COLORADO RIVER RECOVERY PROGRAM
FY 2013 ANNUAL PROJECT REPORT

RECOVERY PROGRAM
PROJECT NUMBER: C4-b

I. Project Title: **GVIC Fish Screen Return Pipe Monitoring**

II. Bureau of Reclamation Agreement Number: R11PG40021

Project/Grant Period: Start date: 7/20/2011
End date: 9/30/2019
Reporting period start/end date: 10/01/2012 to 9/30/2013
Is this the final report? Yes __X__ No _ _ _

III. Principal Investigators:

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IV. Abstract: The Recovery Program has constructed fish screens in the Government Highline (GVWU) Canal, the Grand Valley Irrigation Companies (GVIC) Canal, and at the Redlands Irrigation Canal (Grand Valley Area Fish Screens) as an important component of recovery efforts for Colorado pikeminnow and razorback sucker. The Service issued a biological opinion for the Grand Valley endangered fish passage facilities containing an incidental take statement to the Bureau of Reclamation for operations of the Grand Valley Project Fish Passage and Government Highline Canal Fish Screen (ES/GJ-6-CO-99-F-033-CP016 MS 65412GJ). The biological opinion required the Recovery Program to develop a plan to monitor the amount of take by September 30, 2001 and incorporate it into the Recovery Action Plan. High water in 2011 and low water in 2012 delayed the project and this project was completed in FY 2013. It is our opinion that little to no fish loss occurs at these facilities directly attributable to the use of these fish return tubes operated at any water control gate elevation.

V. Study Schedule: Completed in FY 2013

VI. Relationship to RIPRAP: Colorado River Action Plan: Mainstem II.B.1b Screen GVIC diversion to prevent endangered fish entrainment, if warranted.

VII. Accomplishment of FY 2013 Tasks and Deliverables, Discussion of Initial Findings and Shortcomings:

Study area: The GVIC Diversion Dam is located on the Colorado River, near Palisade, Colorado, approximately 3 miles below the abandoned Price-Stubb Diversion

Dam at river mile (RM) 185.3.

Description of Proposed Work: USFWS with the technical assistance of the USBR proposed to design and construct a fyke net structure (deflector and fyke net) in the Colorado River to monitor fish screened from the GVIC Canal. A similar system has been used to monitor fish screens in the Columbia River Basin on the Yakima River in the Pacific Northwest (Neitzel et al, 1990; Mueller et al, 1995).

After an impressive water year in 2011, many fisheries projects in the Upper Colorado River were postponed and/or shortened because of safety and equipment limitations. This project was not only postponed, but completely set aside (with Recovery Program Office approval) until FY 2012. The reason for this was that average base flows were never achieved during the time slots that our field station had employees available to perform the work. These record flows in 2011 deposited a large cobble bar within and in front of the return tube, necessitating removal of this bar prior to this experiment in FY 2012. After removal in FY 2012, there was not enough time left in the FY 2012 field season to conduct the experiment. Thus, work on this project was completed in FY 2013.

In addition, after receiving the blueprints of the return tube's outlet structure, we realized that our original punch-plate design would not work. There are concrete walls that start at the shore and continue straight out into the riverbed at a 45 degree angle for approximately 15 ft. The only feasible way to capture released surrogate white sucker was to use a large purse seine, being actively manned by many people, as opposed to the passive sampling method described in our SOW (e.g. fishing via fyke nets). Any other installations of a different passive structure would have exceeded the budget, leaving no funds to cover sampling costs.

Proposed Task 1-Controlled Screened Fish Condition Investigations: White sucker (*Catostomus commersonii*; as an analogous substitute for sensitive native species) of various size classes would be collected from the Grand Valley Water User's Fish Passageway after spring runoff (~ early July) and used to document the effects of canal screening on fish condition. A total of 120 white sucker (if possible, of varying size classes) would be collected from the fish trap and FLOY-tagged for individual identification. Each fish would be weighed, measured, examined and photographed to document general fish condition and health. Twenty white sucker would be sacrificed to complete a baseline fish autopsy based Health Condition Profile (Goede and Mellenthin, 2002) prior to the test. The fish would be acclimated to the canal conditions and released in the GVIC Canal upstream of the fish screen. One test with 50 white sucker will occur in July or August and another in September. During a two-day period following release, fish would be collected in a fyke- net structure attached to the fish return pipeline outlet.

Recaptured fish would be weighed, measured, examined and photographed to determine general fish condition and to evaluate fish descaling. An evaluation system developed by the U.S. Army Corps of Engineers (Basham et al. 1982; Basham method) would be used to monitor the condition of screened fish. Descaling would evaluate ten areas on each fish, five on each side. When 40% or more scale loss is observed in two areas on one side

of a fish, the fish will be classified as descaled. Descaled fish are in poor condition (meaning they have a poor chance for survival). Temporary holding facilities would be installed onsite to hold fish during the descaling evaluation. All recaptured fish would be kept in the holding facility and observed for 48 hours following capture to document mortality. The holding facility would consist of two circular fiberglass tanks 1.22 m (4ft.) in diameter supplied with canal or river water pumped from behind the fish screen. All recaptured white sucker will be sacrificed to perform a complete autopsy based health condition profile developed by the Utah Division of Wildlife Resources (Goede and Mellenthin, 2002).

Actual Task 1-Controlled Screened Fish Condition Investigations; Fish Collections: Staffing was available to complete this work in late October. Unfortunately, because of low base flows, the GVWU's Fish Passageway was shut down on 5 July 2013. Redlands Fish Passageway was also shut down on 15 October 2013. Therefore, white sucker and hybrids with flannelmouth sucker (*Catostomus latipinnis*) and bluehead sucker (*Catostomus discobulus*), common carp (*Cyprinus carpio*), and longnose sucker (*Catostomus catostomus*) were collected, on 22-23 October, by electrofishing crews from the lower Gunnison River (RM 3.0 to 0.7) to be used as analogous substitutes for native sensitive species. After collection, these fish were placed in a stocking truck and were transported to GVIC. The composition of fish used for this experiment included 132 white sucker (55%), 66 white x flannelmouth sucker hybrids (27%), 22 white x bluehead sucker hybrids (9%), 19 common carp (8%), and 2 longnose sucker (1%). The total length (TL) of the sucker species ranged from 130-478 mm, with a mean TL of 245 mm. The TL of the common carp ranged from 151-543 mm, with a mean TL of 364 mm. These fish were measured, weighed, FLOY-tagged, and evaluated with the Basham method by two biologists prior to being held in one circular fiberglass tank 1.22 m (4 ft) in diameter being supplied with canal water being pumped from behind the fish screen. A photograph was taken of each side of all fish.

Facility Description: See inserted pictures and Google Earth image.

The terminal end of the GVIC canal is located in the town of Palisade, Colorado at RM 185.1. The terminal end of the fish return tube is located 129.63 m (0.08 miles) from the dam at 39.100726° latitude and -108.351408° longitude on the south side of the canal. A water control gate is located at the beginning of the return tube and there is a ~1m fall to a 1.22m diameter pipe (or tube) that hits a hard 90° angle ~ 6m from water control gate. The distance to the basal end (end that delivers fish back to the Colorado River) from the terminal end is 201.08 m (0.12 miles). Depending on Colorado River flows (because of downstream water rights) and the needed "head" to deliver water to the basal end of the canal's water users, GVIC staff operate the water control gate at various heights throughout the irrigation season.

Google earth image of GVIC canal intake, fish screen and return tube at an altitude of 5855 ft.

Terminal end of GVIC return tube. Water control gate next to GVIC employee with black hoodie. Fish were released for test where grate has been removed.

Basal end of GVIC return tube. 201.08m (.12 miles) from terminal end. Return tube diameter is 1.22m (4ft.). Technicians are manning the purse seine for fish collection.

