

SAN JUAN RIVER SPECIMEN CURATION
AT THE MUSEUM OF SOUTHWESTERN BIOLOGY,
DIVISION OF FISHES,
UNIVERSITY OF NEW MEXICO



SUBMITTED TO:

SAN JUAN RIVER BASIN RECOVERY
IMPLEMENTATION PROGRAM

SUBMITTED BY:

DR. THOMAS F. TURNER
ALEXANDRA M. SNYDER
MUSEUM OF SOUTHWESTERN BIOLOGY
DIVISION OF FISHES
UNIVERSITY OF NEW MEXICO

18 JUNE 2007

SAN JUAN RIVER SPECIMEN CURATION
AT THE MUSEUM OF SOUTHWESTERN BIOLOGY,
DIVISION OF FISHES,
UNIVERSITY OF NEW MEXICO

SUBMITTED BY

SAN JUAN RIVER BASIN RECOVERY
IMPLEMENTATION PROGRAM

SUBMITTED BY:

DR. THOMAS F. TURNER
ALEXANDRA M. SNYDER
MUSEUM OF SOUTHWESTERN BIOLOGY
DIVISION OF FISHES
UNIVERSITY OF NEW MEXICO

18 JUNE 2007

Table of Contents

	<u>page</u>
List of Tables.....	ii
List of Figures.....	ii
Introduction.....	1
Methods.....	1
Facilities.....	2
Results.....	4
Acknowledgments.....	8
References.....	9
Appendix I. San Juan River specimens deposited in MSB catalog collections.....	10
Appendix II. MSB specimen and data processing.....	13

List of Tables

	<u>page</u>
Table 1.	Specimen table field structure, MSB NTop.....14
Table 2.	Locality table field structure, MSB NBottom.....15
Table 3.	Specimen table field structure, MSB released fish.....18

List of Figures

Figure 1.	MSB fluid preserved collection, Division of Fishes.....3
Figure 2.	Compactor storage shelves with jar and tank collections.....3
Figure 3.	Specimen preparation lab.....5
Figure 4.	Lab space used for fish identification.....5
Figure 5.	Number of specimens MSB received from the San Juan River Recovery Implementation Program by year (1987 - 2006).....6
Figure 6.	Number of specimens MSB received from the San Juan River Recovery Implementation Program by agency (1987 - 2006).....7
Figure 7.	Digitally captured field note. Example of field note from MSB.....18
Figure 8.	Digitally captured field note. Example of field note from NMDGF.....19

INTRODUCTION

Since 1987, the Museum of Southwestern Biology (MSB), Division of Fishes at the University of New Mexico (UNM), in Albuquerque has served as the primary repository for collections of fishes (eggs, larvae, and adults) and field notes taken for the San Juan River Recovery Implementation Program (Appendix I). Photographs of habitat and genetic materials derived from these research activities are also archived with the MSB.

San Juan River fish specimens maintained at the MSB represent a physical record of the presence/absence of those species in the drainage. Often referred to as “voucher collections,” fish specimens (San Juan River specimens included) are preserved so that they will remain in good condition, in perpetuity. Housing the San Juan River collections in a new museum facility (2000) has greatly facilitated research and access to these specimens as well as ensuring long-term preservation.

As with all collections of fishes, these important San Juan River collections and their data will be maintained in optimal conditions ensuring that they are available to future generations of researchers and ichthyologists. To this end, the MSB Division of Fishes follows the “best practices” guides in museum work (Cato, 2001) and specimen preservation as set forth by professional groups like the American Society of Ichthyologists and Herpetologists (Fink, et al., 1979), the Society for the Protection of Natural History Collections, the American Fisheries Society, and the American Association of Museums. For the past 15 years, MSB staff have been in contact with various experts in the field of “best practices” for fish specimen preservation. These experts include Darrel E. Snyder, Colorado State University; John E. Simmons, University of Kansas; David L. Smith, Smithsonian Institution; Lou Van Guelpen, Atlantic Research Centre, New Brunswick.

METHODS

“Processing” San Juan River specimens, received by the MSB Division of Fishes, refers to cleaning and transferring samples to 10% or 5% buffered (Markle, 1984) formalin depending on life stage of specimens; each collection is sorted and identified by species. Before collections are entered into the MSB database, each series must be counted and measured (smallest and the largest of the series). An important part of the MSB specimen processing protocol is data entry. Three MS Access data tables, (specimen data, released fishes data, locality/collection data) allow for a wider variety of data types (e.g., type of coordinates used UTM, latitude/longitude, township/range/section) by having a total of 127 possible fields in which to organize data (Walsh and Meador, 1998). Once data are entered, the collections are cataloged, transferred to final preservative (5% buffered formalin or 70% ethanol), and labeled with permanent (wet) labels. Specimen jars and vials are filed on shelves of the permanent collections, organized under family, genus, species, and drainage.

Processing rates for incoming San Juan River specimens can be variable. A collection of 250 WhirlPaks of specimens and debris can take anywhere from 2 weeks to 2 months, or even a year. Collections from researchers outside of the MSB (e.g. Utah Dept. of Wildlife Resources) can take up to one year to completely process, sometimes longer, depending on whether all of the collections were received at the same time or not. Other factors that affect processing time are marked changes in the amount of material collected, which is dependent on collection method. For example, when passive drift nets were used, collections normally required intensive cleaning, which sometimes took up to four days to remove larval fishes (average 3.00 to 5.00 mm length) from a single one-gallon bag of debris. Likewise, data entry can be facilitated or slowed down considerably depending on how field data are organized on field sheets, legibility of handwriting, and the use of “in house” terminology or encoded data that requires checking with field crews.

