

2002 ANNUAL REPORT

Whirling Disease Initiative

submitted by the

Whirling Disease Steering Committee
of the
National Partnership
for the Management of Wild and Native Coldwater Fisheries

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BACKGROUND

Over the past decade, the microscopic parasite *Myxobolus cerebralis*, which causes whirling disease in many salmonid fish species, has spread and infected hundreds of river and stream reaches in the Western United States. The impacts of this parasite on susceptible trout can be dramatic: darkening of the tail, skeletal deformities, frenzied tail chasing (thus the name “whirling” disease), and death. The whirling disease parasite is extremely hardy and long-lived. Like the malaria parasite, it infects two very different hosts alternately. In the case of whirling disease the life cycle employs a fish host and an aquatic worm host (*Tubifex tubifex*), and so reaching an understanding of the parasite has required defining the biology of infected fish, infected worms, parasite spores and the so-called “TAM” life stage.

A Eurasian native, *M. cerebralis* made its way to North America in the 1950s. It was once believed to be relatively harmless to wild fish, but research in the mid-1990s found that it was decimating rainbow trout populations in some of the Rocky Mountain region’s finest river fisheries, from Montana’s Madison River to the Gunnison River in Colorado. Native cutthroat trout, steelhead and whitefish have been found to be susceptible. Whirling disease is therefore a major threat both to biological diversity and to the Nation’s multi-million-dollar fishing and tourism economy. The whirling disease parasite has been reported in 23 states, from New York to California, and has generated great concern among anglers, scientists, and fisheries managers.

THE WHIRLING DISEASE INITIATIVE

The Whirling Disease Initiative was established by Act of Congress in 1997. Its purpose is to conduct research that develops practical management solutions to maintain viable, self-sustaining wild trout fisheries in the presence of the whirling disease parasite. The Initiative’s ultimate clients are state, tribal and federal fisheries-management agencies.

General oversight of the Initiative is provided by the National Partnership for the Management of Wild and Native Coldwater Fisheries. The National Partnership is a consortium of organizations concerned with the status of wild and native fisheries in the United States – Federal and state agencies, professional associations and private advocacy organizations (Appendix A). Besides providing long-term direction to the Whirling Disease Initiative, the National Partnership has also periodically assessed the overall status of coldwater fisheries to identify areas where similar research initiatives could be warranted (Appendix B). To do this, the Partnership’s Board of Representatives convenes annually for a detailed briefing by whirling disease researchers, plus discussions of fisheries health and research needs.

In-depth scientific direction is given to the Whirling Disease Initiative by its Steering Committee. The committee is made up of representatives from state fish and wildlife agencies, Federal natural resource agencies, and the Whirling Disease Foundation (Appendix C). The Committee prepares an annual research plan, issues Requests for Proposals based on its topical priorities, selects and approves projects for funding following scientific peer review, and distributes the research results within the scientific and fishery management communities and to other stakeholders. The Montana Water Center is the administrative entity that manages the program.

Each year, Federal funding earmarked in the Interior Appropriations Bill comes to the Initiative through the Division of Hatcheries, U.S. Fish and Wildlife Service. Projects are chosen for funding by the Steering Committee, following peer review by three independent reviewers. During the Initiative's six-year history, the Steering Committee has chosen to support a mix of projects, ranging from basic biological research to applied research directly testing potential management solutions. Early projects were principally aimed at explicating the biology of whirling disease. In 2000, the Steering Committee began deliberately shifting the priority toward field research more closely tied to possible management strategies. This "applied" focus has becoming ever stronger, with the encouragement of large-scale field projects addressing the ecology of whirling disease and the testing of potential methods for controlling its effects or spread.

The Initiative sponsors from 10 to 15 research projects in each cycle. A research cycle generally runs from May of one year through December of the following year, including two field seasons. Typically two to four investigators are involved in each project, and they bring to the project cash or in-kind match of 25 to 150% of the amount of the Federal grant (Appendix D). Students are involved in most projects, either as technicians or, more often, graduate research assistants.

2002 ACTIVITIES

Projects Concluded in 2002

During the 2001-2002 cycle, 13 research projects were funded with a total of \$535,000 in Federal dollars, leveraging an additional \$387,000 in match from state, private and Federal research collaborators. Research teams included 35 investigators from nine states (Appendix E). Highlights from four just-concluded projects are summarized below:

- 1) A team of Colorado investigators set out to determine the feasibility of direct filtration methods for removal of *Myxobolus cerebralis* TAMs in various filtration media. Bench testing and field demonstrations were conducted using domestic and natural water sources to develop a scope of operational considerations and to evaluate several possible filtration media. The results of the fieldwork suggest that direct passive filtration may be effective; however, operation and maintenance will be crucial elements in full-scale operations. The results of the research provide design considerations, filtration media selection, and application rates of infected influent to achieve desired rates of *M. cerebralis* TAM removal.
- 2) In Oregon, a research team assessed the whirling disease susceptibility of several important salmonid species and examined fishery management practices that may lead to parasite exposure.

Laboratory studies on the susceptibility of chinook salmon indicated this species is at low risk for development of clinical disease under natural exposure conditions. In addition to the potential direct effects of clinical disease, exposure of anadromous salmonids to *M. cerebralis* may contribute to the dissemination of the parasite. Detection of infection in fish at facilities where cultured anadromous fish are acclimated prior to release demonstrates that infection occurs even though exposure is delayed until one year of age. Further, infected fish from eastern Oregon have been detected as adults straying into lower Columbia River tributaries, suggesting that these fish may interfere with management efforts to prevent the spread of *M. cerebralis*. Finally, transfer of naturally-exposed and experimentally-challenged steelhead to salt water demonstrated a decreased ability to survive, suggesting that *M. cerebralis* infection may contribute to mortality during saltwater adaptation.

