

BULLETIN
OF THE
UNITED STATES FISH COMMISSION.
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STOCKING THE STETTINER HAFF WITH CARP.

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A truly gigantic enterprise which will greatly increase our sources of national wealth, if successful, is at present agitated by the well known pisciculturist, M. von dem Borne, of Berneuchen, viz, the stocking of all the waters belonging to the mouths of the Oder, *i. e.*, the Stettiner Haff, the Papenwasser, and the Dammsche See, with the highest esteemed German food-fish, the carp. This large expanse of water, extending far to the east and west of the usual steamboat route, is only partially known to the visitors of our Baltic watering-places; it embraces an area of 87,000 hectares, or more than $15\frac{1}{2}$ German square miles—about 214,985 (English) acres. If every hectare of water is on an average stocked with 250 carp it would require the enormous number of nearly 22,500,000 of carp, which, placed in these waters when young, would after three years be fit for the market, and would—even if during that period many of them should have been destroyed—furnish ample food to a vast number of our population.

No one will deny that this is a grand idea, and the only question was for Mr. von dem Borne to furnish the proof of its practicability. Mr. von dem Borne has done this in the presence of a specially invited company of representatives of the authorities most interested in this matter, by laying his plan before them on the occasion of large pond-carp fisheries near his estate of Berneuchen. The result was such as to remove all doubt from the minds of those present as to the feasibility of Mr. von dem Borne's plan for increasing the productiveness of large sheets of fresh water. It may therefore interest our readers if we lay before them an outline of this plan.

The main question is, whether it is possible to produce about 22 millions of young carp in four years and place them in the Stettiner Haff. As pisciculture has reached a high degree of development in our coun-

“Die Besetzung des Stettiner Haff's mit Karpfen.”—Translated by HERMAN JACOBSON.

try, one might think that the easiest way of solving the problem would be to obtain the necessary carp from our piscicultural establishments, commissioning them to furnish as many young carp as possible, paying perhaps 3 marks (71 cents) per 100. In this way the required number of fish could be procured in a comparatively short time. But at this rate the cost of stocking the Stettiner Haff with carp would be between 600,000 and 700,000 marks, not counting the expense of transporting the fish. Although this large sum might pay some interest at a future time, the expense of starting the enterprise would be too great, and the parties to profit by this arrangement would be the piscicultural establishments and not the people.

Another way of solving the problem would be to adopt the method followed for a number of years by the eminent pisciculturist, Mr. Eckardt of Lübbinchen, by which impregnated carp-eggs can be sent a great distance, and by which the German Fishery Association has succeeded in stocking with carp some of our largest German rivers within a comparatively small number of years. The objection might, however, be raised that it would not be advisable to place the young fry of the carp, immediately after leaving the eggs, in the large basin of the mouths of the Oder, where strong winds often prevail and produce considerable waves. Mr. von dem Borne's plan, therefore, proposes that the parties most interested in the fisheries of the Stettiner Haff, *i. e.*, the local authorities, should procure the required 22,000,000 of carp, not by buying them, but in the simplest manner in the world, by raising them.

In order to fully understand this plan, we have to give a brief review of artificial carp culture, as it has been developed among us in a most rational manner. Not only during the last few years, but for centuries, the nutritious, delicate, golden-yellow carp has been the favorite of our nation. The carp, the unassuming inhabitant of our numerous marshy ponds, has by its peaceful nature become almost as much of a domestic animal as the hog or the goose. All during the Middle Ages carp formed the favorite dish during the Lenten season; and to-day more than ever it is, at certain seasons of the year, the favorite food of a large number of our population, and has, in the shape of "carp in beer," become a characteristic national dish of the Germans. The flesh of the carp contains (in proportion) as much nutritious substance as the finest piece of beef, and is peculiarly suited for making a savory dish; it is moreover entirely free from the disagreeable fishy taste found in many other fish. Owing to the very limited development of its brain, the carp possesses but little ambition, and is content to grovel in the mud of our ponds, generally living on small aquatic plants, and only occasionally allowing itself the luxury of a larva or of an insect. Its excellent appetite is followed by favorable results sooner than is the case with any other artificially raised fish; and its well-rounded body soon assumes such proportions as to make the pike—that most voracious fish-of-prey—absolutely harmless, for the simple reason that no pike can be found

large enough to swallow such a carp. The carp occasionally, as in the famous carp ponds of Charlottenburg, near Berlin, reaches the age of a hundred and more years.