Specimens received from the San Juan River Recovery Implementation Program are subject to species verification. That is, prior to incorporation of specimens into the cataloged collections, the specimens are examined by qualified museum personnel and identified or the principle investigators' identifications are checked. The MSB Division of Fishes recognizes the importance of this part of the processing protocol especially for San Juan River larval collections and Colorado pikeminnow and razorback sucker studies. Member of the MSB staff have trained with Darrel E. Snyder (at the Colorado State University Larval Fish Lab Laboratory) who is an expert in the field of native larval fishes of the Southwestern US (Snyder and Muth, 2004). If MSB staff members have difficulty identifying any larval specimen, then those specimens are sent to Mr. Snyder for verification. Mr. Snyder submits a detailed report to the MSB Collections Manager, identifying characters used to determine the species.

Genetic collections consist of San Juan River catostomid larvae fixed and preserved in 95% ethanol and fin clips from suspected hybrid catostomids (*Xyrauchen texanus* x *Catostomus spp*). When fin clips and whole larvae are received, the original 95% ethanol preservative is replaced. Then individual tissues to be used for DNA isolation and analysis are assigned a specimen number and linked to the formalin fixed vouchers (if available) in the main collection (for species verification).

Data capture and data management (Chapman, 2005) for San Juan River specimens is accomplished by UNM student employees (undergraduate and graduate) and the MSB Collections Manager. San Juan River locality data are captured using spreadsheet format (Excel) with MSB table (MS Access Nbottom) field structure (79 possible fields). Students are trained to enter data, do preliminary checking of numbers, and to make some decisions regarding ambiguous or erroneous data. Student employees scan and "clean" digital images of all San Juan River field notes received with specimens. These images are saved in three formats: tif, jpg, and pdf. The responsibility of checking locality data entries (QC) and verification of ambiguous localities is that of the MSB Collections Manager (Chapman, 2005). Species data (MSB catalog number, species identification, count, measure, and deposition) are entered by the MSB Collections Manager in the MSB catalog (MS Access Ntop table- 48 possible fields). (Appendix II.)

Original field notes and habitat pictures are hyperlinked to individual locality records in the MSB Division of Fishes MS Access database for cataloged collections. This allows researchers to view the original data in juxtaposition with data entries. The species table has a hyperlink capability to specimen photographs, spreadsheets with project related information, and so forth

FACILITIES

In 2000, the MSB Division of Fishes moved to a renovated museum facility across from the UNM Department of Biology. This afforded more space and improved facilities for collection archives and specimen processing. The collections of specimens from the American Southwest (47% from the San Juan River) now occupy 1,858 linear meters of shelving, which includes growth space (Figure 1). The shelving units are mobile, "compactor shelving," eliminating unused aisle space (Figure 2). The fluid collection archive room is maintained at 18° Celsius and lighting is kept to a minimum by illuminating few sections of shelves at any one time. Otherwise, the room is kept dark. Four-hour fire walls, overhead emergency sprinkler system, floor drains with holding tank for large spills, and controlled room access (alarmed to Campus Police during off hours) are all part of the new facility for maintaining the fish collections (and all MSB fluid-preserved collections) in optimal conditions.

Cleaning and sorting San Juan River specimen collections has been greatly facilitated by having two fume hoods with sinks and eleven workstations with point exhaust or fume collectors in the specimen preparation labs (Figure 3). Typically, San Juan River collections are initially processed in 5% buffered formalin, making it necessary to have good ventilation. The old facility did not



Figure 1. MSB fluid preserved collection, Division of Fishes



Figure 2. Compactor storage shelves with jar and tank collections

provide such ventilation and collections could not be safely or efficiently processed. These new preparation and research labs also afford ample room for specimen jars (being processed) and multiple workstations for staff and student employees (Figure 4). Barrels of chemicals are easily accessible in a new flammable storage room and distilled water points of use are placed throughout the lab area. High speed internet access is available at all processing workstations aiding in data transfer between staff and researchers.

Supplies and materials necessary to curate and preserve San Juan River specimens include glass jars with polypropylene twist top lids or bail top lids with custom made Buna-N rubber gaskets. Forty percent of the total MSB fish collection is maintained in jars from 8 ounce to three liter sizes. Five percent of the collection is preserved in stainless steel tanks (18 and 35 gallon capacity), which are used for oversized fish specimens. About 55% of the collections are maintained in glass vials. These are typically small collections or individuals but there are significant collections of delicate fish eggs and larvae, mostly from the San Juan River, archived in this manner. Annual purchases of glassware, formaldehyde, buffering chemicals, and ethanol have averaged from \$3,000 to \$6,000 per year. San Juan River research funding has been the primary source for acquiring these supplies. Since 2000, the MSB budget (permanent funds from State budget or funding from previous National Science Foundation grant) has helped purchase jars, tanks, and preservation fluids. Glass jars, vials, and closures on average cost \$2,100 per year. Currently, one 55 gallon barrel of 37% formaldehyde costs \$250 and is purchased once a year. The annual cost for formalin buffering chemicals is \$840, and about twelve barrels of 95% ethanol are required to preserve all incoming fish specimens, the majority being from the San Juan River. The current cost of these barrels is \$500 each or \$6,000 per year. The US Bureau of Reclamation funding for materials and supplies has been crucial for the MSB to completely and professionally curate these collections from the San Juan River as other funds in the MSB budget are required to meet other obligations.

