



Catostomus murivallis, a new species of sucker (Cypriniformes: Catostomidae) from Wall Canyon Creek, Surprise Valley, in Northwestern Nevada, U.S.A.

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Abstract

Since 1934 when it was originally collected by C. L. Hubbs and R. R. Miller, a *Catostomus* from Wall Canyon Creek has been considered a putative species. Occurring in a limited range in Surprise Valley, Washoe Co., Nevada, USA, this undescribed Wall Canyon Sucker exhibits an overall similarity to other *Catostomus* species that are naturally distributed in close geographic proximity. Molecular phylogenetic and population genetic studies have included the Wall Canyon Sucker and refined its relationships such that it is the sister taxon of the Warner Sucker *Ca. warnerensis* endemic to the Warner Basin of Oregon and closely related to the Owens Sucker *Ca. fumeiventris* of the Owens Valley in California. All three lineages occupy drainages just east of the Cascade Range and the Sierra Nevada mountains in western North America. Multiple genetic data sources support the separation of the Wall Canyon Sucker from *Ca. murivallis* and *Ca. warnerensis* with at least a Pleistocene division without recent gene flow. Here, we formally describe *Catostomus murivallis* sp. nov. from Wall Canyon Creek in Surprise Valley. *Catostomus murivallis* is statistically significantly different from *Ca. fumeiventris* and *Ca. warnerensis* at 16 of 34 and 17 of 34 morphometric characters investigated. Three of four and two of four meristic characters respectively were found to be significant different as well between *Ca. murivallis* and the two valid and closely related *Catostomus* species.

Key words: Catostomini; Conservation; Desert Fishes; Endangered Species; Great Basin

Introduction

The Wall Canyon Sucker was first collected in 1934 by C.L. Hubbs and R.R. Miller (Miller *et al.* 1991) from Wall Canyon Creek, Surprise Valley, Nevada. Hubbs and Miller recognized this sucker as a new species and tentatively assigned a specific epithet in an uncompleted manuscript (Miller 1990, pers. comm. to G. Scopetone). Despite long-standing interest in this taxon and conservation concerns, it remains undescribed.

Although not formally described, several authors have referred to the Wall Canyon or Surprise Valley Sucker in scientific manuscripts and Endangered Species Act documentation as an undescribed species (e.g., Siebert and Minckley 1986; U.S. Fish and Wildlife Service 1994, Bagley *et al.* 2018). The affinities of the Wall Canyon Sucker to several other *Catostomus* species including the Warner Sucker *Ca. warnerensis* Snyder 1908, Modoc Sucker *Ca. microps* Rutter 1908, Tahoe Sucker *Ca. tahoensis* Gill & Jordan 1878, and Owens Sucker *Ca. fumeiventris* Miller 1973 were indicated by Siebert and Minckley (1986) by overall similarity in lip structure, scalation, coloration and body shapes. Subsequent integrative anatomical and molecular phylogenetic study refined the placement of the Wall Canyon Sucker as the sister lineage of the Warner Sucker, in a clade of three *Catostomus* species that also includes the Owens Sucker (Bagley *et al.* 2018). This clade, Clade 6a of Bagley *et al.* (2018), is distributed from southcentral

Oregon to eastern California on the eastern side of the Cascade Range and Sierra Nevada mountains in Great Basin sub-basins (Figure 1). Conservation interest in the Wall Canyon Sucker resulted in the generation of a genome-wide SNP data set (RADseq) to further test the reality of a Wall Canyon Sucker species as well as provide insights in the population genetics of this putative species (Campbell *et al.* 2023).

In a reanalysis of the molecular phylogenetic data set of Bagley *et al.* (2018), Campbell *et al.* (2023) included mitochondrial sequence data from the Cui-ui *Chasmistes cujus* Cope 1883 (Dowling *et al.* 2016). A clade composed of the Wall Canyon, Warner, Owens suckers and the Cui-ui was indicated as a result expanding the membership of Clade 6a of Bagley *et al.* (2018). A version of the fossil-calibrated phylogeny of Campbell *et al.* (2023) is presented as Supplemental Figure S1. A median divergence time estimate of 16.36 million years ago from other catostomine fishes and a median estimated time to most common recent common ancestor of 9.40 million years ago were inferred for the clade containing the Wall Canyon Sucker and its three nearest relatives.

