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:

ALEXANDRA M. SNYDER
MUSEUM OF SOUTHWESTERN BIOLOGY
DIVISION OF FISHES
UNIVERSITY OF NEW MEXICO

30 MAY 2008

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INTRODUCTION

Since 1987, the Museum of Southwestern Biology (MSB), Division of Fishes at the University of New Mexico (UNM), 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 . Photographs of habitat and genetic materials derived from these research activities are also archived in 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 (Appendix I). Often referred to as "voucher collections," these fish specimens are preserved so that they will remain in good condition, in perpetuity. Housing the San Juan River collections (and all other fish collections) in a new museum facility (2000) has greatly facilitated research by providing better access to these specimens as well as ensuring long-term preservation.

As with all collections of fishes, the San Juan River collections and field 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 a "best practices" guide for the conservation of museum collections (Cato, 2001) as set forth by professional groups like the American Society of Ichthyologists and Herpetologists (Fink, et al., 1979), the Society for the Preservation 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 larval and adult fish specimen preservation. These experts include Darrel E. Snyder, Colorado State University; David L. Smith, Natural History Museum, Smithsonian Institution; Lou Van Guelpen, Atlantic Research Centre, New Brunswick.

METHODS

"Processing" San Juan River specimens refers to cleaning and transferring field samples to 10% or 5% buffered (Markle, 1984) formalin depending on the life stages of the specimens for a complete fixing of tissues. As collections are sorted and identified to species, they are transferred through three concentrations of ethanol and into a final preservative of 70% ethanol. Larval fishes may remain in 5% buffered formalin as the final preservative. Prior to entering the collection data (MS Access 2007), each lot of fishes must be identified or verified, enumerated and measured (smallest and the largest in the series).

An important part of the MSB specimen processing protocol is data entry. Three MS Access data tables, (Appendix III Tables 1, 2, and 3) for specimen data, released fishes data, and locality/ collection data allow for a wider variety of data types (e.g., type of coordinates used can include UTMs, 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/chemical proof) labels. Jars and vials of cataloged specimens are filed on shelves in the permanent collections, organized under family, genus, species, and drainage.

Processing rates for incoming San Juan River specimens have been variable over the years depending on three factors: when the collections were received by MSB staff and if the collection was received in stages or at the same time; the amount of debris in the samples, which can hamper detection of fish larvae and eggs; and the amount of material collected via a particular 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 4.00 to 13.00 mm length) from a single one-gallon bag of debris. If these collections, which were labor

intensive to process, were then received late in the year or in various stages, the processing time was further delayed.

Likewise, data entry can be considerably slowed down 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 contacting field crews for clarification. 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 personnel (museum or SJRRIP researchers) and identified. The MSB Division of Fishes recognizes the importance of this part of the processing protocol, especially for San Juan River larval fish collections of Colorado pikeminnow and razorback suckers. Researchers with the SJRRIP working in the MSB have trained with Darrel E. Snyder, (now retired from the Colorado State University (CSU) Larval Fish Lab Laboratory) an expert in the field of native larval fishes of the Southwestern US (Snyder and Muth, 2004). Specimens that cannot be identified by SJRRIP researchers are sent to CSU for verification before being cataloged by the MSB. Personnel at CSU submit a detailed report to the MSB Collections Manager, documenting relevant characters used to determine the species. These reports are readily available to SJRRIP researchers.

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 field 95% ethanol preservative is replaced. These examples 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). Frozen or ethanol fixed fish specimens cannot be used in any study involving morphological analysis because the specimen is dehydrated and shrunken.

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 and do a preliminary “QC” or checking of data; decisions regarding ambiguous or erroneous data are made in consultation with the Collections Manager. The responsibility of doing a final “QC” of locality data entries and verification of ambiguous localities is that of the MSB Collections Manager (Chapman, 2005). Student employees scan and “clean” digital images of San Juan River field notes received with specimens. These images are saved in three formats: tif, jpg, and pdf and maintained on the museum computer catalog. 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. The San Juan River database, along with the whole MSB fishes database, is backed up on an external hard drive.

FACILITIES

In 2000, the MSB Division of Fishes moved into 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% are 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 1. MSB fluid preserved collection, Division of Fishes

Figure 2. Compactor storage shelves with jar and tank collections

(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 improvements in 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 provide such ventilation and collections could not be safely or efficiently processed under those conditions.) These new preparation and research labs also have ample room for working with specimen jars, as well as multiple workstations for both 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 workstations thereby aiding in data transfer between staff and researchers.

