

**Michigan Department of Natural Resources
Fisheries Division**

**Moratorium on Coolwater Fish Production for Walleye, Northern Pike, and
Muskellunge - 2007**

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Briefing for the Natural Resources Commission, Director, and Staff

Contacts: Kelley Smith, Chief, Fisheries Division, (517) 373-3375
Gary Whelan, Fish Production Manager, (517) 373-6948

Action

A one year moratorium on the hatchery production of walleye, northern pike, and muskellunge using eggs collected from wild broodstocks in Michigan's waters is being imposed for 2007. The moratorium is necessary to protect both the State's aquatic resources in inland waters and fish currently being reared at State-owned hatchery facilities from infection by Viral Hemorrhagic Septicemia virus (VHSv), thus minimizing the potential risk of significant economic impacts posed by the presence of the virus.

Executive Summary

Viral Hemorrhagic Septicemia virus (VHSv) is now known to be present in Michigan's waters of Lake Erie, Lake St. Clair, and Lake Huron. The virus is not harmful to humans or other warm-blooded animals. The disease is a significant threat to wild populations of fish, including wild broodstocks from which eggs are collected and used for the production of fish for stocking. Thus, the risk of spreading the virus to inland waters of the State given the rearing process for coolwater fish species that uses outlying rearing ponds throughout the State is very high. Additionally, the current regulatory status of the disease requires that all fish in a hatchery, including trout and salmon, must be destroyed and the entire facility disinfected if any fish in the hatchery becomes infected with VHSv. While effective disinfection methods for salmon and trout eggs are well established, no information is available regarding the efficacy of disinfection techniques for coolwater species of fish, such as walleye, northern pike, and muskellunge. Alternate approaches and locations for hatching eggs and rearing coolwater fish were evaluated by the Department of Natural Resources (DNR), including: offsite rearing at DNR-owned

facilities; offsite rearing at other locations; obtaining fish from other agencies; obtaining eggs from inland sources; and building temporary isolation facilities. None of these options can be implemented without significant risk to our aquatic resources or to fish being reared in any facility. The most prudent alternative at this time is to place a one year moratorium on rearing coolwater fish species while focusing efforts on the following actions:

- developing methods to disinfect eggs of coolwater fish species;
- conducting statewide surveillance for VHSV, with an emphasis on broodstock sources;
- determining the availability of other coolwater broodstocks; and
- developing alternative rearing facilities.

The moratorium on the production of coolwater fish species for 2007 will not create any budgetary savings since those funds will be required for developing and testing disinfection methods for eggs of coolwater fish species, additional VHSV surveillance and testing, and implementing other biosecurity measures.

Background on Viral Hemorrhagic Septicemia Virus

Viral Hemorrhagic Septicemia virus (VHSv) Isolate IVb is not harmful to humans or other warm-blooded animals, but is known to cause large-scale mortalities in fish populations over short periods of time. The virus is more active in cold water (< 15 C or 59 F), based on research related to the virus and observations that most mortalities occur in the spring. Fish typically exhibit hemorrhaging in the skin, including large red patches frequently seen on the sides and anterior portion of the head. Infected fish may also exhibit very minor external hemorrhaging (pin-point spots called petichia) or no external signs at all. Internal organs are often congested with fluids and blood, and the liver, spleen, and intestines will have multiple hemorrhages. The swim bladder is frequently very congested with hemorrhages, giving the otherwise transparent membrane a mottled appearance. Sick fish will often appear listless, swim in circles, or hang just below the surface based on staff observations made this past spring.

Analyses of the viral strain and fish kill pattern information suggest that VHSv was likely introduced into the Great Lakes around 2002 from infected ballast water discharges. The virus is currently distributed in Michigan's waters from northern Lake Huron to Lake Erie. Widespread mortalities in muskellunge and gizzard shad in Michigan's waters of Lake St. Clair were observed in 2006, along with significant mortalities of yellow perch, white bass, freshwater drum and round gobies in lakes Erie and Ontario. VHSv continues to infect new fish species as it spreads throughout the Great Lakes. However, population-level effects of the disease in freshwater fish populations are not well understood, nor are the mechanisms responsible for spreading the disease between fish.