Permanent staff at the MSB Division of Fishes includes a 0.33 FTE Curator of Fishes and 1.0 FTE Collections Manager. Student employees include 0.5 FTE Graduate Student RA and two 0.125 FTE UNM-Federal work study student positions. Besides these UNM funded positions, San Juan River research funding (San Juan River specimen curation contracts and other San Juan River research contracts) has paid for the salaries of additional student employees, either graduate or undergraduate students, hired to process specimens. Over the past 15 years, a total of \$102,315 in San Juan River research funding has paid for student salaries. UNM students are trained in museum techniques, identification of fishes of the American Southwest, and database management. To date, seven former student employees, hired to work on San Juan River fishes (museum, lab, and fieldwork), have gone on to pursue careers in aquatic biology, freshwater and marine fishes, terrestrial mammalogy, and genetics lab work. Many other former student employees have pursued advanced degrees in the medical fields and computer technology.

RESULTS

To date, 38,861 lots or 1,767,771 specimens collected by the San Juan River research group have been processed and archived at the Museum of Southwestern Biology, Division of Fishes (Figure 5). The primary contributors of San Juan River specimens have been the Utah Department of Wildlife Resources, the New Mexico Department of Game and Fish, the Museum of Southwestern Biology, US Bureau of Reclamation, US Fish and Wildlife Service (Figure 6). Approximately 14,000 field sheets/notes with locality data have been entered. Of these handwritten field notes, about 7,000 have been digitally captured and the original hardcopies archived in acid free boxes for long-term storage. The specimens and data are primarily used by the San Juan River research group but given the long-term data set, the MSB has received requests from a few other agencies and researchers interested in water quality data, fish genetics, and fish community structure. (E.g.



Figure 3. Specimen preparation lab (fume hoods along the west wall)



Figure 4. Lab space used for fish identification.

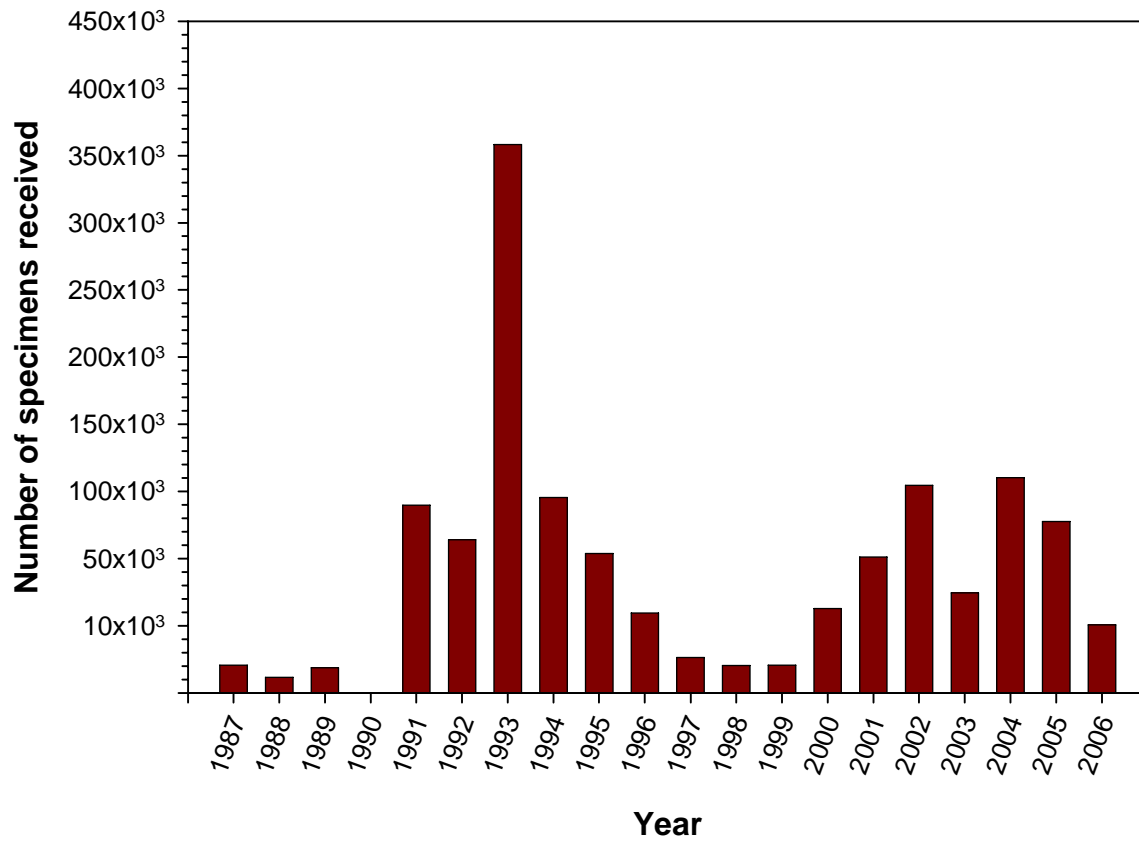


Figure 5. Number of specimens MSB received from the San Juan River Recovery Implementation Program by year (1987 to 2006).

