

## WARM WATER FISH LITERATURE REVIEW, by Rick Anderson

The upper Colorado River basin, which is composed of the Colorado River and its tributaries upstream of Lake Powell, is home to 14 native fish species, four of which are now endangered. These four fish – the Colorado pikeminnow (*Ptychocheilus lucius*), razorback sucker (*Xyrauchen taxanus*), bonytail (*Gila elegans*) and humpback chub (*Gila cypha*) – evolved in the Colorado River basin and exist nowhere else on earth ([www.r6.fws.gov/coloradoriver](http://www.r6.fws.gov/coloradoriver)). The Dolores River is a significant tributary to the Colorado River and thus the status of its native fish community is of keen interest to state and federal agencies that manage native fish.

The Colorado River Recovery Program commissioned a fish survey of the Dolores River downstream of McPhee Reservoir in 1990 and 1991 to determine this river's suitability for endangered Colorado River fishes (Valdez et al 1992). Prior to this investigation, little was known about historical or present use of the Dolores River by Colorado pikeminnow. Valdez et al. (1992) provided a review of earlier surveys:

'The Dolores River once supported unknown numbers of Colorado pikeminnow (*Ptychocheilus lucius*) and perhaps functioned as a spawning tributary for this species in the upper Colorado River. Seethaler (1978) reported that T.M. Lynch seined small pikeminnow from Paradox Valley in 1962. Several other collections of Colorado pikeminnow were reported during the 1950's and 1960's by Lemons (1955), Nolting (1956) and Coon (1965). The most recent collection of Colorado pikeminnow in the drainage was an unconfirmed report by Horpestad (1973), who captured seven individuals in the San Miguel River, approximately 6 miles above its confluence with the Dolores River. No Colorado pikeminnow were captured during a fishery survey of the Dolores River by Holden and Stalnaker (1975) in 19721. More recent surveys by the U.S. Fish and Wildlife Service (Service) in the early 1980's also failed to locate Colorado pikeminnow in the Dolores River (Valdez et al 1982).'

Fish collections by Holden and Stalnaker (1975) included 11 species of which only four were native (flannelmouth sucker, bluehead sucker, roundtail chub and speckled dace). Valdez et al. (1982) collected a total of 16 species and also the same four native species. A total of 19 species, including six native and thirteen non-native fish were captured in the 1990 and 1991 by Valdez et al. (1992). The additional native fish collected in the 1991 survey were mottled sculpin and Colorado pikeminnow. Mottled sculpin were only found in Reach 6, a reach not sampled in prior surveys. Only four Colorado squawfish were collected in 1991 and all were located within 2 km of the

confluence with the Colorado River. No other endangered species including bonytail, humpback chub or razorback sucker were captured by Valdez et al. (1992).

Valdez et al. (1992) employed a variety of sampling gear that included seines, gill nets, trammel nets and boat electrofishing. For all gear types combined the most common species captured were red shiner (33.4%), sand shiner (23.1%) and fathead minnow (18.4%), all non-native cyprinids. Combined the native species totaled 19% of the total catch with flannelmouth sucker (9.2%) the most ubiquitous, followed by roundtail chub (4.6%), bluehead sucker (2.7%) speckled dace (2.5%), mottled sculpin (<0.1%) and Colorado pikeminnow (<0.1%) (Valdez et al. 1992).

Valdez et al. (1992) found strong differences in native fish species composition between river reaches. These reaches were established to account for differences in water quality, geomorphology and flow conditions and are:

Reach 1: Dolores-Colorado River Confluence (RM 0.0 to the Utah-Colorado Stateline (RM 22.7).

Reach 2: Utah-Colorado Stateline to Salt Creek (RM 41.3).

Reach 3: Salt Creek to Dolores-San Miguel River confluence (RM 64.4)

Reach 4: Dolores-San Miguel River Confluence to Paradox Valley at Bedrock (RM 74.8)

Reach 5: Paradox valley at Bedrock to Dolores-Disappointment Creek Confluence (RM 128.7)

Reach 6: Dolores Disappointment Creek Confluence to Bradfield Bridge (RM 177).

