

- I. Project Title: **Identification and Curation of Larval Fish by Colorado State University Larval Fish Laboratory.**
- II. Principal Investigator(s): Darrel E. Snyder, Sean C. Seal, and Kevin R. Bestgen  
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- III. Project Summary: This ongoing project provides for: (1) final identification and cataloging of preserved fish collections for Project 22F (Yampa and Middle-Green Colorado Pikeminnow and Razorback Sucker Larval Abundance), (2) incidental taxonomic services and consultation, and (3) ongoing maintenance and management (curation) of the growing Upper Colorado River Basin (UCRB) portion of the Larval Fish Laboratory (LFL) Collection, including controlled access to and use of collection holdings and data by UCRB and other researchers. Additional identification and otolith analysis tasks were added in spring 2009.
- IV. Study Schedule: Ongoing project since 1995. Specified project collections (currently Project 22F—Task 1a, and since spring 2009, middle Green River drift and backwater sampling—Task 1b, increased light-trap sampling in lower Green River for razorback sucker larvae—Task 1c, and analysis of age-0 smallmouth bass otoliths from the Colorado River—Task 1d) are processed annually and the resultant data provided to the principal investigator as soon as logistically possible after the collections are received. General collection maintenance activities (e.g., fluid level and container checks) are conducted annually; other maintenance and management concerns are addressed as needed, and any backlog collections are cataloged as time permits. Responses to requests for loans, collection use, or information on collection holdings, sampling, sample preservation and handling, and taxonomy also are provided as needed.
- V. Relationship to RIPRAP: This project is related to General Recovery Program Support Action Plan V (monitor populations and habitat and conduct research to support recovery actions, research, monitoring, and data management). Identification of Project 22F and other specified collections contributes to Task V.A. (measure and document population and habitat parameters to determine status and biological response to recovery actions). The remainder of the project specifically addresses Task V.E (provide for long-term care, cataloging, and accessibility of preserved specimens) and, in that preserved specimens are the ultimate natural history database, contributes to current Task V.A.1 (conduct interagency data management program to compile, manage, and maintain all research and monitoring data collected by the Recovery Program).

VI. Accomplishments of FY 2009 Tasks and Deliverables, Discussion of Initial Findings and Shortcomings:

Task 1, Taxonomic Services—For Task 1a, Project 22F, we processed 450 preserved 2008 drift-net collections from the Yampa and Green Rivers in Echo Park (620 lots, 3,741 specimens and 93 lots, 232 specimens respectively) and 76 preserved 2008 razorback light trap collections from the Green River (192 lots, 4,853 specimens). Collection data has been forwarded for analysis and reporting and all specimens have been catalogued and shelved as part of the LFL Collection. Incidental requests from UCRB researchers for taxonomic assistance or consultation on larval-fish sampling and collection handling matters were addressed as received. Collections for Tasks 1b, 1c, and 1d were received and processing was started near the end of FY 2009.

Task 2, Ongoing Collection Maintenance and Management—As of September 30<sup>th</sup>, we have: (1) added a total of 5,275 lots of fish (105,348 specimens) from UCRB collections or investigations to the catalogued collection (Appendix A), (2) submitted an updated *Access* database version of our catalog records through FY 2008 (selected fields, flat file) to the Interagency Database Management Program (IDMP) archive, (3) made collection holdings and selected data available to UCRB researchers and other interested parties, including specimens used for developmental study of cyprinid larvae for Project 149 and inventory checks requested by the National Park Service (NPS), (4) corrected incidentally found errors in our catalog database, (5) conducted an annual fluid level and condition check, and (6) replaced most wooden and steel fixed collection shelving in both collection storage areas with mobile-shelving (compactor) systems, doubling our storage capacity. The latter, funded through both the NPS and this project, resolved our urgent need for more collection storage space and will allow for continued additions to the LFL Collection during at least the next several years (Appendix B). Redirection of project funds for this purpose was approved in October 2008 by the Bureau of Reclamation and Recovery Program. Dr. Chure, collections curator for Dinosaur National Monument, no longer requires that fish collected within monument boundaries be cross-catalogued with the NPS. Installation of the latest version of our collection database and management program, *Specify*, resolution of some data entry problems, and cataloguing of some back-logged collections have been deferred to FY 2009.

