Pister

NUMBER 667 APRIL 2, 1973

OCCASIONAL PAPERS OF THE MUSEUM OF ZOOLOGY

UNIVERSITY OF MICHIGAN

ANN ARBOR, MICHIGAN

TWO NEW FISHES, *GILA BICOLOR SNYDERI* AND *CATOSTOMUS FUMEIVENTRIS*, FROM THE OWENS RIVER BASIN, CALIFORNIA

BY ROBERT RUSH MILLER

INTRODUCTION

MANY YEARS AGO Snyder (1917) described the isolated basin occupied by Owens River in eastern California and gave an account of its fishes. He recognized four species, three of which he believed to be identical with species in the Lahontan basin to the north, whereas the fourth was identified as *Cyprinodon macularius* of the Colorado River basin to the southeast. Subsequently, the *Cyprinodon* of Owens Valley was described as an endemic species, *C. radiosus* (Miller, 1948: 87–99); its near extinction and recovery were recently treated by Miller and Pister (1971). For some time it has been known that two other kinds of Owens Valley fishes, a minnow and a sucker, are also restricted to the basin. The faunal relationships of the fourth species, *Rhinichthys osculus,* remain to be determined.

High endemism of the fauna is correlated with its isolation from that of surrounding drainage systems (Miller, 1948: 18–20; Hubbs and Miller, 1948: 77–78). The zoogeographical implications of the Owens River fauna have been treated by Miller (1946) and are discussed further here. The interconnected pluvial lakes of the area have been mapped and discussed most recently by Morrison (1965).

Gila bicolor snyderi, new subspecies
Owens Tui Chub
Figs. 1–4

Rutilus symmetricus (non Baird and Girard)—Gilbert, 1893: 231 (Owens Lake only; description).

Siphateles obesus—Snyder, 1917: 203–204 (counts and measurements).

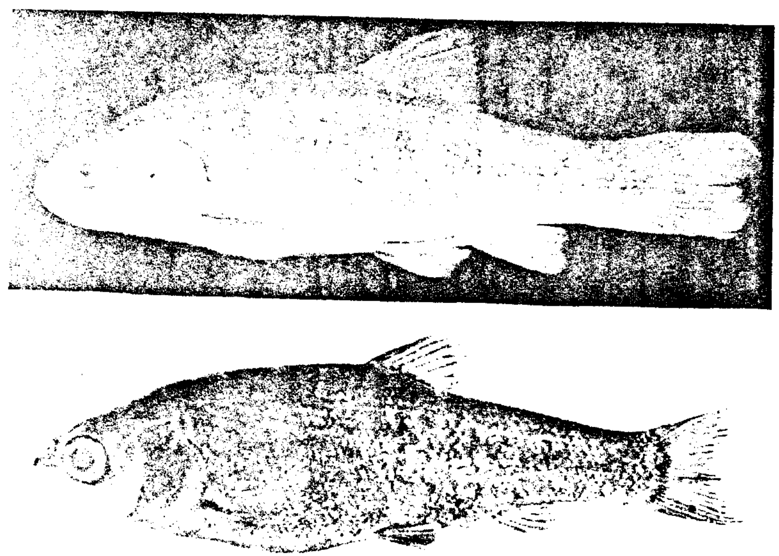

FIG. 1. *Gila bicolor snyderi*. A, holotype, ♂, 105.5 mm S.L.; B, paratype, UMMZ 133006, ♀, 71 mm S.L.

Siphateles sp.—Hubbs and Miller, 1948: 80 (Long Valley).
Gila n.sp.—Miller, 1969: 113 (depletion).

DIAGNOSIS.—A representative of the subgenus *Siphateles* (pharyngeal teeth uniserial), differing from other subspecies of *Gila* ***bicolor*** (Girard) in having: pharyngeal arches with a strong shield at the posterior end of the anterior limb (Fig. 2, A and B); the scale (Fig. 3, A) typically with a weak or no basal shield and with lateral as well as apical (rarely a few basal) radii, the total number of radii varying from 13 to 29; the dentary deep below the subvertical ascending process with the gnathic ramus strong and evenly curved and the thin, elevated ridge of the dentary little flared away from the median (Fig. 4, A and B); and usually from 10 to 14 gill rakers, 7 anal rays, and from 52 to 58 lateral-line scales.

