

The analyses of baits used suggest that bait is not the most important factor in producing good catches. The roles of trap location, spawning activity and "decoy effect" are not clear. These would be promising avenues for additional research.

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REDUCTION OF THREADFIN SHAD HAULING MORTALITY BY THE USE OF M.S. 222 AND COMMON SALT*

Since the advent of intensive fishery management of large man-made impoundments, biologists have searched for the perfect forage fish. They wanted a species that would be suited to reservoir living, but would not be detrimental to the desirable species normally found in these impoundments.

Small gizzard shad, *Dorosoma cepedianum*, although temporarily supplying the needs of young predators in newly impounded waters, soon outgrow their usefulness. The large adult size obtained by gizzard shad and tendency to overpopulate with consequential reduction of spawning success reduces its utilization by smaller carnivorous species.

In 1956, Arkansas fishery personnel became interested in threadfin shad, *Dorosoma petenense*, as a replacement for the less desirous gizzard shad.

The climate here is such that the threadfin, once established, expand rapidly during the spring and summer, but are controlled naturally by winter kills.

A source of supply was discovered in the southeastern portion of the state in Lake Chicot. Biologists began hauling threadfin shad often as far as two hundred miles or more north of their native range. Using routine hauling methods, fifty percent mortality was common and as much as ninety-five percent mortality was experienced at times.

During hauling operations in the early summer of 1961, Dr. Kirk Strawn, Zoology Department, University of Arkansas and Project Leader of Arkansas' Dingell-Johnson Project F-8-R, (a project concerned with threadfin shad introduction in Lake Ft. Smith, Arkansas) suggested that the addition of common salt to the hauling water might reduce mortality. He based his suggestion on his previous experience with marine and aquarium fishes where the addition of salt improved survival during handling. Since threadfin shad are considered recent

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emigrants of marine waters, the salt technique was considered worthy of investigation. Early trials, using concentrations of common salt (NaCl) ranging from 0.5 per cent to 3.0 per cent, proved so efficacious that the hatcheries immediately began hauling threadfin shad in 1.0 percent salt solutions.

In addition, it was observed that threadfin shad being transported in plastic bags, inside cardboard cartons, repeatedly (if not continuously) bumped the sides of the containers which, of course, resulted in injury to these delicate fish. Preliminary experiments with M.S.222 (Tricaine Methanesulphonate, a product of Sandoz Pharmaceuticals, Hanover, New Jersey) showed that threadfin shad could be tranquilized with dilute solutions of M.S.222 without apparent harm.

To further determine the best concentrations of salt and M.S.222 to use in the transporting water, an experiment using various concentrations of salt, M.S.222, or a combination of the two was carried out at the Joe Hogan State Fish Hatchery, Lonoke, Arkansas, Table I.

As a result of this experiment, it was concluded that threadfin shad would survive longer in a combination of salt and M.S.222 equivalent to one gram in twelve gallons of water.

Following this procedure, in 1962 the hatcheries transported over 200,000 threadfin shad with consistent survival rates exceeding ninety-five per cent. In subsequent years the only deviation from the above described technique has been to discontinue the use of agitation. Compressed oxygen is still bubbled through the hauling water.

This method of hauling threadfin shad has withstood the test of time.
