

- I. Project Title: Selenium effects on larval razorback sucker: field verification of laboratory results.
- II. Principal Investigator(s): Daniel W. Beyers, Ph.D., Larval Fish Laboratory, Department of Fishery and Wildlife Biology, Colorado State University, Fort Collins, CO 80523; T: 970-491-5475; F: 970-491-5091; E: danb@lamar.colostate.edu
- III. Project Summary: Many potential nursery habitats have selenium in water and food organisms that may be toxic to fish. Concern exists about potential effects on larval razorback sucker that may reside in these habitats. In response to this concern, a study entitled "*Assessment and Prediction of Effects of Selenium Exposure to Larval Razorback Sucker*" (CAP-6 SE-1) was completed.

This study evaluates and extends predictions of the previous study, and will determine if co-contaminants in nursery habitats influence toxicity. Methods were similar to those in the companion project except exposure water was obtained from potential nursery habitats in the Colorado River. Growth and survival of larvae was monitored over a 28-day period. Analyses are being conducted to evaluate agreement between observed and predicted toxicity.
- IV. Study Schedule: Initial year: FY99; final year: FY00. All activities scheduled to be completed by the end of February 2001.
- V. Relationship to RIPRAP:

General Recovery Program Action Plan

II. restore habitat

II.A. restore flooded bottom land habitats

II.A.2. screen high-priority sites for restoration

II.B. support actions to reduce contaminant impacts

II.B.1. evaluate effects of... ..agriculture, and municipal... ..sources of potential contaminants throughout the Upper Basin

II.C.1. identify what restoration and protection are needed

Green River Action Plan

II. restore habitat

II.A. restore flooded bottom land habitats

II.A.2.a. identify and evaluate sites

II.D. support actions to reduce contaminant impacts at Ashley Creek and Stewart Drain

Colorado River Action Plan-Mainstem

II. restore habitat

II.A. restore and manage flooded bottom land habitat

II.A.1. 29-1/2 Road gravel pit

II.A.1.e. monitor and evaluate success

II.A.2. Adobe Creek

II.A.2.e. monitor and evaluate success

II.A.3. Walter Walker

II.A.3.e. monitor and evaluate success

II.A.4. develop and implement levee removal

II.A.4.a. preconstruction contaminants screening

Colorado River Action Plan-Gunnison

II. restore habitat

II.A. restore flooded bottom land habitat

II.A.2.a. preconstruction contaminants screening

II.A.2.d. evaluation

VI. Accomplishment of FY 00 Tasks and Deliverables, Discussion of Initial Findings and Shortcomings:

The objective of this investigation was to evaluate the accuracy of predictions of the previous experiment by comparing its predictions to results observed when razorback sucker larvae are exposed to naturally occurring selenium in surface waters from three localities on the Colorado River near Grand Junction, Colorado. Assessment of predictions of the previous experiment is important because natural waters may contain different forms of selenium, as well as co-contaminants that influence the bioaccumulation and toxicity of ambient concentrations.

Razorback sucker larvae (27-days old, after hatching) were exposed for 28 d to site waters and food organisms cultured in site waters. Data were analyzed using analysis of variance to describe the response of survival and growth of fish in each site water and to describe the relative contribution of dissolved versus dietary exposure to constituents in site waters. Results were compared to predictions of the previous investigation to evaluate agreement, and the potential for adverse effects caused by selenium exposure.

Existing guidelines suggest that $>3 \mu\text{g/g}$ dietary selenium, or $>4 \mu\text{g/g}$ whole-body tissue concentrations in fish will produce adverse effects. The highest dietary and whole-body concentrations achieved in this investigation were $21.8 \mu\text{g/g}$ and $42.0 \mu\text{g/g}$, respectively. Negative effects from dietary exposure to site-water constituents were detected, but the data suggest that they were caused by co-contaminants in the diet, not selenium exposure.

Lack of detection of adverse effects from exposure does not imply that razorback sucker populations are not affected by increased selenium concentrations. There are a variety of factors which were not included in this investigation that may influence sensitivity of razorback sucker to selenium. For example, razorback sucker larvae in this investigation were not pre-exposed to high concentrations of selenium via maternal

transfer. Pre-exposure may increase effects of selenium exposure during larval development. In addition, there are other life stages that may be especially sensitive to exposure.

Shortcomings: None.

VII. Recommendations:

Conduct investigations to quantify dietary exposure in nursery habitats by collecting potential prey organisms at times that correspond with habitat use by larval razorback sucker.

Conduct investigations to evaluate potential for reduced overwinter survival of young-of-year fish from selenium exposure.

Conduct investigations to predict selenium bioaccumulation in wild adult razorback sucker and link bioaccumulation to natural movements of the fish using radio telemetry.

Conduct mesocosm-scale investigations with young-of-year fish to evaluate effects of exposure under environmentally realistic conditions of selenium cycling, physical habitat, and natural food organisms.

Consider additional investigations on effects of selenium on reproductive success depending on conclusions of previous investigations.

VIII. Project Status: Draft final report has been approved by the Biology Committee. Preparation of the final report is underway and should be available February 2001.

IX. FY 00 Budget Status

- A. Funds Provided: \$14,900
- B. Funds Expended: \$13,400
- C. Difference: \$1,500 to cover indirect and direct costs of report printing and distribution.
- A. Percent of the FY 00 work completed, and projected costs to complete: Proposed research is 99% complete; remaining budget is adequate to finish this component.
- B. Recovery Program funds spent for publication charges: \$0.00

X. Status of Data Submission (Where applicable): NA

XI. Signed: Daniel W. Beyers, Ph.D. 7 December 2000
Principal Investigator Date

selenium CAP-6-SE-4