TYPES.—Holotype, UMMZ 141858, an adult male 105.5 mm in standard length (Fig. 1, A) from an irrigation canal and ditches about

8 mi. S of Bishop near Keough Hot Springs, Inyo County, California, 1 September 1942, R. R., R. G., and F. H. Miller. Taken with the holotype were 17 paratopotypes, UMMZ 140411 (22–139 mm). Additional paratypes have been examined as follows: UMMZ 65309 (63, 25–61 mm), Owens River at Laws, Inyo Co.; UMMZ 124842 (81, 18–89 mm), western head spring in Fish Slough about 10 mi. N of Bishop in Mono Co.; UMMZ 133006 (44, 47–120 mm), same locality; UMMZ 140403 (95, 21–73 mm), same locality; UMMZ 132151 (536, 34–126 mm), drainage ditch 5.4 mi. S of Big Pine, Inyo Co.; UMMZ 132158 (5, 28–57 mm), Bishop Creek just N of Bishop, Inyo Co.; UMMZ 133010 (32, 19–96 mm), Hot Creek, tributary to Owens River in Long Valley, Mono Co.; UMMZ 133098 (61, 20–84 mm), same locality; UMMZ 140399 (557, 15–109 mm, incl. 12 cleared and stained), same locality; UMMZ 132153 (7, 25–104 mm), feeder of Hot Creek at Hot Creek Rearing Station (Calif. Dept. Fish and Game) T. 3 S, R.

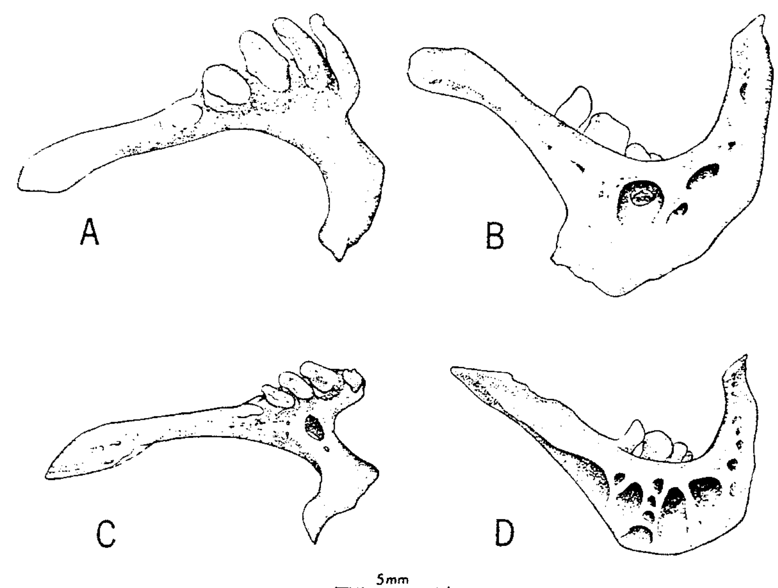

FIG. 2. Dorsal and lateral aspects of left pharyngeal arches of two subspecies of *Gila bicolor*. A, B, *G. b. snyderi*, UMMZ 189883, ♀, 180 mm S.L., Owens R. below Crowley Dam; C, D, *G. b. obesa*, UMMZ 174438, ♂, 185 mm S.L., Pyramid L., Nevada.

