B. MICHIGAN'S FISH AND AQUATIC ANIMAL HEALTH PROGRAM

Program Background

Program Overview

Fish and aquatic animal health programs must cover all potential areas ranging from biosecurity to pathogen detection to disease management recommendations. The Michigan Department of Natural Resources Fisheries Division Fish Health Program has the following components that address all of the key areas:

1) Biosecurity
2) Disease Prevention
3) Pathogen Surveillance and Testing
4) Disease Treatment
5) Epidemiology
6) Decision Support

Program Administration

The Michigan Department of Natural Resources' Fish Health Program is embedded into the Fish Production Section of the Fisheries Division as one of six programs administered by the Fish Production Section. This is a common location for the administration of this program. There are two of reasons for this: 1) problems with fish health are manifested with high density and stress environments so hatcheries in general must be continuously monitored with respect to fish health to produce healthy fish within the hatchery system; and 2) it is critical that public fisheries agencies with public trust responsibilities are not a factor in spreading fish pathogens that may jeopardize the public trust resources.

Resources

The Michigan Department of Natural Resources' Fish Health Program has a planned staffing of a Fish Pathologist or Veterinarian and a Fish Health Technician. The Fish Pathologist/Veterinarian roles are: to ensure that all samples are properly collected for lab analysis; to conduct some pathogen and disease testing; to ensure the laboratory work is properly conducted; to analyze the laboratory results; and to provide fish health management recommendations to Fisheries Division. The Fish Health Technician's duties are to: collect samples in accordance to accepted collection practices; properly catalog and store samples; ensure chain of custody is maintained; ensure the proper shipping and delivery of all samples; assist the Fish Pathologist/Veterinarian in laboratory analyses; and properly record all data into databases.

These assets are to be backed up with additional expertise and lab support at the Michigan State University Aquatic Animal Health Laboratory under Dr. Mohamed Faisal. The Michigan State University assets are currently contracted at $167,000 annually, a bare minimum of funding. To

properly fund this contract, approximately $240,000 is needed given the current distribution of work between Michigan State University and Fisheries Division staff. Additional capacity to handle fish health work is being developed at Lake Superior State University and future plans are to contract appropriately $25,000 per year of work with this University. The long term plan is to have emerging fish pathogen and advanced fish pathogen analysis conducted with the state-of-the-art facilities and expertise at Michigan State University with most of the more routine pathogen work being handled by Lake Superior State University.

There are a number of key advantages to having these University contracts. The first is the availability of state-of-the-art analytical facilities that are very difficult for state agencies to maintain and operate. The second is that it is very difficult and expensive for state agencies to keep up with the ever changing laboratory regulations. The third is the availability of a large pool of inexpensive labor at the Universities to handle laboratory work. The fourth is that Universities have much greater ability to leverage assets that in turn attract additional funding for fish pathogen and disease research. Finally, Universities have staff fully versed in the latest information on fish pathogens and diseases which brings the very best information to the decision process.

Currently, both of Fisheries Division positions are vacant and most of the policy development and decision support is handled by the Fish Production Manager and the Fish Health Program Manager with the assistance of Michigan State University staff. This is not an ideal way to handle these tasks but is manageable. To fully operate this program in a state with the water resources of the State of Michigan, there should be an allocation of: 2 FTEs; a contracting budget of $225,000; and an overall annual operating budget of $500,000. Current funding for this program which covers the minimum fish health needs of Fisheries Division is approximately $225,000 and it is entirely covered by U.S. Fish and Wildlife Service - Federal Aid in Sport Fish Restoration dollars.

Program Components

Biosecurity

The Michigan Department of Natural Resources has implemented a broad range of biosecurity measures at our Fish Production facilities and for our field fisheries management staff. These measures include:

1) A strict program of facility sanitation at hatcheries to remove organic matter that promotes pathogen growth;
2) Strategically located foot baths in hatcheries to prevent pathogen movement between raceway areas;
3) The use of individual rearing unit nets and other gear with no sharing of equipment between rearing units at hatcheries;
4) Disinfection of all rearing units after a lot of fish has been moved from it to another rearing unit;

5) Disinfection of all boats and equipment after sampling bouts;
6) Disinfection of all fish planting units when units are transferred between hatcheries and after each stocking trip; and
7) Limitation of publically accessible hatchery locations to prevent the accidental movement of pathogens by the visiting public.

