

NOTES ON CERTAIN CATOSTOMIDS OF THE BONNEVILLE SYSTEM, INCLUDING THE TYPE OF *PANTOSTEUS VIRESCENS* COPE.

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For a long time the catostomid described by Cope¹ as *Pantosteus virescens* has remained a puzzle to ichthyologists². It was originally described as a native of the Arkansas River, where no member of the genus has since been found. The present paper is intended as a brief contribution toward a settlement of the matter, as the writer has rediscovered the species, abundantly represented in Weber and Bear Rivers, of the Bonneville system of Utah.³

The type of *Pantosteus virescens*, No. 16758, U. S. National Museum, is a large specimen measuring 370 millimeters in length. The body is long and slender, the caudal peduncle narrow, snout long, mouth large, the broad lips projecting laterally beyond the sides of the head. Along the lateral line the scales grow gradually larger from the head to the tail. On the throat and breast they are very minute. There are 100 scales in the lateral series, 51 between the occiput and dorsal fin, 21 between the lateral line and middle of back, and 15 between lateral line and base of anal. The cranial foramen is open.

The type specimen has been referred by some authors to *Pantosteus delphinus*, a species native to the Colorado basin.⁴ *P. delphinus*, differs from *P. virescens* in having a body of somewhat different proportions as will be seen from an examination of the tables of measurements. The scales of *P. delphinus* are smaller, there being 105 to 112 in the lateral series, 55 to 63 before the dorsal, 20 to 24 above the lateral line, and 17 to 20 below the lateral line.

¹ Wheeler's Explor. West of the 100th Merid., vol. 5, 1875 (1876), p. 675. Type No. 16758, Div. Fish, U. S. N. M. Indicating the locality, Cope's expression carries doubt with it; "One species (meaning specimen) accompanying an *Amiurus*, which is marked Arkansas River, at Pueblo, Mr. C. E. Aiken."

² Jordan and Evermann, Fishes North Amer., Bull. U. S. Nat. Mus., No. 47, pt. 1, 1896, p. 171, *P. delphinus* (Cope).

Snyder, J. O., Proc. U. S. Nat. Mus., vol. 49, 1915, p. 577.

³ Under the authority of the United States Bureau of Fisheries, the writer began an investigation of the fishes of the Bonneville system of Utah, in 1915. After some field work had been done, it was interrupted by the war, and has not been resumed. Specimens referred to were collected at the time.

⁴ The writer is indebted to Dr. Max M. Ellis for some particularly fine specimens of *P. delphinus* which were collected in the Uncompahgre and Rio Florida, tributaries of the Colorado River.

Proportional measurements and scale counts of 11 specimens of Pantosteus delphinus.

	Rio Florida-Durango.						Uncompahgre-Montrose.				
	191	200	195	173	175	185	205	175	205	220	202
Length of body (millimeters).....	191	200	195	173	175	185	205	175	205	220	202
Length of head.....	0.21	0.22	0.22	0.205	0.22	0.225	0.21	0.22	0.20	0.195	0.21
Depth of body.....	.20	.19	.20	.23	.22	.21	.20	.21	.19	.19	.22
Depth of caudal peduncle.....	.065	.07	.07	.07	.075	.075	.075	.07	.075	.07	.07
Length of caudal peduncle.....	.16	.17	.16	.17	.16	.165	.16	.16	.15	.17	.15
Length of snout.....	.125	.125	.13	.115	.125	.13	.11	.115	.11	.11	.115
Diameter of eye.....	.03	.03	.03	.035	.035	.03	.03	.03	.03	.03	.03
Interorbital width.....	.09	.095	.09	.095	.10	.095	.095	.10	.10	.095	.10
Depth of head.....	.14	.145	.14	.145	.15	.14	.14	.15	.15	.14	.14
Snout to occiput.....	.185	.195	.14	.20	.21	.205	.18	.18	.17	.17	.18
Snout to dorsal.....	.51	.515	.51	.50	.51	.51	.51	.52	.51	.49	.52
Snout to ventral.....	.57	.56	.585	.55	.58	.57	.575	.60	.58	.56	.57
Length base of dorsal.....	.16	.14	.14	.155	.145	.14	.13	.135	.135	.13	.14
Length base of anal.....	.075	.07	.08	.085	.075	.07	.075	.08	.08	.08	.08
Height of dorsal.....	.165	.17	.185	.165	.18	.185	.165	.17	.165	.17	.165
Height of anal.....	.20	.18	.20	.22	.235	.22	.18	.20	.185	.20	.19
Length of pectoral.....	.19	.18	.19	.215	.205	.20	.185	.195	.20	.20	.18
Length of ventral.....	.15	.15	.15	.17	.16	.17	.15	.155	.16	.17	.155
Length of caudal.....	.23	.215	.23	.23	.225	.24	.21	.23	.22	.22	.215
Dorsal rays.....	11	11	10	11	11	11	10	11	10	11	10
Anal rays.....	7	7	7	7	7	7	7	7	7	7	7
Scales lateral series.....	109	108	105	110	109	109	107	106	105	109	105
Scales above lateral line.....	20	21	21	21	22	23	24	23	24	24	23
Scales below lateral line.....	17	17	17	19	17	18	19	20	19	20	18
Scales before dorsal.....	57	56	55	56	55	55	61	59	63	63	57