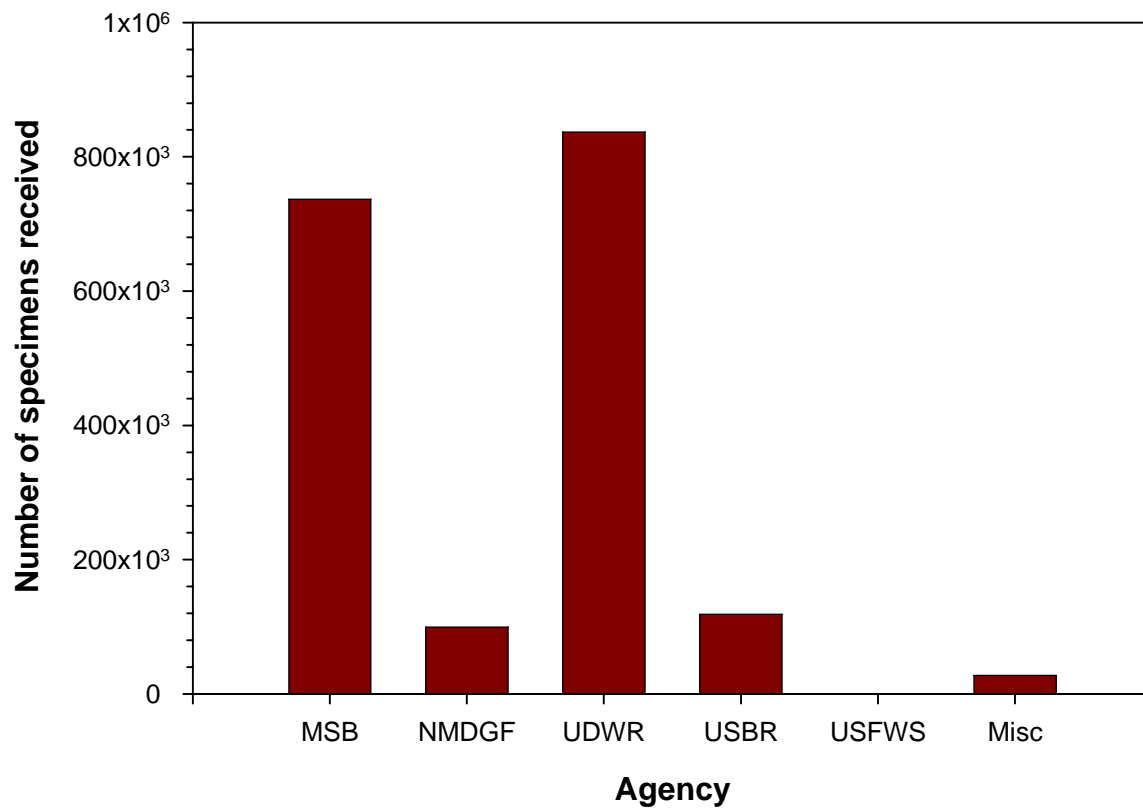


Figure 6. Number of specimens MSB received from the San Juan River Recovery Implementation Program by agency between (1987 - 2006).

employee at the San Juan River water treatment facility near Mexican Hat UT; Matt White, Ohio University, Athens; pathologist, Conor Pacific Environmental Technologies, Inc.)

ACKNOWLEDGMENTS

Funding was approved by the San Juan River Basin Biology Committee through the San Juan River Basin Recovery Implementation Program and funded under US Bureau of Reclamation, Salt Lake City Project Office Award # 06-FG-40-2411 administered by Dr. Mark McKinstry (US Bureau of Reclamation). Numerous individuals have assisted with recent specimen curation and database efforts: Tamara L. Max, Christine M. Poandl, Alicia M. Hodson, Cynthia Rivera, and Nathan B. Zerbe. Invaluable support in both the lab and museum were provided by W. Howard Brandenburg, Michael A. Farrington, and Lee E. Renfro.

REFERENCES

Cato, P. S. 2001. Best practices-what does that imply? Society for the Preservation of Natural History Collection Newsletter Vol. 15 (1):1-11

Chapman, A. D. 2005. *Principles of Data Quality*, version 1.0. Report for the Global Biodiversity Information Facility, Copenhagen.

_____ 2005. *Principles and Methods of Data Cleaning – Primary Species and Species-Occurrence Data*, version 1.0. Report for the Global Biodiversity Information Facility, Copenhagen.

Fink, W.L., K.E. Hartel, W.G. Saul, E.M. Koon, and E.O. Wiley. 1979. A Report on Current Supplies and Practices Used in Curation of Ichthyological Collections. American Society of Ichthyologists and Herpetologists, Ichthyological Collection Committee. 63 pp.

Markle, D. F. 1984. Phosphate buffered formalin for long term preservation of formalin fixed ichthyoplankton. *Copeia* 1984 (2): 525-528

Snyder, D.E. and R.T. Muth. 2004. Catostomid fish larvae and early juveniles of the upper Colorado River Basin-Morphological descriptions, comparisons, and computer-interactive key. Colorado Division of Wildlife Tech. Pub. No. 42. 110 pp + CD interactive key.

Walsh, S.J. and M.R. Meador. 1998. Guidelines for quality assurance and quality control of fish taxonomic data collected as part of the national water-quality assessment program. U.S. Geological Survey Water-Resources Investigations Report 98-4239. 39 pp.

Appendix I. San Juan River specimens deposited in MSB catalog collections.