Actual Task 1-Controlled Screened Fish Condition Investigations; Fish Experiment:

On 24 October 2013 we ran the experiment by releasing fish at four water control gate heights: 0.5 ft (n = 96 fish), 1.0 ft (n = 44 fish), 1.5 ft (n = 75 fish) and 2.0 ft (gate fully open; n = 30 fish). All fish were analyzed with the Basham method (by two biologists) and photographs were taken of both sides of the fish prior to deploying them into the tube. Fish were released on the downstream side of the gate where the ~1 meter fall began so fish wouldn't have an opportunity to swim upstream of the return tube. As mentioned earlier, the punch plate fyke net was not feasible at the basal end of the return tube. A purse seine was used instead to collect fish (see above picture). All four groups of fish (groupings by aforementioned gate height) were given one hour for collection in the purse seine prior to shutting the water control gate off. All fish collected at the basal end of the fish return tube were measured, weighed, analyzed with the Basham method (by two biologists) and had a photograph taken of each side.

Results:

Thirty (13%) of the 241 fish released in the experiment were collected at the basal end of the

fish return tube. These fish included white sucker (n = 19), white by flannelmouth sucker hybrids (n = 7), white by bluehead sucker hybrids (n = 2), and a common carp (n = 2, both TL = 220mm). The suckers collected ranged in TL from 143 mm to 413 mm, with a mean TL of 219 mm. In addition, six adult native fish were collected that were not part of the experiment (n = 2 bluehead sucker, n = 2 flannelmouth sucker, n = 2 roundtail chub {*Gila robusta*}). Experimental fish that were collected at the basal end of the fish return tube were released at all water control gate heights: 37% at a gate height of 0.5 ft (n = 11), 20% at a gate height of 1.0 ft (n = 6), 40% at a gate height of 1.5 ft (n = 12), and 3% at a gate height of 2.0 ft (n = 1). The non-experimental native fish were collected at all water control gate heights: one bluehead sucker was collected at a gate height of 0.5 ft, one roundtail chub was collected at a gate height of 1.0 ft, two flannelmouth sucker and one roundtail chub were collected at a gate height of 1.5 ft, and one bluehead sucker was collected at a gate height of 2.0 ft.

Basham et al. suggest that when 40% or more scale loss is observed in two areas on one side of a fish, the fish will be classified as descaled. None of the fish collected at the basal end of the GVIC fish return tube met this standard. A white sucker (pink FLOY tag 1279) experienced the highest rate of scale loss with one area losing 35% and another losing 20%. The range of scale loss per quadrant ranged from 0% to 35% with a mean scale loss of 0.62%. In addition, the six native fish were analyzed with the Basham method and the quadrants missing scales ranged from 0% to 10% with a mean observed scale loss of 1%. Pictures of all fish recaptured at the basal end of the fish return tube can be found in the appendix of this report.

Discussion:

This experiment's initial design was fraught with problems ranging from structural, to spatial, to natural challenges. However, the results from the actual experiment conducted are promising for answering the question about endangered fish take at these facilities' return tubes. It is our opinion that little to no fish loss occurs at these facilities directly attributable to the use of these fish return tubes operated at any water control gate elevation. The one exception may be if fish are stranded in the very long tube (201.08 m) when it becomes dewatered. Mark Wernke (US Bureau of Reclamation, pers. comm.) suggests that the length, gradient and debris piling up in the tube (during high water, water pools up in the tube from the basal end, and debris being deposited from the terminal end) most likely contributed to our low recapture of fish during the experiment. However, we believe that a fish that suffered a lot of trauma would have been more likely to be collected in our purse seine because of disorientation. Most of our test fish that were not collected likely remained in the return tube, not making it all the way down to our purse seine during the time our experiment was being conducted. The collection of six native fish outside of our test fish, all found in good condition, further supports our opinion of little take is occurring because of the design of these return tubes. However, these fish may have entered the return tube at the basal end.

VIII. Additional noteworthy observations: *Please see above.*

IX. Recommendations: Considering the length, gradient and potential for debris build-up in the return tubes, we recommend hiring an imaging company to scope the tubes with a camera to

determine if maintenance and/or replacement of sections of the return tubes may be warranted.

X. Project Status: Completed.

XI. FY 2013 Budget Status

A. Funds Provided: $18,100
B. Funds Expended: $18,100
C. Difference: -0-
D. Percent of the FY 2013 work completed, and projected costs to complete: 100%
E. Recovery Program funds spent for publication charges: -0-

XII. Status of Data Submission: Submitted 2013

XIII. Signed: Travis Francis 12/03/2019
Principal Investigator Date

APPENDIX:

References:

Basham, L.R., M.R. Delarm, J.B. Athern, and S.W. Pettit. 1982. Fish Transportation Oversight Team Annual Report, FY 1981-Transport Operations on the Snake and Columbia River: Technical Services Division, Northwest Regional Office, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Portland, Oregon.

Goede, R. and R. Mellenthen. 2002. Excel version: AUSUM, A Computer Program for Autopsy Based Fish Health/Condition Assessment System. Utah Division of Wildlife Resources, Fisheries Experiment Station, Logan, Utah.

Mueller, R. P., CS Abernethy, and D.A. Neitzel. 1994. A Fisheries Evaluation of the Dryden Fish Screening Facility, Annual Report to Bonneville Power Administration, Contract No. DE_A179-93BP00029, Project No. 85-062 (BPA Report DOE/BP-00029-2), Pacific Northwest Laboratory, Portland Oregon, 56 electronic pages.

Neitzel, D.A., CS Abernethy, and E.W. Lusty. 1990. A Fisheries Evaluation of the Westside Ditch and Wapato Canal Fish Screening Facilities, Spring 1989. U.S. Department of Energy, Bonneville Power Administration, Division of Fish and Wildlife, Project No. 1985-62, Contract No. DE-AC06-76RL01830 (BPA Report DOE?BP-01830-8), Portland, Oregon, 94 electronic pages.

Tag 1258

Left Side

Right Side

Before Experiment

After Experiment

Tag 1260

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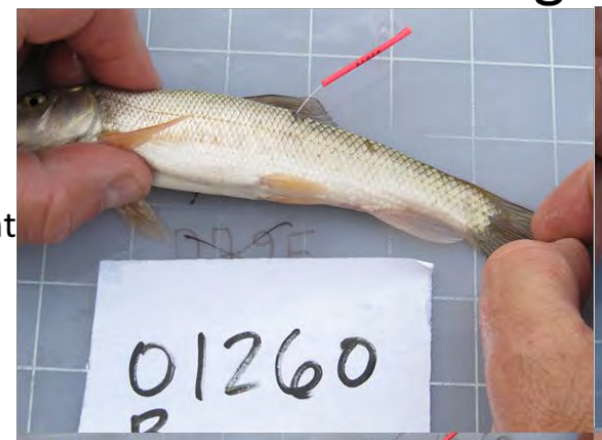
Before Experiment		
After Experiment		

Tag 1263

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Before Experiment

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Tag 1274

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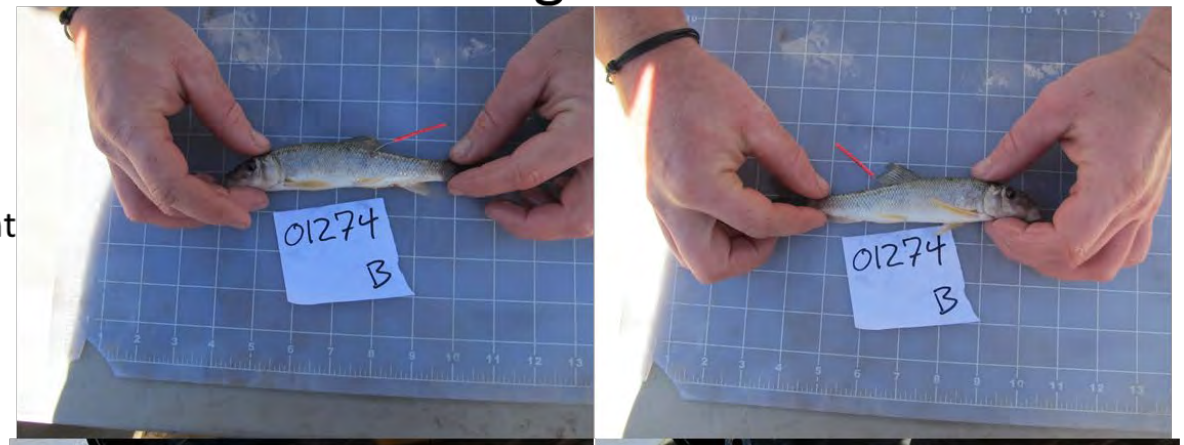
Before Experiment



