**STUDY PERFORMANCE REPORT**

**State:** Michigan **Project No.:** F-81-R-4

**Study No.:** 680 **Title:** Patterns in community structure, life histories, and ecological distributions of fishes in Michigan rivers.

**Period Covered:** October 1, 2002 to September 30, 2003

**Study Objectives:** 1) To develop models that explain abundance patterns of the most common fishes in Lower Michigan streams; 2) to evaluate the role of landscape-scale characteristics of streams in favoring fishes having particular life history characteristics; 3) to develop an atlas describing the geographic and ecological distributions of fishes in Lower Michigan streams.

**Summary:** Temperature recorders were recovered from rivers at 56 sites in Lower Michigan during 2002. Data from the recorders were downloaded, summarized, and entered into a database for analysis. Preliminary analyses of temperature data collected from 151 sites suggested that weekly maximum and minimum temperature readings could be used to calculate an average July temperature that was unbiased and comparable to an average computed from hourly temperature measurements. Fish and habitat data have been compiled into a single database and analysis has begun. Two manuscripts were submitted for publication as Fisheries Division research reports.

**Findings:** Jobs 3, 4, and 5 were scheduled for 2002-03, and progress is reported below.

**Job 3. Title: Obtain temperature and fish data as necessary.**–Electronic temperature recorders placed into rivers at 56 Michigan Rivers Inventory (MRI) sites to obtain hourly summer water temperatures were recovered in fall 2002. No additional data were collected in summer 2003.

**Job 4. Title: Develop ecological atlas.–**Hourly water temperature data collected at 113 MRI sites (Figure 1) during summers 2002-03 were summarized. I used weekly maximum and minimum temperatures for the first four weeks in July to compute an average weekly temperature range at each site. I also compared two different calculations of July mean temperature for data collected in 2001-02 and previous years from 151 sites to determine how closely the average of four weekly maximum and minimum temperature readings would approximate the July 1-28 mean temperature, as computed from hourly measurements by electronic recording thermometers. The difference between the two calculation methods was small (mean and standard deviation of the difference were $0.02^{o}$ and $0.38^{o}$ C) and not correlated with average July temperature. This suggested that weekly max-min thermometer data could be used to provide unbiased estimates of July temperature conditions at sites where hourly temperature measurements were lacking. The July temperature data, along with data characterizing each site's size, hydrology, catchment, connectivity, and instream habitat, have been entered into a database that will be used to describe relationships between abundances of common Michigan fishes and key habitat features.

**Job 5. Title: Write report.**–Two reports have been submitted for publication as Fisheries Division research reports. The first details predictive models for the 68 most common fishes in Lower Michigan rivers (Zorn et al. Draft). The second describes causal relations between fish abundance and habitat attributes measure at various spatial scales, and the influence of sample set selection on the relative importance of abiotic and biotic factors (Zorn and Wiley, Draft).

Fish and habitat data needed for development of an ecological atlas have been assembled into a database, and analyses of relationships between species abundance and key habitat variables are starting. In addition to a report on species-habitat relationships, I am also interested in looking at the relative representation of different reproductive, habitat use, and life history guilds in fish assemblages and seeing how they relate to river size and hydrology. Previous reviews of life history summaries (e.g., Scott and Crossman 1973; Becker 1983) suggest that life history data may be limited or missing for several species (mostly rare and exotic fishes). So, further investigation of the literature, use of data for similar species, or exclusion of some species may be needed to complete the analysis. A study amendment may be needed for 2003-04 to accomplish the latter analysis.

**Literature Cited:**

Becker, G. C. 1983. Fishes of Wisconsin. University of Wisconsin Press, Madison.

Scott, W. B., and E. J. Crossman. 1973. Freshwater fishes of Canada. Fisheries Research Board of Canada Bulletin 184, Ottawa, Canada.