Supplies and materials necessary to curate and preserve San Juan River specimens include glass jars with either 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 operating budget (i.e., permanent funds from New Mexico State funding or from previous National Science Foundation grants) 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 three 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 mammals, and genetics lab work. Many other former student employees have pursued advanced degrees in the medical fields and computer technology.

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

Figure 4. Lab space used for fish identification.

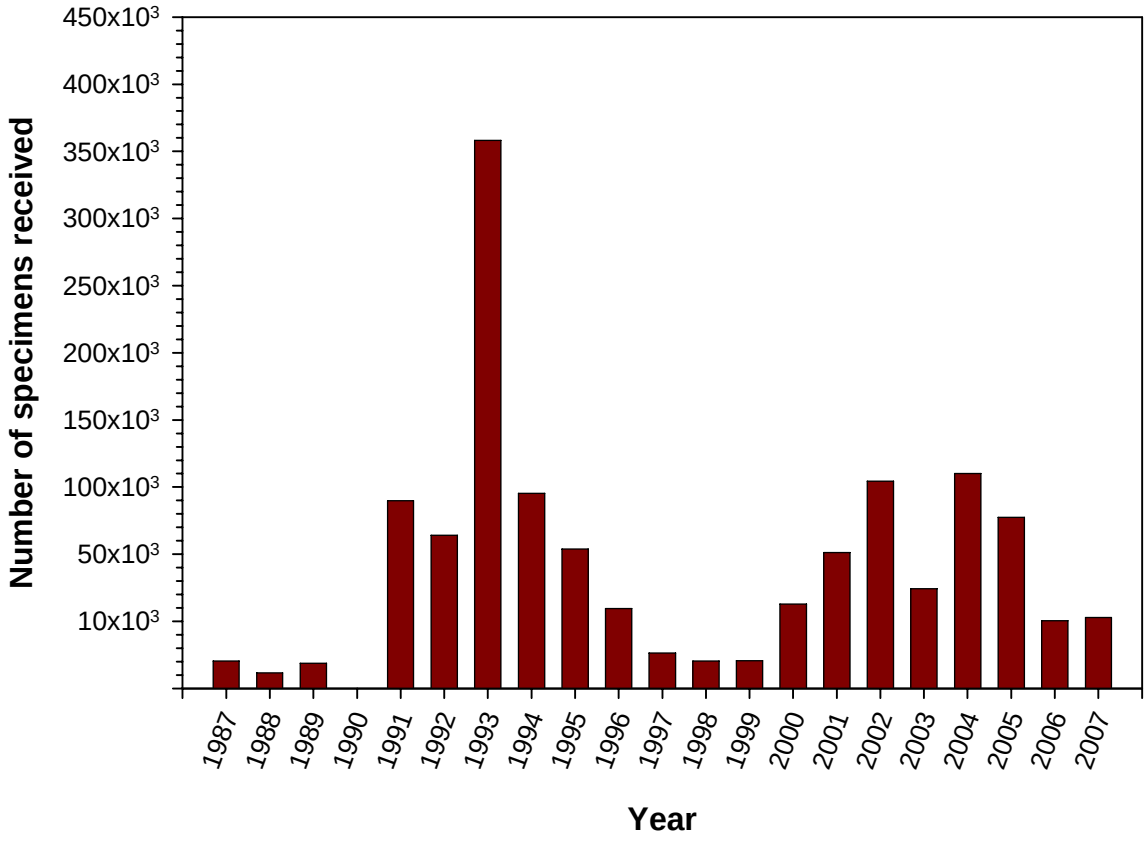

Figure 5. Number of specimens MSB received from the San Juan River Recovery Implementation Program by year (1987 to 2007).