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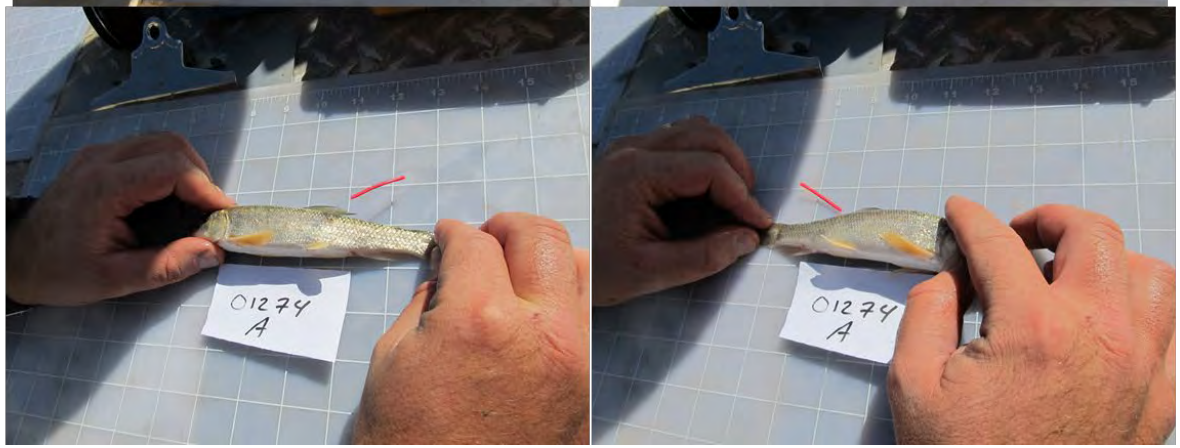

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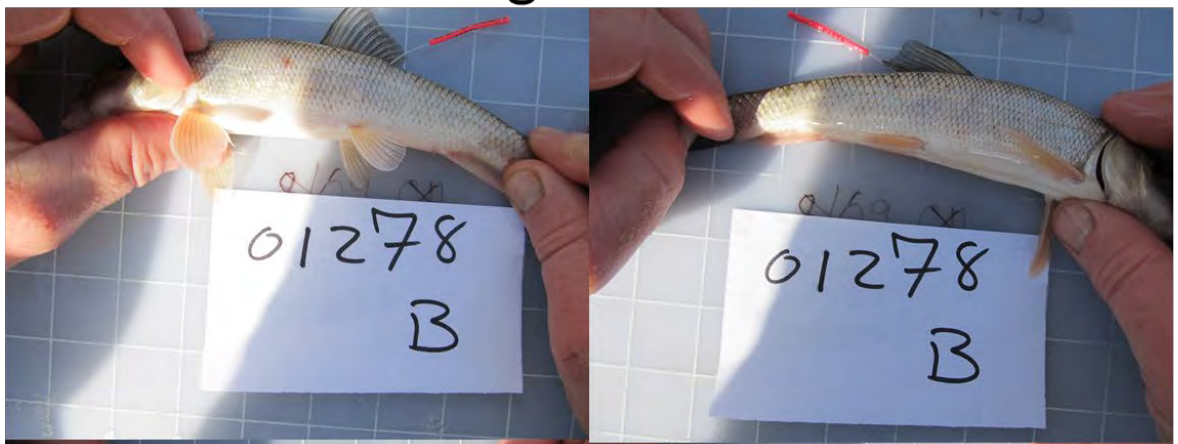

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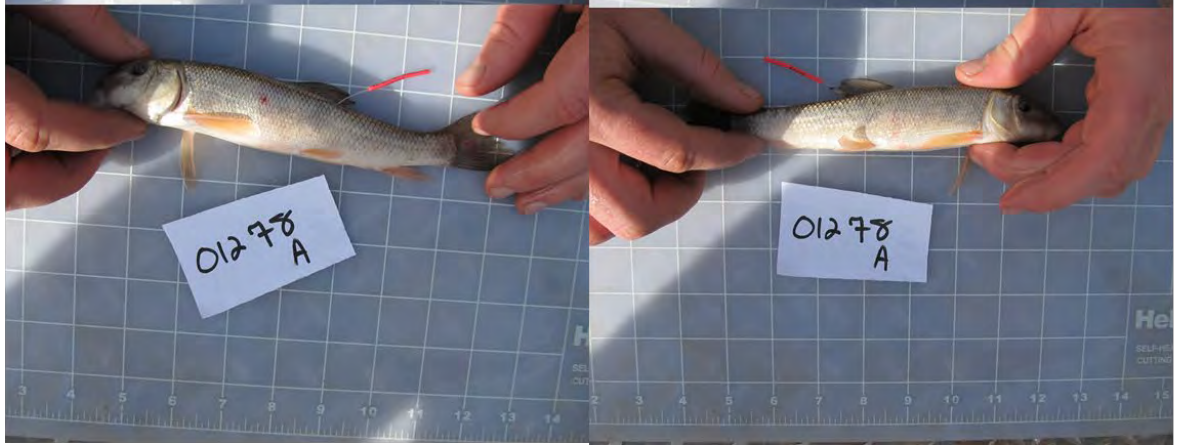

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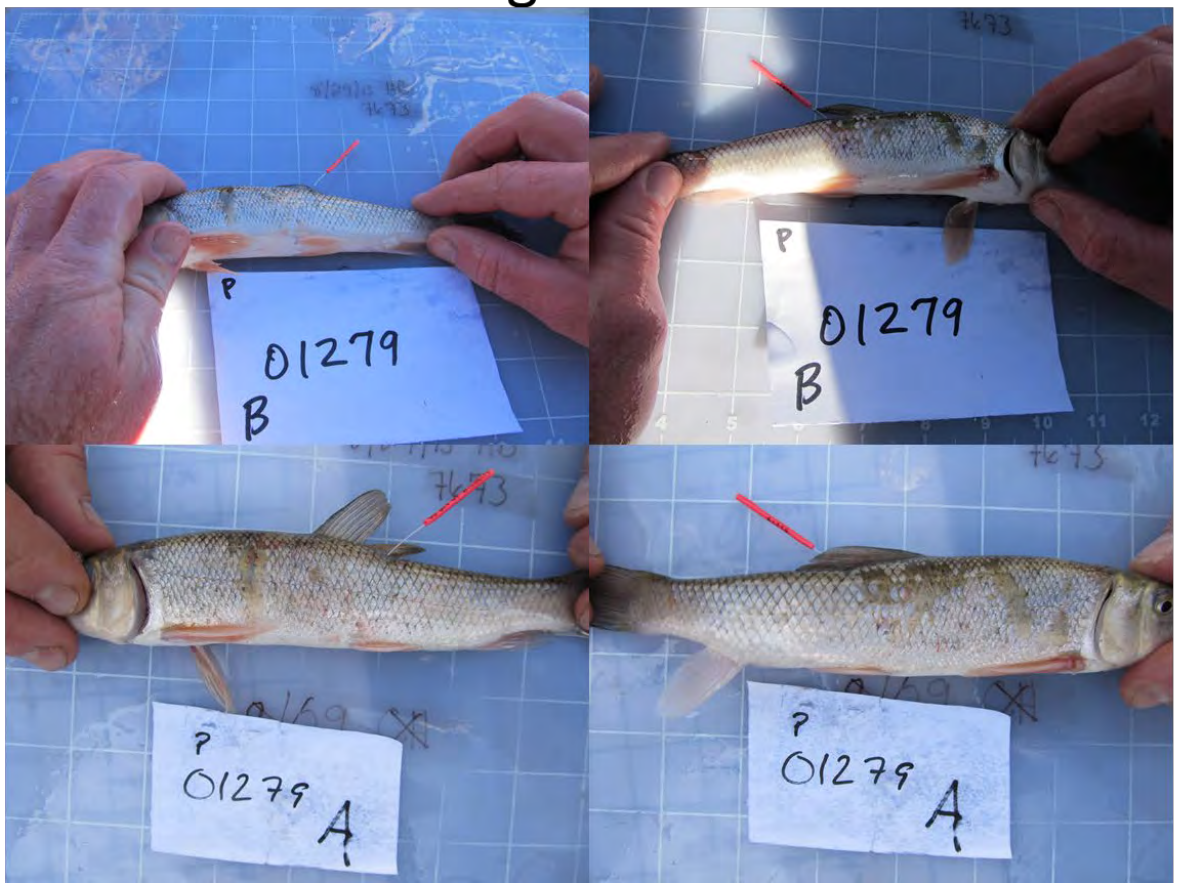