In our continuing effort to pursue improved and more spacious facilities for the LFL Collection and better assure its permanency, we, and the curators of other Colorado State University natural history collections, have continued to work with university Facilities Planning personnel and the acting Dean of the College of Agriculture on plans for a major addition to the university's Plant Sciences Building to house our various collections together as a university natural history museum. If approved and adequately funded, our collections and new mobile shelving systems will be moved to these new museum-quality facilities when built and ready for occupancy.

As of 30 September 2009, we have been maintaining and managing 106,484 lots of catalogued fish (3,506,657 specimens) collected from the UCRB or used for UCRB Recovery Program investigations. These holdings represent about 96% of all catalogued lots (98% of catalogued specimens) in the LFL Collection.

VII. Recommendations: We recommend continued annual support of Project 15 with sufficient funds for processing newly preserved collections covered by this project, incidental taxonomic services and consultation, and on-going maintenance and management (curation) of all UCRB specimens held by LFL.

VIII. Project Status: On-track and ongoing

IX. FY 2009 Budget Status

A. Funds Provided: \$157,211 (\$57,879 originally budgeted, \$41,791 carried over from FY 2008, and \$57,541 for identification and otolith analysis tasks added in spring 2009)

B. Funds Expended: \$62,900 (including \$17,812 for a portion of the costs for the purchase and installation of mobile shelving systems and related LFL labor)

C. Difference: \$94,311.  
Explanation: See end of first paragraphs for Tasks 1 and 2 in Section VI. Also, funds expended to replace fixed collection shelving with mobile (compactor) systems to increase storage capacity (approved by Recovery Program and Bureau of Reclamation in October 2008) and a large portion of the difference, are saved PI labor costs since November 2006 resulting from the retirement and subsequent part-time rehiring and voluntary services of Snyder at substantially lower costs.

D. Percent of FY 2009 work completed and projected costs to complete: 44% of work completed; \$87,428 to complete (remaining difference above, \$6,883, is estimated saved PI labor costs from FY 2007–09 not spent for mobile shelving and which will be used for other LFL Collection-related purposes).

E. Recovery Program funds spent for publication charges: \$0

X. Status of Data Submission: Data for Project 22F 2008 collections were internally submitted to Kevin Bestgen in June and July 2009. An updated *Access* database version of our catalog for UCRB holdings (selected fields, flat file) through FY 2008 was submitted to the IDMP archive on November 19, 2008.

XI. Signed: Darrel E. Snyder November 11, 2009  
Principal Investigator Date

Signed: Sean C. Seal November 11, 2009  
Principal Investigator Date

Signed: Kevin R. Bestgen November 11, 2009  
Principal Investigator Date

APPENDIX A:

Study-year sets of Upper Colorado River Basin collection-species lots cataloged as part of the Colorado State University Larval Fish Laboratory Collection from October 1, 2008 through September 30, 2009 (5,275 lots; 105,348 specimens).

Catalog No.	Field Numbers	Description of Sample Sets
7289	FWS/GJ-93L-GU27*	93 Larvae, SN, Gunnison R, CO misidentified
70789	CR/ZAE-08TPC-MT	08 Misc, Dipnet, tributary to Piceance Ck.,CO
70794	GHC 1600	81 HB chub, SN, Little Colorado R, AZ
83871	FWS/GJ-GU03-057*	03 Larvae, RZ eval , SN, Gunnison R, CO
83883	FWS/GJ-GU03-059*	03 Larvae, RZ eval , SN, Gunnison R, CO
85086	FWS/V-03RZ-067*	03 Larvae, RZ LT, Green R., Vernal, UT
105492-5493	FWS/V-07RZ-075, 132*	07 Larvae, RZ LT, Green R., Vernal, UT
105781-5812	LFL-08YA-J1R1 to J709, L101 to L701	08 EL, Yampa R, Juniper and Lily Park, CO
105813-6166	LFL-08YA-SBF101 to 713,1R1	08 Small -bodied fish, EL/SN, Yampa R, CO
106167-6175	FWS/GJ-06GU-001 to 006	06 Larvae, RZ eval , SN, Gunnison R, CO
106176	FWS/GJ-06CO-061*	06 Larvae, RZ eval , SN, Colorado R, CO
106177	FWS/GJ-06GU-007*	06 Larvae, RZ eval , SN, Gunnison R, CO
106178-6215	FWS/GJ-06CO-008 to 024	06 Larvae, RZ eval , SN, Colorado R, CO
106216-6281	FWS/GJ-06GU-025 to 055	06 Larvae, RZ eval , SN, Gunnison R, CO
106282-6338	FWS/GJ-06CO-056 to 074	06 Larvae, RZ eval , SN, Colorado R, CO
106339-6397	FWS/GJ-06GU-075 to 090	06 Larvae, RZ eval , SN, Gunnison R, CO
106398-6449	FWS/GJ-06CO-091 to 105	06 Larvae, RZ eval , SN, Colorado R, CO
106450-6607	FWS/GJ-06GU-106 to 141	06 Larvae, RZ eval , SN, Gunnison R, CO
106608-6746	FWS/GJ-06CO-142 to 182	06 Larvae, RZ eval , SN, Colorado R, CO
106747	FWS/GJ-06GU-192*	06 Larvae, RZ eval , SN, Gunnison R, CO
106748-6771	FWS/GJ-06CO-182 to 188	06 Larvae, RZ eval , SN, Colorado R, CO
106772-7026	FWS/GJ-06GU-189 to 239	06 Larvae, RZ eval , SN, Gunnison R, CO
107027	FWS/GJ-06CO-093*	06 Larvae, RZ eval , SN, Colorado R, CO
107028-7058	FWS/GJ-06GU-239 to 245	06 Larvae, RZ eval , SN, Gunnison R, CO