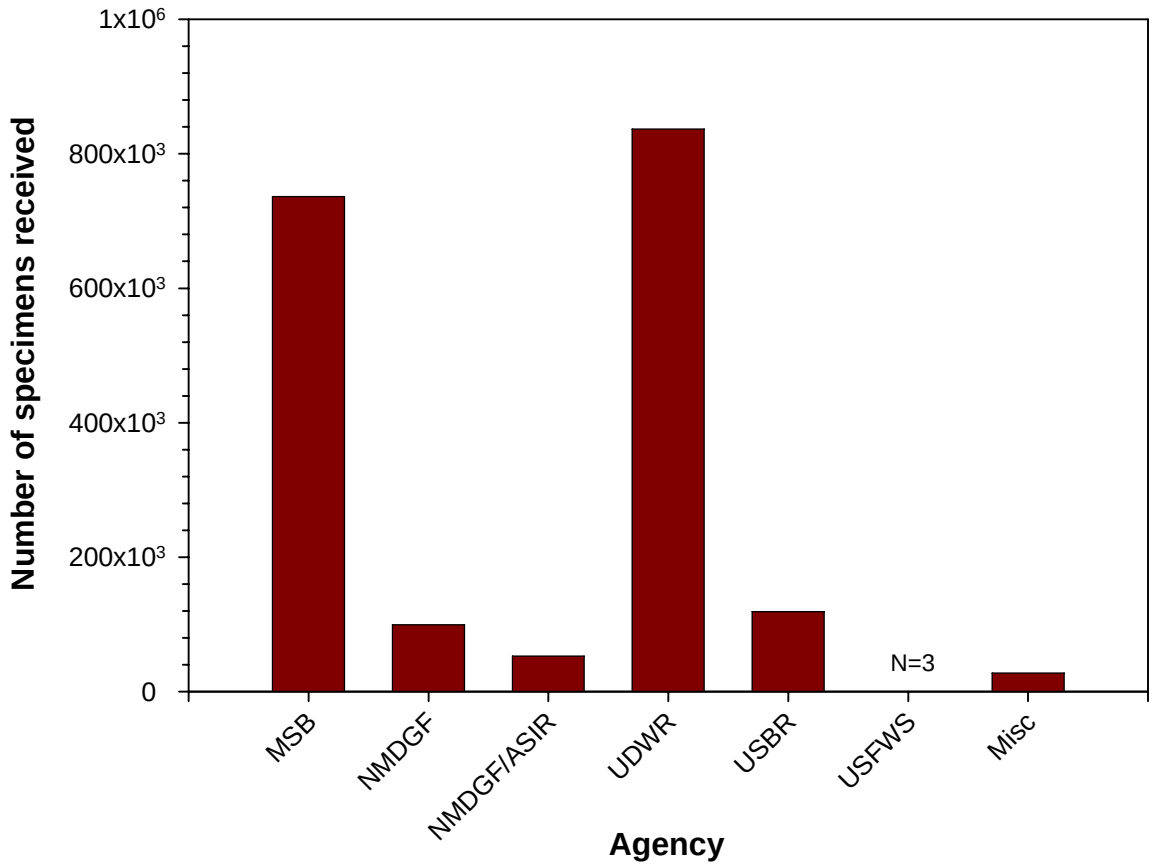

Figure 6. Number of specimens MSB received from the San Juan River Recovery Implementation Program by agency between (1987 - 2007).

RESULTS

To date, 91,689 lots or 1,820,599 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). Primary contributors of San Juan River specimens have been American Southwest Ichthyological Research, Albuquerque NM (ASIR), Museum of Southwestern Biology, Albuquerque NM (MSB), the New Mexico Department of Game and Fish, Santa Fe (NMDGF), Utah Department of Wildlife Resources, Moab CO (UDWR), US Bureau of Reclamation, Durango CO (USBR), US Fish and Wildlife Service, Grand Junction CO and Albuquerque NM (USFWS) (Figure 6). Approximately 14,374 field sheets/notes with locality data have been entered. Of these handwritten field notes, about 7,374 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. employee at the San Juan River water treatment facility near Mexican Hat UT; Matthew White, Ph.D. faculty Ohio University, Athens; pathologist, Conor Pacific Environmental Technologies, Inc.)