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Tag 1295

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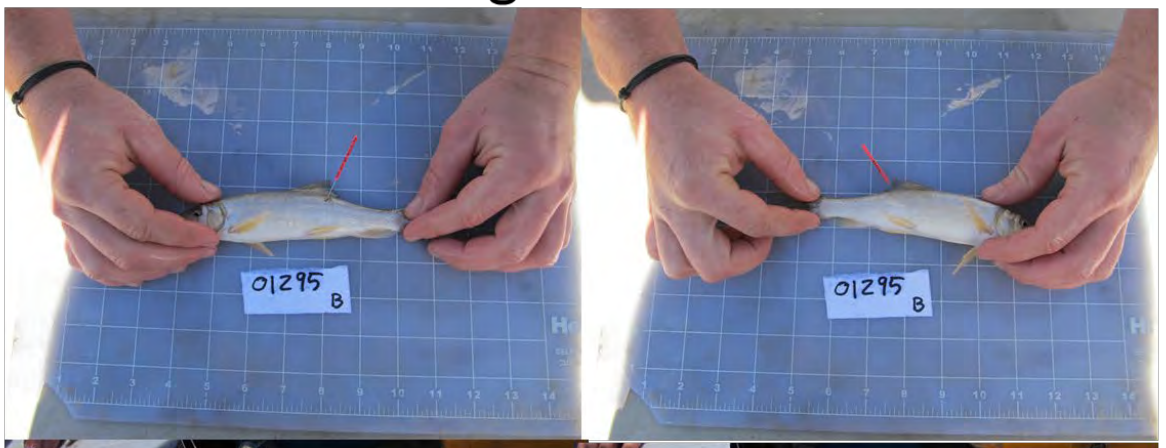
Before Experiment



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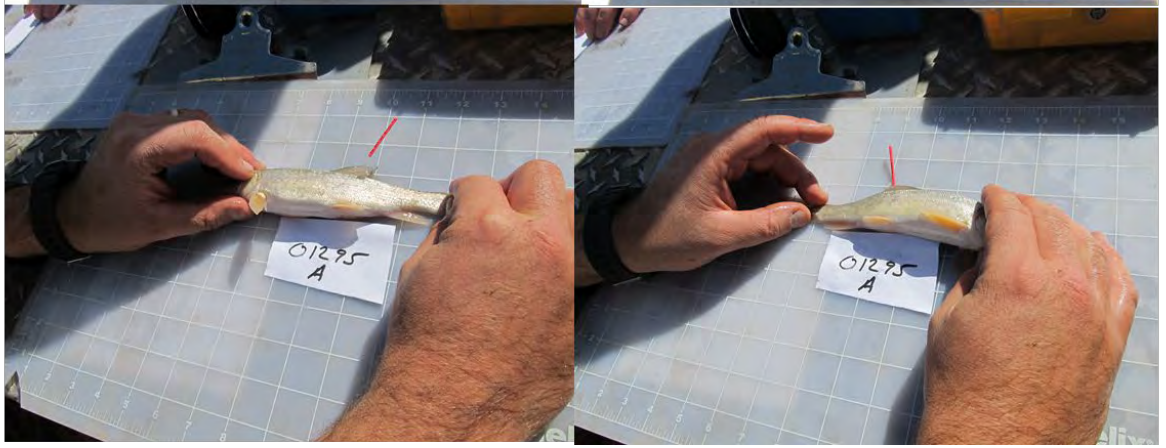

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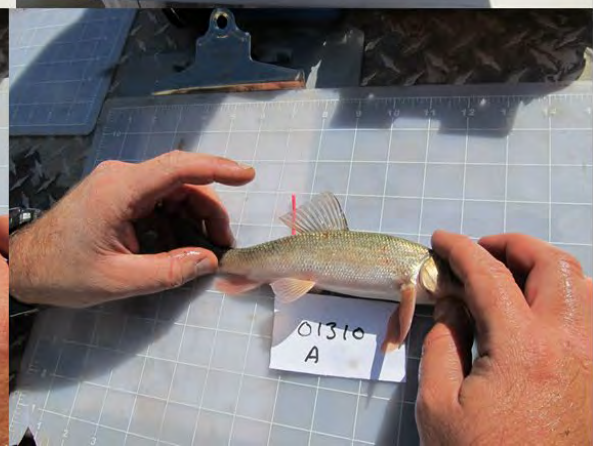
After Experiment		

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Tag 1553

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Tag 1557

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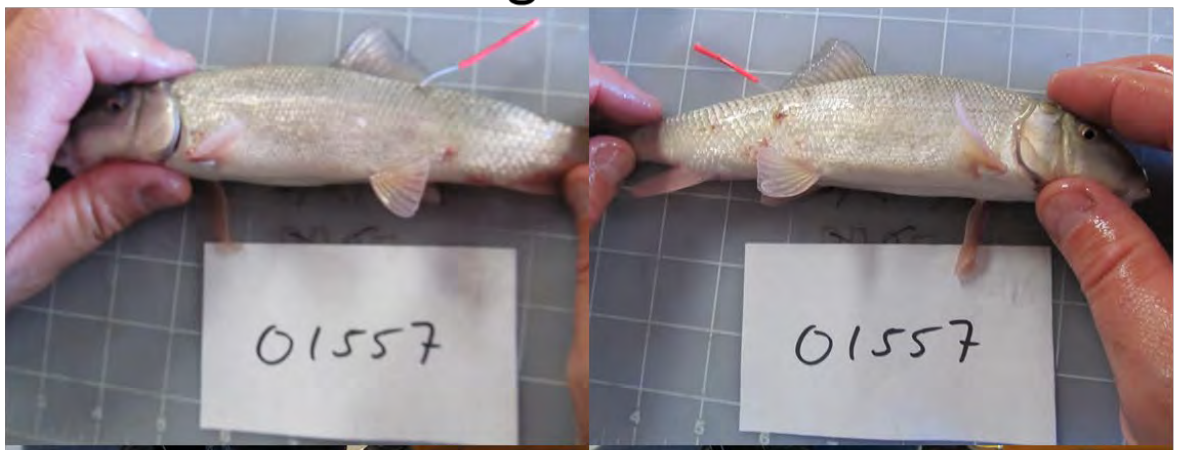
Before Experiment



