

52.—SUCCESS OF FISH-CULTURE.

By MAX VON DEM BORNE.

[Translated by Charles G. Atkins from the circular of the German Fishery Union.]

It cannot be often enough repeated that not every kind of fish thrives in every water, and that we can expect success in fish-culture only when we put the right fish into the right water. If fish fry are to be planted in lakes or rivers, such places should be chosen for the deposit of the fry as the fish themselves would select. Where failure is complained of, it is commonly the case that a species of fish has been planted in uncongenial waters, or it has been forgotten that the limited amount of fish food afforded in the water can only sustain a correspondingly limited weight of fish.

When they undertake to stock the Havel at Potsdam with one or two year old salmon, bought anywhere, failure is to my mind certain. The lake trout lives in lakes and resorts to rapid brooks to spawn on stony ground; therefore I hold it to have been wrong to plant the fry of this fish in lakes and carp ponds as soon as they had absorbed the yolk-sack. The same is true of the brook trout introduced from North America, whose fry were planted in lakes, while they naturally inhabit stony brooks. Vain I consider the turning out of salmon fry at the mouths of the streams, and the planting of young German char in brooks, for the former is at home in brooks, the latter in lakes. The grayling is not so widely distributed as the trout, and it is difficult to determine, in case of a river not already inhabited by this fish, whether it is suitable for grayling or not. In some instances the planting of grayling continued for several years has been unsuccessful; probably these waters are not adapted to the species.

Where, however, the appropriate conditions of existence are afforded the fish, and there is no lack of sustenance, success is not wanting. The transplanting of our brook trout to Australia, of our carp to America, of the California salmon and the brook char to Europe, are facts that admit of no doubt.

The successes of fish-culture are, of course, more readily observable when small bodies of water, brooks or lakes, are stocked than in case of large river systems; they are easier recognized in the culture of local fishes than of the migratory kinds that run to the sea and spend most of their lives there.

SUCCESS OF SALMON AND SEA TROUT CULTURE.

The Rhine.—Von Winterstein reports from the Mosel district that the increase of salmon in the Prims is yearly more evident. In the Sauer the yield is extraordinarily abundant, as well as at the junction of the

Sauer and Mosel. In the Lower Mosel the salmon catch is satisfactory. Baron von Dücker, at Menden, says that there are a good many salmon in the Ruhr as far as they could ascend in the long-continued low stage of the water over the almost impassable dams on the Ruhr (with a favorable stage of water they used to ascend as far as Herdecke), so that the Westphalian fish-culturists may have the satisfaction of asserting that they have accomplished something. At Werden, for instance, salmon of all sizes can be seen morning and evening continually leaping. It is an interesting circumstance that at Witten, in September, Mr. Carl Lohmann took a 5½-pound salmon in the Ruhr with an artificial fly, a red palmer 20 millimeters long. At Hattingen many salmon have been taken—in the Schleuse, as the reporter says. We hope that the capture is not accomplished in the same way as it used to be in the now abolished trap at Mühlheim. In the Main salmon appear more plentiful than formerly (report from Hammelburg). The greater part of the Rhine salmon are caught in Holland, and the most of them come to the market of Kralings-veer. Since 1870, when the fish-breeding establishment at Hüningeu came into German possession, a great number of salmon fry have been turned out in the Rhine Valley. The following table shows that since that time the salmon fishery has improved, though, to be sure, it cannot be shown how much fish-culture has contributed to it, since the final result is the product of sundry factors in part unknown.

CONDENSED STATEMENT OF RECEIPTS OF SALMON AT KRALINGS-VEER.

1870	21, 687
1871	23, 209
1872	32, 228
1873	58, 384
1874	77, 080
1875	56, 436
1876	42, 293
1877	44, 580
1878	49, 691
1879	38, 914
1880	41, 736
1881	44, 376
1882	55, 079
1883	79, 008

For the months of October, November, and December, 1883, it is assumed that the catch will average as in the thirteen years preceding. It will be seen that 1883 is the best year since 1870, even exceeding 1874.

From the Ems district Von der Wengen reports that in July of this year, in the Werse, at Munster, the run of salmon was very good. The

Weser, according to G. Seelig, in Cassel, is now richer in salmon than formerly.