As previously noted, *P. virescens* was found in considerable numbers in Weber and Bear Rivers. When compared directly with the type, these fishes differ in no way, many specimens from Weber River being exact counterparts, even in size and general appearance. An examination of a series of specimens resulted in the following scale counts:

Scales in lateral series.....	90	91	92	93	94	95	96	97	98	99	100
Number of specimens.....	1	1	4	4	10	10	6	6	7	2	3
Scales occiput to dorsal.....	49	50	51	52	53	54	55	56	57	58	
Number of specimens.....	1	5	9	10	8	8	7	2	3	3	
Scales above lateral line.....	18	19	20	21	22	23					
Number of specimens.....	1	3	17	15	16	2					
Scales below lateral line.....	12	13	14	15	16	17					
Number of specimens.....	5	8	19	16	3	3					

The anterior lip has 4 or 5 rows of papillae, the outer ones being very small. The posterior lip is deeply incised. It is separated from the anterior or upper, on either side, by a pronounced notch, behind which the lobe is angular and pointed. There are about 15 series of papillae which are not disposed in rows. The pectoral fins are bluntly pointed, the edge of the dorsal concave, the caudal deeply concave, or rather sharply notched in some specimens. There are 36 to 40 gillrakers on the first arch. The crania of many specimens were examined, and in no case was the fontanelle found to be closed.

In the appended table, measurements of mature examples from Weber River are given. In smaller examples, 145 to 180 millimeters in length, the body is deeper, 0.19 to 0.23 of the length; the caudal

peduncle more attenuate, 0.15 to 0.18; the eye larger, 0.03 to 0.35; and the fins, excepting the caudal considerably longer. The dorsal rays number 11, occasionally 12.

Proportional measurements of 10 specimens of Pantosteus virescens from Weber River near The Devil's Slide.

Length of body (millimeters)...	320	292	298	298	285	300	308	275	321	297
Length of head.....	0.195	0.21	0.21	0.205	0.205	0.20	0.20	0.215	0.19	0.20
Depth of body.....	.17	.195	.18	.17	.19	.18	.185	.19	.18	.17
Depth of caudal peduncle.....	.085	.082	.085	.08	.08	.08	.08	.08	.08	.08
Length of caudal peduncle.....	.145	.15	.14	.145	.15	.155	.145	.155	.15	.135
Length of snout.....	.115	.115	.11	.12	.12	.125	.112	.122	.11	.115
Diameter of eye.....	.023	.025	.025	.025	.025	.024	.025	.025	.021	.025
Interorbital width.....	.09	.098	.091	.098	.09	.095	.088	.09	.09	.086
Depth of head.....	.125	.13	.132	.132	.13	.136	.13	.14	.13	.135
Snout to occiput.....	.17	.19	.172	.18	.18	.175	.18	.18	.16	.175
Snout to dorsal.....	.47	.49	.485	.49	.48	.47	.463	.485	.47	.48
Snout to ventral.....	.56	.57	.58	.57	.56	.585	.56	.575	.576	.58
Length base of dorsal.....	.13	.15	.125	.135	.14	.15	.15	.135	.14	.135
Height of dorsal.....	.075	.07	.07	.07	.07	.07	.07	.07	.068	.075
Height of anal.....	.14	.152	.145	.15	.155	.16	.15	.16	.15	.16
Length of pectoral.....	.165	.17	.17	.172	.16	.162	.165	.19	.18	.17
Length of pectoral.....	.165	.175	.175	.172	.17	.18	.17	.195	.18	.175
Length of ventral.....	.14	.15	.145	.145	.145	.145	.145	.155	.145	.148
Length of caudal.....	.20	.22	.215	.205	.206	.215	.205	.24	.207	.212
Dorsal rays.....	11	11	11	11	11	11	11	11	11	11
Anal rays.....	7	7	7	7	7	7	6	7	7	7
Scales lateral series.....	97	94	100	94	100	98	98	98	95	93
Scales above lateral line.....	19	21	20	19	21	20	22	19	22	22
Scales below lateral line.....	16	15	15	17	17	15	16	15	15	15
Scales before dorsal.....	51	51	54	56	55	55	54	54	58	57