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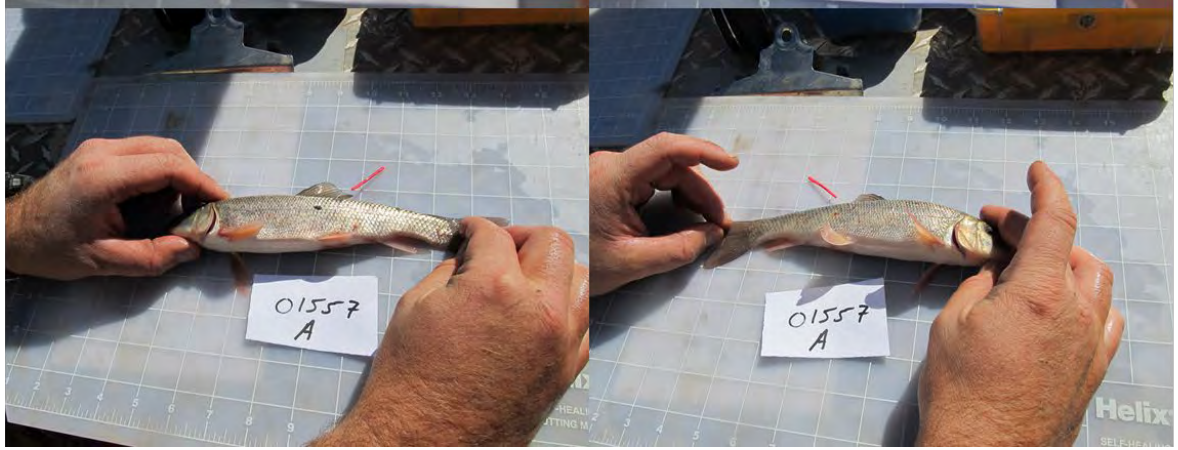

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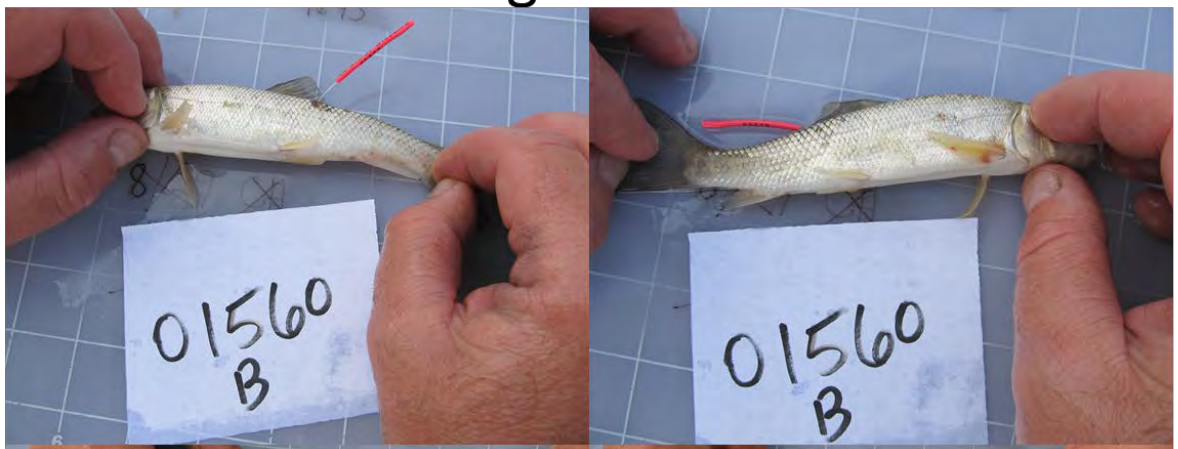

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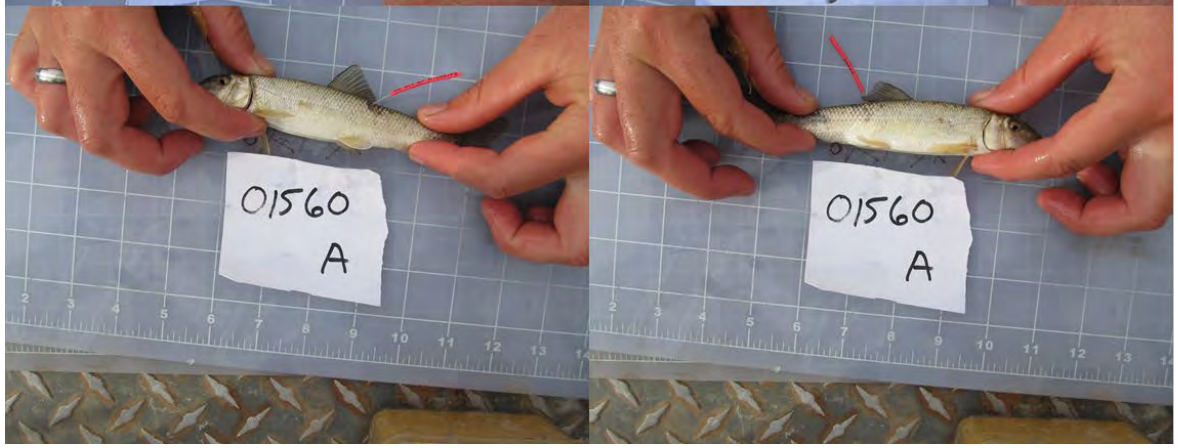

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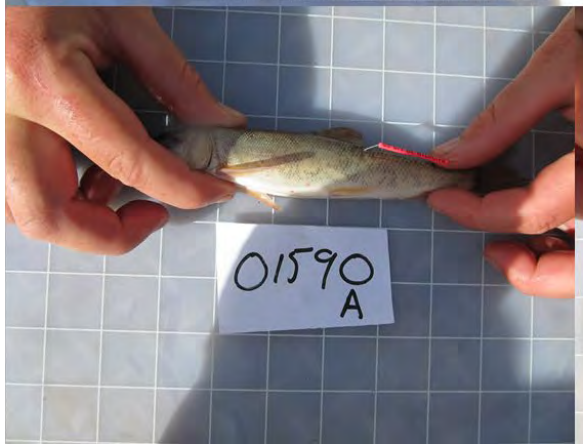
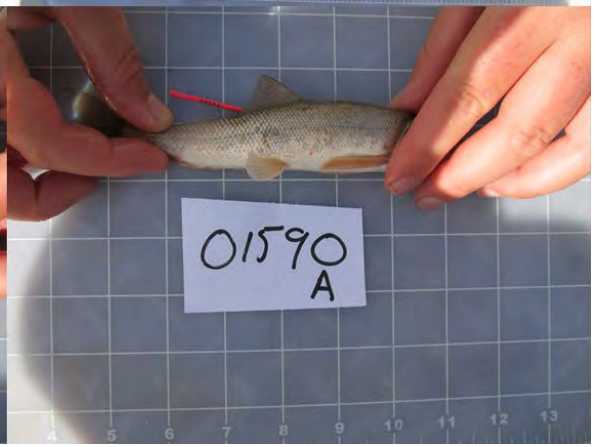
After Experiment		

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Tag 1596

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Tag 1598/1599

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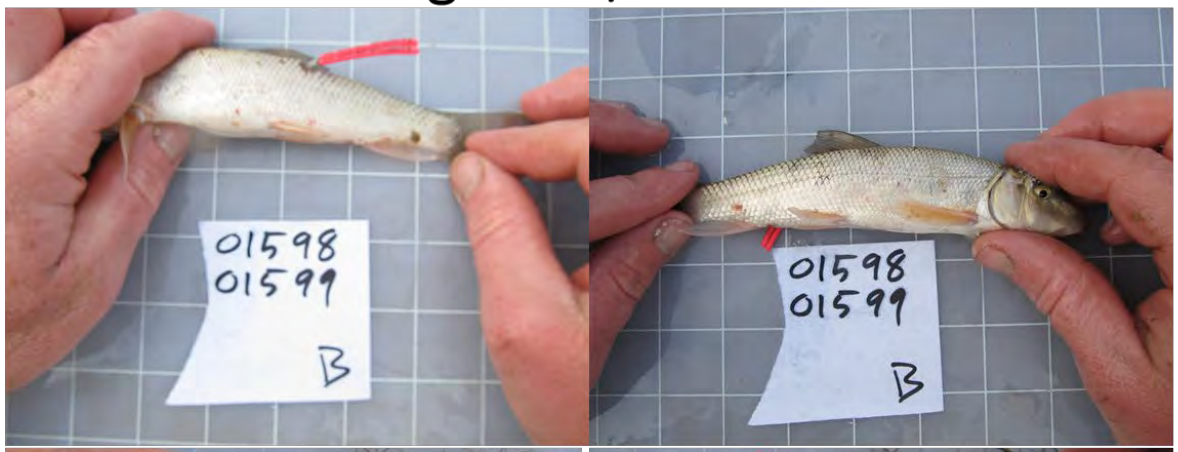

