

AN EVALUATION OF NATIVE FISHES
OF THE FREMONT RIVER
IN OR NEAR CAPITOL REEF NATIONAL PARK

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Introduction

Surveys of fish populations in the Fremont River in Capitol Reef National Park (CRNP) were conducted by the Utah Division of Wildlife Resources (UDWR) in cooperation with the National Park Service to evaluate potential effects of an accidental release of rotenone and potassium permanganate into the river by UDWR. In 1991, UDWR discovered whirling disease (*Myxobolus cerebralis*) in trout populations in the Fremont River drainage upstream from CRNP and in several nearby private aquaculture facilities. A plan was developed to control the spread of the disease which included chemical treatment projects to remove infected trout populations. Although plans did not include treating the river as far downstream as CRNP, dead and dying fish were reported within the park boundaries during a treatment project conducted on November 19-20, 1991. Despite efforts to detoxify river flows before they entered the park, it was thought that the fish kill was a result of either rotenone (the fish toxicant) or potassium permanganate (the detoxifying agent) or both. Initial inspections within the park indicated a fish kill or drift of dead and dying fish from upstream. To evaluate any potential impacts, surveys were planned for 1992 to examine fish populations within the Fremont River in CRNP. Specific objectives of the survey were to see if the chemical reclamation project had greatly reduced or eliminated any native fish species, and to compare fish abundance by species with previous survey data.

Methods and Study Area

Fish populations were sampled on May 5, 1992 with Coffelt Model BP-1C back pack electrofishing gear. Sampling methods and population estimate techniques were patterned after those used by Hardy et al. (1989). Sample areas were selected to include between 1,000 and 1,200 ft² of stream surface area. Stream length at individual stations ranged from 35 to 55 ft. Total numbers of fish in a station were estimated by stock depletion from multiple electrofishing passes through each station. Multiple passes were conducted until the number of fish captured was less than 10% of the highest number captured from previous passes. Population estimates were made for each fish species.

Sample sites (Table 1 and Figure 1) were selected and numbered to correspond with areas surveyed by Hardy et al. (1989). Station 3 was located above the confluence of Fish Creek, just downstream from the Grover bridge. Moving downstream, station 4 was adjacent to the campground in CRNP (Hardy et al., 1989, subdivided this station into locations numbered 4a, 4b, 4c, and 4d to include several more upstream sites). Station 5 was near the parking area for the trail to Hickman Natural Bridge in CRNP, and Station 6 was 7.6 miles east of Fruita, also in CRNP.

Because of the short lengths of stream sections sampled at each station, some supplemental electrofishing was also conducted. This was done simply to provide a general idea of fish abundance at each site and to verify if sampling within station boundaries adequately reflected species diversity and abundance.

Figure 1 also shows the locations of the detoxification stations where potassium permanganate was applied to the river. The lowermost rotenone application station was approximately 11 miles upstream of the first detoxification station.

Data from this study were compared to McAda et al. (1978), Hardy et al. (1989), and to UDWR file reports of previous stream surveys (Collotzie and Worthen 1970; Hepworth and Leppink 1982), as well as other references on the Fremont River.

Results

Native suckers and a native minnow were found to be abundant at all locations sampled within CRNP (Table 2). These included flannelmouth suckers (*Catostomus latipinnis*), bluehead suckers (*Catostomus discobolus*), and speckled dace (*Rhinichthys osculus*). Only one mottled sculpin (*Cottus bairdi*) was found during this survey (at Station 4). Mottled sculpin have only been reported upstream from the confluence of Sulphur Creek, with increasing abundance occurring further upstream (Collotzie and Worthen 1970; McAda et al. 1978; Hepworth and Leppink 1982; Hardy et al. 1989). Mottled sculpin never have been numerous at the locations sampled during this study in CRNP. In addition, mottled sculpin are difficult to sample even under ideal electrofishing conditions. Turbid water from return irrigation flows at Fruita and dense growth of algae made sampling for this species especially difficult.

The only exotic species found during this survey within CRNP was the leatherside chub (*Gila copei*), a native to nearby Great Basin streams in the Sevier River drainage. A total of three leatherside chubs were found at Station 6, the furthest downstream area sampled.

Hardy et al. (1989) reported finding numerous redbside shiners (*Richardsonius balteatus*) in CRNP and considered them a native species. Redside shiners were not found in collections made during this study. Redside shiners have been abundant at times in reservoirs in the drainage above CRNP. These reservoirs were probably the source of redbside shiners reported by Hardy et al. (1989). It is our belief that redbside shiners are an exotic fish in the Colorado River drainage, having been transferred from the Great Basin as described by Sigler and Miller (1963).