The Wall Canyon and Warner suckers were found to be sister lineages and the Cui-ui was placed as the sister taxon of the Owens Sucker in the molecular phylogenetic analyses of Campbell *et al.* (2023). However, genome-wide sequence data was not included from the Cui-ui in that study and the nuclear genome relationships of the Cui-ui to the Owens Sucker could not be assessed. Geographically, the composition of the Wall Canyon Sucker clade is sensible as all four species are restricted to the western Great Basin. The Cui-ui is still found in Pyramid Lake and was found in the adjacent Winnemucca Lake in recent times in the Lahontan Basin. The Owens Sucker is restricted to the Owens Valley and there were historical connections to the Lahontan Basin leading to the exchange of ichthyofauna (e.g., Su *et al.* 2022). Likewise, the Warner Sucker and Wall Canyon Sucker are geographically proximate with exchange of ichthyofauna possible. This placement of the Cui-ui with three *Catostomus* species provides important context; however, questions about the monophyly of catostomine genera and invoking hypotheses of parallel evolution, reticulate evolution or hybridization scenarios is beyond the scope of this study. Numerous studies may be consulted for additional perspective on the intertwining of *Catostomus* and other genera (e.g., Bangs *et al.* 2018; Bangs *et al.* 2020; Campbell *et al.* 2023; Chen and Mayden 2012; Dowling *et al.* 2016; Smith *et al.* 2018).

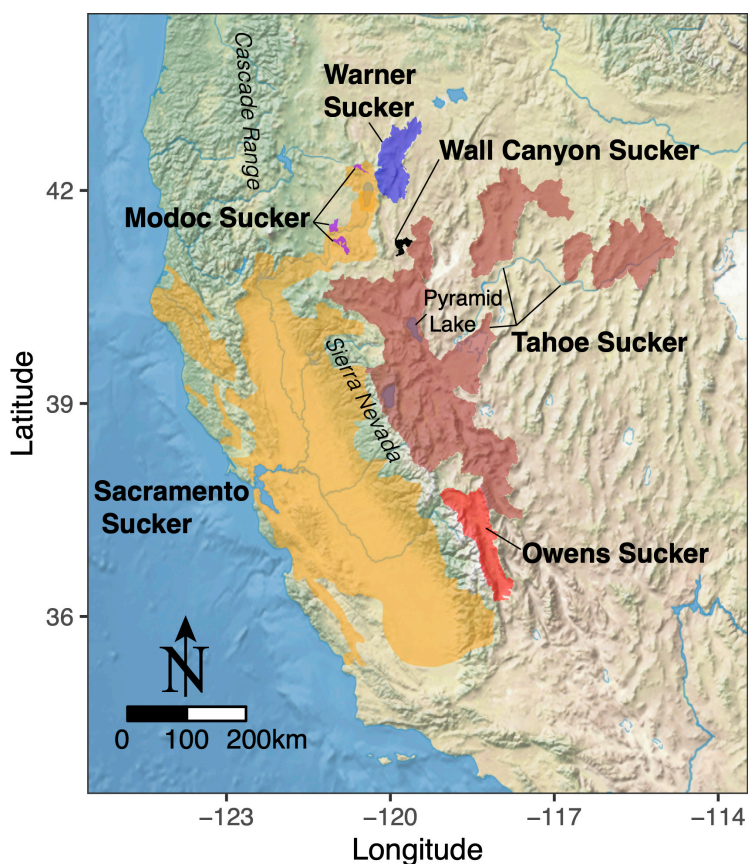


FIGURE 1. Distributions of key *Catostomus* lineages in western North America, the Wall Canyon Sucker *Catostomus murivallis*, the Warner Sucker *Ca. warnerensis*, and the Owens Sucker *Ca. fumeiventris*. The distributions of the Tahoe Sucker *Ca. tahoensis*, Sacramento Sucker *Ca. occidentalis* and Modoc Sucker *Ca. microps*, as other *Catostomus* lineages that are geographically proximate are also shown. The extant distribution of the Cui-ui *Chasmistes cujus*, Pyramid Lake, is indicated.

Campbell *et al.* (2023) examined genome-wide SNP data from the Wall Canyon Sucker and key potential lineages as indicated by Siebert and Minckley (1986) and Bagley *et al.* (2018) (e.g., the Tahoe Sucker, the Modoc Sucker and the Owens Sucker, but not the Cui-UI). The Warner Sucker was identified as the sister lineage of the Wall Canyon Sucker in phylogenetic analyses of genome-wide SNP data and substantial genetic differentiation (F_{ST}) beyond any observed intraspecific values was found between the Wall Canyon Sucker and the Warner Sucker in a population genetics framework. Neither phylogenetic network analyses nor admixture analyses indicated recent or historical admixture of these lineages. Phylogenetic analyses were clear in the reciprocal monophyly of the Wall Canyon Sucker and Warner Sucker and give a median divergence time estimate of 2.12 million years ago, with 95% highest posterior density estimates placing the divergence at a minimum in the Pleistocene (Campbell *et al.* 2023). As a result, Campbell *et al.* (2023) concluded in support of the Wall Canyon Sucker as a species and advocated for a formal description of the taxon. Other evidence of the age and separation of the Wall Canyon Sucker lineage is that †*Ca. shoshonensis* Cope 1883 from the Miocene and Pliocene Snake River Plain as well as Pliocene deposits at Honey Lake (Lassen County, California in the Great Basin) may be considered to be represented by the Wall Canyon Sucker today (Taylor and Smith 1981; Smith *et al.* 1982; Smith *et al.* 2002).