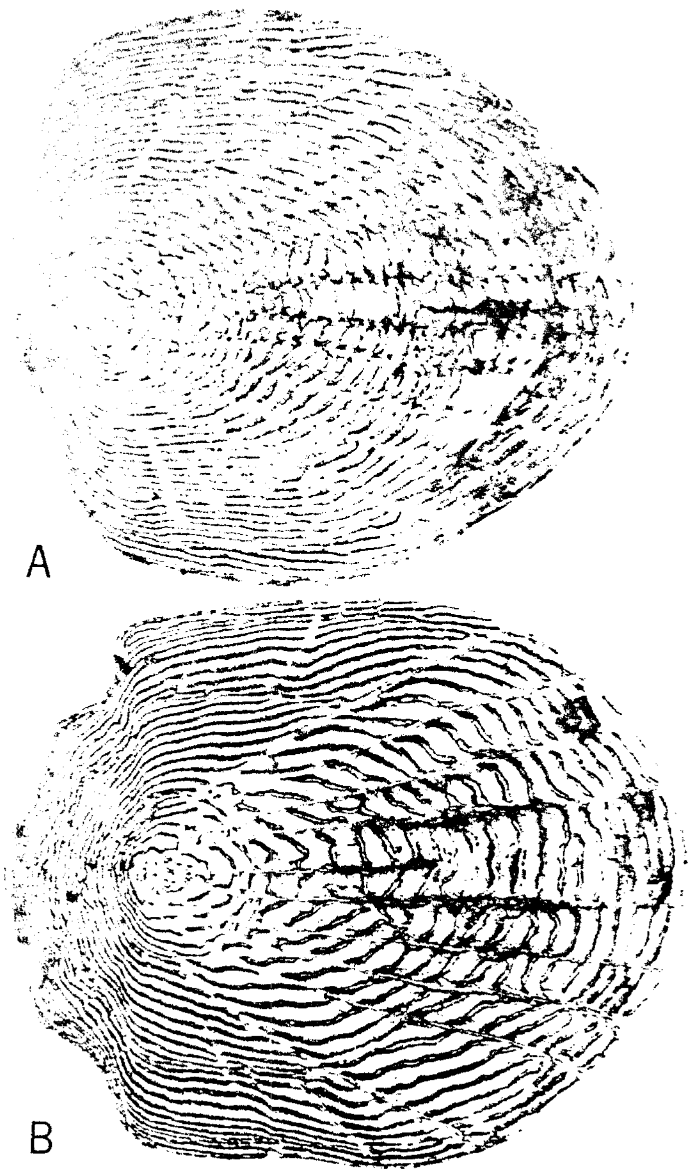

FIG. 3. Scales from mid-side of two subspecies of *Gila bicolor*. A, *G. b. snyderi*, UMMZ 133006, ♀, 90 mm S.L., western head spring, Fish Slough, California; B, *G. b. obesa*, UMMZ 124873, ♀, 90 mm S.L., Humboldt R. near Lovelock, Nevada.

28 E; UMMZ 133101 (1, 92 mm), N Fork Bishop Creek, Inyo Co.; UMMZ 140406 (45, 31–40 mm), irrigation ditch from Owens River, 3.2 mi. N of Bishop, Inyo Co.; UMMZ 160947 (178, 47–134 mm, incl. 3 cleared and stained), Whiskey Creek at mouth in Crowley Lake, Mono Co.; UMMZ 189640 (10, 55–137 mm, incl. 1 cleared and stained), Hot Creek, tributary to Owens River below gorge near bridge, Mono Co.; UMMZ 189883 (12, 36–180 mm, largest is skeleton), Owens River about 0.5 mi. below Crowley Dam, Mono Co.; SU 133 (1, 62.7 mm), Owens Lake, Inyo Co.; SU 4270 (4, 118–153 mm), Lone Pine, Inyo Co.; SU 4273, 4322 (51, 23.4–66.9 mm), Morton's Slough, near Independence, Inyo Co.; SU 4813 (6, 25.9–62.6 mm), Morton's Slough, Independence; SU 23043 (37, 52.7–117.4 mm), Owens River, Laws, N of Bishop, Inyo Co.

DESCRIPTION.—Body form and coloration are shown for a mature male and an immature female (Fig. 1, A and B), the latter illustrating well the distribution and abundance of melanophores. The diagnostic features of the scale (essentially rounded at base and with lateral radii) and the shape of the pharyngeal arch and dentary are illustrated and compared with its closest relative, *G. b. obesa* (Girard) (Figs. 3 and 4). Counts of scale radii and proportional body measurements appear in Tables 1 and 2, respectively.

Scales were examined from 30 fish, from 65 to 139 mm S.L., from four different localities (2 in Owens Valley and 2 in Long Valley). Total radii vary from 13 to 29 (Table 1), with lateral radii (weak to well developed) on all and the basal shield lacking on 20, weak on 8 and well developed on 2.

The pharyngeal dentition varies as follows: 0, 5–4, 0 in 18 and 0, 5–5, 0 in 3 from two localities. The teeth have a well developed grinding surface.

Vertebrae (including 4 for the Weberian apparatus and counting all centra) vary as follows: 37 (1), 38 (27), 39 (24), 40 (1), based on four samples from Owens Valley, two from Long Valley, and one from Owens River below Crowley Lake Dam.

Gill rakers (total on first arch, including rudiments) vary in 223 as follows: 9 (2), 10 (11), 11 (52), 12 (85), 13 (48), 14 (23), 15 (2), avg. 12.09.