Internationally, VHSv is a fish disease of concern and therefore must be reported to the International Organization of Animal Health (OIE) once discovered. The United States is a member of OIE and, as such, is required to take steps to prevent the spread of the disease in the United States. In October and November 2006, the United States Department of Agriculture, Animal and Plant Health Inspection Service (USDA-APHIS) imposed a prohibition on the interstate and international movement of live fish to prevent the spread of VHSv in the U.S. Any operator of a fish rearing facility with fish that become infected will be ordered by USDA-APHIS to depopulate (kill and dispose of all fish in the facility) and fully disinfect their facilities, resulting in a complete loss of production at that facility. If the disease were to be found in fish reared at a State-owned fish hatchery operated by the Department of Natural Resources (DNR), it would mean the loss of all production at that facility. The resulting

economic loss to Michigan would be in the range of \$40 to \$80 million for each facility requiring depopulation. As such, the DNR must be diligent in its efforts to keep VHSV out of the State's hatchery system if we are to successfully manage the significantly high risk of losing fishing opportunities and the concomitant economic implications to the people of Michigan.

Disease Management Approaches in Hatchery Production

Techniques are available to disinfect salmonid (trout and salmon) eggs, and use of these techniques has been a routine part of egg-take operations conducted by the DNR for the last 10 years. Topical disinfection using an iodine solution is an effective treatment because the virus does not penetrate into salmonid eggs during fertilization. Unfortunately, nothing is known about whether the methods used to disinfect salmonid eggs from VHSV will work on eggs of coolwater fish species. There are several factors involved, including whether the virus is within or on the surface of eggs from coolwater fish, differences in the size of eggs of salmonid species versus coolwater fish species, and differences in fertilization methods used by hatchery personnel for eggs from coolwater fish. Therefore, no confirming evidence exists today about the effectiveness of topical disinfection methods for eggs from coolwater fish species. Given this reality, the primary goals of Fisheries Division are to test the efficacy of topical disinfection methods for eggs from coolwater fish species and to develop new approaches that will be effective in preventing VHSV from infecting fish in our hatchery facilities. Other States around the Great Lakes are also pursuing these goals, and our combined efforts will contribute greatly in the coming year to the collective understanding of how to manage VHSV in eggs from coolwater fish species.

Of the six State-owned hatchery facilities, the DNR incubates and hatches eggs from coolwater fish at Thompson and Wolf Lake State Fish Hatcheries. Both of these facilities are also used to incubate and rear salmon and trout. Brown trout, Chinook salmon, steelhead, rainbow trout, and Atlantic salmon are reared at Thompson State Fish Hatchery in addition to coolwater fish species, including walleye, northern pike and muskellunge. Chinook salmon and steelhead are reared at Wolf Lake State Fish Hatchery along with walleye, northern pike, muskellunge, and lake sturgeon. Thompson and Wolf Lake are the only State-owned facilities at which steelhead are reared, and about 40% of the Chinook salmon stocked into Michigan's waters of the Great Lakes are reared at these two facilities. Infection of fish at either of these two facilities by VHSV represents a large risk that would seriously affect the management of salmonid populations in Michigan's waters of the Great Lakes.

The DNR collects eggs from walleye at three locations, eggs from northern pike at three locations, and eggs from muskellunge at two locations (Table 1) to provide the highest quality of fish with respect to genetic integrity and fitness,. Although VHSv has yet to be detected at any of these locations, the potential for infection is still present because of either the highly mobile behavior of adult fish or the potential for inadvertent exposure of these waters to VHSv by activities of anglers and boaters.

Table 1. Locations of wild broodstocks of coolwater fish species used by the DNR to provide eggs for hatchery production.