We describe the Wall Canyon Sucker and present comparisons of this new species with its near relatives of the Warner Sucker and Owens Sucker. We also discuss differences between the Wall Canyon Sucker and the geographically proximate Modoc and Tahoe suckers.

Materials and methods

Measurements and counts are those described by Hubbs *et al.* (2004), except as noted below (see Tables 1 & 2). Because there is no consensus among ichthyologists with regard to the terms origin and insertion relative to the anterior-most and posterior-most points of median and paired fins on the body, we define origin as the anterior-most point and insertion as the posterior-most point of the fin on the body. Standard length (SL) is used throughout, unless indicated otherwise. Body width was measured at the dorsal-fin origin; snout-to-occiput length, from the tip of snout to the middle of the occipital line; dorsal-fin insertion to hypural plate length; snout to pectoral-fin origin length; pectoral-fin origin to pelvic-fin origin length; pelvic-fin origin to anal-fin origin length; anal-fin origin to hypural plate length; dorsal-fin origin to pectoral-fin origin length; dorsal-fin origin to pelvic-fin origin length; dorsal-fin origin to anal-fin origin length; dorsal-fin insertion to pelvic-fin origin length; dorsal-fin insertion to anal-fin origin length; eye to nare length, from anterior margin of orbit to posterior margin of nare; snout to nare length, from tip of snout to anterior margin of nare; eye to occiput length, from dorsal margin of eye to middle of the occipital line; upper lip length, from middle of upper lip to posterior lip margin; lower lip length, from middle of lower lip to posterior lip margin.

Univariate and multivariate analyses were conducted using Statgraphics Plus 5 (Manugistics, Rockville, MD) and SAS ver. 5 (Statistical Analysis Systems Institute, Inc., Cary, NC) with statistical significance determined at the $\alpha = 0.05$ level. Arcsine-transformed morphometric ratios (with SL as denominator) and meristic characters were tested to meet the assumptions of normality required for ANOVA. The following morphometric characters exhibited normal distributions, did not differ significantly in variance between species, and were subjected to ANOVA without transformation: snout length, head length, head width, predorsal length, body width, body depth, caudal-peduncle depth, caudal-peduncle length, pelvic-fin length, pectoral-fin length, snout-to-occiput length, dorsal-fin base length, dorsal insertion to hypural length, snout to pelvic-fin origin length, pelvic-fin origin to anal-fin origin length, anal-fin origin to hypural length, anal-fin base length, dorsal-fin origin to pelvic-fin origin length, dorsal-fin origin to pelvic-fin origin length, dorsal-fin origin to anal-fin origin length, dorsal-fin insertion to pelvic-fin origin length, dorsal-fin insertion to anal-fin origin length, eye to nare length, snout to nare length, eye to occiput length, upper lip length, lower lip length. Because not all morphometric characters satisfied the assumption of homogeneity of slopes, an ANCOVA was not used to test group mean differences among morphometric characters. Likewise, because all four meristic characters failed to satisfy the assumption of homogeneity of variance required for ANOVA, a Wilcoxon two-sample test was used to assess mean differences between species. Post hoc comparisons used Bonferroni-adjusted significance levels.

Institutional abbreviations follow those recommended by the American Society of Ichthyologists and Herpetologists (Leviton & Gibbs, 1988; Leviton *et al.*, 1985). Comparative material examined as follows: *Catostomus*

warnerensis—OS 13220, 1 (272.0 mm SL); OS 17485, 1 (240.0 mm SL); OS 17486, 1 (201.5 mm SL); OS 2440, 1 (151.4 mm SL); OS 2710, 1 (155.9 mm SL); OS 3557, 4 (73.3–98.1 mm SL); OS 4315, 5 (66.7–105.7 mm SL); OS 5140, 9 (69.5–88.5 mm SL); OS 5142, 4 (133.5–253.9 mm SL); OS 5256, 3 (176.5–232.9 mm SL); OS 5311, 2 (138.6–151.9 mm SL); OS 6359, 1 (254.8 mm SL); OS 7035, 1 (213.9 mm SL). *Catostomus fumeiventris*—CAS 51630, 2 (72.8–95.5 mm SL); UMMZ 124837, paratype, 1 (155.4 mm SL); UMMZ 131665, paratypes, 2 (143.1–143.5 mm SL); UMMZ 132146, paratypes, 2 (53.2–142.1 mm SL); UMMZ 132150, paratypes, 30 (108.5–182.3 mm SL); UMMZ 132152, paratypes, 25 (75.5–163.0 mm SL); UMMZ 133093, paratypes, 2 (172.3–198.6 mm SL); UMMZ 133857, paratype, 1 (115.5 mm SL).

