

this is possible, if a proper method of transporting them could be found. It is maintained, but whether justly or not we do not know, that out of the water the crab cannot be kept alive as long as the lobster. If this should be the case, it is probable that some other method of transporting crabs could be found; if not raw, they could possibly be transported cooked.

Our hope in seeing our crabs made an article of commerce is based on the fact that crabs bring a high price in England. In London large quantities of crabs are offered for sale, and they may be seen in many stalls on the Strand, Fleet street, &c., where lobster salad and crab salad are favorite dishes. In the London markets last summer [1885] the price of crabs varied from 8 cents to 90 cents apiece, while the average price was about 40 cents. Such figures ought to furnish a satisfactory answer to the question, whether our crabs are too good an article to be left lying on the sea-shore, all the more as our fishermen incidentally catch ten times more crabs than lobsters, which represent a considerable income in our fisheries.

There is therefore every reason to urge our fish-dealers to take up this matter. Attempts should be made to export crabs. Even if they were to bring a much lower price than is paid for them in the London fish-market, these fisheries would yield some profit; and we are convinced that our fishermen would be well satisfied, if they could sell crabs at a low price. But our fish-dealers should also endeavor to introduce crabs in our domestic fish-markets. The Danish public might possibly be induced to entertain a better idea of crabs, if it learns what prices are paid for them in London.

53.—CARP CULTURE IN SWEDEN.*

By **FILIP TRYBOM.**

Carp culture has of late years made considerable progress in Sweden, after the old carp ponds had been allowed to lie idle for a long time, as is unfortunately still the case in many parts of Denmark. Carp culture was again taken up in 1879, when C. Wendt, a landed proprietor, who was familiar with it from his German home, commenced carp culture on a large scale and according to a rational method, on his property Gustafsberg, near Perstorp. His land comprises several small lakes, which are very well adapted to carp culture, as they can be laid entirely dry and again be filled with water. The gentle valleys on his property have mostly an otherwise worthless peat and swamp soil, where, by means of dikes, ponds can easily be formed. These ponds are amply supplied with water from marshes lying on higher ground, at least under the usual conditions of rain.

* "*Om Karpavli Sverige.*" From the Danish *Fiskeritidende*, Copenhagen, September 29, 1885. Translated from the Danish by HERMAN JACOBSON.

The first year he used about 12 acres of land [4 *tönder*; and 1 *tönde* = about 3 acres] for carp ponds. From sixteen female and ten male carp, which he obtained from Denmark, he raised one hundred thousand carp, sufficient to stock an area of about 1,200 acres. In the north of Germany, Denmark, and the south of Sweden, carp are ready to spawn in the third or fourth year, and weigh at that time from 2 to 4 pounds. Each female contains about one hundred thousand eggs, but of course not all of these become young fish.

The ponds for the young fry are not made very large, about from 1 acre to a few acres in extent. They should have very flat banks, and have shallow water throughout, from 1 to a few feet deep; if the water is deeper it is heated too slowly, the carp spawn too late in the season, the eggs are hatched very slowly, and the development of the young fish does not progress fast enough. The fish do not only become thinner and more slender during the first summer, but even later their growth will be retarded. In Germany the opinion is held that carp do not like to spawn until the water has a temperature of 17.5° C. [about 63° F.], and some people even maintain that the temperature of the water should be from 22.5° to 25° C. [about 75° F.].

Near Gustafsberg the spawning season has often set in during the last half of May, and the young carp have been hatched in as short a time as six days; but when the weather was cold it has taken ten or more days. A warm spring and a mild autumn are of the greatest importance for carp culture. Mr. Wendt states that carp do not grow at all when the temperature of the water falls below 9° C. [about 48° F.], while their growth progresses in proportion as the warmth increases. The period of growth is, even in Germany, limited to five months, and it has been calculated that in May it is 13 per cent of the growth of the entire summer, in June 31 per cent, in July 34, in August 18, and in September 4 per cent. If the spring is warm, the growth is not only comparatively greater in May, but also greater throughout the entire year, as the young fry can then during the summer far better derive all the possible benefit from their food. Attempts have therefore been made in Germany, and with considerable success, to cause carp to spawn earlier than usual by heating the water, so that they spawn as early as March. One spring Mr. Wendt placed glass frames over a portion of his pond which contained young fry, but this experiment was not successful.

