

58.—CARP CULTURE IN CHINA.

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Minister Young having desired Consul Stevens, of Ningpo, to institute inquiries concerning the culture of fish and especially of carp in China, I cheerfully respond to Mr. Stevens's request for aid in the matter; not because of any intrinsic value that my research may possess, but again to manifest my readiness to co-operate in undertakings that have for their object the introduction into our country of appliances and industries which this ancient and ingenious race has developed in the long march to its present state of civilization.

Pisciculture was cultivated as an industry at an early period, having been regarded a branch of agriculture. A treatise on "Rearing Fish" is ascribed to Fanli, a famous minister of the State of Yu (modern Cheh-kiang), fifth century B. C. He is renowned for promoting industries which enriched the country, and by which, in retirement, he amassed enormous wealth, chiefly by rearing stock. Tradition says he constructed carp ponds and planted mulberry-trees on the margins, on which apiaries were placed, the droppings from which fed the fish, while the leaves of the tree nourished first silk-worms and then goats.* That work, however, on fish-culture was not by Fanli; it appears to have been composed in the third century A. D., and has been long lost, but there exists a quotation from it in a work entitled "Important methods of maintaining population," written about a century later, which will serve as an introduction to the subject in hand, premising, that while carp, especially, is the most frequently reared by artificial means, nearly every species of *Cyprinidæ*, bream, tench, roach or rudd, goldfish, &c., is so raised.

"Now, of the five modes of rearing animals, by far the most productive and valuable is fish-breeding. Let the pond be an acre in extent (depth not stated, they are usually less than 8 feet); construct in it nine stone islets, each having eight inlets or bays, a yard below the surface of the water; select 20 spawning carp and 4 males, all 3 feet long; deposit them noiselessly during the month of March. Two months later place in the fish-pond a turtle, two months later a couple, and after a like period 3 turtles, by which time there will be 360 carp. The turtles are to prevent their being transformed into dragons and flying away.† The object of the islets and bays is to afford greater space for

*Ravines at Snowy Valley, Ningpo, abound in hives, which, by their droppings, nourish a variety of the carp family, a bream, imparting to the fish a peculiar flavor. What gives mutton from silk districts its excellence is the mulberry leaf.

† This refers to a belief that this prolific fish changes into that fabulous monster. In the Yang period, when Taoism was in the ascendant, carp were held sacred; when netted, the law required their restoration to the stream, and sixty blows was the penalty for eating one.

the fish in their sinuous voyages, for the more a fish travels the fatter and bigger he becomes. The pond should present the features of a river or lake. The pond will be found to contain

First year.		Third year.	
Length.	Number of carp.	Length.	Number of carp.
1 foot	150,000	1 foot	100,000
2 feet	10,000	2 feet	50,000
3 feet	450,000	3 feet	50,000
		4 feet	40,000

“ Retain 1,000 of those that are 2 feet long for replenishment ; send all the rest to market. In another year the number will exceed all calculation, and they require no feeding ; hence the value of carp-culture.”

It is the practice in some places to feed them with grass, straw, rice, wheat bran, &c., according to the nature of the fish. Ponds are less elaborately constructed by moderns, but to a certain extent the ancient model is conformed to. The narrative will appear less overdrawn when the nature of the soil to which the writer refers is considered ; for the lakelets and pools of reclaimed deltas, containing perhaps the most fertile alluvium in the world, its land and water teeming with animal and vegetable life, afford profuse supplies for the sustenance of fishes.

Although the author says the carp maintain themselves, there is considerable attention paid in many places to supplying them with grass, straw, aquatic plants, and rice or wheat bran.

A modern author recommends three contiguous ponds in a fertile soil ; a small one, about 10 feet square, 7 or 8 feet deep, with a pool half that size, and 2 feet lower, the bottom of which is to be well pounded ; a middle size, 20 to 30 feet square, at least something over 5 feet deep ; and a large one, two, three, or more hundred feet, according to the extent of culture desired. The larger ponds should be at their northern ends a foot deeper, to afford a cool gathering place for their inmates ; and into that portion the food should be cast.

In April, stock the small pond with 600 bream and 200 tench an inch long, feed them at regular intervals twice a day with grass, or, in default of grass, shells of eggs that have been preserved in salt, which should be kept in store for that purpose. In June arrange for the transfer of the fish to the middle-sized pond, by spreading out a sheet supported by poles ; scoop out the fish with a cloth net, place them on the sheet, and make a separation, the bream and tench by themselves (all other fishes being sent to market), to be placed in the middle-sized pond, which is to be prepared in the spring, by removing its occupants to the large pond, draining and planting it with an aquatic vegetable (*Semantthemum?*) when the bottom is half dried. By April this plant will have attained its growth and afford nourishment for the fish. In February or March following transfer them to the large pond, when they will be

found to weigh 4 or 5 pounds, and in the last reservoir, by autumn, they will become a pound or more heavier, and there they may be fed with old straw, chopped and mixed with pond mud or clay; straw saturated with wine is best; the compost rolled into balls the size of a bowl is to be thrown at night into the deepest part of the pond, when it is instantly swallowed. The same is used for the second-sized pond, but chopped finer and cooked in water before being mixed with earth. Sweep goats' or sheep's droppings into the pond for the tench, on which secretion the bream feast, thus saving grass, but this is slightly detrimental to the animals. If duck-weed is not thinned out the fish will die from overcrowding. In a hundred days the fish in the large pond should have 250 pounds of straw. They are marketable in October or November.