Fin-ray counts vary as follows: dorsal, 7 (9), 8 (345), 9 (8) in 362, avg. 8.00; anal, 6 (4), 7 (297), 8 (42), in 343, avg. 7.11; pectorals (both fins), 14 (9), 15 (37), 16 (152), 17 (182), 18 (52), 19 (8) in 440, avg. 16.58; pelvics (both fins), 0 (2), 7 (3), 8 (71), 9 (379), 10 (39) in 494, avg. 8.89.

Scale counts vary as follows: lateral line, 52 (7), 53 (5), 54 (10),

TABLE 1

NUMBER OF SCALE RADII IN TWO SUBSPECIES OF *Gila bicolor*

Subspecies	Number of Scale Radii 7–8	9–11	12–14	15–17	18–20	21–23	24–26	27–29	N	Range	Mean
obesa	2	14	11	3					30	7–15	11.50
snyderi			3	7	4	8	6	2	30	13–29	20.43

55 (10), 56 (9), 57 (14), 58 (8), 59 (3), 60 (3), 61 (3), 62 (3), 63 (0), 64 (1) in 76, avg. 56.25; dorsal origin to lateral line, 11 (1), 12 (30), 13 (31), 14 (11), 15 (3) in 76, avg. 12.80; anal origin to lateral line, 7 (1), 8 (31), 9 (35), 10 (5) in 72, avg. 8.61; pelvic insertion to lateral line, 6 (1), 7 (24), 8 (39), 9 (7), 10 (2) in 76, avg. 7.72; predorsal scales, 28 (6),

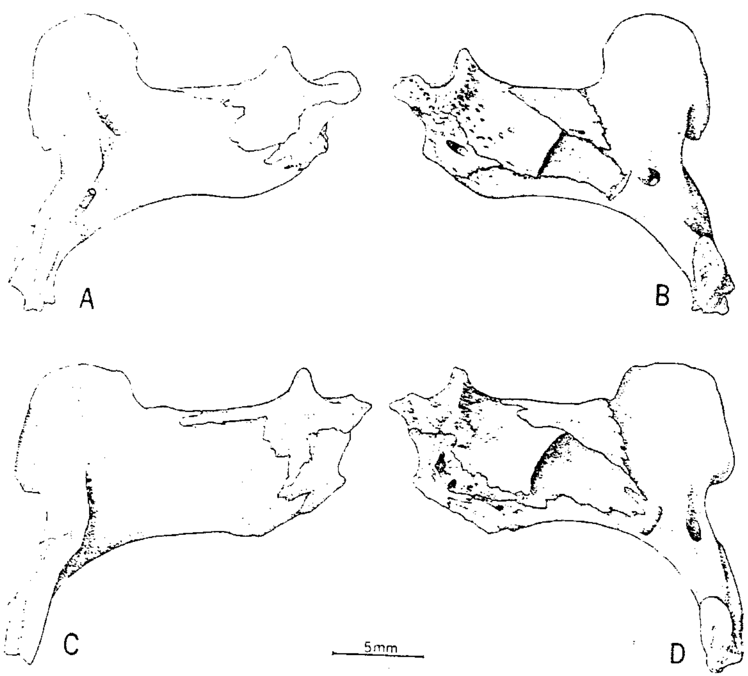

FIG. 4. Lateral and mesial views of left mandibles of two subspecies of *Gila bicolor*. A, B, *G. b. snyderi*, UMMZ 189883, ♀, 180 mm S.L., Owens R. below Crowley Dam; C, D, *G. b. obesa*, UMMZ 174438, ♂, 185 mm S.L., Pyramid L., Nevada.

Occasional Paper No. 667

ERRATA: Legends for Figures 4 (page 6) and 5 (page 10) should be transposed.

TABLE 2

PROPORTIONAL MEASUREMENTS, IN THOUSANDTHS OF STANDARD LENGTH, OF *Gila bicolor snyderi*[1]