MSB ACC. No.	Project Name	Source	Principle	No. Lots	No. Spec.
Unacc 1987	SJR 1987 Post Larval Age 0 Colorado pikeminnow monitoring	UDWR	C.W. Meyer	58	638
Unacc 1987	SJR 1987 Upper Reach	MSB	S.P. Platania	224	19824
Unacc 1988	SJR 1988 Secondary Channel Survey	NMDGF	D.L. Propst	274	11614
Unacc 1988	SJR 1988 Species Record: <i>Ptychocheilus lucius</i>	UDWR	B. Roberts	1	1
Unacc 1989	SJR 1989 Animas River and San Juan River	MSB	S.P. Platania	194	11051
Unacc 1989	SJR 1989 Secondary Channel Survey	NMDGF	D.L. Propst	57	7624
Unacc 1990	SJR 1990 Secondary Channel Survey	NMDGF	D.L. Propst	0	0
Unacc 1991	SJR 1991 Drift Net at NM RM 119.7 Four Corners and UT Mexican Hat	UDWR	Unknown	361	2475
Unacc 1991	SJR 1991 Fishes Early Life History Seine Collections	UDWR	Unknown	3422	120077
Unacc 1991	SJR 1991 Secondary Channel Survey	NMDGF	D.L. Propst	0	0
Unacc 1991	SJR 1991 Fishes Early Life History Seine Collections	USBR-Durango	K. Lashmett	76	17245
Unacc 1991	SJR 1991 Species Record: <i>Ptychocheilus lucius</i>	USFWS	F.K. Pfeifer	1	1
Unacc 1992	SJR 1992 NM RM 119.7 and UT Mexican Hat Larval Drift Net Collections	UDWR	C. Wethington	361	1137
Unacc 1992	SJR 1992 Fishes Early Life History Seine Collections	UDWR	Unknown	3189	93489
Unacc 1992	SJR 1992 Fishes Early Life History Seine Collections	USBR-Durango	K. Lashmett	122	18214
Unacc 1992	SJR 1992 Secondary Channel Survey	NMDGF	D.L. Propst	21	861
Unacc 1992	SJR 1992 Upper Reach	MSB	S.P. Platania	17	262
Unacc 1993	SJR 1993 Secondary Channel Survey	NMDGF	D.L. Propst	0	0
ACC1993-II:2	SJR 1991-1993 Fishes Young of Year Survey	USBR-Durango	K. Lashmett	652	73557
ACC1993-II:22	SJR 1991 Fishes Early Life History Seine Collections	UDWR-Moab	M.J. Buntjer	3780	122536
ACC1993-III:31	SJR 1992 Fishes Early Life History Seine Collections	UDWR-Moab	M.J. Buntjer	3550	94626
ACC1993-VIII:23	SJR 1993 Fishes Early Life History Seine Collectins	UDWR-Moab	M.J. Buntjer	2889	117448
ACC1993-X:25	SJR 1993 Species Record: <i>Ctenopharyngodon idella</i>	USFWS-NMFRO	J.E. Brooks	1	1
ACC1994-X:10	SJR 1994 Drift Net and Seine Collections: Fishes Early Life History	UDWR-Moab	T. Chart	2320	96818
ACC1994-X:10	SJR 1994 Fishes Early Life History Seine Collections	USBR-Durango	K. Lashmett	156	9668
ACC1994-X:10	SJR 1994 Secondary Channel Survey	NMDGF	D.L. Propst	229	11954

Appendix I. San Juan River specimens deposited in MSB catalog collections.

MSB ACC. No.	Project Name	Source	Principle	No. Lots	No. Spec.
ACC1994-VIII:26	SJR 1994 Light Trap Collections-Paiute Farms	NPS-Arizona	S. Dodson	58	26889
ACC1995-VI:4	SJR 1995 Fishes Early Life History Seine Collections	UDWR-Moab	T. Chart	998	46310
ACC1995-VI:4	SJR 1995 Larval Fish Drift Net Collections at NM 127.5 and UT Mexican Hat	MSB	S.P. Platania	722	5163
ACC1995-VI:4	SJR 1995 Secondary Channel Survey	NMDGF	D.L. Propst	0	0
ACC1995-VI:4	SJR 1995 Fishes Early Life History Seine Collections	UDWR-Moab	T. Chart	998	46310
ACC1995-VI:4	SJR 1995 Larval Fish Drift Net Collections	MSB	S.P. Platania	722	5163
ACC1995-VI:4	SJR 1995 Secondary Channel Survey	NMDGF	D.L. Propst	0	0
ACC1995-XII:18	SJR 1995 Eggs and Larvae for identification	E. R. I.	T. Gilson	119	769
ACC1996-II:7	SJR 1996 Secondary Channel Survey	NMDGF	D.L. Propst	0	0
ACC1996-VII:1	SJR 1996 Colorado Pikeminnow Drift Net	MSB	S.P. Platania	240	1265
ACC1996-VII:1	SJR 1996 Fishes Early Life History Seine Collections	UDWR-Moab	T. Chart	826	58296
ACC1997-VII:9	SJR 1997 Colorado Pikeminnow Drift Net	MSB	S.P. Platania	337	2144
ACC1997-VII:9	SJR 1997 Fishes Early Life History Seine Collections	UDWR-Moab	T. Chart	347	14972
ACC1997-IV:1	SJR 1997 Razorback Sucker Light Trap Study	MSB	S.P. Platania	63	296
ACC1997-VII:9	SJR 1997 Secondary Channel Survey	NMDGF	D.L. Propst	624	8956
ACC1998-VII:5	SJR 1998 Fishes Early Life History Seine Collections	UDWR-Moab	T. Chart	0	0
ACC1998-VII:5	SJR 1998 Larval Colorado Pikeminnow Drift Net	MSB	S.P. Platania	523	2457
ACC1998-IV:22	SJR 1998 Larval Razorback Sucker Survey	MSB	S.P. Platania	391	13610
ACC1998-VII:31	SJR 1998 Rates of Drift Transport-Incidental Larval Fish Collections	MSB	S.P. Platania	0	0
ACC1998-XI:2	SJR 1998 Secondary Channel Survey	NMDGF	D.L. Propst	504	4257
ACC1999-IV:9	SJR 1999 Larval Razorback Sucker Survey	MSB	S.P. Platania	351	20339
ACC1999-VI:22	SJR 1999 Rates of Drift Transport-Incidental larval fish collections	MSB	S.P. Platania	0	0
ACC1999-VI:23	SJR 1999 Fishes Early Life History Seine Collections	UDWR-Moab	T. Chart	0	0
ACC1999-VI:23	SJR 1999 MEC Colorado Pikeminnow Collections	MSB	S.P. Platania	180	363
ACC1999-VI:23	SJR 1999 Secondary Channel Study	NMDGF	D.L. Propst	0	0
ACC2000-IV:4	SJR 2000 Larval Razorback Sucker Survey	MSB	S.P. Platania	506	11382
ACC2000-VI:8	SJR 2000 Rates of Drift Transport-Incidental Larval Fish Collections	MSB	S.P. Platania	0	0

Appendix I. San Juan River specimens deposited in MSB catalog collections.