ACKNOWLEDGMENTS

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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: *Ptychocheilus lucius*	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: *Ptychocheilus lucius*	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:*Ctenopharyngodon idella*	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. Meismer	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: *Dorosoma cepedianum*	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 Small Bodied Fish Study	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 Small Bodied Fish Study	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 Small Bodied Fish Study	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 Small Bodied Fish Study	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
ACC2007-IV:16	SJR 2007 Larval Razorback Sucker Survey	NMDGF/ASIR	W.H. Brandenburg	425	21,886
ACC2007-VII:23	SJR 2007 Larval Colorado Pikeminnow Survey	NMDGF/ASIR	M.A. Farrington	352	30,942
ACC2007-X:14	SJR 2007 Small Bodied Fish Study	NMDGF	D.L. Propst	20	500

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 replace 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 III. MSB specimen and data processing

Field Name	Field Type	Metadata
Catnum	number	MSB catalog number unique
Genus	text	
Species	text	
Subspecies	text	
Station	text	Field number unique
Spec	number	number of specimens in series
Origno	text	Any other number related to specimen lot
NK	text	Tissue numbers
ID	text	Author of identification current
Invoice	text	Alphanumeric invoice number assigned to transactions- unique
IDDate	Date/Time	Date specimens were identified
ACC_No	text	Accession number assigned to project-unique
Kind_Type	text	Vial jar
Calcfld	text	Alphanumeric assigned to Vial Jar-unique for 40 vials
Other Kind_Type	text	Tank, Hybrid, C&S, Skeleton, Paratype
Storage	text	70% EtOH, 95% EtOH, 50% Isopropanol, 100% Glycerin, 5% Buffered Formalin, 10% Buffered
Formalin,		
Storage_Secondary	text	70% EtOH, 95% EtOH, 50% Isopropanol, 100% Glycerin, 5% Buffered Formalin, 10% Buffered
Formalin,		
Storage_Tertiary	text	70% EtOH, 95% EtOH, 50% Isopropanol, 100% Glycerin, 5% 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 III. 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 of1927 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.

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 III. 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	Electrofisher effort
Volts	Number	Electrofisher effort
Amps	Number	Electrofisher 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

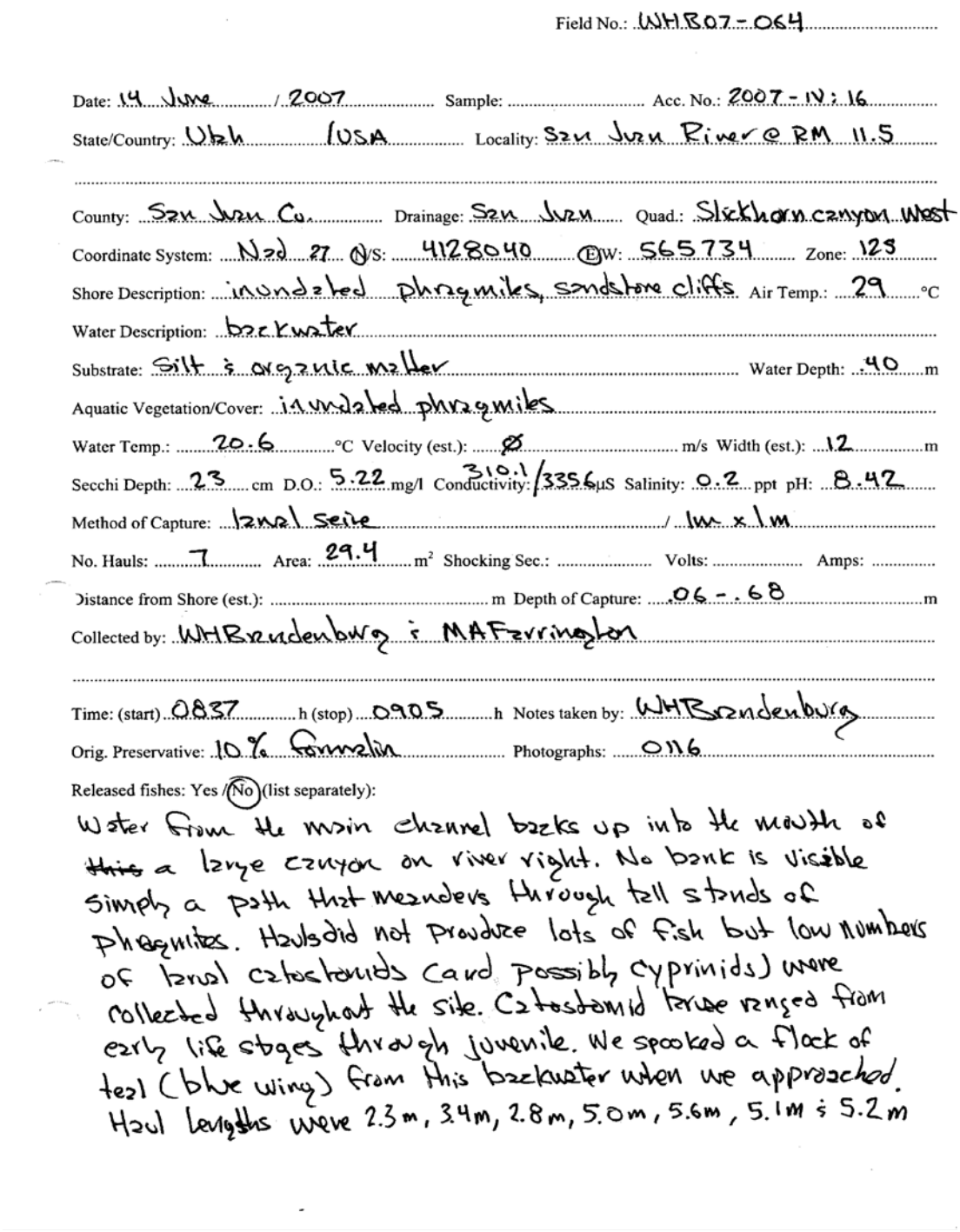
Table 2 cont. Locality table field structure MSB NBottom.

