

4.—THE ARTIFICIAL PROPAGATION OF STURGEON IN SCHLESWIG-HOLSTEIN, GERMANY.*

EXPERIMENTS ON THE RIVER STÖR IN 1877.

[From the "Itzehoe Nachrichten," No. 87, Itzehoe, July 31, 1887.]

This new and interesting branch of fish-culture has repeatedly been tried in Europe, but so far without favorable results. An attempt made in America two years ago, however, to hatch sturgeon eggs by artificial means proved successful. Mr. Seth Green and Mr. A. Marks of the New York State fish commission caught a male and female sturgeon at the mouth of Wappinger's Creek near New Hamburg [on the Hudson River] and succeeded in impregnating the eggs of the latter with the milt taken from the male fish. From the eggs fertilized on June 7, about 40,000 sturgeon were hatched on the 10th and 11th. Another trial made June 12 also proved successful. Mr. Marks then took five pans of eggs, and about one hundred hours subsequent to impregnation in the neighborhood of 60,000 young sturgeon were hatched, the temperature of the water being from 67° to 74° Fahrenheit.

Having learned of these successful experiments, the board of directors of the Itzehoe Sturgeon Fishery Association, which is presided over by Mr. Dohrn, the mayor of Itzehoe, resolved to make an attempt to propagate the sturgeon artificially in their waters.

July 2, two fishermen, J. Trede and Kappelau, captured a male and a female sturgeon; on the following day the roe was taken from the spawner and after being impregnated with the milt was put in hatching boxes. At the end of eighty hours the embryos had so far developed that they could be seen in the eggs, but on account of the great change in the temperature of the water the eggs had been injured, so that the embryos, which in the evening had a clear bluish-gray color, assumed a yellowish tint the next morning resembling that of a decayed fish. From that time on the eggs presented a bad appearance and gradually decayed, the experiment, therefore, terminating unfavorably.

Nevertheless, a second trial was soon after made. In the morning of July 15, a female sturgeon, weighing about 150 pounds, was caught, which, when taken from the water, began to emit its roe, and was therefore seen to be mature. As much of the roe as possible was gently squeezed from the fish, and the remainder taken from it by cutting. All the roe was immediately put in pans which had been half filled with water from the River Stör, and, while the roe was gently, but continuously, stirred, the milt of a male sturgeon, weighing about 50 pounds, was slowly poured over it. The milt was obtained by removing the testes from the male fish and subjecting them to pressure. After the roe had been impregnated, the stirring was continued for half an hour, and the water in the pans frequently renewed, in order to

* Reports translated from the German by Herman Jacobson.

diminish somewhat the large and constantly increasing quantity of viscid slime. At 10.30 a. m. the fertilized eggs were transferred to hatching-boxes, four of which were placed in the River Stör, where there was a moderately strong current, and where the temperature of the water was about 17° Réaumur. One hatching-box, containing a small quantity of eggs, was moored in a ditch containing water at a temperature of 18° Réaumur. The several hatching-boxes in the River Stör were supplied with different quantities of eggs in order to determine how many could best be kept together.

The formation of the embryos in the eggs could be seen distinctly with the aid of a magnifying glass at 8 p. m., July 17. At 9 a. m. on the 18th, the embryos were observed to be moving about in the eggs, and at 1 p. m., of the same day, the tails of several protruded from the eggs and were actively in motion, although the head was still within the egg. On the evening of this day the embryos could be numbered by the thousands.

On the morning of July 18, the live ones were removed to another empty hatching-box, which, like the former boxes, was floated in a moderately strong current. On the morning of July 19, about 9 o'clock, a good many little fish had entirely released their heads, and were swimming about in the box, the egg still forming the central part of the body. From that time on the egg gradually changed, the central portion of the body of the embryo still developing within it, until it disappeared almost entirely, and was hanging from the lower side of the fish, being reduced in size to that of a grain of mustard. July 23, the young fish were completely developed; and on the 25th two-thirds of them, about 50,000 to 60,000 in number, were conveyed from Beidenfleth to Itzehoe, and placed in the River Stör. The remaining one-third was retained in the hatching-box at Beidenfleth, in order to observe the further growth of the young fish.