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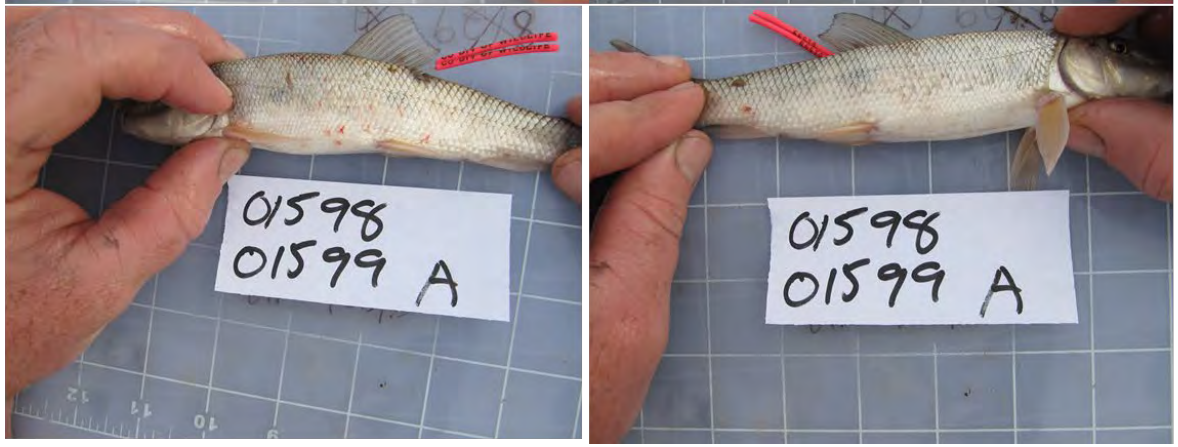

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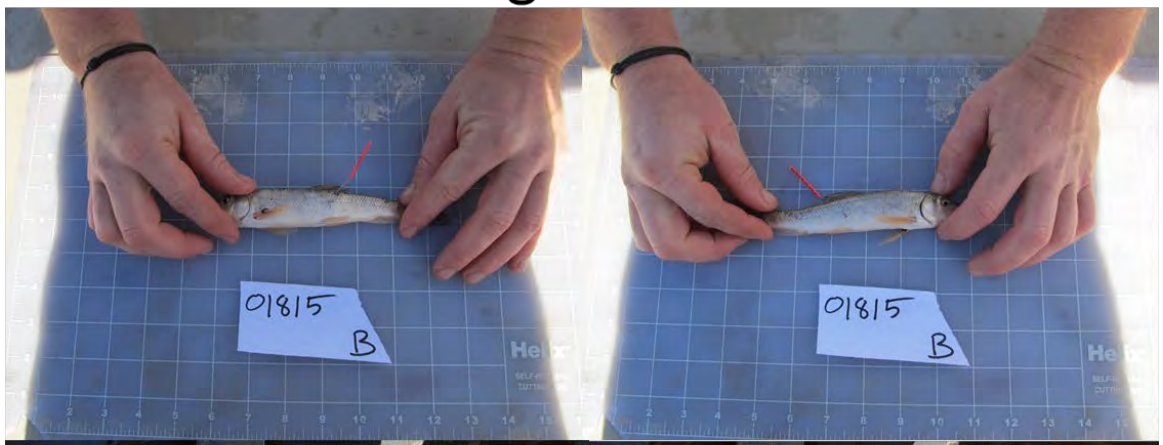

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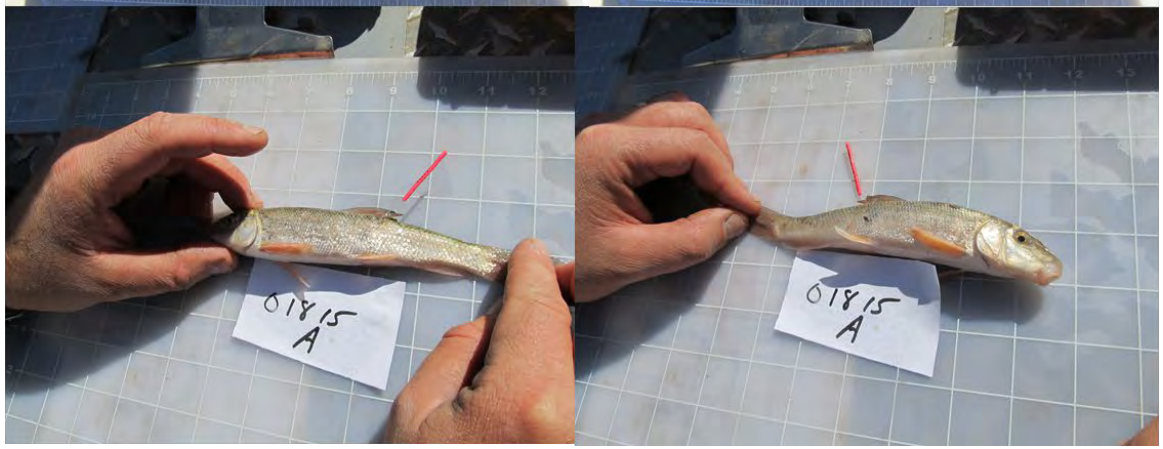

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Tag 1817

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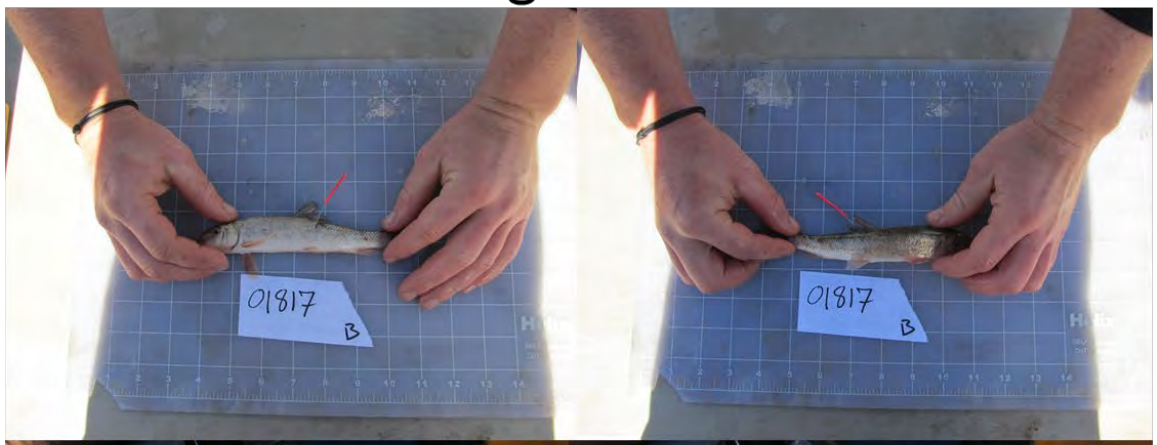

