Freshwater fishes of Mojave River, California: past and present

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ABSTRACT

The Mohave tui chub, *Siphateles bicolor mohavensis* was extirpated from the Mojave River by the 1960's (Miller, 1969, Cal-Nevada Wild. Trans. 1969:107-122) and currently persists in four highly modified isolated habitats. Arroyo chub, *Gila orcutti* appeared in the Mojave River in 1930's, presumably as a released bait fish and hybridized with native Mohave tui chub (Hubbs and Miller, 1943, Pap. Mich. Acad. Scie. Let. 28:343-378). By 2002, an additional 22 non-native fishes had entered the Mojave River watershed (Swift 1993, Bull. Sout. Calif. Acad. Sci. 92(3): 101-167; Moyle, 2002, Inland fishes of California). We conducted surveys to determine the existing fish species in the middle and lower reaches of main stem of the river in order to assess the suitability of the river for a potential reintroduction of Mohave tui chub. We did not observe *S. b. mohavensis* in either place. We found a total of six exotic species which belong to five families (Cyprinidae, Gasterosteidae, Ictaluridae, Centrarchidae and Poeciliidae) and some presumed hybrids among some of the cyprinids. Two of these species occurred in Afton Canyon with one species dominating the catch and a presumed hybrid, while all six were present upstream in Mojave Narrows. We found records for 19 non-native fish species from Mojave River main stem since 1917. The number of non-native species increased rapidly starting in the 1970's probably due to fisheries practices. The dynamics of the fish community provide some insights to the process of species replacement. As Hubbs and Miller (1943) reported, we observed the apparent replacement of a resident species (*G. orcutti*) with a recently introduced non-native (*Lavinia exilicauda*). We also observed evidence of rapid hybridization between these two non-native species. Current prospects for reintroducing Mojave tui chub to Mojave River appear very limited.

INTRODUCTION

- The Mohave tui chub, *Siphateles bicolor mohavensis* was extirpated from the Mojave River in the 1960's (Miller 1969; Hubbs and Miller 1943).
- Arroyo chub, *Gila orcutti* appeared in the Mojave River in 1930's, presumably as a released bait fish and hybridized with native Mohave tui chub (Hubbs and Miller 1943).
- Additional non-native fishes entered the Mojave River watershed through a combination of deliberate and incidental introduction via the California Aqueduct (Swift 1993; Moyle 2002; Marchetti *et al.* 2004).
- By 2002, 23 non-native species were reported in the Mojave River drainage (Swift 1993; Moyle 2002; Marchetti *et al.* 2004).

METHODOLOGY

Historic Data

- We utilized the data from USGS invasive species database, Los Angeles County Museum of Natural History fish collection, historic publications and recent surveys to construct the fish invasion history of Mojave River.

Field Surveys

- Electrofishing, trapping and seining were used to survey the fish community in Mojave Narrows (middle reaches) and Afton Canyon (lower reaches), in order to assess the suitability of the river for a potential reintroduction of Mohave tui chub.

Sampling Sites

Figure 1: Mojave River at Mojave Narrows, CA
Photo © Sujan M. Henkanaththegedara

Figure 2: Mojave River at Afton Canyon, CA
Photo © Sujan M. Henkanaththegedara

RESULTS

Mojave River invasion history

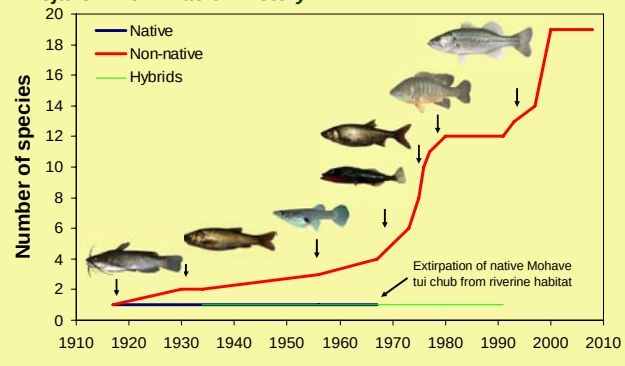

Figure 3: Invasion history of Mojave River. The Mohave tui chub (the only native species) was extirpated from the river by 1970's and by 2008, non-natives total reached 19 species.

Species composition

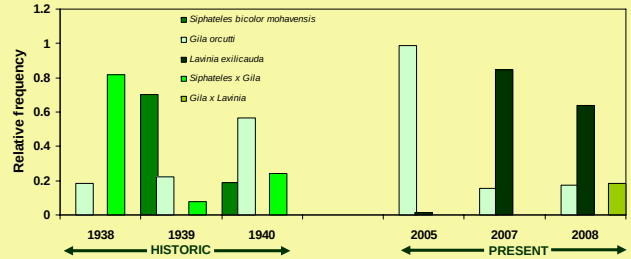

Figure 4: Fish invasion in Afton Canyon, CA. 1938-1940 data from Hubbs and Miller, 1943 (Pap. Mich. Acad. Scie. Let. 28:343-378).