Disease Prevention

A broad range of disease prevention measures have been implemented by the Michigan Department of Natural Resources. These measures are focused on reducing stress and the direct prevention of the pathogen coming into our facilities. Specific measures include:

1) All outdoor raceway units are covered and screened to reduce sun exposure and predator harassment, both key stressors;
2) A focus on the production of quality fish instead of maximum numbers which requires lower rearing densities and reduces stress;
3) Screening of all coolwater and coldwater broodstocks for key fish pathogens. Examples include the QELISA screening of all salmonid broodstocks for bacterial kidney disease; and the screening of all coolwater broodstock for Viral Hemorrhagic Septicemia virus (VHSv);
4) Vaccination of susceptible coldwater fish species against key pathogens including furunculous and bacterial kidney disease; and
5) Fish mortalities are monitored daily in all rearing units and when daily mortalities reach 0.2%, additional attention is paid to the affected lot.

Pathogen Surveillance and Testing

The Michigan Department of Natural Resources - Fisheries Division conducts pathogen surveillance on both hatchery stocks of fish and on wild fish. The pathogen surveillance of hatchery fish ensures that Fisheries Division does not stock fish that could spread known disease agents to wild fish populations thus placing public trust resources at risk. Surveillance on wild fish provides: information on emerging pathogens; potential natural mortality problems on the horizon; areas where fish can be transferred; potential new wild broodstocks to be avoided or at minimum carefully handled; and information on fish populations at risk from epizootic events.

All stocked fish are certified free of specific pathogens as stated in the Great Lakes Fishery Commission – Great Lakes Fish Health Committee (GLFHC) Model Fish Health Program. This includes all coldwater and coolwater broodstock (both feral and captive) and production fish lots. The coolwater fish testing follows the recommendations in the draft GLFHC Model Fish Health Program currently in review. All testing meets or exceeds the recommendations provided in the American Fisheries Society – Fish Health Section Blue Book and is conducted at the Michigan State University – Aquatic Animal Health Laboratory.

Surveillance is focused on key pathogens (whirling disease, largemouth bass virus, bacterial kidney disease (BKD), *Piscirickettsia* sp., and VHSv to name a few) to: track their current distribution in our state; to determine if epizootics are probable; to determine the effectiveness of

salmonid broodstock culling efforts with respect to BKD; and to evaluate fish kill events to determine if these are related to specific pathogens. Efforts have been made to couple fish pathogen surveillance as part of standard fisheries survey work but this has been slowed because of funding issues. Future aquatic pathogen surveillance will entail having fish and other aquatic organism pathogen samples collected during Status and Trends surveys that sample all components of a waterbody (water chemistry, habitat, invertebrates and fish). This will allow for a holistic analysis of aquatic pathogens and place them in the appropriate ecological context.

Currently, we test appropriately 150 lots of fish (typically 60 fish per lot) from Fish Production facilities. This includes: 35 production and 20 broodstock lots for fish disease certification purposes; 50 production and 15 broodstock lots for virology (typically for VHSv); 30 broodstock lots for BKD screening and culling; and another 30 production lots and 5 broodstock lots for diagnostic work related to specific fish disease issues.

Approximately 195 lots of fish are annually examined from wild populations. This includes: 5 salmonid and 9 coolwater broodstock lots; 5 lots for determining if fish transfers can occur; 160 lots for VHSv and other pathogen surveillance; and 15 lots to investigate fish kills.