MSB ACC. No.	Project Name	Source	Principle	No. Lots	No. Spec.
ACC2000-VII:3	SJR 2000 Secondary Channel Survey and Red Shiner Study	NMDGF	D.L. Propst	1319	27714
ACC2000-VII:3	SJR 2000 Fishes Early Life History Seine Collections	UDWR-Moab	S. Meisner	592	21589
ACC2000-VII:3	SJR 2000 Larval Colorado Pikeminnow Drift Net	MSB	S.P. Platania	327	2138
ACC2001-III:28	SJR 2001 Live Larval Razorback Sucker Interim Facility	MSB	S.P. Platania	1	163
ACC2001-IV:17	SJR 2001 Larval Razorback Sucker Survey	MSB	S.P. Platania	604	95598
ACC2001-VII:3	SJR 2001 Secondary Channel Survey	NMDGF	D.L. Propst	8	403
ACC2001-VII:3	SJR 2001 Larval Colorado Pikeminnow Drift Net	MSB	S.P. Platania	307	4873
ACC2002-IV:22	SJR 2002 Larval Razorback sucker Survey	MSB	W.H. Brandenburg	679	56266
ACC2002-IV:22	SJR 2002 Live Larval Razorback suckers Interim Facility	MSB	T.F. Turner	0	0
ACC2002-VII:2	SJR 2002 Species record: <i>Dorosoma cepedianum</i>	USGS-Denver	G. Mueller	1	1
ACC2002-VII:8	SJR 2002 Larval Colorado Pikeminnow Survey	MSB	M.A. Farrington	377	90541
ACC2002-VII:8	SJR 2002 Secondary Channel Survey	NMDGF	D.L. Propst	95	7511
ACC2003-II:26	SJR 2003 Hybrid Catostomid Collections	USFWS	D. Ryden	1	1
ACC2003-IV:24	SJR 2003 Larval Razorback sucker Survey	MSB	W.H. Brandenburg	571	40184
ACC2003-VII:10	SJR 2003 Larval Colorado Pikeminnow Survey	MSB	M.A. Farrington	831	34157
ACC2003-X:19	SJR 2003 Secondary Channel Survey	NMDGF	D.L. Propst	0	0
ACC2004-IV:19	SJR 2004 Larval Razorback sucker Survey	MSB	W.H. Brandenburg	541	14538
ACC2004-VII:23	SJR 2004 Larval Pikeminnow Survey	MSB	M.A. Farrington	662	145532
ACC2004-X:5	SJR 2004 Hogback Diversion Canal	MSB	S.P. Platania	0	0
ACC2005-I:13	SJR 2004 Secondary Channel Survey	NMDGF	D.L. Propst	346	17409
ACC2005-IV:6	SJR 2005 Hybrid Catostomid Collections	MSB	M.A. Farrington	0	0
ACC2005-IV:18	SJR 2005 Larval Razorback sucker Survey	MSB	W.H. Brandenburg	502	19163
ACC2005-VII:13	SJR 2005 Larval Colorado Pikeminnow Survey	MSB	M.A. Farrington	791	89513
ACC2005-VIII:16	SJR 2005 Hogback Diversion Canal	MSB	S.P. Platania	0	0
ACC2005-X:19	SJR 2005 Secondary Channel Survey	NMDGF	D.L. Propst	124	1364
ACC2006-IV:19	SJR 2006 Larval Razorback sucker Survey	MSB	W.H. Brandenburg	591	25080
ACC2006-VII:17	SJR 2006 Larval Colorado Pikeminnow Survey	MSB	M.A. Farrington	667	25444

Appendix II. MSB specimen and data processing

Specimen preservation protocol specific to San Juan River collections

1. When San Juan River collections are received by MSB staff, contents (debris and specimens) are removed from WhirlPak sample bags and “field formalin” (unbuffered formalin of unknown concentration) is drained. This formalin is replaced with 5% or 10% buffered formalin and contents are placed into glass jars with polypropylene twist tops or bail tops with N-Buna gaskets.
2. These jars containing uncleaned and unsorted collections are arranged by field number on special accession shelving in the collection archives (cool and dark environment). All original data sheets or field notes are organized and filed in the hardcopy accession files, which are maintained by MSB Collections Manager.
3. Student employees remove jar or jars (one field site) from accession shelves in field number order, pour contents into tray with formalin (5% or 10%), and removed fish specimens from debris and silt using insect forceps to remove delicate fish larvae. Eggs and larvae are collected into vials so that they are not damaged by labels or other larger specimens.
4. Cleaned samples are returned to accession shelves in any one of the following preservatives, depending on how long the specimens have been in formalin for tissue fixing: 5% buffered formalin, 10% buffered formalin, water or 35% ethanol for the initial rinse of formalin, or eggs and larvae are maintained in 5% buffered formalin for long-term archives.
5. As samples are cleaned and transferred to 50% ethanol or into fresh 5% buffered formalin, MSB staff trained in larval fish identification and San Juan River fishes sort the collections to species. One field site collection is worked on at a time to avoid mixing collections from different localities. As each species is identified, the series is counted and the smallest and largest of the series measured in millimeters for standard length or total length (for larvae only).