Measurement	Holotype	6 Males	7 Females
Standard length, mm	105.5	51.4–105.5 (84.8)	70.5–135.5 (93.3)
Predorsal length	557	520–516 (534)	531–558 (540)
Prepelvic length	534	517–549 (535)	516–554 (538)
Anal origin to caudal base	310	307–330 (315)	285–320 (302)
Body, greatest depth	294	282–295 (290)	266–322 (298)
Width	176	158–176 (169)	168–193 (180)
Head length	298	279–298 (290)	279–300 (291)
Depth	198	195–206 (199)	194–205 (199)
Width	179	167–182 (175)	164–179 (169)
Caudal peduncle length	217	210–223 (214)	199–225 (209)
Least depth	136	125–143 (135)	120–134 (126)
Snout length	82	66–83 (77)	62–83 (74)
Orbit length	56	53–84 (63)	49–75 (63)
Upper jaw length	87	76–87 (84)	67–90 (82)
Mandible length	112	101–112 (108)	101–116 (109)
Mouth width	76	61–78 (73)	58–82 (70)
Interorbital, bony width	86	70–90 (84)	74–92 (83)
Suborbital width	42	31–42 (36)	31–44 (36)
Dorsal fin, depressed length	242	221–260 (237)	194–216 (208)
Pectoral fin length	199	186–228 (200)	143–174 (163)
Pelvic fin length	178	159–181 (173)	134–151 (144)
Middle caudal rays, length	146	144–163 (152)	121–141 (131)

[1]Holotype included with the 6 males. Based on UMMZ 133006 (1 ♂, 5 ♀ ♀), 140403 (1 ♂), 140411 (3 ♂ ♂, 2 ♀ ♀), 141858 (holotype).

29 (9), 30 (10), 31 (8), 32 (9), 33 (12), 34 (10), 35 (5), 36 (0), 37 (1), 38 (2) in 72, avg. 31.79; around body, 48 (1), 49 (1), 50 (3), 51 (3), 52 (8), 53 (10), 54 (8), 55 (10), 56 (11), 57 (8), 58 (4), 59 (4), 60 (1) in 72, avg. 54.56; and around caudal peduncle, 26 (3), 27 (5), 28 (12), 29 (17), 30 (22), 31 (9), 32 (4) in 72, avg. 29.29.

In life the new subspecies is dusky olive above and whitish below, with blue and gold reflections along the side. There is considerable gold on the side of the head, often strongest along the margin of the preopercle. Some specimens show a slight wash of yellow about the bases of the paired fins. The fins are generally washed with olive-brown or reddish brown, the pelvics and anal becoming pale posteriorly but lacking a definite whitish border. No red was noted in the axils of paired fins or elsewhere on the body. This subspecies is not sharply bicolored as is *G. b. obesa*.

COMPARISONS.—The new subspecies is most readily distinguished from other forms of *Gila bicolor* by the presence of lateral radii on the scale combined with the rounded or weakly shield-shaped scale base (Fig. 3, A). The preponderance of 7 anal rays and the 8-rayed dorsal fin also will separate it from all but the Lahontan tui chub, *Gila b. obesa*. In the upper parts of East Walker River near Bridgeport, just north of the Mono Lake basin (UMMZ 133113, 140373–74, 140389–total, 18 specimens), that subspecies shows its closest approach to *G. b. snyderi*. Here the anal rays are typically 7, there may be from 1 to 3 lateral radii on the scale, and its basal shield may be weak; however, there is almost no overlap in total number of scale radii. The gill rakers of these populations of *G. b. obesa* are somewhat more numerous (12–16, usually 14) than in *G. b. snyderi*, but in other parts of the Lahontan basin (the range of *G. b. obesa*) the gill rakers may be fewer, as in *snyderi* (e.g., Bishop Creek, Elko Co., Nevada, UMMZ 141523, 10–15 in 192, avg. 12.61; see Hubbs et al., 1973). The close resemblance of *snyderi* to the East Walker River populations of *obesa* is to be expected since *snyderi* was probably derived from a population of tui chub in the Lahontan basin and the Bridgeport area is the geographically nearest region of that basin that is known to contain *obesa*. In the Pit, Klamath, and Columbia River basins, populations of *Gila bicolor* typically have 9 dorsal and 8 anal rays and from 45 to 51 lateral-line scales (original data), counts that readily distinguish them from *G. b. snyderi*.

The Mohave River *Siphateles* has been accorded full species rank for many years but is here regarded as a subspecies, *Gila bicolor mohavensis* (Snyder), since I have not been able to discover characters that will separate it specifically from all populations of *Gila bicolor* in the Lahontan basin. It is easily distinguished from *G. b. snyderi* by having typically 8 anal rays, usually 10 pelvic rays, 18–29 gill rakers, and a scale with no lateral radii, 6–12 apical radii, and the base strongly shield-shaped (Hubbs and Miller, 1943: 364, 375, pl. I).

Examination of collections of *Gila bicolor* from Crowley Lake and its tributaries made during the past decade reveals that the Owens tui chub has hybridized with the Lahontan tui chub, which gained access to these waters through bait use by anglers.