The color illustration of the Wall Canyon Sucker (Figure 2) was drawn by Joe Tomelleri and is based on color photographs and notes in the field of the live and preserved specimen.

***Catostomus murivallis* Harris, Markle & Campbell, new species**

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Wall Canyon Sucker

(Figures 2 and 3)

Catostomus sp.—Hubbs and Miller, 1948:64 (Wall Canyon endemic). Moyle, 1976:213 (“an undescribed sucker lives in Wall Canyon Creek...”). Williams *et al.* 1985:9 (list of fishes of concern from North American deserts). Williams *et al.* 1989:6 (list of endangered, threatened, or of special concern fishes of North America). Miller, Hubbs, and Miller, 1991:26 (“new taxa collected”). La Rivers, 1994:6d (revised list of Nevada fishes). Smith *et al.*, 2002:216 (“relict sucker of Wall Canyon”). Bagley *et al.* 2018:8 (“*Catostomus* sp. Wall Canyon”). Campbell *et al.* 2023:273 (“Wall Canyon Sucker *Catostomus* sp.”).

Holotype. OS 17570, a gravid female, 213.9 mm SL, from Wall Canyon Creek, Surprise Valley, Washoe Co., Nevada (latitude 41.265983°N, longitude 119.73233°W), 25 May 2001, B. Nielsen, S. Reid, and D. Markle

Paratypes. OS 15769, 3 (70.3–202.0 mm SL); LACM 25189, 12 (66.5–119.9 mm SL); LACM 25190, 4 (94.6–127.4 mm SL); LACM 25192, 10 (62.3–122.7 mm SL); UMMZ 130543, 27 (64.1–131.1 mm SL).

Additional material. OS 13908, 8 (119.0–157.8 mm SL); OS 13909, 1 (248.37 mm SL); OS 14101, 4 (103.5–136.8 mm SL); OS 104101, 18 (96.5–143.6 mm SL); UMMZ 130453, 2 (86.3–95.9 mm SL); UMMZ 181729, 29 (54.2–85.2 mm SL).

Diagnosis. A species of *Catostomus* (sensu stricto) restricted to Wall Canyon Creek, Surprise Valley, Washoe Co., Nevada. It is distinguished from *Ca. warnerensis* and *Ca. fumeiventris* by the following traits: moderately coarse scales, 67–92 usually in the lateral line, modally 85 (vs. modally 74 in *Ca. warnerensis* [range = 64–85]; modally 73 in *Ca. fumeiventris* [66–86]); scale rows between dorsal-fin origin and lateral line 12–17, modally 15 (vs. 14 [11–17]; 13 [12–16]); snout length 6.8–12.6% SL, mean 10.1% (vs. 9.7–12.3%, mean 10.6%; 9.3–12.6%, mean 10.9%); body depth 16.7–24.1% SL, mean 20.9% (vs. 16.8–28.4% SL, mean 22.25; 18.6–27.3% SL, mean 21.7%); caudal-peduncle depth 8.0–12.1% SL, mean 9.5% (vs. 8.3–11.7% SL, mean 10.0; 7.3–11.6% SL, mean 9.75); dorsal-fin base 11.2–16.7% SL, mean 14.0% (vs. 12.3–18.6%, mean 15.6%; 11.9–17.8%, mean 14.6%); dorsal-fin origin to pelvic-fin origin 17.2–25.7% SL, mean 21.2% (vs. 18.3–28.3%, mean 22.6%; 19.7–26.3%, mean 22.4%); dorsal-fin origin to anal-fin origin 28.6–39.1% SL, mean 33.2% (vs. 32.7–42.0% SL, mean 35.3%; 30.8–38.6% SL, mean 35.9%); dorsal-fin insertion to anal-fin origin 17.5–25.4% SL, mean 21.7% (vs. 18.5–26.7% SL, mean 22.6%; 18.6–26.1% SL, mean 22.85); eye to nare 1.3–4.4% SL, mean 3.1% (vs. 2.3–4.1%, mean 3.3%; 2.5–5.1%, mean 3.6%); upper-lip 4.3–7.7% SL, mean 5.8% (vs. 4.1–7.9%, mean 5.3%; 4.1–7.8%, mean 5.6%).

Description. Morphometric data are given in Table 1, and scale-count characters appear in Tables 2 and 3. Body form and pigmentary characters are shown in Figure 2. The body is terete, with other aspects of general appearance resembling those of other western North American *Catostomus* species. Nuptial individuals of both sexes have a red lateral stripe. Color in preservative, dark brown above, pale tan to yellow below. Fin-rays generally darkly pigmented in all fins, fin membranes unpigmented.