It appears, from this experiment, that seventy-two hours after impregnation the embryo can be seen in the egg; that the tail portion is released seventy-eight hours after impregnation; the head one hundred hours after, and that two hundred hours after impregnation the young fish are so far advanced that they can be set free in open water.

REPORT OF OPERATIONS DURING 1885.

[From "Ninth Annual Report of the Central Fishery Association of Schleswig-Holstein" Rendsburg, 1886.]

In the year 1885 our association received 500 marks [\$119] for the purpose of aiding our efforts in sturgeon-culture; and the board of directors promised to do every thing in its power to that end. The writer was commissioned to take charge of this work, and in the spring went to Hamburg for the purpose of arranging with the owners of the large sturgeon establishments on the Elbe, to supply the sturgeon necessary for obtaining the roe and milt, which all of them promised to do. I next visited Twielenfleth, Kollmar and Glückstadt, in order to secure the services of two men to take charge of the proposed sturgeon-hatching. In Twielenfleth I found Mr. Köser, and in Kollmar Mr. Lau, both of whom expressed a great interest in the matter, and would

*By B. Elsner,

gladly undertake the new charge. Mr. Mobr in Glückstadt had assisted in the similar experiments of 1884, and promised to take part in those now proposed. Besides the above Mr. Söth, a fisherman of Tielenhemme, was commissioned to superintend a sturgeon hatchery on the River Eider. All of these persons displayed great activity in their work. Several lots of eggs were fertilized at different times, but, unfortunately, not with successful results, as it was only on rare occasions that mature spawners and milers could be obtained at the same time; and if a ripe male was secured from the nearest fishing station, the female frequently died in the mean time. Mr. Lau at Kollmar alone succeeded in hatching a comparatively small number of sturgeon, which developed in healthy condition, and were planted in the River Elbe.

It will be claimed by some, perhaps, that the same methods could be pursued with the sturgeon as with the salmon, viz, to catch the males and females, and hold them until the spawning season. This has been attempted but without favorable result. We had a large box made and placed in the harbor of Glückstadt, at the mouth of the river Riehn, and put sturgeon in it, with the view of keeping them until the spawning season. But the sturgeon would live in this box only a comparatively short time. This may result from the fact that the hatching season of the sturgeon is in warm weather, chiefly during the month of July, when the temperature of the water is about 17° Réaumur. The large fish also become injured in the box. Not only did we attempt to keep sturgeon in this way, but we also tried to confine them alive in a pond near Glückstadt, through which fresh water from the Elbe flows at every tide. Even in this pond, however, the sturgeon died after a few days.

As far as I have been able to observe, the greatest difficulty in the way of sturgeon culture results from the fact that the spawners, when mature, emit the eggs within a very short space of time. When a mature spawner has been caught, the roe commences to run as soon as the fishermen lift the fish into the boat, and it continues to flow while it is being conveyed to the station where its fertilization is to be effected. In case the fishermen tie up the ovarian duct so that the roe can not escape before the fish reaches the hatching station, the impregnation of the eggs can be accomplished successfully, providing a good miler is on hand. If, however, this is not the case, and the spawner has to lie for ten hours before a miler is obtained from the nearest fishing station, the roe inside the fish becomes so soft that many of the eggs break during the process of impregnation. If a mature fish is thus compelled to retain the roe for any length of time, the eggs become quite transparent, and fall to pieces when touched.

During the present year (1886) the attendants at Glückstadt have succeeded five times, and Mr. Lau, at Kollmar, twice, in hatching sturgeon. Considering the failures of former years, these results must be regarded as exceedingly favorable, but we are still far from having reached a point where we can say that the greatest difficulties in sturgeon hatching have now been overcome. There is, as yet, no absolute certainty about the matter, and a great deal depends upon contingencies.

