

XXX.—CRAW-FISH CULTURE IN EUROPE.

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The attempt to raise craw-fish artificially in inclosed waters is old and has been made repeatedly, but so far none of the methods employed have given entire satisfaction; and at best it requires a number of years before craw-fish culture becomes profitable. It is well known that the common craw-fish, also called river craw-fish (*Astacus fluviatilis*, Rond.), is found throughout nearly the whole of Europe, but especially in North Germany, and that it changes its shell every year. The male craw-fish does this generally in June or in the beginning of July, while the female commences in July. During this period both the male and female craw-fish are very tender, and many of them die. After the craw-fish has thrown off its old shell, a very soft skin forms which begins to harden in a few days. During this time great care must be taken of the craw-fish. The boxes must not be overcrowded, but must be supplied with sufficient food, of which at this time the craw-fish require a double quantity.

The male craw-fish prefer to live together in large numbers in holes high up the bank. The female stays in her hole (*i. e.*, she always returns by day-time to the same hole where she has been before) until the young fry slip out of the eggs which are attached to the abdominal appendages under the tail. A medium-sized craw-fish has, on an average, 150 to 200 eggs, which are hatched in May. The young craw-fish resemble very small worms, and are for some time attached to their mother's tail by fine threads. They are in this way protected against the persecutions of their enemies, the eels, pike, perch, &c.

Some time elapses before the little craw-fish venture out alone. After a year's time they have reached the size of a wasp. They grow so slowly that it takes three to four years before they have reached the length of about 10 centimeters, when they can be brought to market as "soup craw-fish." From the fourth to the sixth year they reach the length of "medium craw-fish" viz, 12 centimeters. A full-sized "table craw-fish" has a length of 15 to 18 centimeters, and is from eight to twelve years old. Their quicker or slower growth depends on the water, its temperature, and their food. Lakes which are situated in moors and are surrounded by mountains generally have warmer water than open lakes and rivers, and are, therefore, more favorable to the development of the

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craw-fish than the latter. In tolerably warm water the eggs begin to appear in January, and the young fry in March. These craw-fish do not, as a general rule, grow very large, for they scarcely reach a length of 10 centimeters even at the age of fifteen. By way of experiment I have placed them in other water, *e. g.*, in my craw-fish box in the river Oder, but they did not grow. Such craw-fish, which are generally of a light green color, are not suited for transportation, as they are very apt to die when carried any distance. Lakes like those above described are generally overcrowded with craw-fish. The finest and largest craw-fish are found in rivers, especially small ones, where boats cannot pass, and where the craw-fish are not disturbed by manufacturing establishments, *e. g.*, the Eilang, the Obra, &c. In such waters the craw-fish develop very rapidly, but cannot be used as "soup craw-fish" till they are four to five years old.

The worst enemy of the craw-fish is the eel. It may truly be said that whenever a river or lake contains many craw-fish there will be no eels, and wherever there are no craw-fish the eels will be numerous. The favorite food of the eel is one-year-old craw-fish, and they but rarely eat larger ones.

The craw-fish themselves, however, are bloodthirsty and voracious feeders. As soon as dusk sets in they grow lively and move backwards and forwards with great agility; they swim well, and their sense of sight is very keen. When a craw-fish has eyed its prey, it sneaks up to it and with one bold dash impales the little fish or frog on its "tusk," the long, pointed, horn-like excrescence found between the eyes. As soon as it has secured its prey, it goes to the bottom of the water and devours it, holding it firmly with its two claws. It has been said that the craw-fish will also eat putrefied meat, but this is a disputed point. It will take such meat as it takes pieces of wood and stone, merely to cover itself. When kept imprisoned it lives on fish, meat, turnips, bread, potatoes, &c., but a craw-fish will never seek as food a putrefying animal body, especially if its odor is offensive. One may easily convince himself of this, if in catching craw-fish two nets of equal size and kind are employed, the one baited with fresh fish, the other with decaying fish emitting a strong odor, and are placed in the water not far from each other. The result will be, that the one net will soon have some craw-fish in it, whilst the other will remain empty.

The most common and most profitable way of catching craw-fish is with the so-called "Bolljacken." These consist of two hoops each, with a tube-shaped net attached. On the outside the two hoops are covered with a net-work, and the whole apparatus has the appearance of a cylinder. The hoops are kept open by wooden pegs, a piece of fresh fish or a frog is put inside as a bait, a stone is tied to it, and thus the "Bolljacken" is let down to the bottom.

Another apparatus for catching craw-fish is the so-called "Tellerhamen," a sort of purse-net,—a hoop covered with a net, in the middle

of which there is a long stick serving to keep the hoop, which resembles a plate, at the bottom of the water. In that portion of the net through which the stick passes, the bait is fixed, so that the craw-fish must go on the "plate" if it wishes to seize the bait. The other end of the stick must be long enough to protrude above the water. This stick is then pulled out with the net and the craw-fish sticking to it, and, baited anew, let down again.