The Elbe.—Prof. A. Fric, of Prague, communicates the information that so many salmon were caught in the valley of the Elbe in Bohemia that the price sank to one mark (24 cents), and in June to half a mark per pound. Formerly it was more than double these figures. Between Leitmeritz and Kolin, according to the testimony of H. Podhorsky (fisherman), more than 1,000 salmon have been caught this year, a number hitherto unheard of. The most of them weighed 8 or 9 pounds. Schools of young salmon were also observed in the Moldau and Elbe, on their way to the sea.

The Saale. though barred by difficult dams, was visited by salmon, and several were taken in the Upper Saale. Count Rantzau, at Breitenburg, in Holstein, reports that in the Stör the salmon were more abundant than formerly.

The Oder.—According to High Forester Ahlborn, of Schönthal, the increase of salmon in the Küddow for the past four years has been remarkable; especially have many more small and medium-sized salmon been observed.

At Borkendorf many salmon were caught at the spawning time, but no eggs fecundated. More efficient supervision is desirable there. According to a report of the Fishery Union for East and West Prussia, small salmon of the size of Swedish anchovies (Strömling) were observed in great numbers the past summer in the Drage. The fishermen of Driesen had, as I am informed by Justice Prietz himself, a good catch of salmon. There were caught 64 salmon, of 14 to 35 pounds weight, that brought 1.1 marks per pound, so that the fishermen received 1,400 marks for them. This autumn the net fishery is still better. At Driesen, up to the middle of September, 148 fish of 16 to 35 pounds had been caught, and as the fishing season lasts till mid-October, the total catch must be reckoned at twice that number at least. In the Drage the catch at Steinbusch is reported likewise good, and the fishermen of Usez, at the mouth of the Küddow, are said to have taken 8 salmon in a single night.

Mecklenburg rivers.—Councilor Brussow traveled in the spring with an official of the land district of Doberan along a part of the Baltic coast to inquire into the results of the planting of salmon fry, and which he found to have been very considerable. Formerly in the district of Doberan on a stretch of coast $2\frac{1}{2}$ miles long lived three sea fishermen, of whom two followed the fishery only as a secondary occupation, and obtained but a scanty subsistence. Since 1880 the salmon fishery has become more important, and now in the same district there are eight fishermen subsisting exclusively and with comparatively ample earnings upon the sea fishery. Their catch consists mainly of salmon, sea trout, and herring, with a few flatfish and eusk. The magistrate of Wismar reports that the salmon fishery has much improved, and that in

consequence a certain Captain Bade has established himself in the neighborhood of the city and engaged in the sea-fishery exclusively. At the mouth of the Warne many hundreds of salmon are now yearly caught. In consequence the magistrate has petitioned Herr Brussow to have 30,000 to 50,000 salmon eggs hatched for him and the fry planted in the Warnow basin. On the whole coast of Mecklenburg the salmon fishing has experienced a remarkable improvement. I am sorry to say that undersized salmon are also caught and secretly sold.

Schleswig-Holstein.—Von Stemann, at Rendsburg, writes that the Rhine salmon was extinct in these waters, but that now it is caught more plentifully than the sea trout. In the fall of last year fine specimens were sold at 50 pfenings (12 cents) per pound. Up to October 5, in the Treene, between Eggebeck and Tarb, 64 salmon were caught. To get salmon spawn several large inclosures were constructed to hold the fish until ripe. Since the fishermen catch plenty of sea trout, brook trout, and the hitherto unknown Rhine salmon, the repute of the Fishery Union grows year by year. The salmon have now reached a weight of 8 pounds each. In 1881 9 males of 3 to 4½ pounds were taken, and in 1882 the first mature females of 6¾ pounds were caught, and 5,000 eggs fecundated. The Luhnau and Wehrau have got a very good stock of trout and sea trout, through the planting of fry. The results of fry-planting always consist in increase. Between Flensburg and Alsenlangballig many salmon and sea trout were taken this winter, which were in great demand, and brought the fishermen from 1.50 to 1.70 marks per pound. But a short time ago, in the neighborhood of Flensburg, at one haul 50 pounds of sea trout were taken, which brought the fishermen 80 marks. At Owschlag about 500 pounds of salmon and sea trout are caught in the winter. The Eider, below Rendsburg, yields many Rhine salmon and sea trout weighing from 3 to 7 pounds apiece. The catch of salmon and sea trout at the village of Brammer, which is very considerable for so small a stream as the Jevenau, gives striking proof of the increase of these fishes through the planting of fry. B. Elsner, fish-breeder at Alt-Muhlendorf, reports that since the founding of the fish-breeding establishment, from a comparatively small number of planted fry, noteworthy good results have followed. Of the fry of sea trout liberated in 1881, according to the statement of fishermen, great quantities (basketsful) of the size of medium herring were caught at Eckernfoerde in 1882, in the basket-nets that stand in the bay of Eckernfoerde. In the spring of 1882 sea-trout fry were turned out at Neustadt, and now, as the fishermen say, in the bay of Neustadt, small sea trout are taken at every haul of the seine. Since great success has been experienced in other parts of the province also, the fishermen, otherwise hard to convince, take a lively interest in the matter.