If sturgeon culture is to be made of economical importance, it is absolutely necessary that we should produce several million young every year. By the occasional hatching of a few thousand sturgeon only we can not say that we materially aid in the increase of the abundance of the species. This has been my view of the case for some time, and it was confirmed when I visited Glückstadt in July, in order to plant in the river Elbe the sturgeon that had been hatched at that station. Some experiments

were made for me with the view of ascertaining the number of sturgeon eggs to a pound. For this purpose a quantity of eggs was carefully weighed and it was found that 68,888 were required to make a pound. Last summer a fisherman brought to Glückstadt a mature sturgeon which was estimated to contain eighty pounds of roe. If the roe of such a sturgeon were successfully treated, we would get 5,511,040 impregnated eggs. I think that this goes to prove that if we desire to aid nature we must hatch sturgeon by the million. But in order to do this, it is necessary to gain much more experience than we now have in regard to the matter. In the first place, it is essential that we should make every possible effort to devise some means of penning sturgeon, which have not been much injured during capture, until they become mature. I would like to see the German Fishery Association grant to our association a certain sum annually for this purpose for a period of ten years, for if we desire to hatch sturgeon successfully, we must arrive at something definite in the matter, so that it can be said when there have been average catches, we are prepared to impregnate a specific number of sturgeon eggs. It is also very desirable that the Seth Green hatching apparatus, now in use, should be slightly modified by replacing the wooden front and back with metal wire grating from 3 to 4 inches high, so that when the apparatus is placed where there is not much current, the tide may nevertheless pass through it. At present the water must be kept in continuous gentle motion in order to insure a slight current through the apparatus. This motion is effected by means of a boat or raft producing gentle waves which pass through the grating from below. The present apparatus is serviceable in the open waters of the Elbe, where the surface, however, sometimes becomes so rough that no boats will venture out from the secure harbor; but if some other arrangement were possible, one would not think of resorting to such a place. If the Seth Green hatching apparatus were changed, in the manner indicated above, it could, in order to adapt it to occasional spells of rough water, easily be altered so as to cause the waves to pass through the grating from below only, by putting boards in front of the grating.

It is exceedingly desirable to hatch large numbers of sturgeon, because the sturgeon fisheries are constantly declining. The sturgeon fishermen on the Elbe take a lively interest in the subject of sturgeon-culture. This is evident from the fact that the Holstein fishermen of the Lower Elbe and of the rivers Stör, Krückan, and Riehn have formed an association, the by-laws of which contain the following provision: "This association considers it as its object to increase the quantity of fish within its territory by planting artificially raised fish in such places as are suited to them. Every mature spawning sturgeon caught by a member of the association shall, for that purpose, be delivered at the nearest hatching station (mouth of the river Stör, Glückstadt, or Kollmar.)" Furthermore, "every member of the association is obliged to set free at once any sturgeon caught by him which does not measure at least 1.25 meters in length," and "only such nets are to be used for catching sturgeon as have the meshes, when wet, at least 16 centimeters across from knot to knot, and therefore measuring at least 64 centimeters in circumference." It appears from the above that our practical fishermen are anxious to protect and increase the sturgeon, and that the old adage, "Fishermen only want to destroy," does not apply to them, for the minimum length of sturgeon allowed by law to be taken is only one meter. I am fully convinced that if our fishermen are given some practical hints by persons who have a thorough knowledge of the fisheries, they will gladly do their share in aiding us to further the interests of the same,

REPORTS OF OPERATIONS DURING 1886.

[From Circular No. 4, 1886, of the German Fishery Association, Berlin, September 28, 1886.]

We are pleased to state that good news has been received relative to the artificial propagation of the sturgeon, and that the experiments made in Schleswig-Holstein have proved successful.

“How long do the young sturgeon which have been artificially hatched remain in the mouths of our rivers?” and “After how many years do these fish return from the sea to the nets of our fishermen?” These are important questions, and letters respecting that subject were addressed to Mr. von Stemann and to Dr. Pancritius. The answer received from the latter gentleman is given below. Mr. von Stemann replied to our jocular request to obtain for us, in 1887, 10,000,000 young sturgeon, as follows: “This year has greatly encouraged us, and we shall surely reach the desired 10,000,000 young sturgeon in 1887.” He continues: “As far as could be observed during the experiments in sturgeon culture made in 1879 at Frauen-Beidenfleth, the young sturgeon remain in the mouths of the rivers. During the years 1882 and 1883 many sturgeon measuring half a meter in length were observed and caught in the lower part of the river Stör, this being accounted for by the hatching work of 1879.” An old Glückstadt sturgeon fisherman has said regarding this year’s hatching, “We ought to have known this fifty years ago and we would now have plenty of sturgeon. But if people want to reap all the time without ever sowing, evil results must follow.”

