

CARP CULTURE IN TEXAS.

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[From the Galveston Weekly News, March 9 and 16, 1882.]

If young carp fish, three or four inches in length, be placed in a lake or brook in March, in September following they will be grown to the length of from ten to fourteen inches, and will weigh sometimes from one to one and a half pounds. It requires three years to bring a trout up to one pound. Such is the wonderful growth of this new food-fish now being introduced into our lakes and brooks for propagation. These fish subsist mainly upon vegetable food, but will not refuse a worm or insect when opportunity offers. "They grow in any kind of water," but we must beware of waters tinged too strongly with turpentine or products of coal distillation. They grow faster with good, natural, and abundant food, in nice, pure water. Too much feeding injures the water by the souring of the remaining surplus. The natural food of this fish is the products of various water plants, some of which I will now proceed to describe:

1. *The great Caladium esculentum*.—This plant grows luxuriantly in water twelve inches deep, or on the banks hard by. It has esculent roots, filled with farinaceous and amyaceous matter, and is in some places used as human food; hence the specific name. The plant is well suited to lakes; also as fish shelter as well as food. Planted in the margin of the lake, six to twelve inches deep in water, it will throw up continuously, three to four feet above the surface, immensely large leaves, sometimes two or three feet wide and three or four feet long, giving the shores or banks quite a subtropical appearance in the size and splendor of its foliage.

2. *Nymphaea odorata*.—This charming water plant grows in from a few inches of water to four feet deep, and yields an abundance of farinaceous matter in its stems, leaves and roots. (See Case's Botanical Index, page 98.) It grows luxuriantly in water, and its leaves, one foot broad, lie flat upon the water, affording shade to the finny tribes beneath. Its curling stems make a safe lodgment for the eggs of the carp, and its pure white flowers which dot the lake over, filling the valley with fragrance, ripen seeds which are full of nutrition.

3. *Nuphar advena*.—Calhoun, of the Southern Stock Journal, is mistaken as to the species (*luteum*) of our *Nuphar*. The yellow flowers of this species have the odor of brandy, and leaves both floating and erect. This is the American species. The *luteum* is the European, and the seed contain a large quantity of farinaceous matter, and some species are used for food in other countries. When planted in a lake or aquarium it makes a more vigorous growth than any other variety

of aquatic plant, consequently it contributes more toward purifying the water by the large amount of oxygen supplied it, and carbon absorbed from it, which is so important to pure water and healthy animal life in confinement. (See Case's Botanical Index, page 8.) We fear that its rapid growth renders it too uncontrollable in small ponds, but such luxuriance of development well suits it to large lakes, where the amateur will experience much pleasure in watching its triumphant progress over the waters.

4. *Nelumbium luteum*.—There is a strange grandeur and an exquisite beauty about this plant which excite the admiration of all romantic lovers of flowers, a sweet loveliness about them which creates a desire to possess and cultivate some of them. All water lillies are lovely, but this one is gorgeous. The flowers are a light canary color, varying from light to pink, and often five inches in diameter, and exquisitely fragrant. The seed receptacle, like the flowers standing out of the water, is a flat, circular surface, and constitutes the base of an inverted cone, which is perforated with holes for the accommodation of the nuts. These are the water chinquepins. "The root contains a large percentage of mucilaginous and farinaceous matter, and is said to be one of the best known native vegetables for food." (See Botanical Index, page 77.) "The tubers are farinaceous and edible." (See Gray's Manual of Botany, page 56.) We are apprehensive, also, that the plant would not suit small lakes on account of its rapid growth; it might fill them up with roots; but give it the great lakes of Texas, and we vouch for its success and its sublime developments in yielding food and shelter.

5. *The Nasturtium officinalis, or Cress*.—This is a favorite fish salad for the table of the Cyprinæ. They devour it greedily. "They are particularly fond of water cresses and other juicy plants." (See Dr. Hessel in American Agriculturist, where he teaches us that carp fish can hear.) Plant the cress hard by the edge of the lake, and it will send its limbs far out in the water.