No fish were found at Station 3, upstream from CRNP near the confluence of Fish Creek. Supplemental electrofishing in this area produced only two Utah chubs (*Gila atraria*). Utah chubs are also a Great Basin fish, exotic to the Colorado River drainage but abundant in the upper Fremont River drainage, particularly in lakes and reservoirs. The failure to find flannelmouth suckers, bluehead suckers, and speckled dace at Station 3 was not unexpected, however, because they had never been found at this location during any previous surveys (Collotzie and Worthen 1970; Hepworth and Leppink 1982). The only native fish found previously at Station 3 that was not found during this study was the mottled sculpin. Even this should not be surprising because this survey station was located only a short distance below the second detoxification station and was likely heavily impacted by the treatment

(Figure 1).

In general, a variety of sizes of native suckers and speckled dace were found at all sample locations within CRNP (Table 2). Total lengths of flannelmouth suckers ranged from 74 to 475 mm. Bluehead suckers ranged from 55 to 309 mm. Speckled dace ranged from 52 to 103 mm in total length. Some differences in fish sizes were evident among sampling stations but no distinct trend was evident. Supplemental electrofishing at each station typically produced a wider range in sizes. Because sample stations were only 35-55 ft in length, the presence or absence of such stream characteristics as pools, riffles, cover, etc. had a great influence on species composition and sizes of fishes within a single station. Overall, numerous year-classes were represented for all native suckers and speckled dace. Adults of spawning ages were numerous, and recently hatched fry of one or more unidentified species were abundant in shallow backwater pools and eddies at all sample locations. Although fry were visually observed, they were too small to collect by electrofishing or identify macroscopically.

Population estimates showing fish densities in terms of number of fish per 1,000 ft² of stream surface were generally high (Table 3). Even though fish densities were usually less during this study compared to that reported by Hardy et al. (1989), all native species except mottled sculpin were still abundant. The lowest value found for any station within CRNP for flannelmouth suckers during this study was 2 fish per 1,000 ft² (greater than 2 fish for each 30 ft section of stream), compared to Hardy's et al. (1989) reported low of 3 fish. Similarly, for speckled dace this study's lowest estimate was 4 fish per

1,000 ft² compared to a 1989 low of 9 fish. For bluehead suckers, comparisons of low values were 4 and 17 fish, respectively, for this study and the 1989 study (Hardy et al.).

Discussion

As the Fremont River flows from west to east through CRNP it undergoes a rapid transition from a generally cold water stream at an elevation of 6,040 ft to a warm-water desert stream at an elevation of 4,960 ft. Along with decreasing elevation and increasing water temperatures, the stream channel and geology changes as numerous washes and gullies enter the Fremont's channel, increasing the probability of flood waters and high silt loads, and becoming more typical of the main Colorado River itself.

Fish populations have adapted to this same transition in environments. The fishes found in CRNP are either derived from downstream and associated with the main Colorado River (such as the flannelmouth and bluehead suckers), or are from cold water upstream sources such as the mottled sculpin. Historically, habitat for native cutthroat trout (*Oncorhynchus clarki pleuriticus*) also extended downstream as far as CRNP, before they were extirpated. Populations of fishes from the lower river have a limit to their upstream extension, which is located somewhere between Station 3 and 4. Upstream limitations might occur because of physical barrier such as rapids or waterfalls, or because of other changes in the environment related to elevation and temperature. Failure of these lower river species to be

found above Station 4 was documented as long ago as 1970 (Collotzie and Worthen 1970). In much the same way, mottled sculpins have a downstream limit to their range. Hardy et al. (1989) found mottled sculpins only in areas above Station 4 (as its location was described in this study), likely because of changes in water quality near the confluence of Sulphur Creek.

The invasion of exotic fishes into the Fremont River in CRNP is possible from both upstream or downstream sources. Many headwater lakes, streams, and reservoirs in the Fremont River drainage are popular sportfisheries and over the years have become focal points for introduction of sport fishes as well as other species from the Great Basin (Popov and Low 1950; Sigler 1953). Redside shiners, for example, are abundant in a number of localities in the upper Fremont drainage. The ability of redside shiners to extend downstream a great distance was documented by Hardy et al. (1989). They found redside shiners to be abundant at all survey stations in CRNP. However, numbers of redside shiners within a population can fluctuate drastically from year to year. Even though none were found during the present study, this species is still abundant in upstream areas of the drainage. Also, redside shiners occur most frequently in streams in slow pools and backwater areas, where sampling was not conducted to a great extent during this study. Redside shiners still could exist in considerable abundance in many slower pool areas within CRNP. Likewise, it is apparent that leatherside chubs have become established from the Great Basin and could expand to inhabit most of the river within CRNP.

