

Why Can't More Yearling salmon and trout be reared?

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This past fall significant reductions were agreed upon by the fishery management agencies for both Lakes Huron and Michigan in terms of the number of Chinook salmon that will be stocked in the future. Anglers often question why we can't produce more steelhead or coho salmon yearlings (or for that matter brown and rainbow trout) if we are producing less Chinook salmon. The reason we can't make this switch is based on the hatchery life cycle of these species and the rearing abilities of our hatcheries. Chinook salmon are reared indoors for six months and they don't typically use outside raceway space that could be used by coho salmon and steelhead. Producing fewer spring fingerling Chinook salmon does not, contrary to belief, open up more rearing space for the other yearling species because they don't occupy the same space at the same time.

Hatchery fish are a lot like people. Some like it hot, some like it cold. Some prefer crowds and some like to be by themselves. Fish are also similar to people in that they have a wide range of tolerance for disease. The environmental preferences that fish have, as determined by their life history, determine the best hatchery for them to be reared in. The goal of any good hatchery management program is to match the species to be reared with the optimal environment. If the right environment is provided for in terms of temperature and space the species will generally do well and the fish produced will be healthy.

The Michigan Department of Natural Resources operates six hatcheries. These hatcheries are spread across the state from near Kalamazoo (Wolf Lake State Fish Hatchery) in the southwestern Lower Peninsula to Marquette (Marquette State Fish Hatchery) in the Upper Peninsula. Based on the experimentation with rearing nearly all of the fish species of interest at all of our hatcheries in the last 130 years, we know that each of our hatcheries have unique features that lend themselves to efficiently rearing specific types of fish to the size needed by fisheries managers. The two features that are most important in determining which species is best suited for a hatchery are water temperature and space.

Let's consider water temperature first. Species such as rainbow and brown trout rear best in cold water in the range of 45 to 48 degrees F. Salmon and steelhead, on the other hand, perform better in warmer hatchery water in the range of 50 to 55 degrees F. The water temperature at any hatchery is determined by the temperature of ground or surface water in the area. This limitation explains why all of the salmon species are reared at three of the six hatcheries.

Wolf Lake State Fish Hatchery near Kalamazoo has a ground water temperature of 51 degrees F year round so it is well suited for rearing steelhead and Chinook salmon. Platte River State Fish Hatchery is operated on surface water which is cold in the winter and warmer in the summer making it suitable for rearing yearling coho salmon and spring

fingerling Chinook salmon. The third salmon hatchery is Thompson State Fish Hatchery near Manistique in the central Upper Peninsula. Thompson has very deep aquifer wells which are geothermal, providing a year round temperature of 55 degrees F along with shallow cold wells. Due to the availability of large amounts of warm water, Chinook salmon and steelhead grow well there.

Studies across the country and in Michigan have shown that coho salmon and steelhead both need to obtain a certain size in order to smolt and survive. For years Michigan stocked fish that were not as large as they are today and survival of those fish was considerably less than those fish stocked today. Obtaining an appropriate size for smolting is directly correlated with the temperature of the rearing water. Because of these limitations, fish such as steelhead cannot be reared to sufficient size at Platte River, and salmon cannot be reared to sufficient size at the trout hatcheries which have colder water supplies.

The Department's other three hatcheries are trout oriented and include Harrietta State Fish Hatchery near Cadillac, Oden State Fish Hatchery near Petoskey and Marquette State Fish Hatchery at Marquette. These three hatcheries have colder water than the salmon hatcheries and are better suited for rearing trout, including browns, rainbows, brook and lake trout. Marquette and Oden State Fish Hatcheries are broodstock facilities that have captive (adult) fish that provide eggs for the rearing program. Because the adult broodstock are very valuable and could not be replaced if lost to disease, hatchery staffs are very careful in protecting these fish from diseases from outside the hatchery. Therefore, we typically do not bring in Great Lakes fish or eggs directly into these broodstock facilities. Since the salmon species are of most interest to this readership let's go on to consider space limitations at our salmon hatcheries.

Trout and salmon are reared in never ending cycles. As one year class of fish is stocked, the next younger year class is quickly moved into the vacant space at the hatchery. Among the salmon species we produce in Department hatcheries, there are differences between species rearing cycles. Chinook salmon are reared for six months (including egg incubation) in tanks located inside hatchery buildings in all three salmon rearing facilities. Once hatched, the fry are placed in small inside tanks about Christmas time each year. Where space is available, such as at Platte River State Fish Hatchery, some of the fish are moved into outdoor raceways to improve growth by spreading them out in the rearing space. By late April to early May, the Chinook salmon are about three to four inches long and are ready to be stocked. This time period coincides with their natural life cycle in the wild. Each spring, typically early May, wild Chinook salmon leave the stream they hatched in and migrate downstream to the Great Lakes.