We are very glad to see that the Schleswig-Holstein fishermen, who for a long time have been our faithful followers and co-workers in the matter of salmon culture, have now also become enthusiastic in the cause of sturgeon culture. With respect to what is being done with reference to this species we feel that it is our first duty to use the money intrusted to us in increasing the supply of standard food products.

We give below the preliminary report of sturgeon culture made by the Central Fishery Association of Schleswig-Holstein and the letter of Dr. Pancritius.

PRELIMINARY REPORT ON STURGEON HATCHING IN 1886.

The many failures which followed the extensive experiments made in 1883, '84, and '85 to obtain, impregnate, and hatch sturgeon eggs in the Elbe and Eider had led us to discuss the question as to whether it was advisable to spend any more time and money on sturgeon culture. The strong encouragement and aid given us by the German Fishery Association overcame our scruples, however, and in the month of May, 1886, extensive and careful preparations were made for beginning a new series of experiments. Hatching apparatus was distributed, the fishermen were properly instructed, and we placed ourselves in direct relations with the sturgeon fishermen and dealers.

Many willing hands worked with us in this deserving cause, and in future special reports we intend to acknowledge our indebtedness to each of our co-workers without whose services it would have been impossible to obtain such favorable results.

On July 5 the first mature spawning sturgeon was brought to Glückstadt. A miller was in readiness, the eggs were successfully fertilized at once, and July 8 fully 200,000 young sturgeon were placed in the Elbe. July 15 another lot of eggs were fertilized, from which 50,000 embryos were obtained.

On July 16 at least 1,000,000 eggs were impregnated near Glückstadt. When the young fish had so far developed that they would have been ready for planting in the Elbe on the following day, the hatching apparatus was tossed about so violently by a rough sea that most of the young fish escaped. The remainder were liberated in the Elbe on the morning of July 21 by Mr. Elsner, but he was unable to give a detailed statement regarding the precise results of this trial. The number of fish hatched in the apparatus was estimated at 400,000. At the same time about 30,000 young sturgeon had been successfully hatched at Kollmar on the Elbe.

On July 25 and 26 all the Glückstadt apparatus was again filled with impregnated eggs, and on July 31 400,000 young sturgeon were planted in the Elbe. The last hatching of the season occurred near Glückstadt August 4, from eggs which had been impregnated on July 31, and produced about 9,000 young fish. The labors of this year may, therefore, be said to have given very favorable results, and our fish culturists have gained a great deal of experience.

In still another direction we are able to record important results, which will be explained in a full and detailed report at some future time.

In the name of the board of directors of the Central Fishery Association of Schleswig-Holstein.

VON STEMANN.
ELSNER:

LETTER OF DR. PANCRITIUS.

It gives me great pleasure to answer your questions of August 20, which I do as follows:

1. How long do the young sturgeon remain in the rivers before migrating to the sea?

It must be assumed that the sturgeon go into salt water in the beginning of the second spring, as sturgeon measuring 10 to 12 centimeters in length have been caught at sea. In the inlets and bays on our coasts many sturgeon of that size are likewise caught, and it must certainly be presumed that these fish are on their way to the sea.

2. How old are the sturgeon when they return from the sea?

Unfortunately we lack precise observations on this point, and without such data it will be absolutely impossible to answer this question. With this object in view, regular observations have, at our suggestion, been made at Neukrug (on the Baltic), and we are now looking for other suitable places where similar observations can be taken in our bays and rivers. A comparison of all these will probably furnish material for replying to this question.

3. The bulk of the sturgeon captured weigh from 25 to 35 kilograms each [55 to 77 pounds]. Are sturgeon of this weight the first to return from the open sea?