Two species of suckers native to the Great Basin (Sigler and

Miller 1963; Sigler and Sigler 1987) are also found in the upper Fremont River drainage, although they have not been found in CRNP. Utah suckers (*Catostomus ardens*) are found in the Fish Lake area and extend downstream to at least Bicknell. Mountain suckers (*Catostomus platyrhynchus*) are established in the headwaters of Fish Creek with populations in Blind Lake, Fish Creek Reservoir, and Beaver Dams Reservoir. Suitable habitat appears to exist for both of these species in at least the west end of CRNP above Station 4, making them candidates for invasion.

Bluehead suckers, which were abundant at Stations 4, 5, and 6 in CRNP, should not be confused with either the mountain sucker or the desert sucker (*Catostomus clarki*). Hardy et al. (1989) mistakenly listed this fish as the mountain sucker in the text of their report and the desert sucker in a table. These fishes are distinctly separated by geographical areas, sizes, and other key characteristics. Bluehead suckers are most closely associated with the main Colorado River and major tributaries. For the most part, the desert sucker is restricted to the Virgin River drainage in Utah, while the mountain sucker is a small fish generally found in cold water locations of the Great Basin.

Colonization of the river within CRNP by exotic fishes from downstream sources fortunately has not occurred. Potential invading species include sunfishes (*Lepomis* spp.), carp (*Cyprinus carpio*), catfishes (*Ictalurus* spp.), and various other minnows. One of the greatest concerns in other portions of the Colorado River drainage has been the widespread invasion and colonization of new areas by the exotic red shiner (*Cyprinella lutrensis*). This species has expanded throughout

much of the Colorado River system. McAda et al. (1978) collected several red shiners in the Fremont River far below CRNP. Red shiners, however, were not found in the Fremont River during this study. McAda et al. (1978) also found a few fathead minnows (*Pimephales promelas*) in the lower Fremont River downstream from CRNP. No fathead minnows were found during this study.

None of the native fishes found in CRNP are listed as threatened or endangered. Although abundance of mottled sculpins in CRNP is uncertain, they are very common in many drainages in Utah, both within the Colorado River drainage and the Great Basin. Speckled dace also are abundant in many locations and in a wide variety of habitats throughout Utah. The flannelmouth sucker and the bluehead sucker were designated as being common and locally common, respectively, by the Colorado River Wildlife Council (1977) in the state of Utah. Although still common, these suckers are likely the fish of most interest in CRNP because of their association with the Colorado River system. The roundtail chub (*Gila robusta*) is also a species native to the Colorado River system, which has been found in the Fremont River drainage downstream from CRNP (McAda et al. 1978). No roundtail chubs, however, have ever been reported within CRNP. Habitat alterations and fragmentation of habitats throughout the Colorado River drainage, while not eliminating these populations, have the potential to cause negative impacts and future declines in numbers of these species.

As an example, the artificial waterfall (an upstream fish barrier) in CRNP is just one case where fragmentation of habitats and isolation of small groups of native fishes has occurred. Although the fish above

the falls can contribute genetically to fish downstream, the opposite is not true. In the event of competition from exotics, natural disasters, or man-caused stresses, upstream fish populations above the waterfall cannot be reinforced or repopulated from downstream. In the event of exotic fish invading from downstream areas, however, the waterfall could serve to isolate and protect native fish populations.

When comparing data on fish numbers from this study to previous work, one can only speculate as to the reasons for differences. With the exception of mottled sculpins, estimated numbers of all fish were high. High fish abundance found in 1992 can best be put into perspective when the number of fish is related to the short distances of stream sampled. Within every 35-ft section of stream sampled in CRNP, numerous ages and sizes of native suckers and speckled dace were found. Differences in fish population estimates between different years are as likely the result of differences in random sampling of pools and riffles, water clarity differences, variability in electrofishing gear, differences in dipnetting techniques, or other factors such as flash floods or droughts, as they are a reflection of actual population changes. A detailed statistical analysis of fish population estimates between sampling dates to determine the impact of the chemical treatment is impossible due to the many variables which could have affected fish numbers. In fact, such an analysis is unnecessary, since the numbers of fish observed in 1992 was still high. Although the treatment project very likely reduced fish populations in CRNP to some extent, in the final analysis, there was no clear indication of major negative impacts on native suckers or minnows. Given the natural reproductive potential

of native species in suitable environments, there should not be undue concern. The chemical treatment project accomplished UDWR's intentions of removing trout from the Fremont River downstream from Mill Meadow Reservoir, while at the same time avoiding serious impacts to native fishes in the lower portions of the river.

