

I. Project Title: **INTERAGENCY STANDARDIZED MONITORING PROGRAM (ISMP) ASSESSMENT OF ENDANGERED FISH REPRODUCTION IN RELATION TO FLAMING GORGE OPERATIONS IN THE MIDDLE GREEN AND LOWER YAMPA RIVERS.**

II. Principal Investigator(s): Dr. Kevin R. Bestgen  
Larval Fish Laboratory (LFL)  
Department of Fishery and Wildlife Biology  
Colorado State University  
Fort Collins, CO 80523  
(970) 491-1848/5295; FAX 491-5091  
E-mail kbestgen@lamar.colostate.edu

and Bruce Haines  
USFWS  
Colorado River Fishery Project  
266 West 100 North, Suite 2  
Vernal, Utah 84078  
Phone: (435) 789-0354; Fax: (435) 789-4805  
E-mail: bruce\_haines@.fws.gov

III. Project Summary: The goal of the recently approved Flaming Gorge flow and temperature recommendations (Muth et al., 2000) was to improve the status and prospects for recovery of endangered fish populations in the Green River. A major emphasis of those recommendations was to enhance the reproductive and recruitment success of endangered fishes in the middle Green River, in particular razorback sucker and Colorado pikeminnow. The primary means to achieve enhanced populations will be to pattern flows after a more natural hydrograph, the timing and duration of which will be based on anticipated annual hydrologic conditions and the biology of the fish. Because of vagaries in timing and runoff patterns within and among various hydrologic scenarios, and uncertainties in anticipated effects of flow and temperature recommendations on endangered fishes, Muth et al. (2000) suggested that real-time data be gathered to guide and fine tune operation of Flaming Gorge dam each year. Two existing studies that have provided data to guide operations of Flaming Gorge Dam in the past are "Basin-wide Monitoring Program for Razorback Sucker" (Project 22C) and "Interagency Standardized Monitoring Program (ISMP) Assessment of Colorado Pikeminnow Reproduction and Larval Abundance in the Lower Yampa River, Colorado" (Project 22f). This proposal, which is an extension of portions of those existing studies, is intended to provide some of the necessary real-time data.

Larvae of razorback sucker *Xyrauchen texanus* and Colorado pikeminnow *Ptychocheilus lucius* (formerly, Colorado squawfish) were in the Green River basin in spring and summer 2001. Razorback sucker sampling was conducted with light traps primarily in the Green River between Jensen and Ouray and Colorado pikeminnow sampling was with drift nets in the lower Yampa River. Sampling was designed to provide a measure of timing of reproduction and a measure of annual reproductive success of each species. Diel variation in abundance of Colorado pikeminnow larvae in the drift was also assessed. This data will be used to assess effects of flow and temperature regimes on reproduction by razorback suckers and Colorado pikeminnow and to correlate abundance of larvae to abundance of juveniles in autumn.

- IV. Study Schedule: It is anticipated that this study will continue under the auspices of the *Interagency Standardized Monitoring Program (ISMP)* and will be a component of studies designed to evaluate operations of Flaming Gorge Reservoir.
- V. Relationship to RIPRAP: Reproduction and recruitment of early life stages are critical components of the life history of endangered razorback sucker and Colorado pikeminnow. Understanding trends in reproductive success may help define status of razorback sucker and Colorado pikeminnow in specific river reaches in the Colorado River Basin and should play a role in determining when recovery has been achieved.

Relationship to specific RIPRAP items:

Green River Action Plan: Mainstem

- I. Provide and protect instream flows–habitat management.
  - I.A. Green River above Duchesne River.
    - I.A.1. Initially identify year-round flows needed for recovery while providing experimental flows.
      - I.A.2.a. Summer/fall flow recommendations.
      - I.A.3. Deliver identified flows.
        - I.A.3.a. Operate Flaming Gorge pursuant to the Biological Opinion to provide summer and fall flows.
        - I.A.3.d. Operate Flaming Gorge Dam to provide winter and spring flows and revised summer/fall flows, if necessary.
  - I.B. Green River below the Duchesne River.
    - I.B.1. Initially identify year-round flows needed for recovery while providing experimental flows.
      - I.B.2. State acceptance of initial flow recommendations.
        - I.B.2.a. Review scientific basis.
- II. Restore habitat--habitat development and maintenance.
  - II.A. Restore and manage flooded bottomland habitat.
    - II.A.1. Conduct site restoration.
      - II.A.1.a. Old Charlie Wash.
        - II.A.1.a.(3) Monitor and evaluate success.

- II.C. Enhance water temperatures to benefit endangered fishes.
- II.C.1. Identify options to release warmer water from Flaming Gorge Reservoir to restore native fish habitat in the Green River.
- V. Monitor populations and habitat and conduct research to support recovery actions--research, monitoring, and data management.
- V.A. Conduct research to acquire life history information and enhance scientific techniques required to complete recovery actions.