Seining typically samples slow-shallow habitats dominated by smaller-bodied fish (length < 120 mm) like non-native cyprinids, speckled dace or age-0 of the large bodied native species. Red shiner, sand shiner and fathead minnow dominated seining collections in all habitats except riffles and isolated pools. Native species were only about 2% native

fish collected in seines in Reach 1. Native composition by seining increased in an upstream direction and was about 10% in Reach 2 and 3, about 20% in Reach 4 and about 26% in Reach 5 (Valdez 1992).

Gill netting and boat electrofishing sample larger main channel habitats and deep pools. These gear types catch both smaller and larger sized fish and flannelmouth sucker, roundtail chub, bluehead sucker, carp and channel catfish, were the most abundant species, respectively, collected in 1990 and 1991 using these gear types.

In 1990 and 1991, flannelmouth sucker were most prevalent in Reaches 3 and 4 at about 52 to 56 % of the catch with the netting and electrofishing gear. Flannelmouth sucker were about 40 to 45% in Reaches 2 and 5, about 20% in Reach 6 and about 15% in reach 1.

Roundtail chub were common in the two upper Reaches (5 & 6) at about 30% of the netting and electrofishing catch. Roundtail chub were uncommon in lower Reaches comprising about 8% in Reach 4 and less than 5% in reaches 1, 2 and 3.

Bluehead sucker were more common in lower Reaches 1, 2 and 3 comprising from 11% to 18%, but were about 5% to 8% in upper Reaches 4, 5 and 6.

In 1990 and 1991, speckled dace were rare in lower Reaches 1, 2, 3, 4 and 5 with only 1 to 3% of the catch, but were common in reach 6 (23%).

Valdez et al. (1992) reported no significant changes in species composition between the 1990 and 1991 samplings to a similar surveys done in 1981 and concluded the ichthyofaunal community remained relatively stable over that ten year period.

The Colorado Division of Wildlife has sampling locations established in the Dolores River. Mike Japhet (biologist in Durango, Colorado) has sampled a 1,000 ft reach below the Dove Creek pump station beginning in 1986 and has accumulated 16 years of data over the last 19 year period. Dove Creek site is located in Reach 6 defined by Valdez et al. (1992). The Dove Creek site was sampled by wade electrofishing using a stationary shore shocker. At least one pass were made, but in most years there were two passes at the site.

The three most common species collected at the Dove Creek site over the 18 year period were roundtail chub, speckled dace and mottled sculpin. Mottled sculpin was the most common species and 1986, 1987 and 1989 (about 50%), but ranked fourth in 2002 and 2003 and was fifth in 2004 at only 8%. Flannelmouth sucker were rare at Dove

Creek (1.3% for the period). Green sunfish were rare from 1986 to 2002 (0 to 1%), but ranked second in 2004 with 21% of the catch (CDOW data obtained from Mike Japhet).

The three most common species collected in 1991 in Reach 6 by Valdez were roundtail chub (27%), speckled dace (24%) and flannelmouth sucker (22%). Mottled sculpin were the least common species (<1%) found by Valdez in 1991 in Reach 6.

Fish community composition was fairly stable at the Dove Creek site from 1986 to 2000 (Japhet, CDOW). During that time period the nonnative fish with the greatest influence were brown and rainbow trout. When trout were excluded, native species comprised between 95 to 100% of the remaining catch at Dove Creek site from 1986 to 2000. In 2002, 2003 and 2004 native composition dropped to 79, 76 and 67%, respectively (trout excluded). The large increase in fathead minnow and green sunfish after 2002 appear to be a result of habitat or temperature alterations due to reduced flow conditions in recent years.

Another Colorado Division of Wildlife study area was established by Rick Anderson (Researcher in the Grand Junction Office) in Big Gypsum Valley which is about 15 miles downstream of the confluence of Disappointment Creek in Reach 5. Anderson (2002) sampled the fish community at Big Gypsum in 2000 and 2001 as part of a habitat suitability/instream flow study. The Big Gypsum site was again sampled in 2004 as part of a drought evaluation study on various rivers (Anderson 2005).

Anderson (2002) did mark and recapture sampling that produced density and biomass estimates for fish larger than 150 mm. In 2000 the two most common species for larger fish (<150 mm) were roundtail chub (55%) and flannelmouth sucker (16%) and these were also the most common fish in 2001 (Table 1). In 2004 roundtail chub were 29% and flannelmouth sucker were rare at only 2%. The density estimates for roundtail chub and flannelmouth sucker were very low on the Dolores River compared to the other study rivers and Anderson (2005) suggested a high degree of fine sedimentation had impacted productivity.