The German Fischerei Zeitung, No. 24, reports from London, under date of August 15, that the salmon fishery in Scotland has been extraordinarily productive the past month, so that the price fell to 6*d.* per

pound. The rigidly enforced close season of the salmon rivers, the prohibition of fixed instruments of capture at the river mouths, as well as the protection of the young salmon and the spawning places in connection with the vigorous employment of artificial salmon culture are generally regarded as the most important causes of the improvement in the salmon fishery.

North America.—In the report of the Commissioner of Fisheries for 1879 (published in Washington in 1882), page 698, Livingston Stone makes the statement that since artificial fish-culture has been carried on in California the salmon have increased immensely in the Sacramento, so much so that, although the canneries have increased and the sea-lions and the fishermen also, the salmon have nevertheless made a steady gain in numbers, or, in other words, the fishery commission has, with the aid of artificial hatching, beaten the sea-lions, the canneries, and the fishermen combined.

SUCCESS OF THE CULTURE OF BROOK TROUT.*

THE DANUBE.—The Fishery Union of Waldmünchen has since 1879 yearly deposited several thousand trout fry in the brooks tributary to the Regen. In consequence the catch of trout has considerably increased.

THE RHINE.—Every fishery lessee is required to turn out yearly in the leased waters 100 trout fry for every cubic meter of water supply, and the trout-fishing is thereby remarkably improved.

Würzburg.—The "Fish Brook" was fishless; it was stocked with 5,000 trout fry per year for three years past, and now it swarms with fish, of which the largest weigh a pound.

Bibelhausen near Saarburg.—The mountain brooks flowing into the Lower Mosel are now well stocked with game fish, and fishing is very remunerative.

Birkenfeld.—Since 1878, 5,000 young trout have been yearly turned out in the Traun Brook Valley. Now trout occur there in plenty; even in the vicinity where formerly trout belonged to the rarities, edible trout are now again caught. The net result of artificial fish-culture is here gratifying.

Montabaur.—The Gelb Brook yields notably more eatable trout since it has been regularly stocked with trout fry.

Deutz, on the Sieg.—Franz Goebel turned out trout fry below Deutz eight years since. The fish ascend at high water as far as Deutz, and many trout now occur there, as was not the case before.

Barmen.—Burdet Chevalier stocked the brooks that he had bought and rented with trout fry, and now has far more edible trout in them than before.

* Each item in the following paragraphs, relative to brook trout, sea trout, char, grayling, whitefish, carp, and eels, is accompanied by a reference to individual authority for the statement. The names being mostly unknown to American readers, they are omitted by the translator.

Füchten, near Neheim.—In consequence of artificial fish-culture, the Ruhr and its tributaries in the neighborhood of Füchten are now better stocked with trout than formerly.

Menden.—Baron von Duecker caught, May 23, with a gray artificial fly, between 4 and 6 o'clock, forty-four trout and one grayling, a consequence of the planting of trout fry in the Hönne; also on the Upper Ruhr he had a good catch, especially on the spots where, in the spring, trout fry had been planted.

THE WESER. *Lauterberg.*—The improvement in the stock of trout through the planting out of fry is very noteworthy, 1½ to 2 pound trout being taken much oftener than formerly.

THE ELBE.—C. Arens, of Cleysingen, near Ellrich, in the Hartz, several years ago placed several thousand trout fry in the canal that feeds his mill, which before had no trout; these were re-enforced by some small fish that had escaped from a rearing pond. On September 21, of this year, the water was drawn off to cleanse the mill canal, and on that occasion 48 pounds of the finest trout were taken under the causeway bridge, besides small trout and fry in quantity. The millers of the neighborhood also find to their astonishment beautiful trout in their water-wheels, as has not in a single instance occurred before for a decade. From which may be seen the use of planting fry, and that it is not advisable to catch too small fish. The mill canal has a gentle current, muddy bottom, a smooth shore, a maximum temperature of 77° Fahr., and is rich in insect life. The water is better for trout than spring water. Although they cannot spawn in it, they grow better than in a swift, stony brook. The water is often much roiled by rains, yet the trout stay in it and do well. The fish turned over to the cook, even those weighing 1½ pounds, had white flesh, fat and toothsome.