ETYMOLOGY.—The new chub is named in memory of John Otterbein Snyder, who pioneered in researches on freshwater fishes of western North America.

Catostomus fumeiventris, new species
Owens sucker
Figs. 5–9

Catostomus arenarius—Snyder, 1917: 202–203 (counts and measurements, Owens River; abundance). Shapovalov, 1941: 443 (likely that the Owens River form is "subspecifically or even specifically distinct" from *C. arenarius*). Vestal, 1943: 53 (June Lake).

Catostomus sp.—Hubbs, Hubbs, and Johnson, 1943: 47–54, fig. 6, pl. 1, fig. 1a, pl. VII, fig. 1a (Santa Clara River basin, where introduced; hybridization with *Pantosteus santaanae*). Miller, 1946: 49 (Owens River endemic; derivation). Hubbs and Miller, 1951: 300 (Owens River basin). Miller, 1969: 114 (listed).

DIAGNOSIS.—A moderately coarse-scaled species of *Catostomus* (subgenus *Catostomus*) with 10 dorsal rays, usually from 75 to 78 lateral-line scales, a dusky abdomen that is most evident in nuptial males, all of which lack a red lateral stripe, the mandible with the ascending process of the dentary abruptly elevated above the mandibular shaft which is shorter than it is in *C. tahoensis* (Fig. 6), the pharyngeal arches moderately heavy (Fig. 7), and the tripus broad and with its articular process rather far back, narrow-based, and bluntly pointed (Fig. 8).

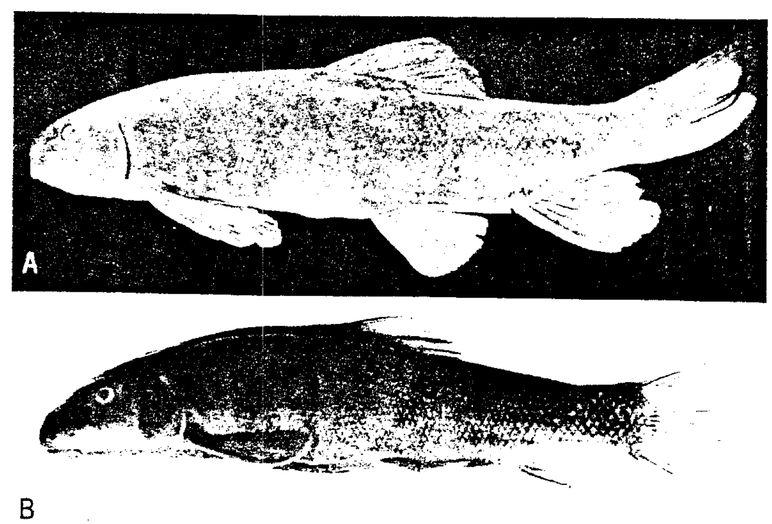

FIG. 5. *Catostomus fumeiventris*. A, holotype, breeding ♂, 212 mm S.L.; B, paratype, UMMZ 140397, ♂, 137 mm S.L.

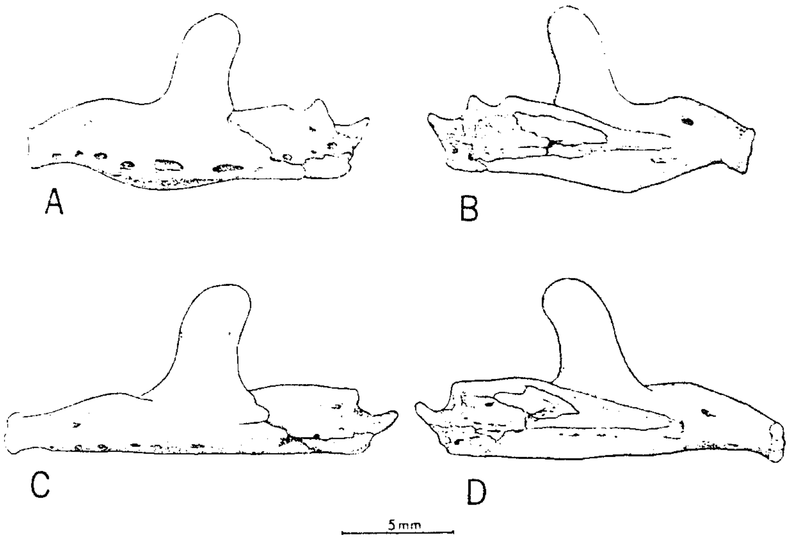

FIG. 6. Lateral and mesial views of left mandibles of two species of *Catostomus*. A, B, *C. fumeiventris*, UMMZ 181667, ♂, 364 mm S.L., June L., California; C, D, *C. tahoensis*, UMMZ 174437, ♀, 365 mm S.L., Pyramid L., Nevada.