Catalog No.	Field Numbers	Description of Sample Sets
107059-7196	FWS/GJ-06CO-246 to 282	06 Larvae, RZ eval , SN, Colorado R, CO
107197	FWS/GJ-06GU-202*	06 Larvae, RZ eval , SN, Gunnison R, CO
107198-7246	FWS/GJ-06CO-282 to 293	06 Larvae, RZ eval , SN, Colorado R, CO
107247-7517	FWS/GJ-06GU-294 to 345	06 Larvae, RZ eval , SN, Gunnison R, CO
107518-7598	FWS/GJ-06CO-346 to 363	06 Larvae, RZ eval , SN, Colorado R, CO
107599-7813	FWS/GJ-06GU-365 to 412	06 Larvae, RZ eval , SN, Gunnison R, CO
107814-7914	FWS/GJ-06CO-413 to 434	06 Larvae, RZ eval , SN, Colorado R, CO
107915-7918	FWS/GJ-06CO-155*	06 Larvae, RZ eval , SN, Colorado R, CO
107919	FWS/GJ-06GU-213*	06 Larvae, RZ eval , SN, Gunnison R, CO
107920-8667	LFL-08GR-LW001 to LW047	08 SN, Green R, Lodore-Whirlpool, CO, UT
108672-8677	FWS/GJ-06GU-035, 083, 305, 336*	06 Larvae, RZ eval , SN, Gunnison R, CO
108688-9391	FWS/GJ-07GU-014 to 412	07 Larvae, RZ eval , SN, Gunnison R, CO
109392-10159	FWS/GJ-07CO-001 to 435	07 Larvae, RZ eval , SN, Colorado R, CO
110160-0781	LFL-08YA-6251 to 8222	08 Larvae, DR, Yampa R, Echo Pk,DNM, CO
110782-0874	LFL-08GR-7301 to 8222	08 Larvae, DR, Green R., Echo Pk, DNM, CO
110906-1097	FWS/V-08RZ-049 to 171	08 Larvae, RZ LT, Green R., Vernal, UT

\* Separately cataloged portion of previously cataloged set of collections.

## APPENDIX B:

Purchase and installation of mobile shelving systems for the Larval Fish Laboratory Collection – final project report to the National Park Service, the primary co-sponsor for the this collection improvement.

# Improve Collections Storage at the Larval Fish Laboratory

## Final Report

September 29, 2009

A project of the  
National Park Service Intermountain Regional Office funded through the  
Colorado Plateau Cooperative Ecosystem Studies Unit to  
Colorado State University, a CP-CESU Partner Institution

Cooperative Agreement H1200-004-0002  
Task Agreement J8100090080, Project # CSUCP-129, Account 8106-LARV-SZD  
Initiation date: February 1, 2009; Completion date: April 30, 2010  
Final report due October 31, 2009

Submitted to

Tef Rodeffer, Museum Services Program Manager  
NPS Western Archeological and Conservation Center  
255 N Commerce Park Loop  
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and

NPS CPCEU Research Coordinator  
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by

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### *Laboratory for the Study and Identification of Fishes in North American Fresh Waters*

Research  
Early Life Stages/Adults  
Native Fish Biology/Ecology  
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Study Design/Analysis  
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Service  
Identification/Verification  
Sample Processing/Depository  
Descriptions/Keys/Illustrations