Königsbruck in Saxony.—Through artificial culture trout are established in wild brooks where they did not before occur.

THE ODER. *Sprottau.*—The town turned out trout fry four years ago, and in consequence trout are now often taken at Sprottau.

THE WEICHSEL.—Miller A. Ohlert, of Somers-in-on-the-Brahe, catches fine trout for the table, the product of the planting of fry.

Christburg.—A brook, utilized for trout culture, affords an abundance of table trout for private use and for sale.

Mecklenburg-Schwerin.—The northern outlet of the great Schwerin lake had formerly no trout, but brook trout of 6 pounds weight are now caught there—a result of fish culture.

Allow me to add a single instance from England. As I was fishing this spring at Walton, above London, I was informed by my friend, T. R. Sachs, and other members of the Thames Angling Preservation Society, that the trout fishery has wonderfully improved in consequence of the planting of trout fry. Mr. M. Cooper Morris writes me, that besides the Thames trout, lake trout and American brook trout were also taken. Certainly the catch is ten times as great as a few years ago. Formerly

it was understood that a Thames angler needed three years for the capture of a single specimen of the giant trout living in the river. Last year one gentleman took 80 good trout. Next to the late Mr. Frank Buckland, unquestionably Mr. James Forbes has obtained the greatest return. He has a small but very prettily arranged fish-breeding establishment near Chertsey bridge, and in ten years has set free in the Thames a total of 120,000 to 150,000 trout fry. At Sunbury, also, has artificial breeding been effective in improving the trout fishery of the Thames. At the annual dinner of the Thames Preservation Society, a list was submitted of trout taken with the hook in a single week in May, 1883, between Chertsey dam and Kingston. It embraces 18 trout, weighing in the aggregate 109 pounds 14 ounces, thus averaging 6 pounds each. There was universal satisfaction over the success, and not a doubt has come to my ears that artificial culture deserves the credit.

Mr. R. B. Marston, reports in the London Field, of October 30, that Mr. S. Wilmot has in the International Fishery Exhibition in London an 11-pound New Zealand trout that was sent to him by the Otago Acclimatization Society; it was caught with the hook, and larger specimens are often killed. About twenty years ago trout eggs were sent from England to New Zealand, and from those has it resulted that the rivers of that region are now stocked with noble trout. Dr. Francis Day received from New Zealand two beautiful trout in ice; they reached London in good condition, and are undoubtedly *Salmo fario*.

LAKE TROUT AND CHAR.

Oekonomierath Brüßow, of Schwerin, Mecklenburg, caught last winter in his lake, with the coarse net, several 3-pound trout.

Zwätzen, near Jena.—The char flourishes very well in several ponds in Thuringia. According to Oberbürgermeister Schuster, of Freiburg, the success of the planting of char in the Lake of Constance is beyond doubt.

GRAYLING.

(Reports are given from seven different localities, showing in each case an increase of grayling resulting from the planting of fry.)

WHITEFISH.

In the Schleier Lake in the Bavarian Alps, in the autumn of 1882, the first ripe whitefish were taken. There were *Coregonus marana*, the well-known fish of the Madui Lake, which have been introduced to the former locality since 1878 by the German Fishery Union.

Success has likewise attended the introduction of *Coregonus Wartmanni*, the "blaufelchen" of Lake Constance, into North German lakes. A spent male was taken February 24, in the Talter Lake, a part of Spirding Lake. According to Professor Benecke, it was 34 centimeters long, 7.5 centimeters high, 4 centimeters thick, and weighed 305 grams.

On both sides were visible, on seven rows of scales, the remains of the excrescences of the spawning season. In the same lake among smelts there was taken, April 6, a second specimen of "blaufelchen," which was identified by Professor Benecke, and which measured 32 centimeters in length, 7 centimeters in height, 3.5 centimeters in thickness, and weighed 284 grams.