Appendix III. MSB specimen and data processing.

Field Name	Data Type	Metadata
ID 1	Number	Primary/indexed fields
R Catnum	Text	Contains “RELEASED”
Genus	Text	
Species	Text	
Subspecies	Text	
Station	Text	Field No. -unique
Spec	Number	Number of specimens in series
Origno	Text	Any other No. related to specimen lot
NK	Text	Tissue No.
ID	Text	Field species identification
ID Date	Date/Time	Date of field identification
ACC_No	Text	Accession No. assigned to project -unique
Size_from	Number	Minimal standard length in released series
Size_to	Number	Maxium standard length in released series
Measure	Text	Standard length or Total length
Remarks	Text	
Last_Mod	Date/Time	Last date changes were made to record
Date_Created	Date/Time	Date that record was entered

Table 3. Specimen table field structure MSB released fish

Appendix IV. MSB specimen and data processing.



Field No.: WHB07-064

Date: 14 June / 2007 Sample: Acc. No.: 2007-IV:16

State/Country: Utah / USA Locality: San Juan River @ RM 11.5

County: San Juan Co. Drainage: San Juan Quad.: Slickhorn canyon West

Coordinate System: Nad 27 (N)/S: 4128040 (E)W: 565734 Zone: 12S

Shore Description: inundated phragmites, sandstone cliffs Air Temp.: 29 °C

Water Description: backwater

Substrate: Silt & organic matter Water Depth: .40 m

Aquatic Vegetation/Cover: inundated phragmites

Water Temp.: 20.6 °C Velocity (est.): Ø m/s Width (est.): 12 m

Secchi Depth: 23 cm D.O.: 5.22 mg/l Conductivity: 310.1 / 3356 µS Salinity: 0.2 ppt pH: 8.42

Method of Capture: haul seine / 1m x 1m

No. Hauls: 7 Area: 29.4 m^2 Shocking Sec.: Volts: Amps:

Distance from Shore (est.): m Depth of Capture: .06-.68 m

Collected by: WHBrandenburg & MAFerrington

Time: (start) 0837 h (stop) 0905 h Notes taken by: WHBrandenburg

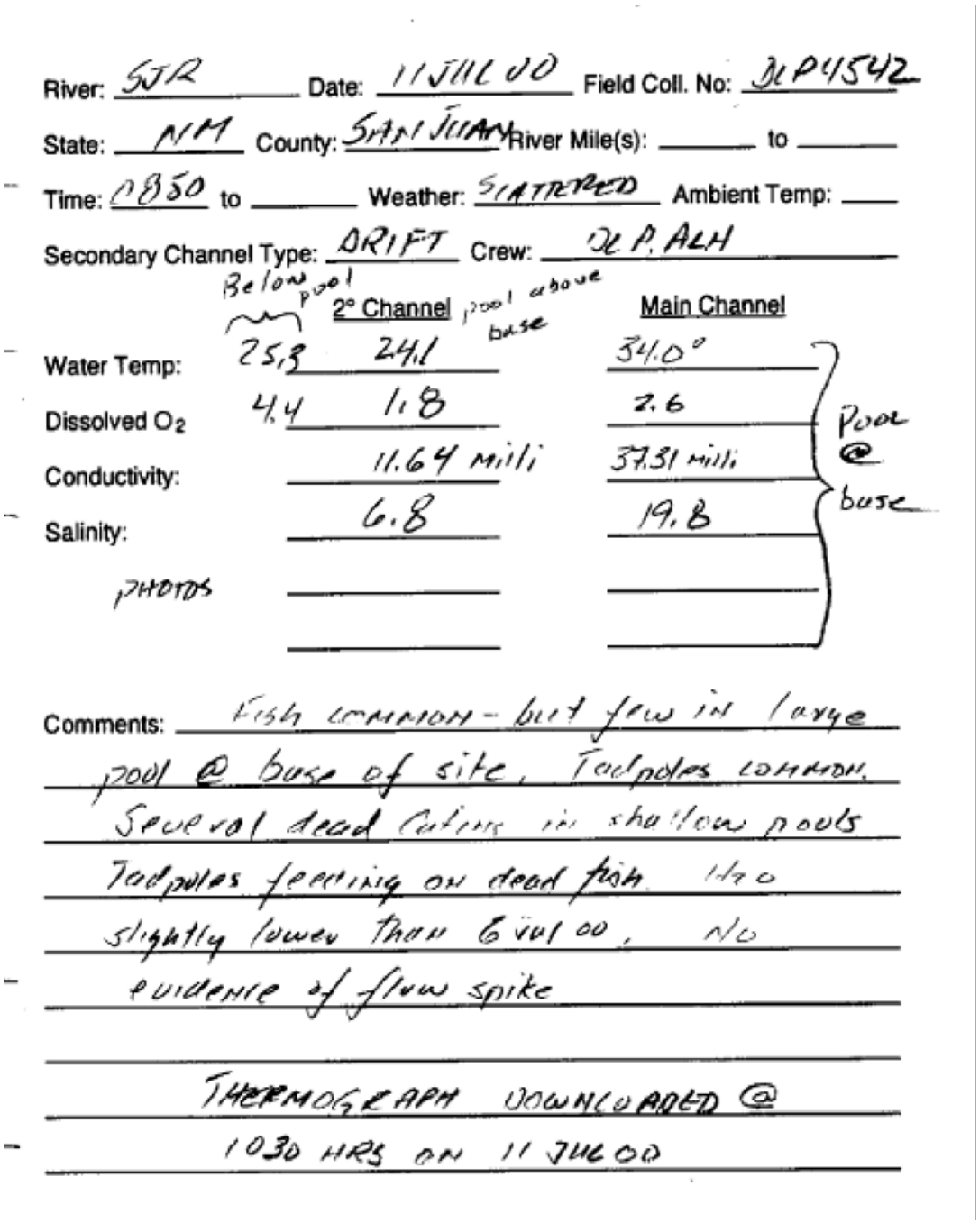
Orig. Preservative: 10% formalin Photographs: 0116

Released fishes: Yes / (No) (list separately):

Water from the main channel backs up into the mouth of ~~this~~ a large canyon on river right. No bank is visible simply a path that meanders through tall stands of phragmites. Hauls did not produce lots of fish but low numbers of larval catostomids (and possibly cyprinids) were collected throughout the site. Catostomid larvae ranged from early life stages through juvenile. We spooked a flock of teal (blue wing) from this backwater when we approached. Haul lengths were 2.3m, 3.4m, 2.8m, 5.0m, 5.6m, 5.1m & 5.2m

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

Appendix IV. MSB specimen and data processing.



River: SJR Date: 11JUL00 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: JL P. ALH

	Below pool 2° Channel	pool above base Main Channel	
Water Temp:	25.3 24.1	34.0°	
Dissolved O_2	4.4 1.8	2.6	Pool @ base
Conductivity:	11.64 milli	37.31 milli	
Salinity:	6.8	19.8	
PHOTOS			

Comments: Fish common - but few in large pool @ base of site. Tadpoles common. Several dead fishes in shallow pools. Tadpoles feeding on dead fish. H$_2$O slightly lower than 6JUL00. 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.