## Improve Collections Storage at the Larval Fish Laboratory

Final Report, September 29, 2009

Darrel E. Snyder, Larval Fish Laboratory, Colorado State University

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### Background and Objectives:

The Larval Fish Laboratory Collection at Colorado State University (CSU) stores, cares for, and manages about 29,000 lots of fish (850,000 specimens, mostly larvae) on behalf of, and cross-catalogued with, Canyonlands National Park, Dinosaur National Monument, and Glen Canyon National Recreation Area. Shelf capacity to accommodate new collections and space for additional fixed (stationary) shelving in existing, environmentally controlled, collection storage areas had been exhausted. The purpose of this project was to improve shelving and increase storage capacity by replacing most of the fixed wooden and metal shelving in the Laboratory's two collection storage areas (rooms 09A and 33, Wagar Building, Fig. 1) with mobile (compactor) shelving units. This improvement doubled the storage capacity of the replaced fixed shelving and enables the Larval Fish Laboratory to continue curating current larval and small fish collections and accept National Park Service and other collections for at least several more years until a planned, more spacious collection facility for all of the University's natural history research collections becomes available. At that time, the mobile shelving units provided through this project will be moved to the new facility. This project helps the cooperating NPS units meet the requirements of NPS Directors Order #24 for museum collections.

The Larval Fish Laboratory requested support from the National Park Service (NPS) to cover much of the cost for purchase and installation of mobile shelving units, including costs for removing existing collections and fixed shelving, necessary modification of storage spaces (e.g., moving a counter top and ceiling sprinkler heads in one storage area), and re-shelving the collections. That support was provided through this project. Costs beyond the National Park Service contribution were covered under an ongoing collection-management project funded by the U.S. Bureau of Reclamation on behalf of the Upper Colorado River Endangered Fishes Recovery Program.

### Project Description:

#### Statement of Work and Schedule:

The cooperator will complete the following tasks that will result in improved and increased storage capacity for the Larval Fish Laboratory Collection at CSU.

1. Purchase and install mobile shelving units—remove existing collections and shelving, modify storage spaces if necessary to accommodate the mobile units, purchase and arrange for installation of the units, and re-shelve the collections by September 30, 2009.
2. Prepare final report for the project—a brief final report suitable for public distribution emailed to the NPS Research Coordinator, c/o Trinkle Jones ([a\\_trinkle\\_jones@nps.gov](mailto:a_trinkle_jones@nps.gov))



and the Intermountain Region Museum Services Program Manager ([tef\\_rodeffer@nps.gov](mailto:tef_rodeffer@nps.gov)), due by October 31, 2009.

#### Statement of NPS Substantial Involvement:

The work will be conducted by the vendor selected for the mobile shelving units and Larval Fish Laboratory staff at CSU. The NPS Museum Services Program Manager will provide assistance, as requested, in reviewing proposals for the mobile shelving units to ensure that the products will meet museum standards.

#### **Project Accomplishments:**

In anticipation of National Park Service support for most of the project and having arranged for coverage of costs beyond NPS support, we prepared specifications for mobile shelving systems in both storage areas, and in December, 2008, the CSU Purchasing Department released an invitation to bid. For one system (Wagar Building, room 09A), we specified (among other details) three manual (crank-operated) carriages, each approximately 18' long with six linearly adjacent double-faced (open on each side) 2'-deep x 3'-wide x ~76"-high shelving units or 12 adjacent and back-to-back 1' x 3' x ~76" shelving units (Fig. 2). The shelving units were to include 10 adjustable-shelf openings, each at least 6.25" high and able to accommodate three 12"-square specimen container trays across their width. Shelving and platform flooring were to be resistant to corrosion by water, formaldehyde, and alcohols. The second, slightly shorter, system (east end of Wagar room 33) was similarly specified but with 16'-long carriages, each with 4'-wide shelving units (or 15' with 3'-wide shelving units, if 4'-wide shelving units were not available or would not meet other specifications).