Appendix II. MSB specimen and data processing

Field Name	Field Type	Metadata
Catnum	number	MSB catalog number unique
Genus	text	
Species	text	
Subspecies	text	
Station	text	
Spec	number	Field number unique
Origno	text	number of specimens in series
NK	text	Any other number related to specimen lot
ID	text	Tissue numbers
Invoice	text	Author of identification current
IDDate	Date/Time	Alphanumeric invoice number assigned to transactions- unique
ACC_No	text	Date specimens were identified
Kind_Type	text	Accession number assigned to project-unique
Calcflid	text	Vial jar, Tank, Hybrid, C&S, Skeleton, Paratype
Storage	text	Alphanumeric assigned to Vial Jar-unique for 40 vials
Storage_Secondary	text	70% EtOH, 95% EtOH, 50% Isopropanol, 100% Glycerin, 5% Buffered Formalin, 10% Buffered Formalin, 10% Buffered Formalin, 10% Buffered Formalin,
Storage_Tertiary	text	70% EtOH, 95% EtOH, 50% Isopropanol, 100% Glycerin, 5% Buffered Formalin, 10% Buffered Formalin, 10% Buffered Formalin,
Specimen_Preparation	text	Whole specimen, fin clip, tissue, blood sample, etc.
Size_From	number	Minimal standard length in cataloged series
Size_To	number	Maximum standard length in cataloged series
Measure	text	SL or TL
Remarks	text	
Last_Mod	Date/Time	Last date changes made to record
Date_Created	Date/Time	Date that record was entered
Inventory	text	T=specimens in collection F=unknown if specimens are in collection
Invoice_Condns	text	Conditions for loan of specimens, eg. No dissections, etc.
Published	text	Enter: Journal, year, volume, number and no. of pages
Taxonomic_History	text	Original descriptions and taxonomy
Voucher_Collection	text	Specimens designated as vouchers for genetic collections
Link_to_Specimen_Photo	Hyperlink	Linked to pertinent files (photos, spreadsheets, etc.)

Table 1. Specimen table field structure MSB NTop.

Appendix II. MSB specimen and data processing.

Field Name	Data Type	Metadata
Station	Text	KEY FIELD. Field number defined by collector; must be unique
Continent	Text	Continent or Ocean
Country	Text	Country or Island
Drainage	Text	MSB defined drainages
State	Text	State or Province
County	Text	County or District
Original_Locality	Text	Locality descriptor written exactly as collector wrote in field notes.
Locality	Text	Original locality descriptor edited by Collections Manager for purposes of database query.
LatDeg	Number	Latitude degree
LatMin	Number	Latitude minute
LatSec	Number	Latitude seconds
LatHem	Text	N or S
LongDeg	Number	Longitude degree
LongMin	Number	Longitude minute
LongSec	Number	Longitude seconds
LongHem	Text	E or W
UTM_Easting	Number	Start coordinate 6 numbers
UTM_Northing	Number	Start coordinate 7 numbers
UTM_Zone	Text	Start Zone - 13S for most of New Mexico; 12S for San Juan R. records
UTM_Easting_Stop	Number	Ending coordinate 6 numbers
UTM_Northing_Stop	Number	Ending coordinate 7 numbers
UTN_Zone_Stop	Text	Ending Zone - 13S for most of New Mexico; 12S for San Juan R. records
Coordinate_Det	Text	How was the UTM coordinate determined? Use drop down list.
Precision	Text	S = Second; M = Minute; G = Quad; U = Unmappable
Datum	Text	North American Datum of 1927 or North American Datum of 1983, or U.S. Department of Defense, WGS1984
Gear_Depth_Min	Number	This field also used for a single entry or averages taken in the field notes.
Gear_Depth_Max	Number	This field also used for a single entry or averages taken in the field notes.
Water_Depth_Min	Number	This field also used for a single entry or averages taken in the field notes.
Water_Depth_Max	Number	This field also used for entries that are modified by a < (less than) symbol.
Secchi_Depth	Number	Measure (minimum or single) taken with Secchi disk
Secchi_Depth_Max	Number	Water visibility measure with Secchi disk, maximum
Gear	Text	Type of collecting method, eg. Seine, light trap, etc.
Time_From	Date/Time	Collecting time start
Time_To	Date/Time	Collecting time end
Project	Text	Project name, defined by collectors

Table 2. Locality table field structure MSB NBottom.

Appendix II. MSB specimen and data processing.

Field Name	Data Type	Metadata
Collector	Text	First two initials-no space-and spell out last name. Eg. A.M. Snyder
DateColl_From	Date/Time	Collecting day-start or single date for collecting
DateColl_To	Date/Time	Collecting day-end
Remarks	Text	Regarding collecting effort, weather, habitat, etc.
Photograph Number	Text	Record number assigned to habitat photograph
RM_Start	Number	River mile designation-as starting point
RM_Stop	Number	River mile designation-as ending point
Township	Text	
Range	Text	
Section	Text	
Quad	Text	Map quadrangle
Width_Min	Number	This field also used for a single entry in the field notes.
Width_Max	Number	This field also used for entries that are modified by a < (less than)symbol.
Salinity_Min	Number	This field also used for a single entry in the field notes.
Salinity_Max	Number	This field also used for entries that are modified by a < (less than)symbol.
Last_Mod	Date/Time	Date that changes or updates made to record
Date_Created	Date/Time	Date that record was entered
Temp_Min	Number	This field also used for a single entry in the field notes.
Temp_Max	Number	This field also used for entries that are modified by a < (less than)symbol.
Water_Descriptor	Text	Riffle, main channel, runs, pools, chutes, and so forth.
Current_Min	Number	Use this field for the single entry or when no min/max range recorded
Current_Max	Number	This field also used for entries that are modified by a < (less than)symbol.
Vegetation	Text	Aquatic vegetation
Air_Temp_Min	Number	This field also used for a single entry in the field notes.
Air_Temp_Max	Number	This field also used for entries that are modified by a < (less than)symbol.
Bottom_Substrate	Text	Sand, gravel, cobble, mud, and so forth.
Shore Description	Text	Bank descriptions like undercut bank, sandy shoreline, cottonwood trees or riparian descriptors, and so forth.
Min_Gear_Distance	Number	This field also used for a single entry in the field notes.
Max_Gear_Distance	Number	This field also used for entries that are modified by a < (less than)symbol.
Effort	Number	Seine effort. Note: for the MSB database, the length of the haul is always multiplied by 2.5 (not the actual seine width).
DO_Min	Number	This field also used for a single entry in the field notes.
DO_Max	Number	This field also used for a single entry in the field notes.
Conductivity_True	Number	True conductivity.
Conductivity_Specific	Number	Specific conductivity at water temp. 25 C