This question, like the second, can not be answered at present, as all the sturgeon on which I have had reports were caught in salt water.

4. Is it known where the sturgeon that spawn in the rivers of the Baltic live during the time they are at sea?

Our coasts furnish sufficient food for the sturgeon, and we therefore have a considerable number, though not a superabundance of them. It is probable that it might be ascertained whether these sturgeon have been hatched in the rivers on these coasts by marking some of the young fish.

We have now commenced to keep very full and careful records respecting the salmon and sturgeon, and we think that uniform and simultaneous observations of this

character made in every part of Germany would result in furnishing a tolerably correct idea of the mode of life of those species. It is necessary, however, that the stations for making observations should be carefully selected, as very erroneous results might be obtained through insufficient and inexact data. The stations should be visited from time to time by competent persons, who should personally give instructions how to conduct the observations. We are now publishing a large edition of our salmon and sturgeon record-books, and shall take the liberty to forward copies for your inspection.

Hoping that it will soon be possible to answer all of the above questions in a satisfactory and exhaustive manner, I am, very respectfully,

Your obedient servant,

Dr. PANCRITIUS.

[From Circular No. 6, 1886, of the German Fishery Association, Berlin, December 30, 1886.]

At the request of the German Fishery Association, the board of directors of the Central Fishery Association of Schleswig-Holstein has continued, in 1886, its efforts in regard to sturgeon-culture, and has attained better results than in any previous years. The work of this year was important not only on account of the many thousands of sturgeons that were hatched, but also by reason of the greater experience gained by the sturgeon fishermen. If sturgeon-culture is to be established upon a secure basis in the future, this can only be brought about through the willing and intelligent aid of the fishermen.

All that has been accomplished in the matter of sturgeon-culture, has been done in the special interest of the sturgeon fishermen, a fact which they now recognize; and in a few years we hope to be able to report that those fishermen on the Elbe and Eider have hatcheries of their own, in which, with the aid of the German Fishery Association, millions of sturgeons will be produced every year.

From the daily reports of this year's work we quote the following:

Mr. Elsner, a fish-culturist, directed the work during June, 1886, at the Elbe stations of Glückstadt, Kollmar, and Twielenfleth and on the Eider near Thielenhemme.

Hatching apparatus was supplied, and rewards of 50 marks [\$11.90], 75 marks [\$17.55], and 100 marks [\$23.80] were offered for lots of 10,000, 20,000, and more young sturgeon hatched at these stations.

July 7 our faithful co-worker, Mr. J. Mohr, of Glückstadt, telegraphed that sturgeon had been hatched near that place. Mr. Elsner immediately went to Glückstadt and found live embryos in three of the hatching-boxes. July 8 the fish were ready for planting to the number of about 200,000. This number was calculated upon the basis of 68,888 eggs to the pound of mature roe.

Mr. Mohr reports as follows: On Saturday, July 3, about 11 o'clock a. m., Mr. Kuhnerti, a fisherman, arrived from Störort with a mature spawning sturgeon. I was immediately informed of the fact, and, in conjunction with Mr. Stepnitsch and several fishermen, commenced to impregnate the eggs. We had two mature males secured by a chain, and the milt of both of these was used in that connection. About 2 o'clock in the afternoon the work of impregnating the eggs was finished, and all the eggs were placed in three hatching-boxes. On Wednesday morning, about 8 o'clock, or ninety-three hours after impregnation, the first free embryos were observed in the apparatus, and about noon, so far as could be determined, all the eggs had been hatched. For this

first successful experiment Mr. Mohr received 100 marks [\$23.80,] to be distributed among his co-workers. After news had been received from Mr. Köser at Twielenfleth that sturgeon-fishing was over for the season at that place, and that nothing had been accomplished, the hatching apparatus was sent to Glückstadt, so as to afford increased facilities at that station.

