

**SUCCESSFUL PROPAGATION OF BLACK BASS.****By MAJOR ISAAC ARNOLD Jr., U. S. A.**

[From letters to Prof. S. F. Baird.]

I have in a small pond at this arsenal about 40 black bass (large and small mouthed), that are weighing from 2 to 4 pounds apiece. I have had them in this pond for three years. Last year they produced a large number of small fry, nearly all of which were destroyed by sun-perch. I have had the pond cleaned this spring and the sun-perch removed. As the bass are in fine condition, I expect there will be thousands of the young fry this season.

INDIANAPOLIS ARSENAL, INDIANAPOLIS, IND., *April 22, 1882.*

This morning I discovered the fish were nesting. They have refused food for the past week, indicating they have been on the nest during that time. I have removed all the sun-perch from the ponds, so there will be no danger to the small fry from that source. My pond is fed with water from the city water-works, and is taken from White River. I have an overflow. All the bass, with one exception, appear healthy.

INDIANAPOLIS, IND., *May 16, 1882.*

The black bass are hatching out very fast. I have partitioned off one end of the pond, so as to protect the small fry from the large fish; have some trouble in catching the small fry as they come off the nests, but should think there are 25,000 or more in the part of the pond partitioned off. We are putting in more as fast as they are caught.

INDIANAPOLIS, IND., *June 2, 1882.*

The black bass hatched out by the thousand, and I think there will be more in a few days. The young fish are all healthy, but they eat each other. Yesterday my foreman, in less than fifteen minutes, saw nine of the young fry swallowed by fish of apparently the same size. The large-mouths seem to do the greater part of this work. I have stopped transferring the small fry into an inclosed space, thinking they will do better in the large pond. I have about 400 fish that are one year old, in fine condition, and believe, if you can remove them, the final result will be more satisfactory. They are from 3 to 6 inches in length, all strong and hardy. Each day the number of this year's small fry grows less, as the strong ones destroy the weaker. The first hatching are now nearly three-fourths of an inch in length, and can probably protect themselves.

INDIANAPOLIS, IND., *June 16, 1882.*

I think I must have had, one week ago, at least 100,000 young fry, and there were four or five large fish on the nests whose eggs had not hatched. This morning I discovered the inclosed place at one end of

the pond was nearly destitute of small fry, but I found a great many in the large pond, the exact number of which would be hard to determine, but should think I saw several thousand. I made one haul with a minnow-net and transferred probably a thousand or more to the inclosed space. At one end of the inclosed space I have dug a shallow ditch some 10 feet long and 2 feet wide, in which the water stands about 10 inches deep; have covered the bottom of this ditch with sand and gravel; it forms the outlet for the surplus water, and is provided with a wire screen to prevent the escape of the young fry. I am in hopes the running water will prove to be beneficial to the young fry; they like it, and are constantly going in and out. I do not find many dead fish or notice any that appear sick. They have all increased in size wonderfully, and to-day I have not noticed any cannibalism; think they are getting large and strong enough to protect themselves. I am trying to protect the fry in the large pond from the old fish by making brush protection along the shores of the pond, and keep the old ones well supplied with food, which they usually take very freely, but have not taken at all for the past week. The upshot of the whole is that I am in hopes there will be enough of the young fry left to pay you for the trouble of taking them away, but every day makes it more uncertain; there will be no danger of losing any of the year-old bass, and I would advise the whole lot be removed as soon as possible. Although there are to-day several thousand young fry in the pond, I do not believe there is the tenth part of what there was two weeks ago, and I am afraid of making any experiments for their protection, as they might not be successful. I should think 1,500 to 2,000 young fry have disappeared from the inclosed space since the afternoon of the 24th. There is a mystery in the loss, always occurring during the night, that still remains unexplained. There are still quite a large number of young fish in the main pond.

INDIANAPOLIS, IND., *June 23, 1882.*

I made small openings through the partition in my ponds this morning, large enough to allow the free passage of the small fry from one part of the pond to the other—too small for the mature fish to pass through. In less than half an hour several thousand of the young fry had collected near the outlet of the pond and were trying to find a passage through the screens. After watching the fry for a couple of hours, it occurred to me they might bruise themselves by rubbing against the wires, and I had a wooden trough made, with a wire screen about 12 by 12 inches, fastened across an opening in the bottom near one end so that the water passing out of the pond goes through the screen in a vertical instead of a horizontal direction. The trough is nailed to four posts, driven into the bottom of the pond, and is placed so as to have about 3 inches of water covering the screen at all times. It effectively prevents the wedging and jamming of the young fry. They have already learned the road backward and forward through the partition. I notice

the young fry have an invariable tendency to follow the outward current, and do not collect at the inlet of the pond. If you have room, in constructing your ponds, to have an overflow from the breeding-pond to a smaller one, all the young fry will naturally collect in the smaller pond without handling, and thus save considerable trouble.

INDIANAPOLIS, IND., *June 29, 1882.*

It is usually the case that thousands of small black bass are taken with hook and line near here in the fall of the year. I think they are fish two years old, and shall give instructions to one of my corporals to catch all he can and put in my ponds; besides, if the streams get very low, as they usually do in the summer months, they may be able to get quite a large number of small fry with the minnow-net. It would do your eyes good to see the yearlings feed upon small minnows and angleworms. They are great pets, and afford me much pleasure.

INDIANAPOLIS, IND., *June 30, 1882.*

I placed the bass in the pond for the sole purpose of noticing them during the breeding season, but the water in the pond was so crowded with a growth of algæ that my observations have not been satisfactory. I think the female prepares the spawning ground or bed, after which the male joins her. Whilst the female is preparing the bed the males fight with each other for possession. (The fish alluded to in my letter of May 15 died from effects of injury received in a free fight; he was injured about the head, and in a few days was covered with a white fungus, which proved fatal.) The male presses the roe from the female by a series of bites or pressures along her belly with his mouth, the female lying upon her side during the operation. The male ejects the milt upon or over the roe from time to time, and the spawning process lasts for two or three days.\* When the spawning is over the male disappears from the scene, and the female remains upon the nest extremely pugnacious, allowing nothing to approach until the eggs have hatched and the young fry are a week or ten days old. The young fish commence at once to prey upon each other and continue until they are two or three weeks old, when cannibalism ceases and there is no more danger from that source. The shallow ditch was a good arrangement; by covering the ditch with a layer of brush the young fry were well protected from all kinds of birds. I think frogs destroy a great many young fish, and should always be destroyed as far as possible. I am satisfied that with the final arrangement adopted, that of having one end of the pond partitioned off, with openings so that the small fry can pass freely back and forth, and with the trough-screen for overflow, better results can be reasonably expected. If I remain at the arsenal I intend to repeat the experiment.

HADDAM, CONN., *September 21, 1882.*

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\* I first advanced this idea in *Forest and Stream*, in an article signed "Gringo," and afterwards saw a confirmation of the same by Mr. Geo. C. Rixford, of Rixford, Fla.