In this species the mountain suckers appear to reach their largest size, and they are to be found at their best in Weber River, where schools numbering thousands of individuals may at times be seen. They occur in the more mountainous parts of the basin, thriving well where the channel is broad and the water deep. They were encountered in numbers at Wanship, and again at several points between Wanship and the mouth of Echo Creek. Farther down the river, particularly in the vicinity of The Devil's Slide, they were met (July 26) in schools of large size. At a distance of 15 or 20 miles below the latter place, none was seen.

The schools move slowly up or down stream, winding about over the river bed in true sucker fashion. When feeding, small detachments occasionally separate from the main school, and moving along slowly and cautiously, the different individuals lazily roll about on the bottom, scraping food from the surface of the rocks. They are, however, very nervous and cautious fishes, fleeing at the approach of a shadow, or the jar of the gravel crunched beneath the observer's feet. Panic seizes an individual suddenly parted from a school although groups of widely separated and perfectly quiet fishes may at times be seen.

In Weber River they appear to greatly outnumber the other large fishes. *Catostomus ardens* associates with this species, and its individuals may be recognized by their more robust, greenish and bronzy bodies, and pink fins. One haul of the collecting seine took 758 fish

from a large school without visibly reducing its size. Among the *Pantosteus* were 50 examples of *Catostomus*. Other catches seemed to support this proportion. The 708 *Pantosteus* measured from 230 to 395 millimeters in length, the largest weighing $1\frac{1}{2}$ pounds, a real giant among the hard-mouthed or mountain suckers.

When in the water, *P. virescens* differs from other catostomids of the river by its dark color, the posterior part of the body usually appearing dense black in contrast with the lighter anterior region. When the side is turned toward the sun, a flash of yellow light appears, and sometimes the white bellies and the broad mouths, with their enormous lips, may be seen, the latter being so large that the edges are visible on either side of the snout.

When fresh from the water the color is a bright metallic yellow on the sides; darker above and dead white below. The top of the head is olive, lighter on the sides, brassy beneath the eyes. The lips and throat are yellowish, the horny edges of the lips white. The scale pockets on the dorsal surface have blackish borders, which are wider on the posterior parts of the body, where they impart a dark color to the entire surface. In some examples the dark borders are very narrow, giving the fish a much lighter appearance. The intensity of the color seemingly changes somewhat as the fish moves about in the water.

Two mountain suckers occur in the Bonneville system, *P. virescens* and *P. platyrhynchus*, the latter appearing to be closely related to *P. lahontan* of the Lahontan system of Nevada.⁵

P. platyrhynchus is a coarse scaled form, the lateral series numbering 78 to 89 rows. The snout is relatively short and rounded, the papillae of the lips large, the caudal peduncle deep, and the caudal fin short.

Scales lateral series.....	78	79	80	81	82	83	84	85	86	87	88	89
Number of specimens.....	1	7	5	9	19	14	12	14	7	8	3	1
Scales before dorsal.....	39	40	41	42	43	44	45	46	47	48		
Number of specimens.....	1	3	8	5	28	24	18	9	2	2		
Scales above lateral line...	15	16	17	18	19							
Number of specimens.....	7	32	51	7	3							
Scales below lateral line...	10	11	12	13	14							
Number of specimens.....	5	26	38	23	8							

⁵ It has been shown that *P. generosus* (Girard), referred by some authors to the Bonneville system, without doubt came from the Colorado. (Proc. U. S. Nat. Mus., vol. 59, 1921, p. 27.)

Minomus jarrovi Cope (Proc. Amer. Philos. Soc. Phila., 1874, p. 135) is not synonymous with either *P. virescens* or *P. platyrhynchus*. The type of *P. jarrovi* is lost, the locality is in doubt, and while the description and figures (Wheeler's Explor. West of the 100th Merid., vol. 5, 1875-76, p. 674, pl. 29, fig. 2, 2a) are sufficient to show that the species is not synonymous with either of the Bonneville forms, the writer is not able to refer them without doubt to another species. In the original description Cope refers to two specimens "obtained by Messrs. Yarrow and Henshaw at Provo," while in the later paper these specimens are ignored without explanation, and the name is applied to fishes from both the Colorado and Rio Grande Rivers. It is possible that the type came from a tributary of one of these streams.