It is well known that all fish have a very large number of eggs. As the "first incarnation" of the vertebrate type, the last and highest grade of which is man, their body has such very simple fundamental forms as to enable nature to produce its germs in every female fish in hundreds of thousands of copies. Even in this respect the carp occupies, on account of the large number of its eggs, a very prominent place among fish. It nevertheless indulges in the pleasure of spawning only once a year, in spring, when the warm May sun raises the temperature of the ponds to a comfortable condition. Then its "spawning season" commences, and the male and female fish may be seen, principally during the early hours of the morning, swimming about in the water at a lively rate, emitting the eggs and milt among the reeds and aquatic plants. After eight to eighteen days thousands of young fish leave the eggs. In order to spawn successfully the carp must not be disturbed in the least, and it is absolutely necessary that *no pike should be allowed in the pond*; for otherwise the carp will not spawn. All these peculiarities are of course well known to the pisciculturist, and he manages his ponds by showing due regard to them. If he wishes to obtain young fry from his carp, he is careful to keep pike out of his ponds; if, on the other hand, he wants to raise large carp, he prevents them from spawning by placing a few pike in the pond. Much to the disgust of the carp the pike plays the part assigned him with the indefatigableness and energy of a policeman, keeping the carp constantly in motion and chasing them through every part of the pond. The result is a very fine, even breed of carp, with hardly any small fish, because the pike, proceeding in a most summary manner, will simply devour any fish which are smaller in size than itself.

The swiftness and strength of the pike are, however, also the cause of the presence of this most dreaded of all fish-of-prey in all our lakes and ponds, where it seriously interferes with the increase of the carp. As Mr. von dem Borne says in his work *Die Fischzucht* (Pisciculture), second edition, P. Parey, Berlin, 1881, the pike in one week eats a quantity of fish equal to at least twice its own weight. Owing to the very general occurrence of the pike, and the extremely small size of its fry, it is absolutely impossible to keep it out of carp ponds which are fed by a brook or other running water, and, mainly owing to this reason, the raising of a large number of young carp, even in carefully managed ponds, is connected with innumerable difficulties, of which Mr. von dem Borne treats fully in his book. After the cause of the evil has been recognized it is comparatively easy to remove it, viz, to select only such ponds as spawning ponds which have absolutely no connection with other waters. Such ponds are supplied with the necessary water either from springs or by rain or snow. Nearly every farmer can have such a

pond. Any alder-marsh or peat-bog with some water can be transformed into a carp pond by making a single dike with a pipe for drawing off the water, which can then be kept at the required depth of one meter, and be let off whenever necessary. By constructing this dike from the mud of the pond itself a deep place is formed, the so-called "fish-pit," in which, whenever the water is let off, all the fish gather, so that they can easily be caught.

But to return to the plan proposed by Mr. von dem Borne: This plan simply consists in constructing such ponds near the shores of the Stettiner Haff in every place where this can possibly be done. In these ponds, which of course would be entirely free from pike, a number of millions of young carp could be raised every year, and in autumn transferred to the Haff. If, for example, the entire 22,000,000 of carp are to be raised in three years, the ponds referred to would have to produce on an average a little more than 7,000,000 per annum.

The principal point which Mr. von dem Borne desired to prove by the draining of the ponds last week on his estate of Berneuchen, was that whenever mature carp are allowed to propagate undisturbed, the result is absolutely enormous. It was his object to give his visitors a correct idea of a genuine fish harvest, such as will presumably be had in the future in the Stettiner Haff. In answer to Mr. von dem Borne's friendly invitation, a large number of gentlemen interested in pisciculture had come to Berneuchen, among whom we noticed Councillor von Büнау, superintendent of fisheries of the Stettiner Haff, and Forester Baron von Dicker, both from Stettin; Governor von Heyden, Forester von Waldow, Superintendent of Fisheries von Barnekor, all three from the district of Frankfurt-on-the-Oder. The neighborhood of Berneuchen was represented by Councillor Jacobs, from the district of Landsberg, Councillor von Kalkreuth-Hohenwalde, and the landed proprietors von Sydor-Bärenfelde, von Klitzing-Charlottenhof, and others. With his usual hospitality, Mr. von dem Borne received his numerous guests in the old and spacious manor house of Berneuchen, and made them feel at home during their stay, which extended over a period of several days. Every day a district of about 2 hectares or 8 acres was gone over with the fishing apparatus, the water having been let off a few weeks beforehand, so that the fish had all returned to the deepest place in the pond, the so-called "fish-pit" referred to above. In this place the water was only knee-deep. About 9 a. m. we reached the ponds, after having traveled for some time through dense forests. The dark, muddy water revealed absolutely nothing of its contents, although its agitated surface indicated that the muddy pool, scarcely measuring 30 paces in diameter, contained numerous small and a number of large fish, which manifested their presence by a greater or less commotion in the water. The fishermen soon commenced their work, and during the first forenoon went over the so-called "Maxa-pond." At the first haul the net could barely hold the densely crowded mass of fish, which, in spite of the most vio-

