

STUDY PERFORMANCE REPORT

State: Michigan

Project No.: F-80-R-7

Study No.: 230728

Title: Effects of *Piscirickettsia* infection on the muskellunge population of Lake St. Clair

Period Covered: October 1, 2005 to September 30, 2006

Study Objective: The objectives of this study are (1) to determine the infection rate in Lake St. Clair muskellunge and whether the rate varies spatially or temporally, (2) to determine if other fish species in the St. Clair System are infected by the bacteria, particularly migratory salmonids, (3) to identify the impacts of the organism on the health of individual muskellunge, and (4) to determine if the disease can be vertically transmitted.

Summary: Samples of fish and invertebrates were collected from Lake St. Clair in 2005 and 2006 for analysis. Ninety-six percent of the 48 muskellunge captured in trap nets in Anchor Bay during 2006 exhibited external symptoms considered consistent with *Piscirickettsia* infection.

The *Piscirickettsia* sp. continued to be found in 2006 samples. The bacteria were present in all of the muskellunge sent to the lab based on electron microscopy and molecular analysis using the ribosomal RNA gene sequences. Histopathological examination on the affected muskellunge revealed severe degeneration of the kidney glomeruli and widespread subcutaneous edema. Based on analysis of the gonads, there were no indications that this bacterium is present there. Additionally, a number of fish species were investigated for the presence of *Piscirickettsia* such as the gizzard shad, yellow perch, northern pike, freshwater drum, the shorthead redhorse sucker, and the rock bass. Of these fish species examined, *Piscirickettsia*-like bacteria were only present in the yellow perch.

Isolation, electron microscopy, and molecular evidence indicated that the Virus Hemorrhagic Septicemia Virus (VHSV) genotype IV, sublineage b was associated with an episode of muskellunge mortalities. The virus was found in high titers in internal organs. The roles each of the VHSV and *Piscirickettsia* has played in causing such mortalities remain to be elucidated.

Findings: Jobs 1, 2, 4, 5 and 6 were scheduled for 2005-06, and progress is reported below.

Job 1. Title: Collect muskellunge samples from Anchor Bay.—During May 2006, trap nets were fished in Anchor Bay, Lake St. Clair under Study 488 (Job 9). In 2006, 48 muskellunge were captured during the survey. Ninety-six percent of the muskellunge captured exhibited external symptoms considered characteristic of *Piscirickettsia* infection including puffy scales, red sores, hemorrhaging fins, and/or sunken eyes. Due to scheduling conflicts and lower muskie catch rates in late May, only four muskellunge from the trap nets were sacrificed and delivered to the Michigan State University Animal Health Laboratory (MSU AHL). One muskellunge found nearly dead on the surface of Lake St. Clair was also submitted to the MSU AHL for examination. Another muskellunge with a large abnormal swelling on the side of the animal was caught during a fishing tournament, kept on ice for 48 hours, and transported to the MSU AHL for examination.

Job 2. Title: Collect other species of fish and macroparasites during spring, summer, and fall.—MSU AHL personnel examined live specimens of various fish species caught in the trap nets.

Blood samples were collected on-board the research vessel Channel Cat. Some fish were then sacrificed and transported to the MSU AHL for further examination and lab analyses. Fish sampled included: gizzard shad (10), yellow perch (1), northern pike (4), smallmouth bass (2), freshwater drum (12), shorthead redhorse suckers (2), and rock bass (1).

Job 4. Title: Analyze samples for bacterial infection (including various life stages and various species of fish and macroparasites).—The *Piscirickettsia* sp. continued to be found in 2006 samples. The bacteria were present in all of the muskellunge sent to the lab based on electron microscopy and molecular analysis using the ribosomal RNA gene sequences. Histopathological examination on the affected muskellunge revealed severe degeneration of the kidney glomeruli and widespread subcutaneous edema. Based on analysis of the gonads, there were no indications that this bacterium is present there.

Other fish species examined were negative for *Piscirickettsia* except the yellow perch, which contained *Piscirickettsia*-like organism in their skin and kidneys.

Other Pathogens of Importance Found in Muskellunge Samples: Isolation, electron microscopy, and molecular evidence indicated that the Virus Hemorrhagic Septicemia Virus genotype IV, sublineage b (Elsayed et al., 2006) is associated with an episode of muskellunge mortalities. The virus was found in high titers in internal organs.

Job 5. Title: Collect data on rate of external marks with muskellunge with voluntary muskellunge lesion diary program.—Due to waning cooperation, lesion diaries were not distributed in 2005 or 2006.

Job 6. Title: Prepare annual performance report.—This report was prepared.

References:

Elsayed, E., M. Faisal, M. Thomas, G. Whelan, W. Batts and J. Winton. 2006. Isolation of viral haemorrhagic septicaemia virus from muskellunge, *Esox masquinongy* (Mitchill), in Lake St. Clair, Michigan, USA reveals a new sublineage of the North American genotype. *Journal of Fish Diseases* 29:611-619.

Prepared by: Michael V. Thomas and Dr. Mohamed Faisal

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