In the autumn they hang them up to dry near the chimney, and in spring cast them into ponds. The vitality of these ova is remarkable. If, says one writer, when they are dried, they are kept from contact with salt, they will hatch three years afterwards. Desiccated places, that have not been reached by water for ten years, on receiving that element have immediately afforded fish. They have been observed on banks from which water has receded for long periods, and again attained its former level.

The lacustrine region of Suchau supplies neighboring departments with carp and its congeners. When captured in the lakelets the minnows are only a line in length, but they double that daily for some time, and require to be dispatched with all possible speed to their places of designation. To facilitate that operation, barriers that are closed by night to all other boats are required by law to be opened on the approach of vessels freighted with young fish.

From the chief of those lakes (the Taihu) the imperial gardens were once stocked by cutting grass from its banks having impregnated ova; the grass was dried and safely conveyed to Shensi, more than 1,000 miles distant. On the upper tidal portions of the same district, at flood, waters are admitted into fish ponds, where marine and river congeners of the carp an inch in length are reared for the Shanghai market; and although they feed exclusively on mud, in the space of six months they attain a larger size, not often having an earthy flavor.

Carp that are bred and reared for ornament do not probably come within the scope of the inquiry submitted to me, yet amateur carp culturists may expect something in relation to the unique goldfish, as this (Chehkiang) province is their original habitat, whence they have spread over the world. I shall not be pardoned if I wholly ignore those varieties of *Cyprinidae*. Their study merits attention from naturalists who investigate the modification of species through cultivation and domestication, a subject that does not require to be considered in this paper.

Approximatively, the eleventh century A. D. may be assigned as the time of the first observation of those fancy carp, although a Han author appears to allude to them.

All the numerous varieties come from a black species; in domestication they are first black, subsequently going through several changes; those that become white change to silver or yellow, the black becoming red and then golden. Some of the white are so nearly transparent that their viscera are visible. What was for many ages cultivated as a secret art has become public, although the popular belief that their colors were due to red-headed worms found in garbage (probably an invention of carp-culturists) still prevails. Much of the art consists in affording due amounts of shade and sunshine, in the course of their growth, and in changing their water; not more than half is to be removed at once every fourth or fifth day.

They are no longer considered edible. Their food is the larvæ of insects that are skimmed from the surface of stagnant waters; still better are the ova of shrimps, given but sparingly. Aquatic plants float in the jars in which they are kept. Those receptacles which are old, or have been used as latrines are preferred; they hold half a hogshead of water, and are sunk half way in the ground; they must be without rims.

Perhaps the origin of abnormal carp may be referred to a fish that partakes, according to description, of the carp and bream that is found in the chief river of Chehkiang, Chientang. It is "five-colored [variegated] or from a many-colored carp found in an ancient well in the adjacent province, Kiang-Si, with four caudal fins, like a dragon." In droughts it was taken to the Palladium Temple, and invoked for rain; when put into the lake it found its way back to the well. Disease had probably something to do in the production of some of the markings, for an author feebly combats the vulgar notion that they are due to an eruption. Carp generally, and many fish, suffer from a disease that is indicated by whitish spots on the body.

The normal golden carp, of Chehkiang, has congeners in caves and chasms of Piehchi Mountain, in Shensi; "golden-striped carp," and a tortoise-shell variety are found in Honan.

Red eels and red turtles are met with, though rarely, probably being spontaneously produced.

Foreign writers on China have stated that the Chinese skim impregnated fish eggs from the surface of the rivers, and that they are hatched in pools. This is such an extensive country that one should hesitate to deny any statement respecting it which is not obviously erroneous. I can only say with regard to this matter that after much inquiry I am unable to confirm the statement, though it has been authoritatively made. Possibly it arose from the common practice of collecting the larvæ of mosquitoes and other insects; which is an important industry in itself.

Interspersed through various ichthyological essays a few remarks occur on the treatment of fish maladies. Parasites of the size and shape of flattened peas attack carp and other fish; waters from mountain streams bring poisonous matters from serpents, which give origin to

infusoria and parasitic animals, causing fish to become emaciated. The remedy is found in throwing in some pine leaves, which will cause the parasites to disappear.