6. *Zizania aquatica, or Water Rice*.—This grass produces many slender, linear seeds, which are farinaceous and well suited to water. When alone it flourishes. It grows in shallow water, which is always found around well-constructed ponds. "The luxuriant water oat should be planted in every pond devoted to carp culture. These plants yield great quantities of seed, of which the fish are extravagantly fond." (See Calhoun, in the Southern Stock Journal, vol. 6, No. 21, in which he calls it *Zizania aquatica, or Water Oat*), which shows, at least, that he was striking at the same thing.

7. *Typha latifolia, or Water Mace*.—This is a grand marsh or aquatic herb with nerved, linear, sessile leaves. The flowers and fruit are elevated on a dense cylindrical spike, terminating the stem, at least six feet above the roots, but sometimes ten feet. It will grow in water perhaps six feet deep. Its small nutlets fall into its native water and germinate in the mud at the bottom. All seeds during the process of

germination are sweet and nutritious. It gives a peculiar aspect to lakes that is both rare and pleasant. The adornment of our artificial lakes should receive some attention. When we visit some of our natural lakes we find them almost filled and surrounded with strange and beautiful forms of vegetable life, which accompaniments render these places a great deal more attractive. The very wildness which these curious children of nature are capable of superadding to a pure and placid lake surrounded by echoing shores and reverberating hills, mingle with the charms and pleasures of such places and sweeten and hallow such impressions of the beautiful and picturesque upon those seeking the innocent enjoyments of life. We should add these native ornaments and rare water plants to our convenient lakes and make them the most delightful of the home scenes and associations.

8. *Pancreatum rotatum*.—In the evening and morning, and when the clouds are over the sun, this plant unfolds its snow-white imperial flowers, all arrayed in royal robes, and bearing a white, delicate crown about two feet above the water or marsh. It is well styled the "wild crown imperial."

9. *Saururus cernuus*.—This is rather a delicate plant among the aquatic plants. It waves a small white plume, which bends gracefully to the side opposite to the wind, and presents quite a military appearance among the lake plants for a little fellow.

10. *Sagittaria hastata*.—The foliage of this plant has a very rich appearance. The leaves, as the name indicates, are in the form of arrow or spear heads, but on a large scale, and are quite peculiar in their surface markings. Grows two feet high.

11. *Sarracenia purpurea*, or *Flava*.—The leaves of this plant are pitcher shaped and are usually half filled with water. The flower is a large nodding, something between the form of a side-saddle and a Dutch pillion; an indescribable curiosity to the uninitiated.

12. *Iris lacustris*.—This has sword-shape and grass-like leaves, and large showy flowers, of all the rainbow colors—hence the name.

13. *Pontederia cordata*.—This is a strong water plant, and grows in shallow water. Through its collection of heart-shaped leaves it throws up occasionally a stem or scape, terminated by a beautiful spike of violet-blue flowers. The heart-shaped leaves and pretty flowers do not stand far above the water's surface.

14. *Acorus calamus*, Calamus Flag.—Its creeping roots, which are pungent and aromatic, send up sword-like leaves and stems. A valuable addition to lake plants on account of its usefulness as a domestic medicine, and a pleasant aromatic carminative.

I am perfectly familiar with all the above plants and have transplanted them to my own fish lakes, and know well that they are useful.

Anybody can make a pond, but it may not be durable in its planning or its structure or in the exit of its superfluous water. The earth should be well packed while it is in its naturally moist condition. If too dry

or wet it does not pack well. The best packing is secured by building with a scraper and two mules. The mules pack as you go. When you have ascertained the elevation of water which you desire, make your banks about eighteen inches higher and finish up on a perfect level. Have the top of embankment broad enough for a walk—say from four to six feet wide. The sides should slant at about forty-five degrees. The Bermuda grass makes a firm sod. One of our oldest-inhabitant rains ran over my dams covered with Bermuda lately and never fazed them. Willow holds the dam against floods, but they become trees, and make the lake filthy and impure with rotting leaves. Plant no deciduous trees about lakes. Plant only such vegetables as fish eat for food, and these should be water-plants.