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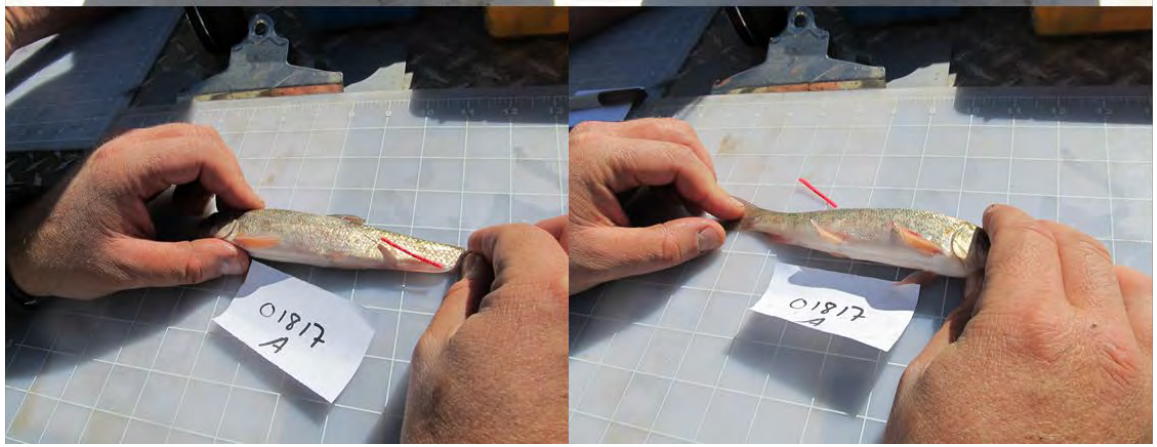

Tag 1821

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Before Experiment

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Tag 1832

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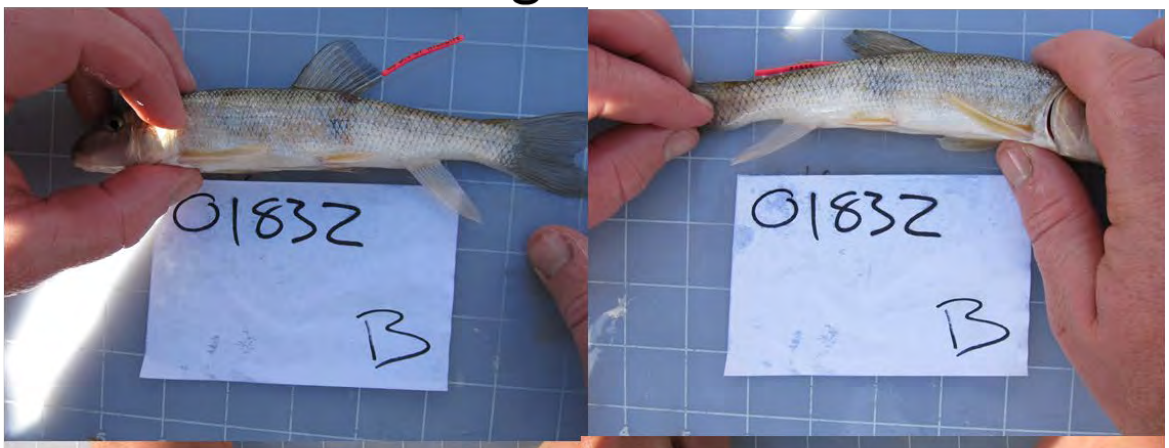

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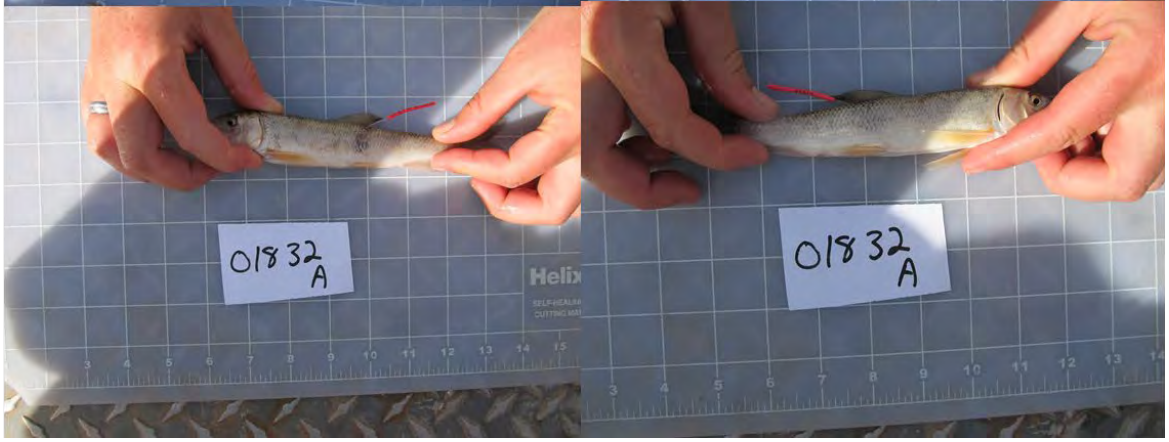
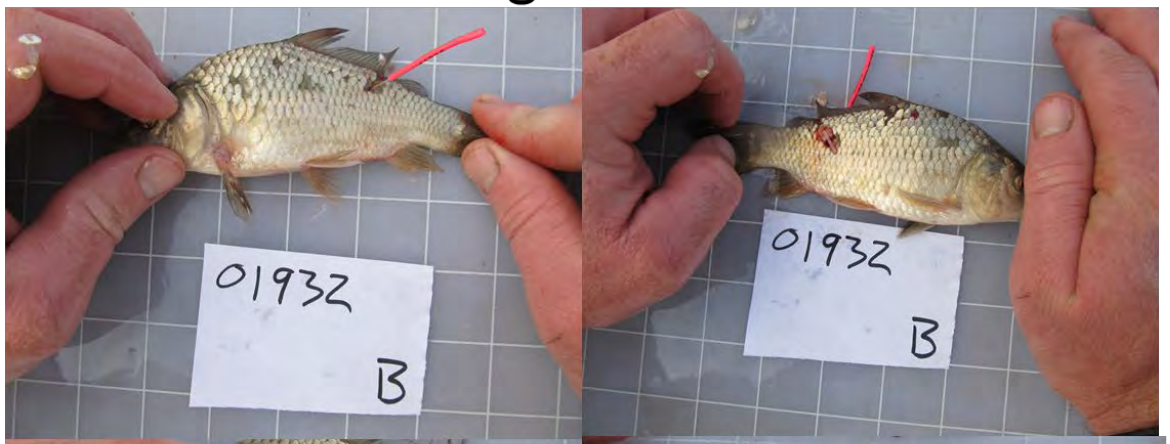