Recommendations

Some question still exists on overall abundance of mottled sculpins. However, some mottled sculpins were moved from an upstream area of the Fremont River drainage to the river near Station 3 to insure that these fish would be replenished in areas near CRNP. This was done prior to treatment projects near Mill Meadow and Forsyth reservoirs during October, 1992. In addition, it should also be noted that mottled sculpin were still present in the Fremont River near Bicknell, Utah, following the 1991 chemical treatment project. Mottled sculpin were found during the 1992 treatment project in August, and were evidently being recruited to the river from side springs and tributaries that did not require chemical treatment to remove trout. Other species were also found including Utah chubs, redbottom shiners, and leatherside chubs. Mottled sculpin numbers will be monitored over the next several years in the river near Station 3 (upstream from CRNP) to assess their abundance. If a healthy population does not become established, additional corrective actions will be considered.

It does not appear that any supplemental actions are needed to augment populations of native suckers and speckled dace. Populations

are healthy as indicated by abundant numbers of fish of numerous sizes. Trying to assess impacts of the rotenone spill any further or define what constitutes a normal level of fish abundance is not possible. Environmental conditions of the Fremont River within CRNP vary among such extremes that fish numbers can fluctuate within a wide range and still represent healthy populations. There is no such thing as a static carrying capacity for the river. Recovery from the rotenone spill has either taken place already or reductions in abundance were minor.

Any additional surveys that might provide more information or might be of general management interest are outside of the objectives and scope of this study, and need to be addressed separately.

References

- Collotzie, A. and D. Worthen. 1970. Stream survey, Utah State Division of Fish and Game, file report. Fremont River Section 3, Station 3-7-1. Salt Lake City.
- Colorado River Wildlife Council. 1977. Endemic fishes of the Colorado River system a status report. Prepared by the Endemic Species Committees, Nevada Department of Fish and Game, Las Vegas, Nevada.
- Hardy, T. B., B. A. Bartz, and W. Carter. 1989. Impact analysis of the proposed Fremont River hydropower project. Twelve-Nine, Inc. Logan, Utah.

- Hepworth, D. K. and J. Leppink. 1982. Stream survey, Utah State Division of Wildlife Resources, file report. Fremont River Section 3, Station 3-7-2. Salt Lake City.
- McAda, C., C. Phillips, C. R. Berry, and R. S. Wydoski. 1978. A survey of endangered, threatened, and unique fish in southeastern Utah streams within the coal planning area. Utah Cooperative Fishery Research Unit, Utah State University, Logan.
- Popov, B. H. and J. B. Low. 1950. Game, fur animal and fish introductions into Utah. Utah State Department of Fish and Game, Misc. Publication Number 4, Salt Lake City.
- Sigler, W. F. 1953. The rainbow trout in relation to the other fish in Fish Lake. Bulletin 358, Agriculture Experimental Station, Utah State Agricultural College, Logan.
- Sigler, W. F. and R. R. Miller. 1963. Fishes of Utah. Utah State Department of Fish and Game, Salt Lake City, Utah.
- Sigler, W. F. and J. W. Sigler. 1987. Fishes of the Great Basin a natural history. University of Nevada Press, Reno.

Table 1. Physical descriptions of survey stations on the Fremont River in or near CRNP.

Station	Description
Station 3	Approximately 1/2 mile below bridge on highway U12 upstream from confluence with Fish Creek - station length 35 ft - area 1,190 ft ² .
Station 4	Behind CRNP building near campground at Fruita - station length 55 ft - area 1,100 ft ² .
Station 5	Approximately 1/4 mile downstream from parking area for trail to Hickman Natural Bridge - station length 35 ft - area 1,085 ft ² .
Station 6	Located 7.6 miles downstream from CRNP headquarters at Fruita - station length 35 ft - area 1,138 ft ² .

Table 2. Numbers, species, and sizes of fishes sampled from the Fremont River in or near CRNP, May 1992 (exotic species are listed in parentheses).