lent struggle for liberty, was safely brought to land. Here the foreman of the fishermen dipped out the harvest with purse-nets, and deposited the fish in large baskets, transferring every time hundreds and thousands of small, golden-yellow young carp, which measured on an average 5 to 6 centimeters, and occasionally some magnificent food-carp and delicate leather carp. Basket after basket did the men carry up the steep bank, and, separating the large from the small fish, put them in enormous tubs half filled with fresh water, where the little fish remained quiet, gathered in dense crowds, whilst the large ones, as if by common consent, engaged in a sort of swimming race, swimming invariably to the left, round the tub, after having expressed their first astonishment by standing on their heads and beating the water with their tails. The next part of the programme was to count the fish, by repeatedly filling a certain standard measure, and thereby calculating the entire quantity. A number of wagons were on hand, each supplied with several fish-kegs half filled with water, and the measuring and loading of the wagons soon commenced, the pond meanwhile having been emptied after seven or eight hauls. All this time the water was being let off.

Although every one of our party was well supplied with rubber boots and warm clothing, the fine rain and raw air soon seemed to penetrate even the thickest covering. It was, therefore, with no common pleasure that we were called on to witness the preparations for an original and savory meal, which the forester of Mr. von dem Borne cooked with consummate skill, closely following the method employed by the North American trappers and sportsmen during their camp-life in the vast forests of the Western Hemisphere. Four plump carp were cleaned, washed, well strewed with salt and pepper both on the inside and the outside, and thereupon wrapped—each one separately—in a white sheet of paper well buttered. Round this a sheet of newspaper was wrapped, the package was for a few moments dipped in cold water, and finally placed on a bed of hot coals of an open fire. Above the four carp came a layer of raw potatoes, which were thus baked in the ashes. The dining-room was just as primitive as the preparation for the meal, and consisted of an open frame shanty of the simplest construction. In about half an hour the "pepper carps" were ready for the table. Full of their own juice, they formed a most tempting and delicious dish, and being handed round, together with potatoes, on large napkins, satisfied even the most epicurean taste, and were washed down by an excellent bowl of punch (amid great merriment). After the meal we again turned our attention to the fish, which had meanwhile all been placed on the wagons. The result of this forenoon's work was 90,000 small and 528 large carp, this whole enormous number having been produced from 570 large carp, which Mr. von dem Borne had placed in this small pond—not quite as large as the Lustgarten in Berlin—in the beginning of April of the present year—only six to seven months ago. While the 570 large carp

had been reduced to 528 by fish of prey, thieves, and other causes, but had increased in weight, the total number of 90,000 beautiful young carp had originated in this time. There was, of course, not a single pike in the pond, and nothing whatever was brought up in the nets with the fish but a number of frogs, water-beetles, and sticklebacks. These three last mentioned are notorious enemies of the roe of the carp, and we were destined to learn on the following day how dangerous they may become to the roe.

Wonderfully rich as was the result from the Maxa-pond, it was hardly the original intention that it should be so, for all these 90,000 young carp had come into life contrary to regulations and owed their existence to a mere accident. It had by no means been the intention that the 570 large carp should spawn in this pond, but they were intended to grow up into large food-carp. For the simple reason that they were not yet supposed to be ready for spawning, no pike had been placed in the pond with them, and about a dozen of the carp which were fully prepared for spawning had made good use of this circumstance, and had done their utmost to stock the pond with young fish. If the pond had been intended for a spawning pond, twelve spawners and six milers would have been sufficient for a pond of two hectares. This number had been placed in the large "Dachsberger" pond, which, on the second day of our visit, was subjected to the same process of fishing as the Maxa-pond. We were now destined to witness the injurious influence of other enemies of the carp than the pike. The young carp in this pond were on an average six times as heavy as those captured on the previous day, and the total yield was twice as large as that of the Maxa-pond. The increase in the size of the eighteen carp originally placed in the pond was also much greater than that of the carp placed in the Maxa-pond; but the total number of fish captured fell below the expectation. Even during the first haul we were struck with the unusually large number of sticklebacks which were brought up with the carp. Large numbers of these dangerous fellows were boldly pushing their way in the tubs among the pretty golden-yellow young carps, in some cases, it is true also struggling for life, as they cannot live without fresh air as long as the carp. What damage was done by these fish of prey, which, by persistent attacks, even succeed in killing large fish, during one summer, to the young carp of the Dachsberger pond, may be gathered from the circumstance that we only captured 23,600 young carp, whilst in other years as many as 100,000 to 150,000 had been caught every autumn. In stocking the Stettiner Haff such circumstances should be taken into consideration, the recurrence of which may in this case be avoided by simply laying the pond dry and pouring in a solution of lime and water. The average production of a hectare of water may therefore be calculated at 45,000 young carp per annum. In order, therefore, to produce the required number of 22,000,000 of carp in four years, all that would be necessary would be

to construct and put in working order about 120 hectares of spawning ponds. According to Mr. von dem Borne's former experience, the result would be still more favorable. He found that a good spawning-pond produces on an average 50,000 to 75,000 young carp, per hectare, in one year, so that 80 to 90 hectares of spawning ponds would be sufficient to stock the Stettiner Haff with the required quantity of carp within four years.

