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POSSIBLE EXPANSION OF SHAD-HATCHERY WORK



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In the past thirty years the methods of shad hatching and distribution have been carried to a high degree of excellence, and it may be said that little is left to be desired in these branches of fish-cultural work. There is an invitation to greater effectiveness, however, in the possibility of carrying the hatchery work beyond its present scope into rearing methods, so that the young fish may be planted after they have reached the fingerling stage and thus enter the open waters with greater chances of survival.

It has been exceptional to employ a gravity supply of water in any shad hatchery, the shad-spawning area being in the coastal plain region where tide water or equivalent conditions precludes the idea of dams, waterfalls, and reservoirs. If lunar tides do not exist then there are wind tides; there are no constant downward flowing streams in the spawning neighborhoods, or if any such exist the country is too low to permit the utilization of the flow. Hence nearly all shad hatching has been conducted in water supplied by steam pumps, with the expense of which it has been regarded as impracticable to undertake pond work of any kind at the shad-hatching stations. The activities have thus been concentrated upon hatching eggs and liberating the embryo fish product, attempt to carry the work beyond this point being exceptional. It was limited, in fact, to the Fish Ponds, Washington, D. C., a station now abandoned.

At that station, however, the rearing of shad was taken up in 1888, and continued until the abandonment of the establishment, in 1906, with highly satisfactory results. In the Commissioner's Report for 1888, page xxviii, appears the following statement:

Nearly 3,000,000 shad fry were placed in the west pond in May, 1888. These were held in the ponds during the summer, but were not fed; on the natural food found in the ponds they made rapid growth. In October, when the young shad were released in the Potomac River, they had attained the average length of 3 inches. It was not possible to determine by actual count the number of fish liberated, but conservative estimates placed the number at 50 per cent of the number of fry placed in the pond. These results were as satisfactory as they were unexpected, and indicated a new departure in fish-cultural work which promises important consequences.

The experience of 1888 was repeated with scarcely a variation for ten years or more. In other words, the rearing of shad fry was a success throughout. In my intimate association with the Fish Ponds and the Superintendent, the late Rudolph Hessel, and with the Central Station, which supplied the fry, I heard no suggestion of disappointment from any source. On one occasion I understood that some of the fingerling fish, on close examination, were found to be alewives, or river herring, but it may be said that any pond of a tidal or semi-tidal kind in the region of the river herrings is almost sure to contain some of their young. In the experimental ponds at Edenton Station the screens were kept in all the time and adult herring could not enter, but eggs were deposited on the outer surface of the wire mesh and the resultant fry, along with many others, perhaps, swam through the meshes. In fact, any screen that would allow the water to drain or waste from a pond would scarcely exclude the minute young of the river herrings. A noteworthy feature of the shad-rearing in connection with the work at the Fish Ponds, in view of the successful results, was the inferior quality of the fry supplied to the station. I personally know that, for a number of seasons, it was "the weak fry," "the early and weak fry"—fry that were of less than average vitality—that were consigned for these experiments.

Not only was the rearing of shad at the Fish Ponds a striking success, but an experiment at the more distant Neosho Station, in Missouri, under the late Superintendent William F. Page, was equally gratifying. In the commissioner's report for 1893, Superintendent Page says:

In addition, 200,000 fingerling shad were liberated in waters tributary to the Gulf of Mexico. Their number could not be ascertained except by estimate, owing to the fact that these fish can not be successfully handled. They were the product of 700,000 fry sent from Washington in the preceding June. In preparing for their release the hatchery branch was, in October, cleared of shoals, drifts, and aquatic plants for three-quarters of a mile, to a point where it empties into Hickory Creek. Early in November, when the branch was swollen by rain water, the 6-months-old fish were allowed to pass through open gates. They were some hours in escaping—a continuous silvery mass. These were the first fingerling shad planted in waters tributary to the Gulf of Mexico.

It will be well to note also what follows in Mr. Page's account, as below:

The pond which contained the shad was infested with crawfish, 1,750 pounds being removed and destroyed between August 3 and October 31. These were estimated to be 70,000 in number. By some unaccountable means black bass of the large-mouthed variety were also present. In preparing for receipt of the shad the pond had been drawn in November, 1891, and the bottom exposed for three weeks, and in the following April the process was repeated, all water connections with black bass ponds having been broken and an independent supply being established. On August 3, the intruding fish being observed, a hook and line were brought into use, and on the first day 5, averaging  $1\frac{1}{2}$  pounds each, were caught, and by October 31 the catch had reached a total of 152. It is believed that they burrowed in the mud, surviving the absence of water during the two periods mentioned.

The fish-cultural reputations of both Mr. Hessel and Mr. Page assure acceptance of their figures; and we know, of course, that no river herrings were among the fingerlings released from Neosho station, while the large output notwithstanding the crawfish and intruding black bass is a demonstration of the certainty of results in shad rearing where the right kind of ponds are employed.

The simplicity and the minimized cost in the rearing of shad makes it entirely practicable to entertain the idea that perhaps all of the output of the shad hatcheries might, in a short time, be subjected to the process. Deep ponds are not required, 3-foot depth being ample. Necessary conditions are to have ponds so arranged that the fingerlings require no handling—for their scales drop off at a mere touch—and to exclude as many natural enemies as possible. The first condition can be secured in either tidal or upland ponds, for the latter can be arranged in a series of two or more, each one backing the head of water against the gates of the next higher, the one nearest the stream being tidal or semitidal. The uppermost ponds could be emptied serially into the next lower down until the one next the stream contained all, when its gates could be opened. In tidal ponds there would be difficulty in excluding natural enemies, owing to the impossibility, ordinarily, of drying the bottom and keeping it exposed.

Lands available for the desired purposes are to be found throughout the shad region, and twenty years ago I pointed out the ponds used as meadows by farmers below Gloucester City, N. J., as exactly adapted to such use, they having automatic gates which turned rain water out at low tide and closed against the rising Delaware River lunar tides. Lands suitable for shad-rearing ponds would as a rule, be too low for agriculture, and their market price, or annual rental, would be inconsiderable. It has not been determined how large the ponds should be, but the one so long used for rearing at Washington contained about 5 acres. While such work should be directed intelligently, the chief cost would be the maintenance of a faithful watchman during the few months the shad were held.

In view of the extraordinary interest that attaches to the shad along so great a seaboard—Maine to Florida—by all citizens, of all degrees and conditions, and with the renown that shad culture has brought to its originators and sustainers, the work would seem to merit the bestowal of all rational culture methods that are really apparent. The rearing of the young fish can not be considered other than a strictly rational proposition, while, at the same time, it has passed all experimental stages. Welcome the day when all the shad fry produced at the shad-cultural stations shall be reared to fingerling size before being liberated in the open waters.