3) In Rock Creek, western Montana, results of a four-year project indicate that infected *T. tubifex* are present in much greater numbers and are more widely dispersed in areas with degraded riparian habitat. However, trout become infected at many locations where infected *T. tubifex* have not been recovered, and it is possible that fish are infected by parasites originating hundreds or thousands of meters upstream. It also appears that the range of whirling disease within the Rock Creek drainage is still expanding, more than four years after its initial detection. Total water flow appears to affect the severity of disease; an apparent dilution effect on TAMs was observed in the upper portion of the drainage. Genetic analysis indicated the presence of at least three distinct genotypes of *T. tubifex* within the Rock Creek drainage; all three are susceptible to infection.

4) A long-term study on the Missouri River in Montana combines monitoring of the spread of infection with detailed measures of population response to the disease. The investigators are testing whether spawning and rearing in disease-free areas is a viable management option for maintaining and enhancing trout populations in infected systems. During this study cycle rainbow trout populations remained high and did not drop as a result of whirling disease. However, there are signs of impending population decline as the remaining adults are nearing the end of their life span and the size structure of the adult population shows a much-reduced number of younger fish than in pre-whirling disease years. Expansion of whirling disease into lower tributaries, while not observed to a great degree thus far, could have catastrophic consequences since it appears that most of the adult population is supported at present by recruitment from these tributaries.

Projects Funded Through 2003

In spring 2002, the Steering Committee selected 12 new projects for funding in the 2002-2003 research cycle. These range in subject from immunologic methods for whirling disease diagnosis, to large-scale field studies of the parasite's population-level impacts. A total of 24 investigators from six states are involved. Adding grant and match funding, the dollar value of this work is \$939,000.

Papers Published or Presented

In 2002 the American Fisheries Society brought out a Special Symposium publication based on the 2001 Whirling Disease Symposium. Ten of the peer-reviewed papers therein were based partly or entirely on Initiative-sponsored research. These are cited in Appendix F. Between July 2001 and September 2002, six additional papers stemming from Initiative-sponsored research were published in peer-reviewed literature (Appendix F). Twenty-one papers based on Initiative-funded work were presented at the Whirling Disease Symposium in February 2002 in Denver.

Annual Meeting of the Board of Representatives of the National Partnership

The Partnership Board of Representatives convened October 10-11, 2002 in Bozeman, Montana (Appendix G), along with the Whirling Disease Steering Committee and several fisheries researchers. The deliberations focused on the status of knowledge of whirling disease, how the 2003-2004 research plan should be focused, and the long-term needs and milestones for all whirling disease research. The participants concluded that roughly five more years of research and field testing at the current level of funding will be needed to provide fisheries biologists a set of diagnostic, predictive and management tools for coping with the disease. The Board strongly urged the Steering Committee to concentrate further Initiative funding on developing these practical tools. They should include methods to assess the risk to uninfected or lightly-infected waterways, a portfolio of techniques for manipulating stream or watershed characteristics to control the disease, and case histories of disease-control projects. The Board endorsed active outreach to state, tribal and Federal fisheries managers, in addition to research and testing.

PLANS FOR 2003

2002-2003 Ongoing Projects

As noted above, 12 projects that received funding in May 2002 are underway (Appendix H). These will conclude on or before December 31, 2003. They include three large-scale ecological projects, projects to develop rapid and practical diagnostic techniques, and a field project testing disease control at hatchery ponds.

Solicitation for 2003-2004 Projects

Although the U. S. Congress has not yet passed an Interior appropriations bill for Federal FY03, we are proceeding in the expectation that there will be another round of funding for the Whirling Disease Initiative. Depending on when the appropriation passes, the next projects will begin sometime in summer 2003 and conclude at the end of 2004. The solicitation for research proposals has been distributed (Appendix I). In its 2003-2004 research plan, the Steering Committee is soliciting collaborative projects involving scientists and fishery-management agencies, to test and monitor environmental manipulation projects.

In 2003-2004 Initiative activities will be coordinated more closely with those of other research entities than in the past. Beginning with the February 2003 Whirling Disease Symposium, all

research sponsors have pledged to work together to plan the last several years of a concerted research effort. In the near term this will focus on developing a risk-assessment methodology for fisheries. There will also be a careful strategy to disseminate up-to-date research findings and other information to fisheries managers. The Whirling Disease Steering Committee has earmarked funds from the 2003-2004 grant for this purpose. Its chief outreach collaborator will be the Whirling Disease Foundation.

SUMMARY

It is unlikely that fishery managers will be able to eradicate whirling disease from infected drainages. The goal of the Whirling Disease Initiative and other research enterprises must be the development of a clear understanding of the disease cycle, the predisposing environmental factors, and methods for maintaining fisheries despite its presence. Initiative research has made great strides in these areas, and it is now appropriate to plan the last phase of a concerted research, testing and technology transfer effort.

The Steering Committee particularly thanks Montana's Congressional delegation – Senator Conrad Burns, Senator Max Baucus, and Congressman Dennis Rehberg – for their advocacy of this research. They also thank the Representatives of the National Partnership member organizations for their time and guidance.

APPENDICES

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APPENDIX A

**National Partnership Board of Representatives
2002**

APPENDIX B

Partnership Charter 2002

APPENDIX C

Whirling Disease Steering Committee 2002

APPENDIX D

**Whirling Disease Initiative Summary Statistics
through 2002**

APPENDIX E

Project Findings 2001- 2002

APPENDIX F

**Peer-reviewed Papers Published between
July 2001 and September 2002**

APPENDIX G

**Partnership Meeting Agenda
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APPENDIX H

Project Summaries 2002 - 2003

APPENDIX I

**December 2002 Request for Proposals
for 2003 - 2004 Research**