Green River Action Plan: Yampa and Little Snake Rivers

- I. Provide and protect instream flows--habitat management.
- I.D. Yampa River below Little Snake River.
- I.D.1. Initially identify year-round flows needed for recovery.
- I.D.2. Evaluate need for instream flow water rights.
- I.D.2.a. Review scientific basis.

Green River Action Plan: Yampa and Little Snake Rivers

- V.A.1. Conduct standardized monitoring.
- V.B.2. Conduct appropriate studies to provide needed life history information.

VI. Accomplishment of FY 2001 Tasks and Deliverables, Discussion of Initial Findings and Shortcomings:

Project Objectives

- 1). To determine timing and duration of spawning by razorback suckers and presence and abundance of larvae in the system as measured by capture of larvae in light traps.
- 2). To determine timing and duration of spawning by Colorado pikeminnow and presence and abundance of larvae in the system as measured by capture of larvae downstream of spawning areas in the lower Yampa River.

**Task Description (FY 2001)**

- I). Collect light trap samples for razorback suckers. The CRFP office in Vernal will be responsible for this task.
- II). Collect drift net samples for Colorado pikeminnow. The Larval Fish Laboratory will be responsible for this task.
- III). Identify light trap and drift net samples. Preliminary identifications will be conducted by the responsible sampling entity, with assistance from the LFL, as samples are collected to provide real-time data. Final specimen identification and curation will be conducted by the LFL.
- IV). Summarize specimen data collection in an annual report.

#### Accomplishments by Task.

- I). Collect light trap samples for razorback suckers. Light trap samples were collected from early-May until mid-June by the Vernal CRFP.
- II). Collect drift net samples for Colorado pikeminnow. Drift net samples were collected daily from 24 June until 8 August 2001 by the Larval Fish Laboratory.
- III). Identify light trap and drift net samples.

Middle Green River light trap samples. Preliminary screening of light trap samples by B. Haines, Vernal CRFP, is nearly complete. Samples will be sent to the Larval Fish Laboratory after that work is completed for verification and curation.

Lower Yampa River drift net sampling. Samples were collected in the Yampa River about 0.8 km upstream from the Green River, the same site that samples were collected from 1990 to 1996 (Bestgen et al. 1998) and in 1998 to 2000. A total of 180 samples were collected between 28 June and 8 August 2001. These included samples collected at dawn, noon, dusk, and midnight on six days to detect diel variation in drift abundance.

Preliminary identification of samples has been completed, but identification of questionable or difficult specimens has not yet been completed, nor has curation. We expect final verification to be completed in early January. Based on specimens in samples that were positively identified, a total of 768 Colorado pikeminnow larvae were collected between 28 June and 4 August (Fig. 1). Most Colorado pikeminnow captured in August were relatively large and old. Reproduction by Colorado pikeminnow in the Yampa River, as evidenced by capture of relatively small larvae, had ceased by early August. Most (760 of 768, 99%) Colorado pikeminnow larvae were collected from 30 June to 17 July. Large drift pulses were detected on 5 July, 11-14 July, and 17 July. Reproductive success of Colorado pikeminnow was considered moderate in 2001, and perhaps similar to 1999 and 1998, when 685 and 716 pikeminnow larvae were collected, respectively. The total number of fish captured in 1998 and 1999 were substantially higher than previous years from 1991 to 1997.

Of the total of 768 Colorado pikeminnow larvae captured during 2001, 571 (74%) of those were captured in dusk samples, and most of those ( $n = 562$ , 73% of all pikeminnow larvae) on only three sampling dates. Drift patterns noted from 1992 to 1996 suggested occasional peaks at midnite and noon, but rarely at dusk. Water clarity was very high during most of the 2001 sampling season. Clear water may have limited downstream drift of larvae during the day because fish could maintain positions in clear water. Drift rates may have increased at dusk because larvae lost position. A similar diel pattern was noted in 1994, a year

when Yampa River discharge was low and very clear for most of the year. However, drift rates in that year were exceptionally low and on par with number of fish collected in the standard dawn sets in 2001.

We also sampled the Green River just upstream of the Yampa River in Echo Park in 2001 to assess if Colorado pikeminnow had reproduced. Reproduction might be expected there because newly implemented flow and temperature recommendations were designed in part to create conditions in the Green River more like the free-flowing Yampa River where Colorado pikeminnow reproduce. A total of 40 samples were collected there from 29 June to 8 August; two samples were collected about every other day. No razorback suckers or Colorado pikeminnow were captured in those samples. Sampling may have been too sporadic to have a high probability of detecting reproduction by Colorado pikeminnow in the Green River, if such had occurred. A more concerted effort will be made in 2002 associated with another project to determine if Colorado pikeminnow are reproducing in the Green River upstream of the Yampa River.

Water temperature data collection which was originally proposed in this scope of work was accomplished by G. Smith, USFWS, Denver. Results of that data collection effort will presumably be reported elsewhere.