Eight bids were received by the mid-January deadline with total combined costs for the two mobile shelving systems ranging from \$23,776 to \$36,926. All bids were for entirely new components, but one vendor, Space Concepts (SC), also offered two optional alternatives using reconditioned mechanical or electrical carriages (with new-carriage warranty—10-yr on all, life on non-moving parts) that would reduce their total bid from \$32,014 to \$29,014 or \$29,928, respectively. Of the eight vendors, only SC met all of our specifications. Their system included industrial, clip shelving with a (delta) post system that allowed our specified preference to be able to use the full depth and width of the shelves to accommodate three (or four) 12.0" square container trays on each side of 36"-wide (or 48"-wide) shelving units, and additionally did so without confining post flanges at the front. All other vendors offered four-post shelving which looks nicer (library/office style) but has shelves that are notched at the corners (~1"-long x 1/4"-deep recesses, both ways) to receive the angle posts, thereby reducing available shelf width and depth at the corners and precluding the ability to fit 12" trays fully across the shelves. To offset the loss of usable shelf depth and most of the loss of usable shelf width (still about 1/2" short) with four-post shelving, two vendors offered optional, extra-cost alternatives using 26"-deep rather than 24"-deep shelving, but such shelving would also reduce already narrow maximum aisle width of the systems by 6". Two vendors also offered alternative, slightly shorter systems using 42"-wide four-post shelving units, rather than six 36"-wide units. One vendor offered optional, extra-cost alternatives using back-to-back 12"-deep, compression-clip shelving units with beaded posts that are similar to the delta-post shelving offered by SC and, like it, provide for full use of shelf width and depth, but with the rounded portions of the posts protruding in front of the corners

of the shelves and limiting open front access by 3/8" on each side (container trays would have to be slid behind these protrusions) and, more critically, only nine rather than ten vertical shelf openings. Some bids also failed to meet other specifications. As a bonus, beyond our specifications, SC had noted substantially a higher ceiling height between heating and cooling ducts in our larger storage area and included (for bid and alternative options) taller shelving with an extra shelf at the top for shelving units that would fit between the ducts (adding nearly the capacity of a 19th back-to-back shelving unit). We evaluated and ranked bid responses according to cost and how well they met our system specifications with the bid offered by SC using reconditioned mechanical carriages (\$29,014) as our first choice.

We sent our draft evaluation and ranking of bids to NPS Museum Services Program Manager Tef Rodeffer in the beginning of February for NPS review and recommendations to assure that our top selections met museum standards. She found our analysis thorough and our rankings well supported, and, pending clarification on a few concerns, concurred with our first-choice selection of SC as vendor for the mobile shelving systems.

In mid-February, we provided the CSU Purchasing Department with our evaluations and ranking, and asked them to proceed immediately with arrangements for purchase and installation of the selected mobile shelving systems offered by SC. In preparation for installation in one storage area (Wagar 33), ceiling fire-suppression sprinkler heads were relocated and the top of a work counter was repositioned. Then, in one storage area at a time, most collections were temporarily relocated and the fixed shelving to be replaced was removed. The removed wooden shelving was surplus or offered for use elsewhere on campus, some removed metal shelving was reused for collection storage along the walls in one storage area (Wagar 33), and the remaining metal shelving to be replaced was disassembled and stored for potential future use. Installation of the new mobile shelving systems by SC was completed in late April, and reorganization of the displaced collections on the new shelving was completed in May.

The new mobile shelving systems nearly double the shelf capacity available for the Larval Fish Laboratory Collection. At this time, shelving in one collection storage area (Wagar 09A) is almost completely filled with cataloged holdings but that in the other storage area (Wagar 33) is largely empty and available for storage of currently uncataloged holdings (mostly non-NPS specimens) and future additions to the Larval Fish Laboratory Collection from the NPS, the Recovery Program, and other entities (Fig. 3).

**Budget Status:** All funds granted for this project by the NPS were expended to cover most of the cost for purchase and vendor installation of the two mobile shelving systems (\$23,830 in direct costs, \$4,170 in indirect costs, \$28,000 total). The remainder of the cost for the shelving systems (\$5,184 + \$778 indirect costs), sprinkler head relocation (\$1,332 + \$200 indirect) and project-related LFL labor since the beginning of the year (\$8,972 + \$1,346 indirect) were covered by the ongoing collection-management project funded by the Recovery Program.

**Project Status:** Pending acceptance of this final report, the project has been completed.

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**Figure 1.** Photographs of Colorado State University Larval Fish Laboratory Collection storage areas in the Wagar Building prior to replacement of most fixed shelving with mobile (compactor) shelving systems—room 09A (above) and along east wall of room 33 (below).







**Figure 3.** Photographs of Colorado State University Larval Fish Laboratory Collection storage areas in the Wagar Building after replacement of most fixed shelving with mobile (compactor) shelving systems—room 09A (above) and along east wall of room 33 (below).