Station	Species	1st Catch	2nd Catch	3rd Catch	4th Catch	Total	Standard Error	95% C.I.	Size range mm TL
Station 3									
	No fish collected	-	-	-	-	0	-	-	-
Station 4									
	Bluehead sucker	6	8	2	1	17	5.2	17-27	145-309
	Flannemouth sucker	1	1	2	0	4	1.8	4-8	162-250
	Speckled dace	4	0	0	0	4	0	4	89-103
	Mottled sculpin	0	1	0	0	1	0.6	1-2	119
Station 5									
	Bluehead sucker	2	0	1	-	4	1.9	3-8	209-263
	Flannemouth sucker	2	0	0	-	2	-	2	400-475
	Speckled dace	3	6	0	-	11	3.3	9-14	81-96
Station 6									
	Bluehead sucker	18	1	-	-	19	0.3	19-20	55-135
	Flannemouth sucker	3	0	-	-	3	-	3	74-107
	Speckled dace	23	2	-	-	25	0.5	25-26	52-78
	(Leatherside chub)	1	2	-	-	3	-	-	50-102

Table 3. Comparison of native fishes sampled during 1992 in the Fremont River in or near CRNP to previous collections (population estimates listed as number per 1,000 ft²).

Station and Collections	Bluehead Sucker	Flannelmouth Sucker	Speckled dace	Mottled Sculpin
Station 3				
Current study	0	0	0	0
UDWR 1970	0	0	0	numerous
UDWR 1982	0	0	0	4
Station 4				
Current study	15	4	4	1
Hardy et al 1989	17	3	9	0
Station 5				
Current study	4	2	10	0
Hardy et al 1989	30	4	99	0
Station 6				
Current study	17	3	22	0
Hardy et al 1989	34	10	105	0

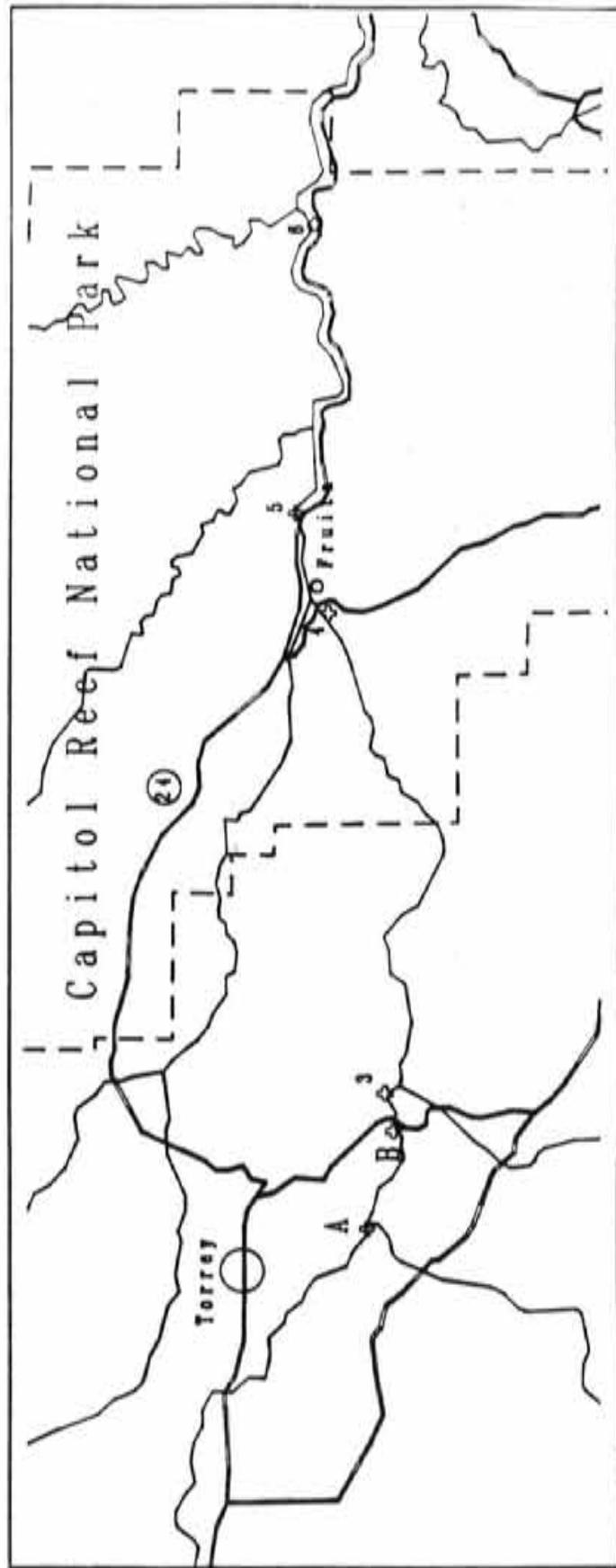


Figure 1. Fremont River study reach illustrating fish sampling and detoxification stations.