The mouth is horizontal and inferior; upper lip 4.3–7.7% SL, lower lip 3.5–5.6% SL. Lips small, the lower lobes incompletely cleft, with a space of one or two intervening papillae, but closely appressed at the midline (Figure 3). Upper lip with three rows of round papillae crossing the midline; lower lip with nine or fewer rows of round to rectangularly-shaped papillae crossing a longitudinal line on longest part of lower lobes. Frontoparietal fontanelle well developed.

Based on eight specimens (OS 13908), gill-rakers on first arch 23–30, gill-teeth on back of first arch 33–35 (N=4), vertebrae anterior to dorsal origin 14–15 (N=7) and anterior to anal origin 29–30 (N=8), precaudal vertebrae 24–25 (N=8), caudal vertebrae 15–17 (N=8), total vertebrae 39–41 (N=8).

Etymology. *Muri* from the Latin *murus* for wall, and *vallis* for valley; the specific epithet is treated as a noun in apposition. Specific and common names refer to the distribution of this species, which is Wall Canyon, in Surprise Valley, NV.

Range. Restricted to Wall Canyon Creek in Surprise Valley, Washoe Co., Nevada.

Comparisons. Among morphometric characters meeting statistical assumptions for ANOVA, 16 of 34 and 17 of 34 characters differed significantly between the Wall Canyon Sucker and *Ca. warnerensis* and *Ca. fumeiventris*, respectively (Table 1). Nineteen of 34 morphometric characters were significantly different between *Ca. warnerensis* and *Ca. fumeiventris* (Table 1).

Three of four and two of four meristic characters differed significantly between the Wall Canyon Sucker and *Ca. warnerensis* and *Ca. fumeiventris*, respectively (Tables 2 & 3). All four meristic characters were significantly different between *Ca. warnerensis* and *Ca. fumeiventris* (Tables 2 & 3).

Body form and coloration of *Ca. murivallis* are most similar to *Ca. warnerensis*, with the abdomen of both species being creamy white; a red lateral stripe is displayed by nuptial individuals of both sexes. In contrast, *Ca. fumeiventris* has a dusky abdomen and lacks the red lateral stripe (Miller, 1973).

The lips of *Ca. murivallis* are small, although both lips are proportionally longer than those of *Ca. warnerensis* and *Ca. fumeiventris* (Table 1). Upper lip papillae of *Ca. murivallis* are round, resembling those of *Ca. fumeiventris*; whereas the upper lip papillae of *Ca. warnerensis* are oblong in appearance. Papillae on the lower lip of *Ca. murivallis* are round anteriorly, becoming more rectangular posteriorly; lower lip papillae of *Ca. warnerensis* are generally round, while appearing more oblong on *Ca. fumeiventris* (Figure 3).

All three species have a well-developed frontoparietal fontanelle. Of the two other geographically proximate *Catostomus* species, this condition is shared with the Tahoe Sucker (*Ca. tahoensis*) but contrasts with the Modoc Sucker (*Ca. microps*), which has a partially or fully closed fontanelle (Moyle, 1976; Smith, 1992). *Catostomus tahoensis* differs from *Ca. murivallis* in having finer scales (82–95 lateral line scales vs. 67–92), a larger mouth with larger papillae, and a thicker caudal peduncle (Moyle, 1976). In addition, combined mtDNA cytochrome *b* and NADH2 gene sequence data (Bagley *et al.* 2018) indicates pair-wise sequence divergence between *Ca. tahoensis* and *Ca. microps* versus *Ca. murivallis* as 15.1% and 14.7%, respectively. By comparison, *Ca. fumeiventris* differs from *Ca. murivallis* and *Ca. warnerensis* by 8.2 and 7.7%, respectively; whereas *Ca. murivallis* and *Ca. warnerensis* differ by 1.1%.

The fossil Miocene and Pliocene sucker of the Snake River Plain and Pliocene Honey Lake, †*Ca. shoshonensis*, shares a diagnostic maxilla shape with *Ca. murivallis* according to Smith *et al.* (2002). They also noted that hydrographic cycles in the Great Basin should have led to many opportunities for allopatric speciation, but that desiccation cycles have apparently been so severe that extinction has dominated. If the *Ca. murivallis*-*Ca. warnerensis* clade has persisted since the Miocene, the relatively low sequence divergence suggests that only a more recent allopatric event can be detected. This is reflected in molecular differentiation and molecular phylogenetic divergence time estimation (Supplemental Figure S1) that indicates a divergence during the Pleistocene.



FIGURE 2. *Catostomus murivallis*, paratype, OS 17569, breeding female, 202 mm SL.