- VII. Recommendations: Continue to sample early life stages of razorback sucker and Colorado pikeminnow annually at these sites. This information is critical to establishment of long-term data that can guide informed management decisions regarding population viability and recovery. Data were also used to monitor effects of Flaming Gorge flows and water temperatures in relation to endangered fish reproduction in spring and summer. This information can also be used to make real-time recommendations for flow and temperature regimes for Flaming Gorge Dam during the critical time of reproduction for endangered Colorado pikeminnow. The Recovery Program should increase funding for this project to cover costs for additional sample processing costs incurred for the Green River samples. Sampling may also need to be expanded to assess reproduction by razorback suckers in the Yampa River. Verification of yet unidentified sucker specimens may shed additional light on the prevalence of razorback sucker larvae in the Yampa River.
- VIII. Project Status: On track and ongoing. This project was approved for funding in 2002-2003. That information, combined with more sophisticated water temperature data acquisition, should provide some tools for making flow and temperature recommendations to guide operation of Flaming Gorge Reservoir.

IX. FY 2001 Budget Status

- A. Funds Provided: \$84,000 (+2,800 to FWS, Vernal CRFP)
- B. Funds Expended: \$68,000
- C. Difference: \$16,000, to be used for sample identification, verification, and curation and replacement of some sampling gear by LFL.
- D. Percent of the FY 2001 work completed, and projected costs to complete: Funds remaining should be sufficient to finish Yampa and Green River samples.
- E. Recovery Program funds spent for publication charges: NA

X. Status of Data Submission (Where applicable): Data will be submitted when specimen identity is completed.

XI. Signed: Kevin R. Bestgen                      11 December 2001  
Principal Investigator                              Date  
(Just put name and date here, since you will be submitting the report electronically)

APPENDIX: *[More comprehensive/final project reports (NOT to be used in place of a complete annual report.). If distributed previously, simply reference the document or report.]*

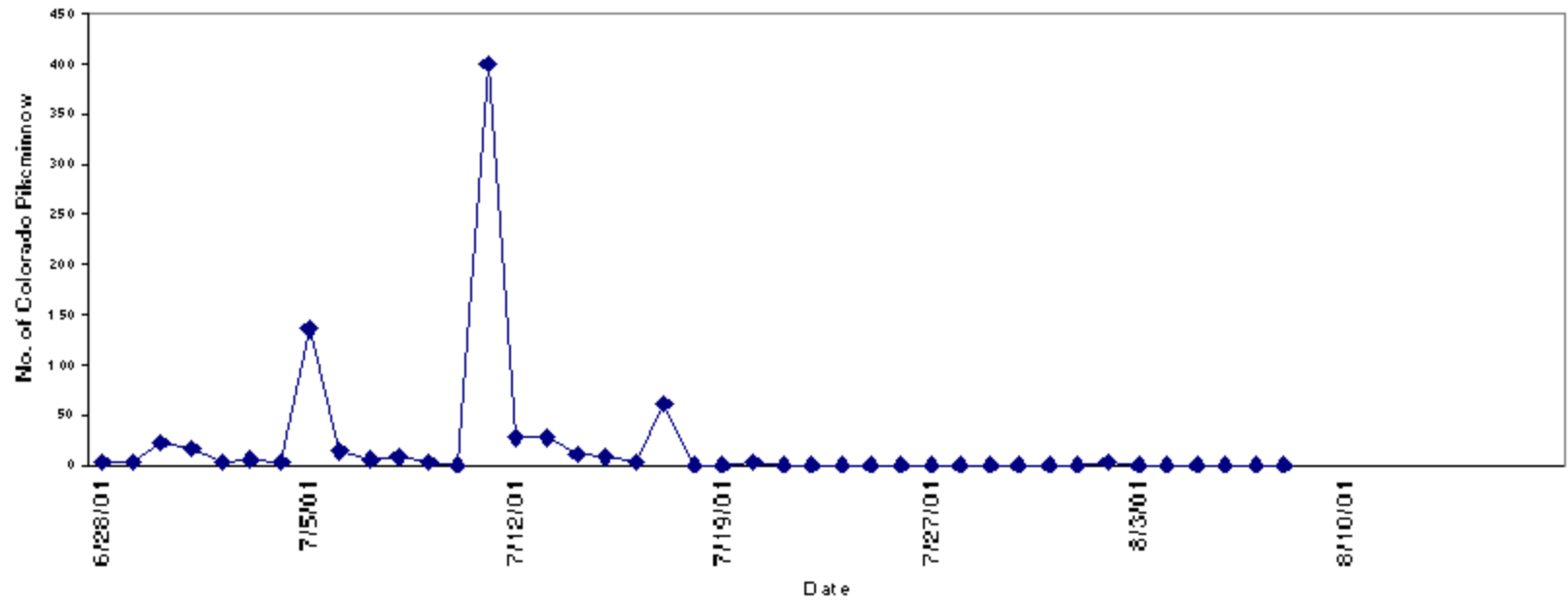


Fig. 1. Number of Colorado pikeminnow larvae captured in the Yampa River, summer 2001.