 pounds in the latter. This fish is prized more highly in the United States than any other kind of salmonidæ.

"These fish commence to spawn in October, and their principal spawning-season is from November 1 to 20. Like *Salmo fontinalis*, they spawn in running streams. In small artificial basins they do not grow as rapidly as *Salmo fontinalis*. They are generally caught in May and June, but also in July, September, and during the winter months.

"The usual bait in May is the skin of salt pork; in June, artificial flies; and in winter, some small live fish."

IV. For two winters large numbers (250,000 to 300,000) of eggs of the white fish, *Coregonus albus*, have been successfully shipped to Germany from the United States; and we, therefore, possess in this fish a fourth salmonidæ.

The artificial hatching of this fish, which is highly prized in the

United States, and which, in our opinion, is closely related to our "Maräne," has in America reached a very high degree of perfection. Enormous numbers are hatched in numerous piscicultural establishments, the one at Northville, under the direction of Mr. Frank N. Clark, annually producing 15,000,000 to 20,000,000. The watching of the exceedingly small *coregonus* eggs, and the separating of the spoiled eggs from the healthy ones, has hitherto been an almost insurmountable difficulty with us; but in America this is managed in the most ingenious manner, the never-resting inventive genius of the Americans having produced a series of apparatus—one more ingenious than the other—which leaves the separating of the spoiled from the healthy eggs to the gentle force of an exactly regulated current, a self-picking system.

Quite recently Messrs. McDonald & Brown have taken out a patent for such a self-picker, which will be described in a future circular. It is well-known that our honored friend Von dem Borne has also invented a self-picking apparatus, which is constantly gaining greater favor in Germany for hatching *coregonus* eggs. As Raveret-Wattel reports, the highly-prized whitefish is now—thanks to the large number of young fry furnished by the hatching establishments—found in very large numbers in many lakes in the United States, where formerly it was unknown; not only in the Eastern States, its proper home, but as far as California. According to the same author, the whitefish in some lakes reaches a weight of 20 to 40 pounds, whilst in others it only has an average weight of 2 pounds.

The report of Raveret-Wattel contains much interesting matter with regard to pisciculture in the United States. The publication of the "Société d'Acclimation" in Paris, containing this report, is to be found in the library of the German Fishery Association.

It has been mentioned as an advantage which the whitefish possesses over our "Maräne," that it is an excellent fish for hook and line fishing. Its flavor is very delicious, and of a kind that one does not easily tire of. It is, therefore, not to be wondered at that I gladly accepted the offer of eggs of this fish.

The success of shipping these eggs, during both winters, has been almost miraculous. Thanks to the excellent manner in which they were packed, there was hardly any loss during the voyage, and the young fry developed very successfully. The eggs were divided between the Lake of Constance, the Walchen Lake, and Ammer Lake in Bavaria, and the Madue Lake, the Schaal Lake, and some lakes in Mecklenburg, all very deep; and it is to be hoped that in three to four years we shall reap a rich harvest of these fish. Further particulars as to the distribution of these eggs are contained in Von dem Borne's reports in our circulars for the years 1881 and 1882.

V. The fifth salmonidae which has been successfully introduced into Germany from the United States, is the *Salmo iridea* (rainbow-trout).

Even in the illimitable territory of the American Union this fish (which

so far I have not been able to consider as anything else but a genuine trout) may be termed a "recent discovery." Its home is in California. Since it has been more closely observed, it has been found to possess a rapid growth, a degree of vitality, and fecundity without a parallel among the salmonidæ, and people vied with each other in spreading it as far as possible throughout the Union. Doubts have been expressed, however, whether it has always been the same fish which has thus been spread, or whether different kinds of fish have not been spread under this name. Years ago Professor Baird had promised me eggs of this fish, but various hinderances and accidents prevented him from fulfilling his promise. It was not till the spring of this year that we received a small quantity. Of the 2,000 eggs a great many were spoiled, so that at the present time we have hardly 400 young fish of this kind in Freiburg, Hüningen, and Starnberg.

These eggs are difficult to obtain even in America, and their transportation is endangered by the circumstance that it must occur in April and May, instead of in the cold months, as is the case with the other salmonidæ.

Mr. Haack writes me, under date of September 7 last, relative to these trout: "The young fish obtained from the few eggs of *Salmo iridea* which I received have proved wonderfully successful. I have not lost a single little fish; and even now they are at least twice as large as the European trout which are five months older, and much larger than the California salmon which are six to seven months older. I have never seen anything like it." Thus writes this experienced pisciculturist.

Also in America there seems to be but one opinion as to the enormously rapid growth of *Salmo iridea*. Of late years, however, some fault has been found with the *quality* of the fish. It is alleged that its meat is not as delicate as that of *Salmo fontinalis*, and that it soon grows soft. It is even said that—in spite of the rainbow colored stripe on the sides—the appearance of the fish is not beautiful, because the spots on the sides of the fish are not red or of any other bright color, but black.