The ponds for the young fry (as it is advisable to have several of them), as well as the ponds for the growing fish, should be kept dry previous to the time when carp are to be placed in them. This method has several advantages. Thus, the water gets warm sooner in a pond which has lain dry. Von dem Borne observed that while the temperature in such ponds was, in the middle of May, 20° C. [68° F.], it was in others where the water had stood for some time, only 17.5° C. [63° F.]. The consequence was a full month's difference in the spawning time, and moreover the young fry in the first-mentioned ponds were much more

numerous. These ponds produce a much larger quantity of small crustaceans, which are the favorite food of young carp. If the ponds lie dry for some time, a large number of injurious insects and other animals which eat roe and young fish are destroyed.

In an area of about 18 acres, one hundred thousand young fish are placed. After about four weeks they are again placed in suitable ponds, each 3 acres receiving about five hundred and twenty-five fish, and when late in autumn the young fish are caught for the third time, about 70 or 72 per cent of them are left, weighing one-quarter of a pound and more apiece. If at the first transfer only from one hundred and fifty to two hundred and fifty carp per *tönde* are placed in the water (as is done in Austrian Silesia), the carp will weigh about a pound apiece at the end of the first summer.

At Gustafsberg the young carp (one year old) have of late years been transferred once during the summer, namely, in July. All the ponds have ditches or furrows, which meet in a large hole inside the dike, near its lower part, so that the fish may congregate there and can easily be caught when the water is let off. From 75 to 95 per cent of the transferred fish could be caught in autumn, if care was taken to protect the fish against their enemies. In 1882 Mr. Wendt set out two hundred and fifty one year's fish per 3 acres. In the autumn of the second year these fish had an average weight of nearly a pound, while some weighed $1\frac{1}{2}$ pounds apiece; of fish that were a year older he set out one hundred, and of those that were still a year older (which were in their fourth summer), he put out from forty-eight to seventy-five in an area of 3 acres. It takes, however, the experience of many years to decide how many fish of the different ages must be placed in ponds of a certain character and size. Above everything else regard must be had to the nature of the bottom and the water. A barren bottom, where plants and small animals cannot live, is just as little adapted to a carp pond as cold spring-water. As a general rule several small ponds can support more fish than one large pond of the same extent, for in the smaller ponds the fish get a larger amount of shallow and warmer water. Formerly several times more fish were placed in the ponds than is done now. The result as regards weight was the same; but the economical advantage was less than now, because a small number of large fish will fetch a higher price than several small fish having the same combined weight.

Under the conditions referred to above, the fish in Mr. Wendt's ponds reach a weight of $2\frac{1}{2}$ to 4 pounds during the fourth autumn, some fish occasionally reaching a weight of 5 or 6 pounds. In a less favorable year when many carp of the above-mentioned age have not reached a weight of $2\frac{1}{2}$ pounds, they are set out in the ponds anew, so as to have another summer for growing. As a general rule, however, the fourth year is the one during which the Gustafsberg carp become salable. In Prussian Silesia carp reach a weight of 2 to 4 pounds when two and one-

half years old. The ponds are distributed in the following manner: From 12 to 15 acres are assigned to the young fry; 12 to 15 per cent of their entire water-area contains one-year-old carp; 18 to 25 per cent two-year-old carp; and in the remaining portion the three-year-old fish are kept, and in some years a few four-year-old fish, that is, those which had not yet reached the necessary size when three and one-half years old. A certain water area is set aside for wintering fish; and the ponds used for this purpose should be 7 feet deep, and if possible should be traversed by some running water containing air. Spring-water is well adapted to these ponds, because it does not freeze in winter.

The salable carp are, at Gustafsberg, placed in good-sized boxes with slat sides, which are set in a brook with a rapid current and clear water. Thus the fish can easily be got at when they are to be sold. In the brook-water they also very soon lose the peat or mud taste which they have when taken out of the ponds.

Late in autumn, in winter, and early in spring, carp do not, as a general rule, eat anything, nor do they grow.

Mr. Wendt has, at present, sixty-four carp ponds, covering an area of about 2,700 acres. The largest are lakes which have been laid dry. The average expense per annum is about 60 crowns [\$16.08] per 3 acres, and sometimes it is even a little higher.