TYPES.—Holotype, UMMZ 191571, a breeding male 212 mm S.L. from Hilton Creek (Fig. 5 A), tributary to Crowley Lake, Mono County, California, 29 June 1952. Three ripe to spent females, UMMZ 165011, 320–322 mm, were taken with the holotype. Additional paratypes are: UMMZ 124837 (1, 156 mm), upper spring of Hot Creek rearing ponds, Mono Co.; UMMZ 124838 (6, 20–29 mm), tributary to Owens River 1.5 mi. N and 2.25 mi. W of Laws, Inyo Co.; UMMZ 124840 (51, 20–105 mm), western head spring of Fish Slough, ca. 10 mi. N of Bishop; UMMZ 132146 (2, 55 and 143 mm), Owens River just above Aberdeen; UMMZ 132150 (215, 60–270 mm), drainage ditch in Owens Valley 5.4 mi. S of Big Pine; UMMZ 132152 (215, 19–190 mm), feeder of Hot Creek at Hot Creek Rearing Station; UMMZ 132155 (9, 32–55 mm), Owens River at Laws; UMMZ 132157 (55, 23–55 mm), Bishop Creek just N of Bishop; UMMZ 133005 (1, 75 mm), western head spring of Fish Slough; UMMZ 133009 (16, 20–31 mm), Hot Creek, Mono Co.; UMMZ 133093 (2, 179 and 204 mm), Sabrina Lake near head of Bishop Creek; UMMZ 133096 (11, 19–39 mm), Owens River ca. 6 mi. S of Big Pine; UMMZ 133099 (7, 18–113 mm), N Fork Bishop Creek 2 mi.