In 2004 native species comprised 53% of the total catch, less than in 2000 (81%) and 2001 (65%) (Table 1). Black bullhead was the most common fish > 150 mm (44%) in 2004, but was uncommon in 2000 (5%) and 2001 (0.6%). Anderson (2005) concluded that sedimentation appeared to have increased suitable habitat for black bullhead and he further speculated that predation by a large bullhead population could be responsible for the reduced flannelmouth sucker and roundtail chub abundance in 2004. The Big Gypsum site is scheduled to be sampled in 2005 (Anderson 2005).

Table 1, Species composition for fish >150 mm and total fish in sample.

Species Composition	Fish over 150 mm			All fish collected		
	2000	2001	2004	2000	2001	2004
Flannelmouth sucker	16	58	2	10	21	3
Bluehead sucker	2	6	1.2	1.0	12	0.7
Roundtail chub	55	25	39	51	18	30
Channel catfish	16	8	6	8	2.2	3
Carp	3	1.7	7	1.7	0.4	4
Green sunfish	2	1.4		4	1.5	4
Brown trout				0.3	0.4	-
Black bullhead	5	0.6	44	2.5	0.5	26
Speckled dace				18	13.5	18
Red shiner				2.8	28	8
Sand shiner				0.1	1.8	1.2
Fathead minnow				0.1	0.4	1.4
Native species	73.1%	87.9%	42.9%	80.5%	64.9%	52.5%

The shift in species composition for flannelmouth sucker and roundtail chub between years (2000 and 2001) was similar to Reach 5 data reported by Valdez et al (1992) for collections made in 1990 and 1991. In 1990 the most common fish was roundtail chub (48%) followed by flannelmouth sucker (35%), but in 1991 flannelmouth sucker (51%) ranked first and roundtail chub (20%) second. Instability in species composition was not observed in other rivers with these native species (Anderson 2004). The most likely explanation is these species are dominated by young age-groups (Age 0 and Age 1) and minor changes in year class strength between years can result in large variations in abundance between years.

Native fish composition and abundance were found to be poor downstream of the San Miguel confluence, a river reach heavily impacted by poor water quality due to uranium tailings (Valdez et al. 1992). The river upstream of the San Miguel confluence appears to have the greatest potential for native fishes, but this river reach is highly vulnerable to altered flow regimes. Concerns about adequate instream flows and releases from McPhee dam have been an issue since the reservoir became operational in 1986. The Dolores River Biology team was formed in 1990 to provide biologically sound recommendations for managed releases from McPhee Dam (Mike Japhet, personal comm.). This Biology Team consists of one member from each of the following agencies and organizations: Bureau of Land Management, Bureau of Reclamation, Colorado Division of Wildlife, U.S. Fish and Wildlife Service, U.S. Forest Service, and Trout Unlimited.

The Biology Team considered their flow recommendations to be the minimum necessary to avoid degraded trout and native fish communities. As biological minima, they felt fish flows should not be subject to shared water shortages in dry years. In recent years releases from McPhee have been much less than the recommendations. The

observed decline in native fish abundance appears to be a consequence reduced runoff and base flows. The provision that included the fish pool in sharing shortages during the recent drought period appears to be problematic for persistence of a thriving native fish community.

Currently management of roundtail chub, flannelmouth sucker and bluehead sucker has been a state and not a federal responsibility. There are currently few rivers in the state that have high biomass populations of these species and in recent years large declines have been documented in the Yampa River. Roundtail chub had a secure population in the Dolores River until recently. Habitat protection for roundtail chub in the Dolores River has become a priority issue for state fisheries managers.

Powerpoint show on 17<sup>th</sup>.

Currently the Dolores River is a high priority habitat for native fish and the CDOW has established sites for habitat and fish monitoring. This upgraded status is primarily based on declines in roundtail chub and flannelmouth sucker populations for both state-wide and basin-wide scales. The loss of roundtail chub from the Dolores River appears avoidable at this time, given habitat/flow protection is quickly implemented. Presumably the Dolores River genetic strain of roundtail chub, flannelmouth sucker, and bluehead sucker is better fit to persist in upper Dolores River, since they were able to persist given historic (gage records) flow conditions. Extirpation of roundtail chub from the Dolores River could likely result in more intensive inquiries and negotiations on management of this species.