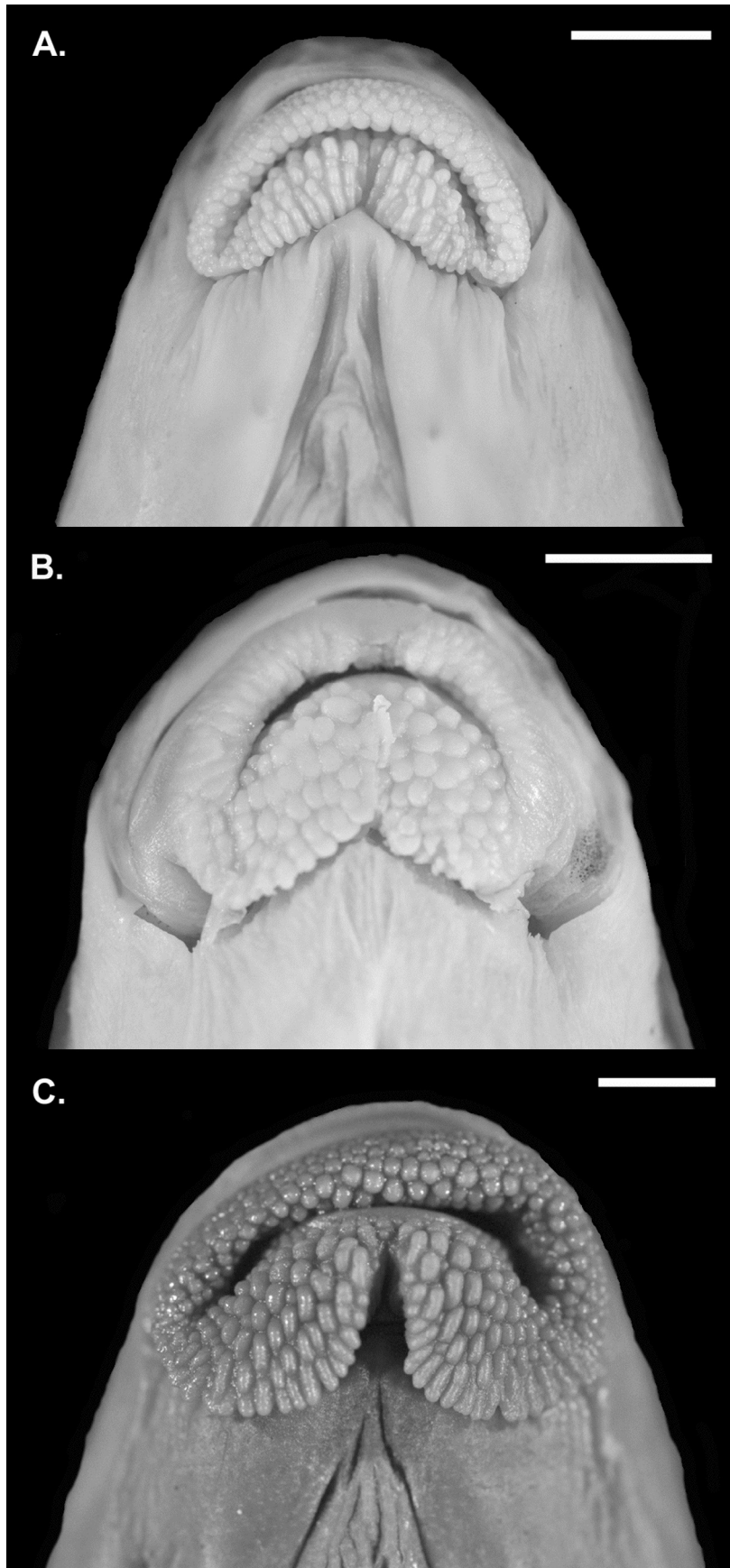


FIGURE 3. Photographs of lips of female holotype of *Catostomus murivallis*, OS 17570, 202.0 mm SL (A), *Ca. warnerensis*, OS 13220, 272.0 mm SL (B), and *Ca. fumeiventris*, UMMZ 133093, 198.6 mm SL (C). Scale bar = 0.5 cm.

TABLE 1. Proportional morphometrics for *Catostomus murivallis* (*mur*), *Ca. warnerensis* (*war*), and *Ca. fumeiventris* (*fum*). All values expressed as % SL, except SL in mm. X = statistically significant difference at 0.05 level, as evaluated by ANOVA when appropriate. Abbreviations: SD = standard deviation; *n* = number of fish in sample.