Another method of catching craw-fish, the so-called "lighting," is much used by private individuals. During the summer months the craw-fish seek shallow places with a clear bottom. The fishermen use a torch of resinous pine-wood, by means of which they throw a strong light on the bottom. The craw-fish are dazzled by the light and can easily be taken out of the water with the hands; and it has happened more than once that a single person has in this manner caught 900 to 1,200 craw-fish in one night.

After the craw-fish have been caught, the main object of the cultivator is to preserve them, to give them a pure flavor and to fatten them. For a number of years I have succeeded very well in this. Pure running water is the first requisite; the boxes must be made according to the plan given below, and must not be overcrowded. The best food is fresh meat, but not too much at a time. Immediately after having cast its old shell, the craw-fish is very voracious and consequently needs the largest quantity of food, whilst in December it needs the least. In January it gets lively again, its voracity increases, and during its imprisonment the eggs begin to appear at that time. Great care should be taken not to leave old and spoilt pieces of meat in the boxes for any length of time, as this will very soon prove fatal to the craw-fish. I have by way of experiment thrown old and spoilt meat in boxes where there were only few craw-fish, and the consequence has been that most of the craw-fish have died. I would also draw attention to a very important matter, viz, to clean the boxes (at least during summer, when it is very warm), twice a day and throw out all the dead craw-fish, for in summer a craw-fish commences to putrefy in 10 to 12 hours after death, and the exhalation invariably kills the healthy craw-fish. One of the greatest dangers to craw-fish culture and transportation is a thunderstorm. As soon as a thunderstorm has passed over, the boxes should be opened and cleaned, and care should be taken to admit fresh air and water.

I have transported craw-fish in various ways and have finally arrived at a method which has, in most cases, proved successful. I have very frequently sent live craw-fish by mail from Frankfort-on-the-Oder to Alsace-Lorraine, and they have invariably arrived in good and healthy condition, unless a thunderstorm came up during the journey, which, however, did not happen very often. During the shedding-period no craw-fish should be shipped, as then they cannot stand any pressure and die easily. Care should also be taken not to have a dead craw-fish packed among the live ones. The main point in shipping craw-fish is to select

good, healthy ones, well fed and properly dried. I generally employ small wicker baskets each holding 60 to 120 craw-fish, so that they are not piled too high on top of one another. First put a layer of straw in the basket and then the craw-fish, one at a time, laying them on their feet, and if the basket should not be quite full, pack it with straw till full. The packing is to prevent the craw-fish from turning when the baskets, as will frequently happen during a long journey, are thrown about a good deal. If the craw-fish falls on its back during the journey, it will die, as it works with its feet till it becomes exhausted. On their arrival at the place of destination the craw-fish are taken out of the baskets and placed, again on their feet, in a large vessel, which should be kept in a cool place, best in a cellar, but not be covered up.

It is an old belief that craw-fish are not good in months whose names contain the letter *r*; but I have found that craw-fish when properly cared for and well fed are good at all times, for I have sold and shipped them during every month in the year, and have never had any complaints.

An important question remains to be answered, viz, whether artificial craw-fish culture in basins is remunerative. Experience has taught me that craw-fish increase and develop better when in a free state than in boxes or basins. To start a somewhat remunerative craw-fish establishment entails considerable expense, and does not yield the expected result. In such establishments the cold of winter kills most of the craw-fish, as they cannot find holes and other places of refuge as when in a free condition. If strong ice forms, as happened this year, the craw-fish are suffocated in the basins; the boxes are soon frozen over on the sides and top, and as soon as the admission of fresh air is stopped, the craw-fish die from suffocation.

I would, therefore, recommend the following method: From rivers and lakes containing but few craw-fish the female craw-fish should not be removed; the eels and pike should, if possible, all be caught, and the young craw-fish, large numbers of which will make their appearance in a year or two, must be well and regularly fed with meat and turnips; during the fourth year all craw-fish which have reached the length of 10 centimeters should be caught and placed in large tanks or boxes prepared in the following manner: The bottom and sides are best made of thin boards, which should not be close together, but have narrow interspaces between them, not large enough to let a small craw-fish escape. The object of having such interspaces on the bottom is to give free egress to the slime, mud, sand, &c., which will get into the box, and thus to keep it clean at all times. The interspaces on the sides have this advantage that fresh water will be constantly passing through the boxes, which of course is an essential condition of keeping the craw-fish alive and in good health. In these boxes, through which fresh water must be kept running all the time, the craw-fish are fattened. When ice forms in winter, the boxes must be let down into the water, so that the openings on the sides do not freeze over.