There is a distemper which causes fish to float helplessly on the surface of the water. It is caused by their eating the droppings of pigeons, or by washing grass-cloth plant (*Ninea*) near to the pond, which causes them to float in the same manner. Treatment: night-soil. Eating their own secretions too freely induces a like disorder; subject them to the same remedial agent. When fishes are found floating on their backs they will soon die.

A curious statement is made respecting an olden-time direction to quicken the hatching of bream. "Open a bream with a bamboo knife, place in its abdomen some brassica pounded with water and a minute portion of quicksilver, roll up the fish in the same vegetable and suspend it forty-nine days, then reopen and deposit the fish in water, and almost immediately the ova will become fish." That member of the carp family, like certain *Chondroptergii*, must have been impregnated before secreting ova.

The rocky creeks of the Chientang prove fatal to young carp, bream, and tench, from colliding with stones, which suggested the construction of ponds on the banks for preserving them. The minnows perish unless the pond is emptied and fresh water let in, with some bruised banana leaves, which will restore them to health. Fishes that as small fry have been nurtured on the yolk of eggs are sterile. In supplying ponds with duck-weed or other aquatic plants, be careful lest the ova of mullet, and the like, should be adherent; those fishes are destructive to all members of the carp family. To protect ponds from pigeons' droppings, grape-vines should be grown on trellis-work over ponds.

When ponds are too deep fish suffer from cold, and also in winter when confined to ponds that are too small. When the frontal foramina of *Cyprinidae* do not freely open when young, their growth is arrested, and if that obstruction should continue for a year or so they will die; such are to be sent to market.

Decoying male fish of the carp family by imprisoned females is well known to be a common practice in this country; on the other hand, in the shallow, clear mountain streams of Chehkiang, males are used to entrap females, one being tied to a string and dropped into a brook, when he is seized by a large number of the other sex. Seizing him by their mouths their tenacious hold enables the Chinese fisherman to grasp with his hand as many as ten at a time.

The foregoing relates mainly to the marshy coast region; inland, carp culture commences by netting carp minnows in the Yangtse. In the spring that great river is the resort of many thousand carp-catchers, who come from distant regions to pursue their vocation; coming from the head of tide-water at Kiukiang, nearly as far up as the gorges or rapids at Ichang, a distance of 600 miles. So important is that commercial fish-

culture considered that the Government supplies needful appliances for the occupation, reimbursing itself by an impost on the first harvest.

Stakes planted a short distance from the shore at right angles and under shelter of projecting points, afford support to netting gear, which are placed to receive the newly-hatched carp as they descend the stream. The fry, about $\frac{1}{2}$ inch in length, are removed to jars placed on the bank, and fed on a minute quantity of the yolks of boiled eggs mixed with bran; later, on aquatic grass (*Hydropyrum latifolium*). The jars are stored in junks, and when well laden the funny freight is conveyed up the affluents and lakes of the Yangtse, supplying agriculturists and fish-dealers, and thereby contributing largely to the food supply of the Great Valley. Farmers stock their ponds, fish-dealers their inclosures in lakes and rivers, and humbler husbandmen purchase a few to inclose in cages which are fastened to water-banks.

When first taken the minnows are fed on aquatic grass. *Hydropyrum latifolium* is given to the young of all fish. Wheat and rice bran are given at almost every state of their growth, but often when they have matured they are left to provide for themselves. Some fatten on grass, and are called "grass carp;" some on snails, "snail carp." It is recommended to place the animals when young in a tank or very small pool, and afterwards temporarily in a larger place, having grassy banks.

When they are a foot in length they should be transferred to large fish-ponds. In autumn all that are found not to have grown are to be removed and sent to market as hopelessly stunted (the largest carp are 7 or 8 feet in length). Domesticated fish are not to be left in shallow ponds in winter, lest they perish from cold. Willow trees should not overshadow a pond, as their flowers are poisonous to fish.

Nothing is said by the Chinese to indicate that they resort to manual operation in artificial fecundation—pressing out spawn and milt.

In concluding a subject that is far from having been exhaustively treated, it may be worth while to add that one of the *Cyprinidæ*, a tench, was formerly utilized in the hills of Canton for reclaiming and fertilizing wild land. A piece of jungle was terraced and leveled, water let in from above, or by water-wheels from below, and the place stocked with the fish, which, in a year or two, grubbed the grass and roots and fertilized the ground. The fish were then sent to market, and their pasture planted with rice.

It is almost superfluous to remark in these desultory notes that cultivated carp are inferior in flavor to the free-born and wild.

I have not described minutely the carp-catching appliances used on the Yangtse, as models can be procured if it should be deemed of sufficient importance.*

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* This paper is reprinted from the Chinese Recorder, June, 1885.