Character	<i>Ca. murivallis</i> (<i>n</i> = 119)				<i>Ca. warnerensis</i> (<i>n</i> = 134)				<i>Ca. fumeiventris</i> (<i>n</i> = 65)				ANOVA		
	Holotype	Range	\bar{X}	SD	Range	\bar{X}	SD	SD	Range	\bar{X}	SD	SD	<i>mur-war</i>	<i>mur-fum</i>	<i>war-fum</i>
SL	213.9	54.2–248.3	96.9	31.4	66.7–272.0	134.7	67.6	67.6	53.2–198.6	127.2	27.1	27.1			
Snout length	9.5	6.8–12.6	10.1	0.8	9.7–12.3	10.6	0.7	0.7	9.3–12.6	10.9	0.7	0.7	X	X	X
Head length	24.5	22.6–28.4	25.5	1.1	23.9–28.1	25.9	1.0	1.0	21.0–28.3	24.9	1.5	1.5	X	X	X
Head width	18.3	14.3–19.3	16.7	1.1	15.2–19.2	16.9	0.9	0.9	12.7–18.9	16.5	1.1	1.1			X
Eye diameter	3.2	3.0–5.6	4.3	0.5	2.9–5.8	4.2	0.8	0.8	3.2–5.5	4.2	0.5	0.5			
Predorsal length	55.0	48.1–56.6	52.4	1.9	50.1–56.5	52.7	1.6	1.6	48.6–54.8	51.5	1.6	1.6	X	X	X
Body width	18.9	11.8–20.3	16.0	1.6	14.1–23.5	16.7	2.4	2.4	11.9–18.9	15.3	1.2	1.2	X	X	X
Body depth	23.3	16.7–24.1	20.9	1.5	16.8–28.4	22.2	2.1	2.1	18.6–27.3	21.7	1.7	1.7	X	X	
Caudal peduncle depth	9.3	8.0–12.1	9.5	0.6	8.3–11.7	10.0	0.8	0.8	7.3–11.6	9.7	0.8	0.8	X	X	
Caudal peduncle length	15.7	11.9–22.4	15.7	1.9	10.5–17.7	14.7	1.6	1.6	12.3–22.2	15.7	2.1	2.1	X		X
Dorsal-fin length	17.7	13.9–24.7	20.2	1.9	17.1–24.3	20.5	1.6	1.6	15.7–25.2	20.0	2.0	2.0			
Dorsal-fin base length	13.4	11.2–16.7	14.0	1.1	12.3–18.6	15.6	1.5	1.5	11.9–17.8	14.6	1.2	1.2	X	X	X
Anal-fin length	21.4	16.0–25.2	20.5	2.0	17.1–27.0	20.7	2.4	2.4	15.2–27.0	21.2	2.2	2.2			X
Anal-fin base length	8.7	7.1–12.1	9.1	0.8	7.7–12.1	9.5	1.1	1.1	6.6–12.7	8.9	1.2	1.2	X		X
Pectoral-fin length	19.4	15.9–24.1	20.7	1.2	14.4–23.4	20.1	1.6	1.6	15.8–24.7	21.0	1.8	1.8	X		X
Pelvic-fin length	13.4	12.3–20.8	15.5	1.8	13.8–20.7	16.3	1.7	1.7	11.3–20.7	15.3	1.5	1.5	X	X	X
Snout to occiput length	19.5	17.2–22.4	20.2	1.0	18.5–25.2	21.0	1.3	1.3	17.9–22.9	20.3	1.2	1.2	X	X	X
Occiput to dorsal-fin origin length	37.5	14.6–37.8	32.8	2.4	28.9–37.9	33.3	2.1	2.1	28.2–36.4	32.5	1.4	1.4			
Dorsal-fin insertion to hypural length	38.3	30.9–49.3	36.6	2.2	33.1–40.9	36.2	1.9	1.9	34.5–43.1	38.8	1.8	1.8	X		X
Snout to pectoral-fin origin length	24.6	22.2–30.1	26.0	1.6	23.8–28.6	26.6	1.2	1.2	22.1–29.1	25.2	1.3	1.3	X		X
Pectoral-fin origin to pelvic-fin origin length	33.4	28.8–37.9	32.9	2.1	29.5–39.7	32.9	2.4	2.4	29.0–36.6	33.3	1.5	1.5			

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TABLE 1. (Continued)