July 15, at 11.30 a. m., another mature female sturgeon was brought by Mr. Mohr, which contained fully 1 pound of ripe eggs. A milter had been kept in readiness, and the eggs were again successfully fertilized. On July 19, at 8.30 a. m., the first free embryos were observed and the remainder hatched out about noon. The number of young fish was estimated at 50,000. Meanwhile Mr. Mohr received another mature spawner at noon July 16. A ripe male was on hand, but did not yield enough milt for all the eggs. A sufficient quantity of eggs was impregnated, however, to fill four hatching-boxes at once, and about 3 o'clock in the afternoon the remaining eggs were fertilized, filling two additional boxes. Altogether at least 1,000,000 eggs were impregnated.

During the night of July 19 and 20, however, a very strong southwest wind arose producing rough water which submerged the hatching apparatus to some extent. On the morning of July 20 three of the boxes contained young sturgeon, but the bottoms of the other three had given way. The wire work in the latter had become rusted along the edges through contact with sea water, and could not withstand the force of the waves. Mr. Mohr had all the boxes conveyed to another locality, towing them slowly along, attached to the stern of a rowboat; but it was impossible to avoid losing some of the embryos during this transfer, from 20 to 30 of them being washed out by every high wave encountered. On the morning of the 21st all of the embryos that remained were set free, but their number was very small, as a large proportion had been lost in the manner described. It must be considered, however, that a great many young sturgeon actually got into the waters of the Elbe, for Mr. Mohr had observed large numbers of young fish in the apparatus that remained in good condition and in one of the boxes whose bottom had been broken he had also noticed a few embryos; but they were not planted directly by the hand of man. Mr. Mohr again received 100 marks [\$23.80] for distribution among the fishermen and assistants. An old sturgeon fisherman, Friedrich Hansen, had witnessed the experiments in sturgeon hatching; and, after the first favorable results, he said: "If we had only impregnated sturgeon eggs many years ago, we would now catch more sturgeon."

In view of these words, spoken by an old and experienced sturgeon fisherman, the board of directors of the Schleswig-Holstein Fishery Association feels justified in presuming that mature spawning sturgeon are caught by the fishermen more frequently than is generally supposed. The board of directors, therefore, hopes that as soon as the fishermen of Schleswig-Holstein have been duly impressed with the great importance of artificial sturgeon-culture, the future of the sturgeon fisheries will be assured; but it should not be forgotten that this will take many years.

On July 18, at 7 p. m., a fisherman brought to Mr. J. Lau, of Kollmar, a mature spawner. A milter was immediately obtained, the eggs were fertilized and transferred to three boxes, and the latter were placed in the river Wetteree. July 19, at 7 a. m., Mr. Lau received a second mature female. A milter was also secured at once, and the eggs fertilized, but there was only one more hatching-box on hand. This was filled with eggs, and the remaining eggs were placed in the Wetteree near the apparatus, where at every tide there is a current of fresh water from the Elbe.

July 22, Mr. Lau reported that some eggs had been hatched. On the evening of July 23, Mr. Elsner returned to Glückstadt, and on the morning of the 24th, went to Kollmar, where he found young sturgeon in only two of the boxes. Mould had also formed in the apparatus to such an extent that the young fish had been affected by it, and large numbers of them died. Mr. Lau, therefore, considered it expedient to liberate the young fish on the 23d. He said that he examined the apparatus on the 22d, about 3 p. m., and found a great many free embryos in the three boxes which had first been filled, fewer in the second and none in the third. On the morning of the 23d, about 6 a. m., he also noticed young fish in the box containing eggs from the second lot; but as all the boxes contained a great amount of mould, he was obliged to plant the young fish in the river, reserving a few, however, as tangible evidence of his success.

Mr. Lau estimated that from 20,000 to 30,000 young sturgeon had been liberated in the open Elbe. He also supposes that young fish were hatched from the eggs placed in the Wetteree; but of this he is not absolutely certain. He received a reward of 100 marks.

In the afternoon of July 25, and the evening of the 26th, some more sturgeon eggs were impregnated at Glückstadt. The young fish obtained from these eggs were planted in the Elbe on July 31. Their number was estimated at 400,000.