Species	Location
Walleye	Muskegon River (Lake Michigan Basin) Little Bay de Noc (Lake Michigan Basin) Tittabawassee River (Lake Huron Basin)
Northern Pike	Little Bay de Noc (Lake Michigan Basin) Sanford Lake (Tittabawassee River, Lake Huron Basin) Kent Lake (Huron River, Lake Erie Basin)
Muskellunge	Lake Hudson (Lenawee County, Lake Erie Basin) Thornapple Lake (Barry County, Lake Michigan)

The Tittabawassee River is located in a VHSv positive management area. Both of the egg-take locations for walleye on Lake Michigan are at high risk for VHSv infection, given that VHSv has been present in waters of northern Lake Huron since late 2005. The egg-take location for northern pike on Little Bay de Noc has the same risk level as that for walleye, given its proximity to northern Lake Huron. Both Sanford Impoundment and Kent Lake are very high risk locations for the virus because of the significant movement of boats between these water bodies and areas of the Great Lakes classified as VHSv positive management areas, including lakes Huron, Erie, and St. Clair. In addition, anglers have likely used baitfish collected from VHSv positive management areas in both Sanford Impoundment and Kent Lake. It is also important to note that the spread of VHSv is likely to follow the same pathways of colonization as observed over the years for zebra mussels, for example via movement of boats and baitfish by anglers. A substantial number of anglers pursuing muskellunge do move between Lake St. Clair, a VHSv positive management area, and the locations used for collecting eggs from muskellunge, which provides a mechanism for VHSv to move into previously uninfected waters. Thus, wild fish used as broodstock in these locations are likely candidates for infection by VHSv.

There is a reasonable likelihood that VHSV may have already be in one or more of the water bodies containing wild broodstocks of coolwater fish species used to provide eggs for hatchery production. Add to that possibility the fact that there are no known methods to disinfect eggs from coolwater fish species, and we must therefore conclude that there is a substantial risk for infection of fish in the DNR's hatchery system by VHSV if we conduct our standard egg-take operations and rear coolwater fish in the State's hatcheries. The inadvertent introduction of VHSV into fish reared at Thompson and Wolf Lake State Fish Hatcheries would require full depopulation and disinfection, resulting in the loss of all fish for stocking from these facilities for two years. The economic loss to the State of such a catastrophe would range between \$80 and \$160 million.

Options Considered for Maintaining Production of Coolwater Fish Species in 2007

Offsite rearing at DNR facilities – Fisheries Division's fish culture staff evaluated the use of existing DNR-owned field facilities that are close to egg-take locations for incubating and hatching eggs from coolwater fish species. The sites examined include Comstock Park, Escanaba, and Bay City Field Stations. Even with substantial investments, it is not possible to produce significant numbers of coolwater fish at any of these locations because of insufficient water supplies, an inability to heat water as required for successful hatching of eggs from coolwater fish species, and no ability to treat effluent water after the use of formalin, which is required for the control of fungus that affects eggs of coolwater fish species. Other locations throughout Michigan were not considered because they are currently uninfected by VHSV.

Offsite rearing at other locations – Fisheries Division's fish culture staff examined the potential of rearing fish at facilities owned by universities, community colleges, and other partner organizations. This option was rejected because of the potential liability if one of these sites became infected with VHSV, resulting in significant costs for disinfection and cleanup of the facility. Additionally, these locations have the same problems as observed for other DNR-owned sites, including the potential to infect fish in disease-free waters, inadequate water supplies and water treatment capabilities, and insufficient capacity for heating water.

Obtaining fish from other agencies – Fisheries Division continues to evaluate this option. There are no known sources of eggs from walleye that are genetically compatible with our walleye populations, so it is unlikely that we will find another source of broodstock. Similarly, we have been unable to locate an appropriate source of eggs from northern pike that are genetically

compatible with our current populations, so alternatives do not exist for this species. The use of fish with different genetic characteristics could cause outbreeding depression problems and reduce the quality of fish populations, an unacceptable long-term risk. We are examining the opportunity of obtaining muskellunge from the State of Iowa since these fish are genetically similar as our existing sources of muskellunge broodstock. Although receiving muskellunge from Iowa is a possibility, it will depend on the ability of Iowa's production program to rear sufficient numbers of fish beyond their needs. That outcome will not be known until late May. Any muskellunge available from Iowa will be tested and certified free of VHSV prior to importing them into Michigan.