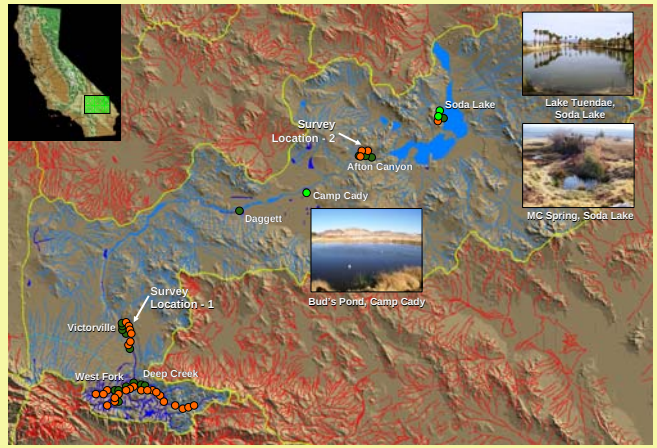

Figure 5: Distribution of Mohave tui chub and non-native fish species in Mojave River.
● Historic and ● current distribution of Mohave tui chub ● Distribution of non-native species
Present survey locations are shown with arrows.
(Source: http://www.esg.montana.edu/gl/huc/h8c/117.70334.163115.33835.49712360846; Inset photos © Sujan M. Henkanaththegedara)

RESULTS

Table 1: List of fish species recorded in Mojave River (including Silverwood Lake), CA. Species recorded from the current survey are marked with an asterisk.

Family	Common Name	Scientific Name	First Record
Cyprinidae	Mohave tui chub	*Gila bicolor mohavensis*	1857
	Arroyo chub*	*Gila orcutti*	1930
	Hitch*	*Lavinia exilicauda*	1973
	Sacramento splittail	*Pogonichthys macrolepidotus*	1977
	Fathead minnow	*Pimephales promelas*	1980
Catostomidae	Sacramento sucker	*Catostomus occidentalis*	1973
Ictaluridae	Brown bullhead	*Ictalurus nebulosus*	1917
	Black bullhead*	*I. melas*	1975
	Channel catfish	*I. punctatus*	2000
Poeciliidae	Western mosquitofish*	*Gambusia affinis*	1956
Salmonidae	Rainbow trout	*Oncorhynchus mykiss*	1975
	Brown trout	*Salmo trutta*	2000
Gasterosteidae	Three-spine stickleback*	*Gasterosteus aculeatus*	1967
Centrarchidae	Green sunfish*	*Lepomis cyanellus*	1976
	Bluegill sunfish	*L. macrochirus*	2000
	Largemouth bass	*Micropterus salmoides*	2000
Percidae	Bigscale logperch	*Percina macrolepida*	1993
Moronidae	Stripped bass	*Morone saxatilis*	2000
Cottidae	Prickly sculpin	*Cottus asper*	1976
Channidae	Northern snakehead	*Channa argus*	1997

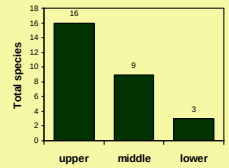

Figure 6: Species richness of non-native fish in upper (including Silverwood Lake), middle and lower reaches of Mojave River.

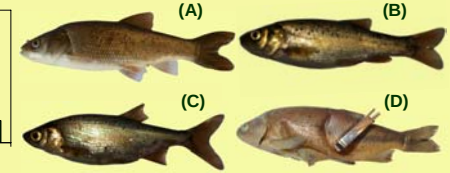

Figure 7: Some cyprinid fishes of Mojave River, CA. (A) Mohave tui chub (*Siphateles bicolor mohavensis*); (B) Arroyo chub (*Gila orcutti*); (C) Hitch (*Lavinia exilicauda*) and (D) presumptive *Siphateles* X *Gila* hybrid collected in 1991 (LACM 45542-1)
(Photos A-C © Sujan M. Henkanaththegedara; D © Jeffrey A. Seigel)

DISCUSSION & CONCLUSION

- Fish community of Mojave River consists only of non-native fishes; 19 species, 16 genera, 11 families.
- We see evidence of species replacement of *Gila orcutti* with *Lavinia exilicauda* which is reminiscent of the historic placement of the Mohave tui chub by the arroyo chub.
- Current prospects for reintroducing Mohave tui chub to Mojave River appear very limited.

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DESERT FISHES COUNCIL