As I have mentioned above, experiments as to the value of this new fish are being made in three prominent German piscicultural establishments. If Professor Baird, as I sincerely hope, again makes an attempt to send me some eggs of this fish next spring, they, too, will be tested in these same excellent piscicultural establishments as to the value of this fish for Germany. Caution will have to be exercised *where* to place this new kind of trout. It will be wiser, for the present at least, not to allow them to share our most highly-favored brooks with our fine trout—just as little as we would place perch or pike there. If, however, as has been stated, the *Salmo iridea* is content with any kind of water, and develops successfully in places where *Salmo fontinalis* could not flourish, it would be proper to make the experiments in such places, therefore in lakes and in the lower course of rivers. In the rivers of

the Western States of the Union these fish frequently reach a weight of 20 pounds. The dispute as to the value of this "hot-blooded and pugnacious" fish waxed hot in the American journals. In California *Salmo fontinalis* is being introduced, and the fish-dealers in New York doubt whether, with its ugly appearance, *Salmo iridea* will fetch the same price as *Salmo fontinalis*. In short, it is wise to exercise some caution. But Mr. Atkins, whom I consider as high authority, writes me: "*Salmo iridea* is a species of fish which promises well." It may be true that it is more advantageous to introduce "land-locked salmon" and *Salmo fontinalis*, but our prominent pisciculturists will doubtless soon have gathered sufficient experience to enable them to decide as to the true value of this fish.

We have, therefore, at present in Germany five of the best known and most highly valued American salmonidæ. It may seem somewhat hasty to propose names for them, and ask all German pisciculturists to adopt these names, before we know whether these fish have become permanently settled with us. Nevertheless, I shall venture to do this, with the view of preventing the adoption of different names which when once in use are difficult to abolish. It seems best to me to adopt the following names:

1. For *Salmo quinnat*, "*Californischer Lachs*" (California salmon).
2. For *Salmo fontinalis*, "*Bach-saibling*" (brook trout).
3. For *landlocked salmon*, "*Amerikanische Seelachs*" (American lake salmon.)
4. For *Coregonus albus*, "*Amerikanische Maräne*," (American maräne).
5. For *Salmo iridea*, "*Regenbogen-Forelle*" (rainbow trout).

Of all these names I like "*Seelachs*" (lake salmon) least because it is not near as expressive as the term "landlocked salmon," which much better had been translated by "firmly-nailed wanderer." I shall be glad to receive any propositions of new names for "*Seelachs*." All the more I am delighted with the short name "*Bach-saibling*," used in contradistinction to our German "*saibling*," which, properly speaking, only lives in deep lakes, whilst—according to Atkins and others—*Salmo fontinalis* seems, as regarding its distribution, to take exactly the place of our "*Bach-forelle*" (brook-trout).

So much for our American importations.

Another very fine salmon—the *Carpione*—has recently been introduced in Germany from Lake Garda in Italy; and several hundreds of these fish are, at the present time, found in excellent health and spirits, in the Starnberg establishment. The eggs of this fish were sent to us from Torbole last summer. There are in Lake Garda *Carpione* which spawn in summer, and others which spawn in winter. Why should we not try the experiment and see whether this delicate salmon-trout could be acclimatized in our waters? Another batch of eggs has been ordered for the coming winter.

There are other problems which have to be solved, relating to the

sterlet and the shad. The last-mentioned fish may well be termed "the old flame of the German Fishery Association," and it must be said that the attempts to transplant the shad from American to German waters have been carried on in the most energetic manner. Quite recently Col. M. McDonald, one of Professor Baird's most active assistants, seems to have shown his intention of making new experiments in transporting shad to Europe. I look to his experiments with great confidence in the fact that the proud English adage "where there's a will there's a way" is nowhere better understood and practiced than in the United States.

Does it seem probable that the above-mentioned fish exhaust the list of those which could be introduced with us to advantage? I can hardly suppose this to be the case; for I think that even on this field of human knowledge we can serve our country still more in the future. As long as I am privileged to serve the German Fishery Association my eyes shall be open in this direction and my zeal shall not grow cold.

SCHMOLDOW, GERMANY, *November 3, 1882.*

CATCHING DOGFISH FOR OIL AND GUANO.

By B. FRANK GALLUP.

[Letter to Prof. S. F. Baird.]

Allow me to call your attention to a new industry started this season on this coast upon scientific principles, and which promises to be a success, providing there is a bounty allowed to the fishermen. I refer to the catching of Dogfish and making them into oil and guano. I have paid this season \$1 per 100 fish, and the fishermen claim that the price is too low, yet it is all that I can afford to pay for them—in fact all they are worth. My views are that if the fishermen received a bounty in addition to the above price, that many more would engage in the business, and add their mite to ridding the ocean of these destructive fish.

I have this season converted the Pogie factory, formerly owned by Gallup & Holmes into using the fish, and can handle during their stay here say 1,000,000 fish, besides being instrumental in destroying twice that number in the young fish nearly matured.

EAST BOOTHBAY, ME., *September 26, 1882.*