Some use a square wooden or a round iron pipe or tube for the conduit. Some place this conduit about the desired water level and others place it almost or quite down to the natural bed and turn the lower end up to the desired level of the lake surface. In either case the same objection obtains—the fish escape. If a wire gauze or network be placed over the tube it soon clogs up with moss, and the lake runs over, washes down, and fish escape at last. Another objection is that the least jar or wrench of the tube makes a break in the dam, and the consequences are ruinous. Here is my plan: I make a solid earth dam as aforesaid, and at the side which suits the purpose best, and in the natural ground I dig a ditch large enough for escape of water, very slightly inclined along the declivity of the hillsides, which shall discharge its water gradually all along its mossy or grassy edge until it wastes entirely away. No misfortune ever can happen to such an exuent of the waters and no fish, old or young, escape in the running season. Very little engineering is required for this construction. Once in about two months moss and water rice, or other aquatic growth, should be cleaned out of the ditch. I used two little ditches on either side of the lake for this purpose and that of watering a strawberry patch and a summer garden in the valley between them.

Some prepare for this by laying a pipe in the bottom of the lake and dam, and through this turn off the water when necessary, which is very seldom. This is all nice; but I still contend for the solid banks. The pipe is foreign matter and resists the settling of the earth and leaves just under it a loose stria and perhaps an open fissure where a break may commence. Also, when you turn off the water the fish, little and big, may escape, unless you get down to the mouth of the discharge pipe at the bottom and cover it with a wire screen. This soon gets filled with moss, mud, and trash, which requires another dive, &c. On the solid bank system use large hose on the syphon system. Muzzle the entrance with wire gauze. Get up on the dam midway; throw the hose into the lake and fill with water. Thus filled, and while it is in the water, stop the end intended for the exit and draw it over the bank and lay it in the ravine below. Unstop it and the discharge com-

mences. You can draw out your hose from the bottom of the lake from time to time, examine and cleanse the wire screen just below the surface of the water and let it down into the bottom again. This is so convenient.

Sometimes the crawfish will give you an exit and save you the trouble of emptying your lake. The crawfish always begins to pierce the dam an inch below the surface of the water above. Then he descends in a devious way to the other side. He soon makes a spring. If that crawfish had to pass through a bed of loose, wet sand he would never make it. Guard his entrance, determined by the above natural instinct, with a layer of six or eight inches of sand and he will not turn off the lake any more. The sand falls in faster than he gets it out. You have beat him.

Never plant a deciduous tree, nor let one stand inside of the lake inclosure. Every leaf will tumble before the wind, and rests not until it sinks to the bottom of the water. This will render the bottom of the lake filthy and the water impure. Evergreen trees will not do this. Their needle-shaped leaves behave themselves, and lie under their own trees to decay. Almost every lake which lies in a hollow or ravine has a considerable watershed above. The water collected by this wide table of land must be turned around the lake and emptied into the ravine below. In order to do this it is not absolutely necessary to make one large ditch on both sides of the lake. A large ditch begun above, by running across the ravine obliquely at the head of the lake and continued to an exit below, is sufficient to discharge the floods that come from hills or fields above. It is desirable to have one side of the lake accessible by an easy descent through a floral garden or undulating lawn. The water which runs into the lake on the other side may be turned away by a few furrows nicely engineered along the hillsides, so as to empty below the lake also. These striations can be worked into the general design for effect.

RESULT OF PLANTING SHAD IN THE MUSKINGUM RIVER.

By CHAS. W. SMILEY.

Young shad were planted by the United States Fish Commission in the Muskingum river at Bayard, Ohio, in 1875, and at Zanesville in 1876. Mr. G. H. H. Moore, a messenger of the Fish Commission, reported May 26, 1882, that while on a trip with fish to the Ohio river he was informed that fifty white shad had lately been taken at the State dam near New Philadelphia, Ohio, from the Tuscarawas river, which is a tributary of the Muskingum.