In answer to the question, whether there are near the Stettiner Haff places suitable for the construction of such ponds, the administration of forests for that part of the country has returned an affirmative answer. In the extensive government forests on the western shores of the Stettiner Haff, between Uckermünde, Pölitz, and the Papenwasser, there are a number of marshy places which, as far as their productiveness as forest land is concerned, are practically useless. With very little trouble, in many cases by merely constructing a dike with a pipe for draining off the water, very fine spawning-ponds for carp could easily be constructed in the immediate neighborhood of the Stettiner Haff. Only nine fully matured carp per hectare, each weighing about four pounds, placed in these ponds in the spring, would in the autumn of every year yield 40,000 to 70,000 young carp per hectare. If one wishes to save the expense of constructing a number of ponds, it will be sufficient to commence with one pond, and let the young carp grow large enough to become spawning carp after three years, and then stock the other ponds with these carp. The transportation of the young carp to the Stettiner Haff could be accomplished by wagons or by trenches leading from the Haff into the ponds; and this should be done every year in October. The question arises whether the Haff is suitable for carp? or if wind and waves, and the numerous enemies of the carp, especially the pike, or lack of food, or the salt water from the Baltic which occasionally enters the outer mouth of the Oder, might injure the carp? In reply we must say that the carp lives under the same conditions as the bream, and is everywhere found in its company; and since we find the bream in the Stettiner Haff, there is not the slightest doubt that the carp can also live in these waters. We must of course be prepared to see the Haff pike, that most voracious fish of prey, devour many thousands of the delicate young carp, and the herons, gulls, sea-eagles, and other enemies of the carp do their share in destroying the young fish. Very probably the most dangerous of all enemies of the carp, man, will capture the young fish before they have reached their full size; but there is no doubt that the flat bottoms of the Haff, which, especially in the west, are rich in the best humus, will provide an inexhaustible supply of food for the carp, and afford many excellent places of refuge. Against the fish-of-prey we shall declare open war, and as for man, the fiercest of these enemies of the carp, is concerned, we shall endeavor to limit his power for evil by carrying out a long and often talked of plan, viz, to build a swift small steamer, which will act as the policeman of the Haff. Mill-

ions of young fish will be furnished for the Haff every year from the safe spawning ponds, and make up for any losses. Success will surely crown these efforts at last, and our waters will again be filled with fish. A successful experiment, like the one we have described, will soon be imitated in other parts of our country, and our lakes and rivers will no longer, as at the present time, when our fresh-water fisheries have reached the lowest stage of their decline, only yield an average annual increase of 2 marks (47 cents) per hectare; but will equal in productiveness the finest and best cultivated portion of our land, and the income from each hectare of water will be at least twenty times as large as the one mentioned above. Whenever this takes place, our pisciculturists, and among them Mr. von dem Borne, with his 600 acres of water, will be the first to feel the consequences of the change, for fish will become much cheaper, and the fishing-waters will yield less income, in proportion as the condition of the lower classes of our population is improved by cheaper food. But this disinterested man, who has conceived the vast plan of stocking the Haff with carp, will not be influenced by such narrow considerations. The execution of this plan will prove a great blessing to our people, for we shall again see the carp, which has been banished from all tables except those of the rich on account of its high price, grace the table of our middle and poorer classes.

APPEARANCE OF DOGFISH (*SQUALUS ACANTHIAS*) ON THE NEW ENGLAND COAST IN WINTER.

By J. W. COLLINS.

(Letter to Prof. S. F. Baird.)

In the Cape Ann Advertiser of February 10, 1882, I find the following paragraph: "Immense schools of dogfish, extending as far as the eye can reach, have appeared off Portsmouth, an unusual sight in winter." Is it not possible that the presence of dogfish in such abundance in that vicinity this winter may have something to do with the scarcity of the cod in Ipswich Bay?

It is a fact well known to fishermen that dogfish in summer will drive the various species of bottom fish from the grounds, and it may be that they are quite as voracious and troublesome to the cod in winter as in warmer weather.

SMITHSONIAN INSTITUTION,

Washington, D. C., February 18, 1882.