During the last two years from 30,000 to 45,000 pounds of carp have been sold from Gustafsberg. Some of them are sent to Stockholm and Copenhagen, where they bring 75 öre [20 cents] per pound. But the principal market for these carp is Lubeck, Germany, where 60 to 67 öre [about 16 cents] is paid per pound. The cost of transporting carp from Gustafsberg to Stockholm is about 8 öre, and to Lubeck 5 öre per pound, if the carp are shipped alive in casks filled with water. Supposing that the price of carp at Gustafsberg was 50 öre [13.8 cents] per pound, these carp ponds have nevertheless yielded an income of 15,000 to 22,500 crowns [\$4,020 to \$6,030] in two years, or a gross revenue of from 20 to 30 crowns [\$5.36 to \$8.04] per 3 acres. Mr. Wendt calculates that there is on an average an increase of 100 pounds per year, for every 3 acres. If all the ponds were filled with water every year and if this calculation remains correct, the gross receipts would be much higher. In Holstein people count on a net income of 27 crowns [\$7.13] per 3 acres from carp ponds. For most of the carp ponds near Reinfeld, in Holstein, 85 crowns [\$22.78] were paid per 3 acres during the years 1874 to 1884, when the price of carp was very high; but these ponds are particularly fine and very productive. For the large ponds near Peitz, in Lusatia (9,000 acres in extent), a rent of 48,000 crowns [\$12,864] per annum was paid; that is, 16 crowns [\$4.28] per 3 acres—the gross receipts from which were 43.20 crowns [\$11.57] per 3 acres.

It is not easy to make any calculations as to the exact profit which will be derived from carp ponds; since, as in farming, there are years of failure and disappointed hopes.

During the pond fisheries early in November Mr. Wendt sold one-year-old fish at 10 crowns [\$2.68] per hundred. Some of these fish were bought by persons from the provinces of Wermland, Västergötland, &c. Whether carp culture north of Scania will pay, is a question which cannot as yet be answered. In such provinces as Småland and Wermland the growth would probably be too slow. It is quite probable that in a more northerly latitude than Scania the carp would gradually degenerate and become smaller. On a large scale it will hardly pay north of Scania, but experiments on a small scale may be recommended. Farther inland, where there is still a considerable supply of other fresh-water fish, the price of carp could not for any length of time be kept at the height of the German prices, and the transportation would cost more than from Scania. Locations should be chosen where the cost of construction is small, and which otherwise are of little or no value. In many respects it would be desirable that north of Scania attempts should be made to cultivate carp on a small scale, in ponds the construction of which would involve but little expense, and where the carp could either be used for home consumption or find a ready sale. In Germany much has recently been said and written in favor of planting large masses of young carp in peat-bogs, marl-pits, lakes, and rivers with a slow current, in the brackish water near the mouths of rivers, and in sheltered inlets of the sea. Experiments made in Berlin by Dr. Petri, at public expense, have shown that the saltness of the water in an aquarium, where carp, tench, goldfish, and eels were kept, could gradually be increased to $2\frac{1}{4}$ per cent without injurious influence on these fish, which remained in this water for more than half a year.

In Sweden the carp is said to have been introduced in 1560, and has since that time been cultivated on many farms in Scania. Linné states in his *Skånska Resa* (Journey through Scania) that in 1749 there were near Marsvinsholm 40 carp ponds, and that these were the largest and most important in the Kingdom. Formerly their number was much larger. It is hardly to be supposed that these ponds were as large as those at the present time in Germany or in Scania, nor is it probable that carp culture in the Scanian ponds was carried on then as rationally as it is now. In some ponds crucians were kept, and in others carp; in the ponds near Larkesholm—at least in one of them—the carp were allowed to stay from four to five years.

Linné does not state that these fish were kept in separate ponds; and it is therefore possible that this was not the custom when he visited Scania. But in a pamphlet on carp culture, published at Lund in 1766, O. Cederlof says that "care should be taken not to have the two kinds of fish intermingle." It was even then known that hybrids of carps are not of much value. Cederlof, who certainly got his information from Scanian carp cultivators, says in another place that "a pond having an area of 14 square yards would annually feed at least 300 three-year-old carp, 300 two-year-old carp, and 400 one-year-old carp."

STOCKHOLM, SWEDEN, *January 19, 1885.*