Mr. Ohlert, of Somersin, in West Prussia, reports that Mr. Caspari took 60 blaufelchen with the coarse net in winter in the Summin Lake, where formerly only small marænæ occurred; three years ago fry of *Madu maræna* and blaufelchen were introduced. Professor Benecke identified a spent male 22 centimeters long, 6.5 high, 2.7 thick, and weighing 220 grams. The same fish was sent to Dr. Gemmiger, of Munich, and by this gentleman also was recognized as a blaufelchen.

(Five other instances are given of successful breeding of the white-fish in German lakes.)

CARP CULTURE.

Sprottau.—A few years since, two-year old carp were placed in the Sprottau, and fine large specimens were taken this summer.

Potsdam, July 15, 1883.—The planting of carp in the waters of Potsdam district has been attended by evident success.

Berneuchen (Max von dem Borne).—Since the lakes of Berneuchen and the Mietzel have been regularly stocked with yearling carp, these waters have been wonderfully productive of beautiful, great table carp. The same is true of the Bötzen Lake of Dölzig, but there it was not possible to catch great numbers of carp until, last winter, the net was enlarged so that the whole lake could be swept at a single draught under the ice.

The success was complete. The net contained all the fish it could hold, mainly carp. The largest of these, about 4,000 pounds weight, were taken out, and the greater part turned back to allow the carp to grow larger.

EEL CULTURE.

Years ago Director Haack, of Hünigen, got a great quantity of eel fry from French rivers, and in the spring sent them by mail to all parts of Germany. From the planting of these fry in the lakes and rivers very good results have followed, in several cases within my own knowledge. This fall a spring pool, unconnected with any other water, and without outlet, was fished. Four eels were taken; they were one and three-fourths years old, and the poorest weighed one and one-quarter pounds. In the spring of 1882 a few specimens of eel fry had been placed here to observe the growth.

On the profitableness of eel culture, Mr. Nehr Korn-Riddagshausen (Braunschweig) says that a short time ago he had a small pond fished out that he had a few years before stocked with 500 young eels, and that about 250 young eels were found, ranging from one-fourths to one kilogram (.55 to 2.20 pounds), some specimens weighing even one and one-

half kilograms (3.3 pounds). The cost of the above 500 eels, post paid, amounted to 6 marks (\$1.92); the proceeds of the sale of 200 eels was 200 marks (\$64); some 50 partly-grown eels transferred to another pond had, besides, a value of 20 marks (\$6.40). Such success should induce owners of stagnant fish waters to make a trial of eel culture.

Of special interest is the attempt to introduce the eels to the waters of the Danube, where, as is well known, this fish does not occur. As the Bavarian Fischerei Zeitung, No. 13, reports at Grossmehring, near Ingolstadt, about the middle of June, in the old bed of the Danube, there was taken an eel 60 centimeters (23.7 inches) long, weighing 500 grams (18 ounces), which was very lively and well fed.

53.—NOTES ON COD, SHRIMP, ETC., AT COLD SPRING HARBOR.

By FRED MATHER.

[From a letter to Prof. S. F. Baird.]

At high tide the tom-cod (*microgadus*) run up to the hatchery and eat the fresh-water shrimp, *gammarus* (?). I have a fyke-net set, and took ten of them to-day, and all had their stomachs crowded with this food. At high tide the water near the hatchery is only of a density of 1.02 to 1.05, and I have there taken menhaden, bluefish, tom-cod, *Muraenoides gunnellus* (L.) Gill, and a species of *Pleuronectes* which I have not worked out. I see that the *M. gunnellus*, tom-cod, and the flat fish will soon spawn. Have only taken one *gunnellus*; kept it a week in a jar of salt water, and it died to-day. Its eggs were large and within a few days of ripening. It had only one ovary.

COLD SPRING HARBOR, N. Y., October 14, 1883.

54.—CARP CAUGHT IN OGEECHEE RIVER.

By GEORGE A. HUDSON.

[From a letter to Prof. S. F. Baird.]

I sent to the National Museum to-day some small fish which were caught in the fresh water of the Ogeechee River, in a trap which had been set for herring, rockfish, &c. Being the first of the kind ever seen in this section, they are sent to you for identification.

SAVANNAH, GA., April 14, 1884.

NOTE.—The fish sent by Mr. Hudson arrived April 16, 1884 (N. M. Acc., No. 14280), and proved to be five carp of about one pound weight.—C. W. S.