Table 2 cont. Locality table field structure MSB NBottom.

Appendix II. MSB specimen and data processing.

Field Name	Data Type	Metadata
pH_Min	Number	This field also used for a single entry in the field notes.
pH_Max	Number	This field also used for entries that are modified by a < (less than) symbol.
Shock_Seconds	Number	Electrofischer effort
Volts	Number	Electrofischer effort
Amps	Number	Electrofischer effort
Start_Flow	Number	Flow meter effort, start
End_Flow	Number	Flow meter effort, end
Flow_Total	Number	Flow meter effort (End minus Start)
Link_to_Photo	Hyperlink	Link to habitat photograph or other relevant photographs
Link_to_Field_Notes	Hyperlink	Link to scanned Field Notes in pdf C:\Program Files\Fishcat\MSB Field Notes

Table 2 cont. Locality table field structure MSB NBottom.

Appendix II. MSB specimen and data processing.

Data Type	Metadata
Autonumber	Primary/indexed field
Text	Contains "RELEASED"
Text	
Text	
Text	
Text	
Number	
Text	If some of the released fishes are retained and preserved, enter MSB catalogue number here.
Text	
Text	
Date/Time	
Text	
Number	
Number	
Text	
Text	
Date/Time	
Date/Time	

Table 3. Specimen table field structure MSB released fish

Appendix II. MSB specimen and data processing.

Acc 2002-11:22

Field No. WHB02-028 (Sample No. two bags)
 State or Country: Utah Locality: San Juan River @ RM 76.1
 T R S Lat.: 37 06 22.629 E Long.: 112 46 04 N
 County: San Juan Co. Drainage: Colorado
 Water: backwater on river right
 Vegetation: Algae
 Temp: 18 °C Air: 23 °C
 Bottom: mud, silt, and some small cobble
 Shore: Russian olive & salt cedar Current: 0 - 2.1 m/s
 Dist. offshore: Width: 1 - 9 m Tide:
 Depth of capture: larvae 0.3 - .24 m Depth of water: 0.3 - .24 m
 Method of capture: larval seine
 Seine: 1 m x 1 m No. Hauls: 9 Area: 66.8 sq. m.
 D.O.: mg/l Conductivity: μ mhos/cm. Secchi: .22 m %
 Salinity:
 Shocking seconds: Voltage: Amps:
 Collected by: WH Brandenburg & MAF Livingston Date: 29. Apr. 2002
 Orig. preserv.: 10% formalin Time: 1128 - 1153

Lots of fish were collected in this backwater, primarily Cyprinella lutrensis. The down stream end of the backwater is primarily where C. lutrensis was collected. This portion had greater depth than the upstream end and also had quite a bit of inundated debris piles. Most of the C. lutrensis collected were larger fish 40-50 mm SL. A few Catostomid larvae were picked up. None of them were taken in the deeper downstream connection. They were picked up towards the back end in shallower water. Most of the larvae appeared to be Catostomus latipinnis. There was a range of sizes from meso- to meta larvae. One other Catostomid ~~larva~~ larvae was collected. It was not C. latipinnis it was smaller and had very little dorsal pigmentation (possible Xyrazelen texanus). On the whole few Catostomid larvae were collected. The habitat appeared to be well suited for them. Apparently flows are up since our last trip out (~570 cfs). Main channel temps were lower than that of the main channel (16.5 °C). The main channel is also a bit more turbid than last week. Haul lengths were 4.5 m, 13.0 m, 5.5 m, 6.1 m, 9.3 m, 5.3 m, 8.2 m, 7.8 m, 7.1 m

Figure 7. Digitally captured field note. Example of field note from MSB

Appendix II. MSB specimen and data processing.

River: SJR Date: 11 JUL 00 Field Coll. No: JLP4542
 State: NM County: SAN JUAN River Mile(s): _____ to _____
 Time: 0850 to _____ Weather: SCATTERED Ambient Temp: _____
 Secondary Channel Type: DRIFT Crew: J.P. ALH

	<u>Below pool</u> <u>2° Channel</u>	<u>pool above</u> <u>base</u>	<u>Main Channel</u>
Water Temp:	<u>25.8</u>	<u>24.1</u>	<u>34.0°</u>
Dissolved O ₂	<u>4.4</u>	<u>1.8</u>	<u>2.6</u>
Conductivity:		<u>11.64 milli</u>	<u>37.31 milli</u>
Salinity:		<u>6.8</u>	<u>19.8</u>
PHOTOS			

Comments: Fish common - but few in large
pool @ base of site. Tadpoles common.
Several dead catfish in shallow pools
Tadpoles feeding on dead fish. H₂O
slightly lower than 6 jul 00. No
evidence of flow spike

THERMOGRAPH DOWNLOADED @
1030 HRS ON 11 JUL 00

Figure 8. Example of field note New Mexico Department of Game and Fish.