Late at night on July 31 still another lot of eggs was impregnated at Glückstadt, and this was the sixth and last trial made for the season. During a part of this time, however, a very strong northwest wind prevailed, producing rough water, so that only a few thousand young sturgeon were hatched in one box (although three had been filled with eggs) and placed in the open Elbe on August 4.

The work of fertilizing the eggs at Glückstadt was conducted chiefly under the direction of Mr. Mohr, and the management of the hatching apparatus was likewise under his supervision. Several other persons also participated in the work and manifested a lively interest in the same. Mr. Mohr, however, deserves the principal credit for the advancement that has been made. Everybody, in fact, was interested in the matter, and both the fishermen and assistants exerted themselves, not on account of the awards which Mr. Mohr distributed among them, but from genuine zeal in the cause of sturgeon-culture.

Much experience has been gained from the experiments of this year. In the first place it became evident that the hatching apparatus would have to be constructed in such a manner that it could be used when the water is rough, and will also serve in places where the currents are sluggish. The changes suggested thereby will be made during the coming winter.

In the second place the removal of the milt from a mature male by cutting and its utilization for the impregnation of the eggs was successfully accomplished. The embryos developed as well as if the eggs had been fertilized with milt emitted in a natural manner, only it took a little longer to hatch them.

A successful attempt was also made to convey freshly impregnated sturgeon eggs in a tin can containing water from the river Elbe, a distance of about one hour across the country, and to transfer them again to hatching-apparatus. These eggs were subsequently hatched in good condition.

It remains to be seen whether the supposition of the board of directors of the Schleswig-Holstein Fishery Association, that more mature spawning sturgeon are caught than is generally known, is correct. If such is the case, it is simply necessary

to further instruct the fishermen, and show them that it will be for their own benefit to become interested in sturgeon-culture. On the Eider, where many sturgeon are caught, no results have been accomplished during the present year. It can not be supposed for a moment that mature spawning sturgeon have not been caught in the Eider as well as in the Elbe; but the fishermen lack zeal and knowledge, and only the persistent labor of many years can succeed in obtaining results on that river.

There are, even at the present time, many men, and among them fishermen, who ridicule the officers of the association when they stand in the water of the Eider in rain and snow to obtain salmon eggs. And still our fishermen see the great results of salmon-culture, which enables some of them to get an annual income of 400 to 500 marks [\$95.20 to \$119] from comparatively small fishing waters. If the German Fishery Association is willing to continue to aid us, it will find eager workers, especially in the cause of sturgeon-culture in our association.

In the name of the board of directors of the Central Fishery Association of Schleswig-Holstein,

VON STEMANN.

[Letter relative to sturgeon-culture addressed to P. Feddersen, Schleswig, by B. Elsner of the Central Fishery Association of Schleswig-Holstein, March 2, 1887.]

In reply to your letter, which arrived here last week while I was absent on a journey, I have to state the following:

The propagation of sturgeon is a very difficult problem, and many experiments will have to be made before we are able to hatch them in large numbers and with certainty of success.

I transmit, herewith, the annual report of our association, in which I have given an account of the subject.

The most perplexing matter is to obtain a mature spawner and milter at one and the same time. It is particularly difficult to secure mature spawners, and when one is captured most of the roe is generally emitted either while it is being lifted into the boat or during its conveyance to the hatching station. If the spawner is not fully mature and is expected to reach maturity while kept in confinement, the problem becomes still more uncertain.

If a mature spawner and milter are obtained at the same time, the eggs should be fertilized at once by holding the former up by the head so that the tail does not touch the ground. The roe is then squeezed out into earthenware vessels, but not too much in each one. As soon as a vessel contains a sufficient quantity of eggs, some milt is added, and the whole is gently stirred once with the hand, so as to distribute the milt among the eggs. After this, enough water is poured slowly into the vessel to cover the eggs, whereupon a person takes a stout feather and gently stirs them for about ten to fifteen minutes, so that they may not adhere together. The eggs are then transferred to hatching apparatus, which, if possible, is placed in the same water from which the sturgeon were taken. If the temperature of the water is 17° Réaumur, the embryos will hatch in about ninety-two hours.

I am now having new hatching apparatus made, in accordance with the experience gained during our last experiments.