Disease Treatment

Once fish pathogens are detected in Fish Production facilities, there are a broad range of responses that can be employed. The initial step used by Fisheries Division is to reduce stress on the affected fish and to remove clinically sick fish from the rearing unit. If the pathogen is viral, little can be done with respect to direct treatment. Bacterial pathogens are examined for sensitivity to approved antibiotics then appropriate antibiotics are used under the guidance of a licensed veterinarian from Michigan State University. Other appropriate and approved treatments are conducted for other pathogens such as external parasites and fungal infections following the directions of a veterinarian. Fisheries Division uses a broad range of approved antibiotics and chemicals to treat fish disease outbreaks under the guidance of a licensed veterinarian from Michigan State University.

Fisheries Division also is an active participant in a number of INADs which allow for the use of the best and latest treatment chemicals for pathogens. Fisheries Division and Michigan State University staff are trained and knowledgeable about all of the required steps in using an new investigatory chemical or drug and all of the required information that must be provided. Being involved in INADs is an essential part of any state fisheries agency's disease treatment strategy.

Fisheries Division does not attempt to treat wild fish but is trying to understand how to manage against certain key pathogens. In the future, Fisheries Division will be looking for opportunities to break disease cycles and to actively manage natural mortality.

Epidemiology

Once an epizootic event occurs, a critical part of the Michigan Department of Natural Resources – Fisheries Division Fish Health Program is to conduct full epidemiological analyses to understand all aspects of the disease outbreak. Most of this work is done by Michigan State

University – Aquatic Animal Health Laboratory staff in cooperation with Fisheries Division staff, particular the Fish Production and Fish Health Program Managers. In the future, this would be a task for the Fish Pathologist/Veterinarian but funding limitations prohibit this at this time. This work includes: tracing back lots of fish to determine disease origin; determining potential and known disease vectors; understanding the disease progression to provide management opportunities and options; risk assessment of pathogens; and providing best estimates on the disease rate and progression. This information is used when possible for real-time disease management and is critical for developing future disease management scenario.

Research

The Michigan Department of Natural Resources – Fisheries Division actively pursues research opportunities with Michigan State University on key fish pathogen and health issues. Fisheries Division is a close partner and assists in sample collection, data analysis and report/paper publication. Michigan State University – Aquatic Animal Health Laboratory staff focus on study design, laboratory analysis, and are usually the lead authors on reports/paper publication. A key role played by Fisheries Division is to find funding opportunities (which occasionally maybe the Michigan Department of Natural Resources) and then to support Michigan State University staff in obtaining research funding to answer fish health issues.

Recent research collaboration includes projects to: develop new rapid detection methods for VHSv; to determine species susceptibility to VHSv; to determine the distribution of Piscirickettsia sp. in Lake St. Clair muskellunge populations; to determine if disease is a contributing factor in the reduction of *Diporeia* sp. numbers; and to determine the ecosystem sinks for bacterial kidney disease in Great Lakes systems. The information generated from these efforts is used directly in understanding and managing fish pathogens in Michigan waters.

Decision Support

Once all of the information is generated on a particular epizootic event or an emerging pathogen, Michigan Department of Natural Resources - Fisheries Division with Michigan State University – Aquatic Animal Health Laboratory staff support develop risk assessments or fish health management options to support decision and policy makers. Information is developed both to inform trained fisheries staff and the general public to ensure that all parties are fully informed on pathogens and their effect on public trust resources of the State of Michigan. It is critical to develop clear scientific information that is approachable for the general public to ensure that are not stampeded into poor conclusions.

Michigan Department of Natural Resources - Fisheries Division with Michigan State University – Aquatic Animal Health Laboratory staff support actively engages in fish health policy through the Great Lakes Fishery Commission – Great Lakes Fish Health Committee. This Committee provides fish health policy and procedure recommendations to the Great Lakes fisheries managers. It is critical for fisheries agencies to directly participate in these forums to ensure the best information is available to decision makers.

Program Contact Information

Gary Whelan
MI DNR Fisheries Division
Fish Production Manager
P.O. Box 30446
Lansing, MI 48909
(517) 373-6948
whelang@michigan.gov