Obtaining eggs from inland sources – As stated previously, inland water bodies containing wild broodstocks of northern pike and muskellunge are at high risk for VHSV infection. There may be some broodstock sources of northern pike and muskellunge in inland waters of the Upper Peninsula, but the logistics of obtaining sufficient numbers of ripe fish in a timely fashion can not be resolved for this production season. In addition, there is a high risk of production failure given the potential large expenditure of limited resources in Fisheries Division if these sources for broodstock are pursued at this time. Additional evaluation will be conducted for future production cycles.

Extensive analysis of possible broodstock sources of walleye in inland waters has been conducted and there is simply insufficient numbers of fish available from any one source. Even when sources are combined together, the available populations of walleye may not produce a sufficient number of eggs to operate a production cycle. Thus, Fisheries Division's biologists have concluded that this is not a feasible option because of the relatively small size of inland walleye populations when compared to the broodstock sources in the Great Lakes.

Building Temporary Isolation Facilities – The opportunities to build temporary isolation facilities at both Thompson and Wolf Lake State Fish Hatcheries was evaluated by Fisheries Division's fish culture staff. At Thompson State Fish Hatchery, drainage of water used for incubation would have to be modified to accommodate installation of an effective UV system for disinfection of VHSV from effluent waters. This would be a costly and significant undertaking, and the Division does not currently have the financial resources to undertake such a project. In addition, there is no possible way to completely isolate incubators used for hatching steelhead eggs or raceways used for early rearing of other fish species from the water used to incubate

walleye eggs at either Thompson or Wolf Lake State Fish Hatcheries. Finally, if either of the facilities is exposed to VHSv or is suspected to be exposed because eggs came from broodstocks originating in waters potentially positive for VHSv, it would change the disease status of the facility for the future. That problem would greatly limit our ability to move fish from the infected facility to other State-owned hatcheries, even after depopulation and disinfection of the facility. This would clearly hamper our ability to deal with other fish production problems in the future.

Funding Issues

Fisheries Division's FY2007 budget has approximately \$85,000 available for coolwater fish production. Depending on the availability of muskellunge and walleye from other States, most of these funds will not be used for production of coolwater fish species. Any savings resulting from the moratorium, however, will be required for developing and testing disinfection methods for eggs of coolwater fish species, additional VHSv surveillance and testing, and implementing other biosecurity measures. Overall, there will not be any cost savings to Fisheries Division because of the moratorium on production of coolwater fish species.

Future Actions to Overcome the Moratorium

1. Staff will conduct experiments using eggs of walleye and muskellunge populations that are likely infected with VHSv from lakes Erie and St. Clair to determine if standard iodine disinfection techniques will work for coolwater fish species. If the experiments can demonstrate that these techniques are effective, then normal production of coolwater fish will continue in 2008.
2. Continue to conduct surveillance and monitoring of current coolwater broodstock populations for VHSv infection to allow a determination of the prevalence (percent of fish infected) and intensity (amount of the virus detected in fish) of infection in each population. These efforts will allow us to better tailor management of our fish production programs towards these populations.
3. Implement the Division's VHSv surveillance and monitoring plan for all waters. This will ensure that we have an estimate of the presence and absence of VHSv, and will allow us to better select potential broodstock sources and rearing locations.
4. Determine other potential out-of-state sources for coolwater fish for future rearing operations. Although this analysis is worthwhile, it is highly unlikely that other genetically compatible sources can be found.

5. Develop additional backup options to incubate and hatch coolwater fish species, including identification of additional broodstock source options from inland waters, identification of other offsite incubation and rearing facilities, and the development of mobile and fully contained incubation and rearing facilities. The cost of mobile incubation facilities is estimated to be approximately \$22,500 per 1 million walleye fry.