Zorn, T. G., P. W. Seelbach, and M.J. Wiley. Draft. Toward prediction of fish assemblages in Lower Michigan rivers: utility of species-specific, multiple linear regression models. Michigan Department of Natural Resources, Fisheries Research Report, Ann Arbor.

Zorn, T. G., and M. J. Wiley. Draft. Untangling relationships among habitat and fishes in Lower Michigan rivers with covariance structure analysis. Michigan Department of Natural Resources, Fisheries Research Report, Ann Arbor.

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**Date:** September 30, 2003

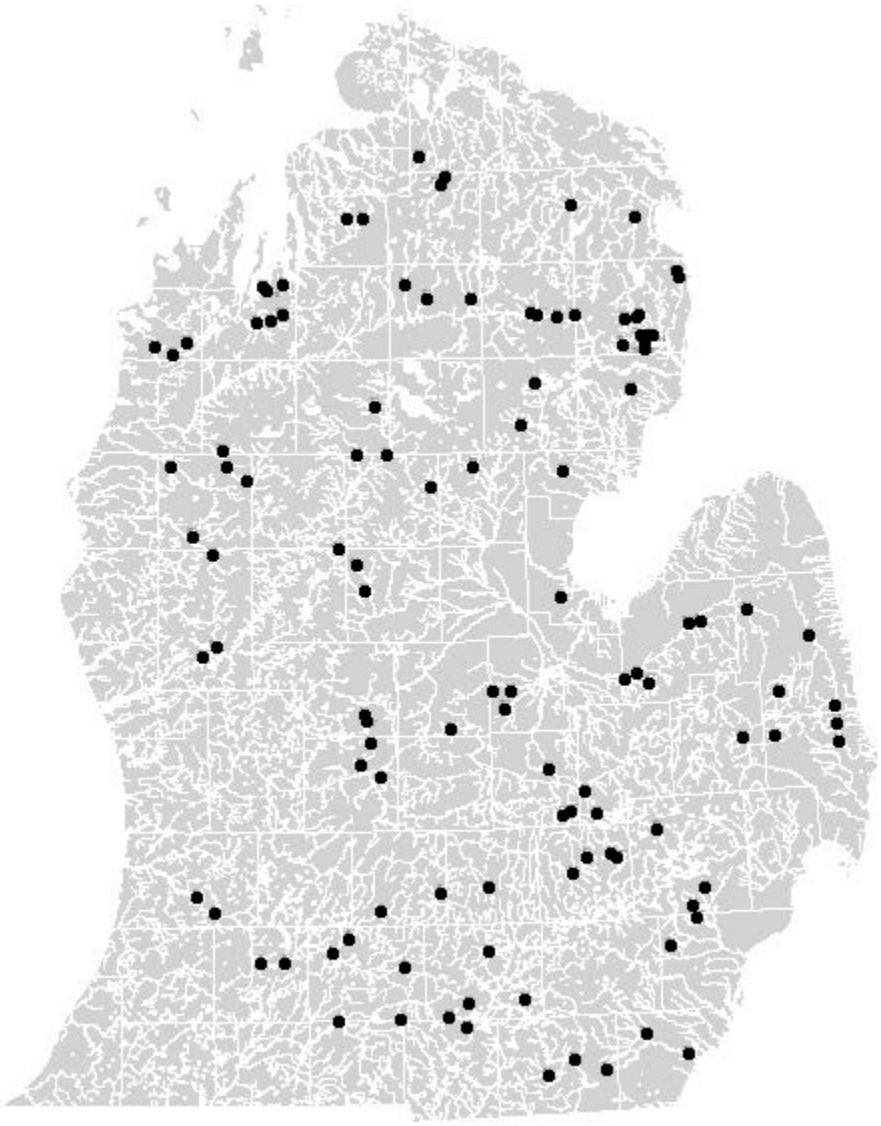

Figure 1.–Locations of Michigan Rivers Inventory sites where electronic thermometers were deployed to obtain hourly water temperature readings during July 2001-02.