The head of *P. platyrhynchus* is small, the snout bluntly rounded, the lips very broad and pendent, the papillae rather coarse, with about 7 series on the broadest part of the lower lip, and 3 or 4 on the upper. The lower lip is not deeply incised, nor are the incisions at the angle of the mouth especially pronounced. The horny part of the lip is very broad and conspicuous. There are 26 to 28 gill-rakers on the first arch, a distinguishing character when compared with that of *P. virescens* which has 36 to 40. The caudal peduncle is rather deep, the fin short, with rounded lobes. The anal fin is rounded and extends to the base of the caudal. The pectorals and ventrals are rounded. There are 10 dorsal rays, occasionally 9 or 11. The scales are not so crowded anteriorly as those of *P. virescens*, and they very gradually grow larger toward the tail. The fontanelle is an open slit of varying width, almost closed in an occasional individual. The largest specimens measure 180 millimeters.

The cotypes of *Minomus platyrhynchus* Cope, from Provo, Utah, are in the United States National Museum (Nos. 15763 and 12906). These have an elongate body, large lips with a horny sheath, open fontanelle, about 80 scales in the lateral line. The cotypes were compared with specimens collected in several localities in the Bonneville basin.

P. platyrhynchus appears to be more abundantly represented in the southern part of the basin than elsewhere, it being the only mountain sucker as yet found in Sevier River and its tributaries. It abounds in Provo River, it was collected in Weber River, but it was not seen in Bear River. It was not seen associated with *P. virescens*, seeming to prefer the shallow riffles and more turbulent water. It is locally known as the mud sucker, and small examples are confused with fishes belonging to the genus *Agosia*. Nothing was observed of the habits of the species. An occasional example possessed a narrow, reddish lateral stripe.

Proportional measurements of 10 specimens of *Pantosteus platyrhynchus*.

	Provo River near Provo.									
Length of body (millimeters)...	152	145	118	115	114	110	131	132	122	122
Length of head.....	0.21	0.23	0.225	0.215	0.22	0.22	0.22	0.22	0.215	0.22
Depth of body.....	.205	.20	.20	.20	.21	.22	.22	.20	.21	.20
Depth of caudal peduncle.....	.09	.088	.10	.09	.09	.095	.10	.10	.095	.09
Length of caudal peduncle.....	.17	.18	.175	.19	.19	.185	.18	.17	.18	.18
Length of snout.....	.115	.12	.12	.12	.112	.115	.11	.12	.12	.11
Diameter of eye.....	.035	.038	.038	.035	.04	.04	.04	.038	.042	.035
Interorbital width.....	.085	.088	.09	.08	.08	.09	.09	.085	.08	.08
Depth of head.....	.135	.145	.14	.14	.15	.15	.14	.145	.135	.14
Snout to occiput.....	.19	.205	.20	.20	.20	.20	.20	.20	.19	.20
Snout to dorsal.....	.43	.50	.50	.49	.50	.51	.50	.50	.49	.50
Snout to ventral.....	.55	.55	.57	.55	.55	.56	.55	.58	.56	.54
Length base of dorsal.....	.14	.15	.135	.14	.14	.135	.145	.135	.14	.14
Length base of anal.....	.08	.09	.08	.08	.085	.07	.08	.07	.08	.07
Height of dorsal.....	.16	.165	.18	.17	.18	.18	.17	.15	.18	.16
Height of anal.....	.195	.215	.20	.19	.22	.19	.19	.20	.20	.21
Length of pectoral.....	.19	.20	.20	.20	.20	.21	.20	.19	.21	.205
Length of ventral.....	.135	.17	.15	.16	.18	.15	.145	.15	.16	.16
Length of caudal.....	.19	.20	.21	.20	.21	.22	.205	.20	.22	.21
Dorsal rays.....	10	10	10	10	10	10	10	10	10	10
Anal rays.....	7	7	7	7	7	7	7	7	7	7
Scales lateral series.....	87	86	86	84	81	78	85	84	83	86
Scales above lateral line.....	17	16	16	16	16	15	17	17	16	16
Scales below lateral line.....	12	11	12	11	12	11	12	11	11	12
Scales before dorsal.....	44	42	43	42	46	41	46	43	44	43