Left Side

Tag 1932

Right Side

Before Experiment



After Experiment

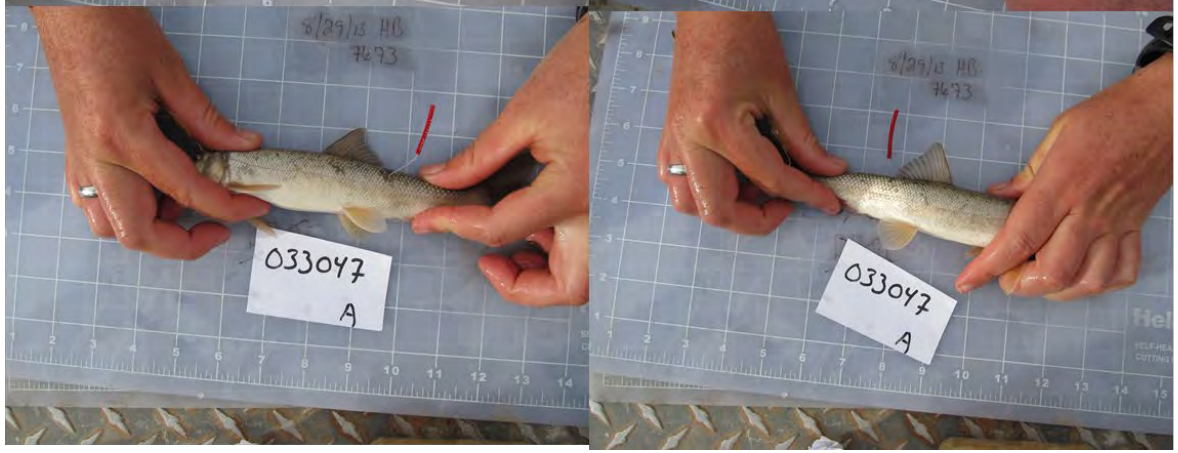
Tag 33047

Left Side

Right Side

Before Experiment

After Experiment



Tag 33075

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Before Experiment

After Experiment

Tag 33078

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Before Experiment

After Experiment

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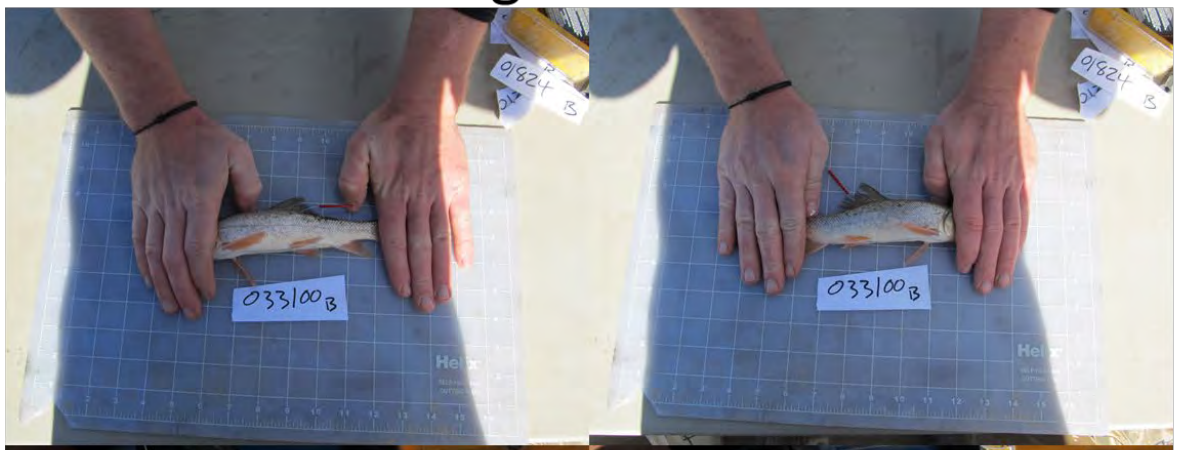
Tag 33100

Right Side

Before Experiment



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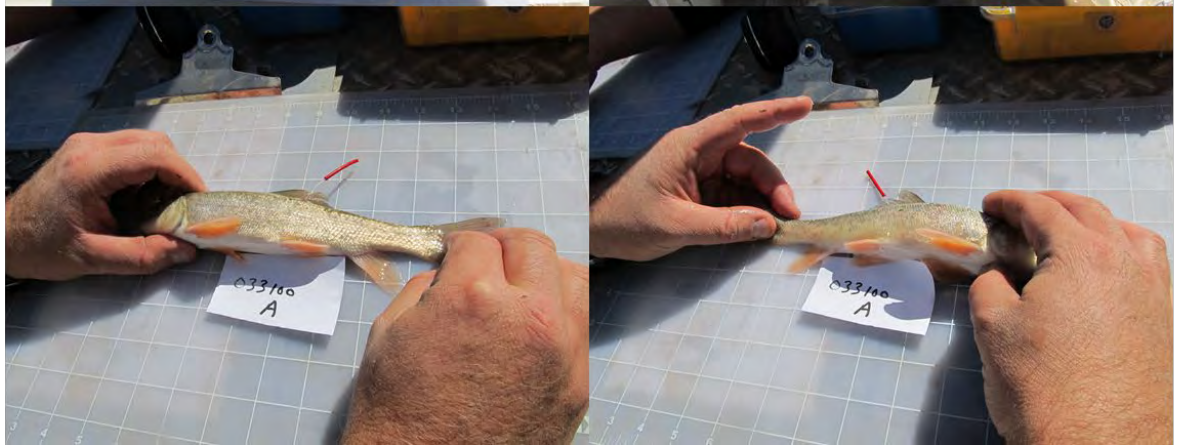


Left Side **bluehead sucker** Right Side

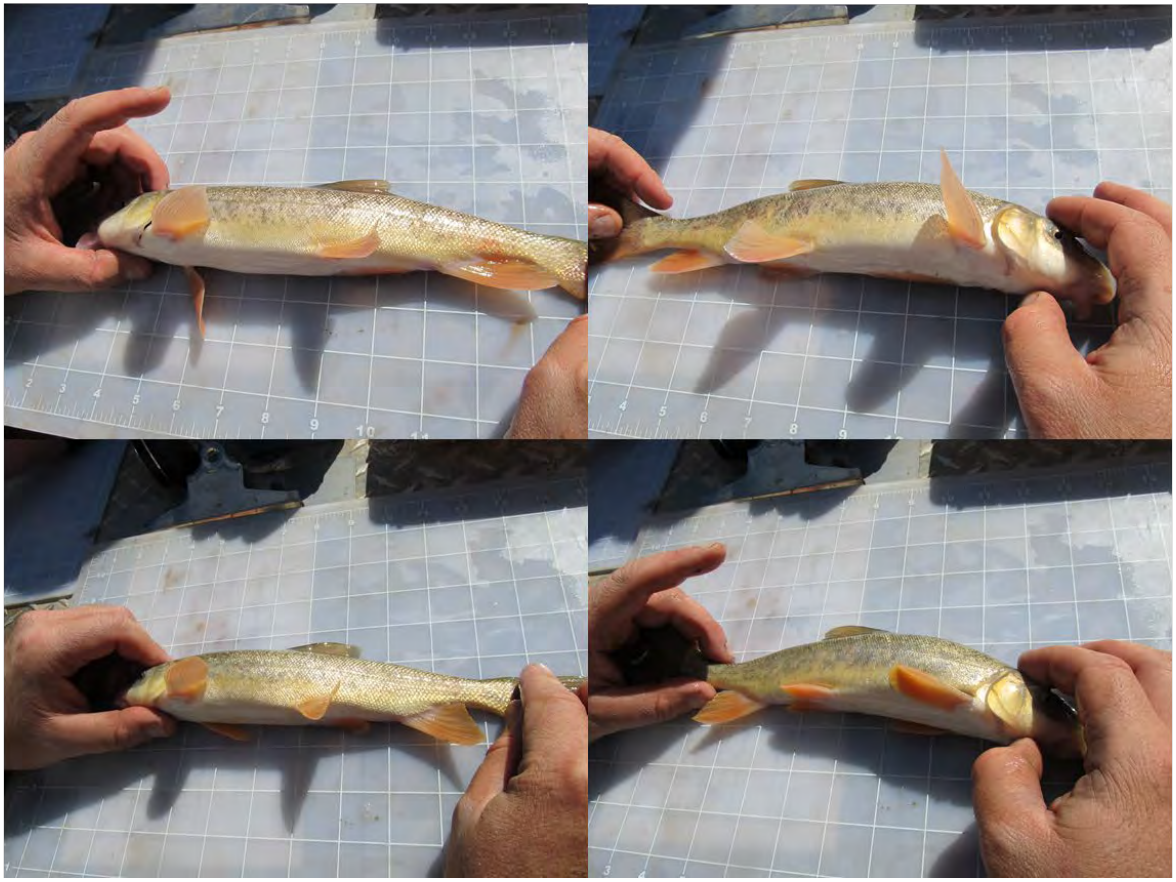
Fish 1

Fish 2

Left Side **flannelmouth sucker** Right Side

Fish 1

Fish 2



Left Side

roundtail chub

Right Side

Fish 1

Fish 2