Character	<i>Ca. murivallis</i> (n = 119)			<i>Ca. warnerensis</i> (n = 134)			<i>Ca. fumeiventris</i> (n = 65)			ANOVA		
	Holotype	Range	\bar{X} SD	Range	\bar{X} SD	Range	\bar{X} SD	mur-war	mur-fum	war-fum	war-fum	
Pelvic-fin origin to anal-fin origin length	23.2	19.4–25.6	22.1 1.4	19.1–30.7	23.7 2.5	19.0–26.5	22.4 1.8	X				
Anal-fin origin to hypural length	23.7	20.1–32.0	24.1 2.0	20.1–28.0	23.5 1.5	20.5–28.6	25.0 1.7		X		X	
Dorsal-fin origin to pectoral-fin origin length	35.5	28.2–35.5	32.1 1.6	29.4–38.6	33.0 2.1	27.8–34.8	31.7 1.6				X	
Dorsal-fin origin to pelvic-fin origin length	22.0	17.2–25.7	21.2 1.3	18.3–28.3	22.6 1.7	19.7–26.3	22.4 1.5	X	X		X	
Dorsal-fin origin to anal-fin origin length	35.0	28.6–39.1	33.2 1.5	32.7–42.0	35.3 2.1	30.8–38.6	35.9 1.8	X	X		X	
Dorsal-fin insertion to pelvic-fin origin length	20.9	15.5–22.5	19.3 1.2	16.3–27.6	20.1 2.0	15.1–22.9	19.2 1.5	X				
Dorsal-fin insertion to anal-fin origin length	23.9	17.5–25.4	21.7 1.5	18.5–26.7	22.6 1.8	18.6–26.1	22.8 1.4	X	X		X	
Interorbital width	11.2	9.6–13.9	11.2 0.7	9.7–12.3	11.1 0.6	9.4–12.4	11.1 0.7					
Eye to nare length	3.1	1.3–4.4	3.0 0.4	2.3–4.1	3.3 0.4	2.5–5.1	3.6 0.4	X	X		X	
Snout to nare length	8.4	7.0–10.4	8.9 0.7	7.9–10.6	9.1 0.6	7.4–12.1	9.3 0.9		X			
Eye to occiput length	10.7	9.0–12.7	10.8 0.8	9.0–12.5	11.0 0.9	7.7–12.5	10.3 0.9		X		X	
Upper lip length	5.4	4.3–7.7	5.8 0.6	4.1–7.9	5.3 0.9	4.1–7.8	5.6 0.9	X	X		X	
Lower lip length	3.8	3.5–5.6	4.4 0.5	3.3–5.6	4.2 0.7	3.2–6.5	4.4 0.7	X	X		X	

TABLE 2. Meristic characters for *Catostomus murivallis* (*mur*), *Ca. warnerensis* (*war*), and *Ca. fumeiventris* (*fum*). X = statistically significant difference at 0.05 level, as evaluated by ANOVA when appropriate. Abbreviations: SD = standard deviation; n = number of fish in sample.

Character	<i>Ca. murivallis</i> (n = 102)				<i>Ca. warnerensis</i> (n = 24)				<i>Ca. fumeiventris</i> (n = 56)				
	Holotype	Range	Mode	\bar{X}	SD	Range	Mode	\bar{X}	SD	Range	Mode	\bar{X}	SD
Lateral-line scales	84	67-92	85	78.6	6.2	64-85	74	72.0	5.6	66-86	73	74.8	4.3
Dorsal-fin origin to lateral-line scale rows	12	12-17	15	14.6	1.0	11-17	14	14.0	1.4	12-16	13	13.6	1.0
Anal-fin origin to lateral-line scale rows	10	9-14	10	10.5	0.8	8-13	10	10.1	1.2	8-12	9	9.7	0.8
Scale rows around caudal peduncle	28	24-32	28	27.8	1.8	25-32	27	27.7	1.9	23-30	26	25.9	1.3

TABLE 3. Counts of meristic characters for *Catostomus murivallis* (*mur*, n = 102), *Ca. warnerensis* (*war*, n = 24), and *Ca. fumeiventris* (*fum*, n = 56). See TABLE 2 for character mean and standard deviation. Scale count for holotype given in TABLE 2.

	Lateral-Line Scales											
	6	6	6	6	6	6	6	6	6	6	6	6
<i>mur</i>	6	6	6	6	6	6	6	6	6	6	6	6
<i>war</i>	4	5	6	7	8	9	0	1	2	3	4	5
<i>fum</i>	3	1	2	4	3	8	4	7	4	5	3	6

	Dorsal-fin origin to lateral line scale rows				Anal-fin origin to lateral line scale rows				Scale rows around caudal peduncle			
	1	1	1	1	8	9	1	1	2	2	2	2
<i>mur</i>	3	1	3	3	4	5	3	1	2	1	1	1
<i>war</i>	1	2	6	9	2	4	1		0	3	5	5
<i>fum</i>	7	2	1	1	1	2	2	7	2	5	7	2

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Supplementary Material. The following supporting information can be downloaded at the DOI landing page of this paper:

Supplemental Figure S1. Fossil-calibrated phylogeny of Catostomidae adapted from Campbell *et al.* (2023). The phylogeny was created in a Bayesian framework from mixed mitochondrial and nuclear DNA sources. For full methods see Campbell *et al.* (2023). Subfamilies and tribes are indicated on the phylogeny with the Wall Canyon Sucker, *Catostomus murivallis* indicated and placed sister to *Ca. warnerensis* within a clade also containing *Ca. fumeiventris* and *Chasmistes cujus*. These four species are restricted to the Great Basin. The median time to most recent common ancestor (TMRCA) *Ca. murivallis* and *Ca. warnerensis* is 2.12 million years (95% highest posterior density (HPD) = 0.45–4.13). A TMRCA of 4.96 million years (95% HPD = 2.17–8.19) for *Ca. fumeiventris* and *Ch. cujus* is reported with a TMRCA of 9.40 million years (95% HPD = 5.86–13.28) for *Ca. murivallis* and its three nearest relatives.