Coho salmon and steelhead have a different life cycle in the wild so their hatchery rearing is adjusted accordingly. Both species normally live in the stream they hatched in for one or more year(s). Both species migrate downstream and out to the Great Lakes in the spring following this one year period in the stream. In the hatchery, these species occupy the small inside tanks for the first several months of their life cycle. When they outgrow the water and space available inside, they are moved to much larger raceways outside.

They remain in the outside raceways another 9-11 months until the following spring when they are one-plus years old. At this time they are ready to be stocked. And so the cycle continues. As the yearlings are stocked out of the outside raceways, the younger year class from inside the building moves into their space.

Hatchery managers are often asked to produce more of one species or strain (a genetically unique type of fish within a species) than another. Managers are also asked to make reductions in the numbers of a particular species produced based on ecosystem limitations or other fishery management needs.

The question could be asked; “Why not rear steelhead or coho in the inside tanks made vacant by the reduced number of chinook?” While it is true that this could be done, the actual number of additional yearlings that could be raised is very small. It is necessary to consider the relative size of the inside tanks, the outside raceways, and the rearing densities and life stage of the species in question. The rearing volume of inside tanks at the salmon hatcheries is about five to twenty five percent of the total outside rearing volume. This does not however equate to an additional five to twenty five percent rearing capacity for yearlings because larger fish need more space. Densities of small fingerling fish are much higher than larger yearling fish. Small inside tanks are also not designed to hold larger yearling fish. It is very difficult to keep larger fish from jumping out of small, low sided inside tanks.

All six hatcheries are operating at what is considered full capacity. This capacity strongly influences the health of the species reared. The reduction in Chinook salmon rearing does not result in any useable empty rearing space to rear more yearling salmon and trout.

Disease concerns also pose many challenges to successful hatchery management. Hatchery managers often make the analogy between a fish hatchery and a hospital. Both environments have populations that are living in close quarters. If a disease is introduced it can spread very quickly with devastating effect. Fish are a lot like people in that some groups are very susceptible to certain diseases while others are resistant. As an example, both salmon species are very susceptible to a disease known as bacterial kidney disease. This disease was responsible for crash of the Chinook and coho salmon populations in Lake Michigan in the late 1980’s and early 1990’s. It can have disastrous effects in a salmon hatchery but species like lake trout are more resistant to it.

However, managers strive to minimize exposure to pathogens in our hatcheries, regardless of the individual fish species or strain’s resistance to pathogens. Fish pathogens are generally either bacteria or viruses with very short life cycles. These short life cycles mean that mutations can and do occur in very short time periods. These mutations can result in greatly increased susceptibility in a given species or strain. Bringing fish that are known to harbor a certain pathogen into a population that is known to be free of that pathogen is a recipe for disaster.

For these concerns stated above and the utmost need to protect broodstock populations, we segregate the rearing of Great Lakes species which may have low level infections with bacterial kidney disease from our other trout simply by rearing them in separate hatcheries. We also take steps such as culling clearly diseased parents to disinfecting all eggs to reduce any potential pathogens before they come into the hatcheries. Salmon hatcheries are like the intensive care ward at a hospital. Fish and people alike will tend to remain healthy if they are taken care of, well feed and are not exposed to new illnesses.

The Department's fishery managers have the utmost concern for maintaining viable sport fisheries but are limited in the tools that can be used. Hatchery systems have clear limitations on the number and type of fish that can be reared at any given facility and work over the last 130 years has produced a system that is very effective and efficient at rearing the fish needed by fisheries managers. There are only very limited abilities to change the amount or locations of fish produced by the Department's fish production system without very large scale disruptions in production or great increases in capitol funding to modify or construct existing hatcheries. There is another way much more efficient way to increase the production of the key fish of interest to anglers and that is through improving the production of wild fish. Department management goals and objectives call for protection and rehabilitation of aquatic habitat which is key to improving wild fish production. While hatchery limitations place caps on the ability to rear increased numbers of certain species, fisheries managers look for opportunities to work with interested constituent groups to improve the natural rearing environment for sport fish. Increasing the ability of our streams to produce wild fish is an area that has real growth potential and will continue to be a focal point for fisheries managers as we creatively work to maintain and improve the fantastic sport fisheries that Michigan anglers enjoy.