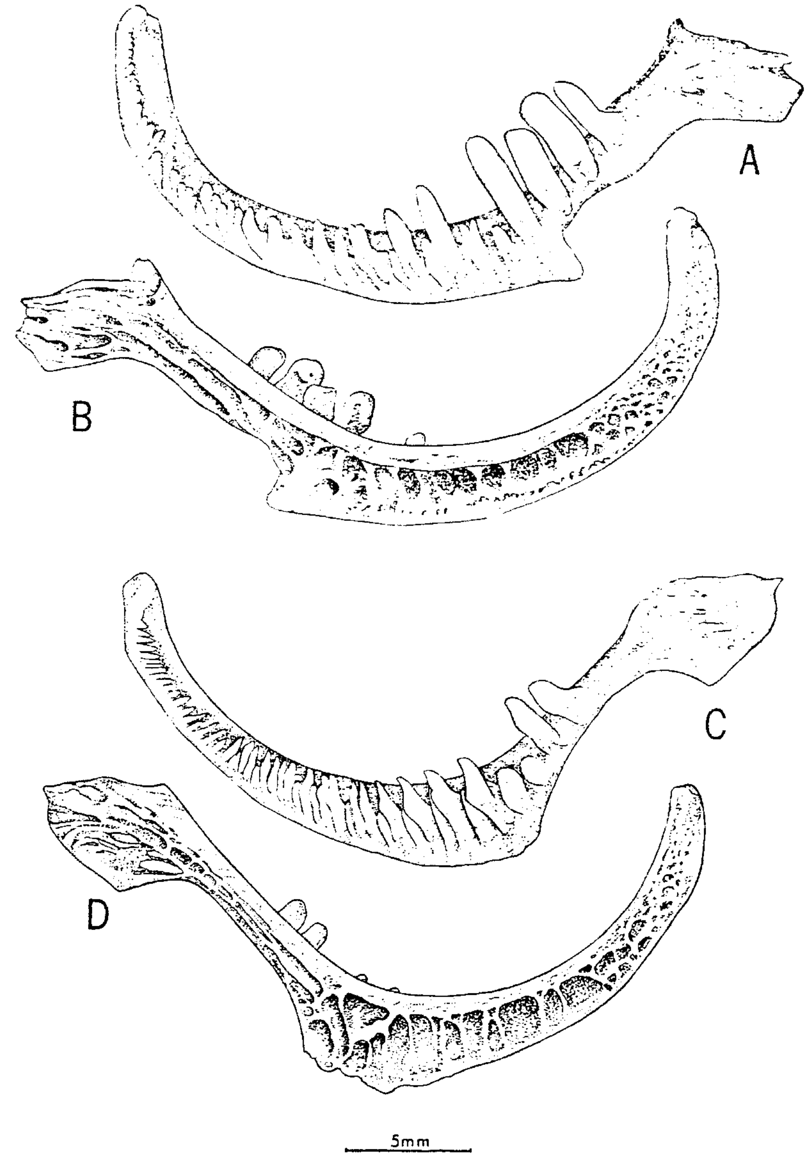

FIG. 7. Ventral views, anterior and posterior, of left pharyngeal arches of two species of *Catostomus*. A, B, *C. fumeiventris*, and C, D, *C. tahoensis*; same data as in Fig. 6.

from Owens River: UMMZ 134678 (123, 21–50 mm), irrigation ditch ca. 8 mi. NE of Bishop; UMMZ 140397 (18, 27–137 mm), spring tributary and most westerly distributary of Hot Creek, ca. 5 mi. N of Whitmore Hot Springs; UMMZ 140401 (13, 46–69 mm), most northwesterly spring head of Fish Slough; UMMZ 140404 (171, 20–53 mm), irrigation ditch from Owens River 3.2 mi. N of Bishop; UMMZ 140407 (19, 23–54 mm), irrigation ditch from Owens River 3.7 mi. N of Bishop; UMMZ 140409 (298, 22–91 mm), irrigation canal and ditches 8 mi. S of Bishop; UMMZ 160949 (32, 180–350 mm), Whiskey Creek at mouth in Crowley Lake, Mono Co.; UMMZ 165010 (697, 11–337 mm), Whiskey Creek, tributary to Crowley Lake; UMMZ 181667-S (3 skeletons, 364–406 mm), June Lake, Mono Lake Basin (introduced); UMMZ 189882 (36, 20–58 mm; 1 skeleton, 260 mm), Owens River ca. 0.5 mi. below Crowley Lake Dam.

DESCRIPTION.—Body form and coloration are shown in Figure 5. The diagnostic features of the mandible, pharyngeal arch, and tripus are

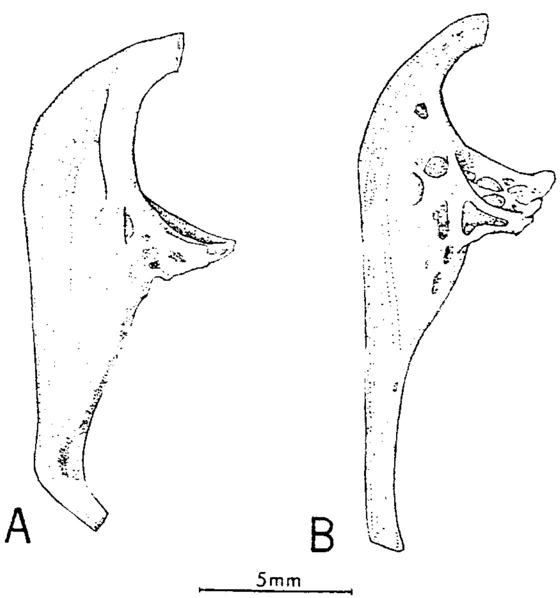

FIG. 8. Dorsal view of left tripus, anterior end up, of two species of *Catostomus*. A, *C, fumeiventris*, and B, *C. tahoensis*; same data as in Fig. 6.

illustrated in Figures 6–8. Proportional measurements are presented in Table 3.

Fin-ray counts vary as follows: dorsal 9(5), 10(69), 11(7) in 81, avg. 10.02; anal 7(31); pectorals (both fins) 16(5), 17(19), 18(22), 19(4) in 50, avg. 17.50; pelvics (both fins) 9(6), 10(43) in 49, avg. 9.88; caudal 18(25).

TABLE 3

PROPORTIONAL MEASUREMENTS, IN THOUSANDTHS OF STANDARD LENGTH, OF *Catostomus fumeiventris*[1]

Measurement	Holotype	10 Males	10 Females
Standard length, mm	212	115–183 (144.7)	120–180 (140.0)
Predorsal	508	494–513 (502)	499–522 (514)
Dorsal origin to occiput	330	302–325 (312)	315–336 (320)
To caudal base	534	517–556 (534)	515–538 (525)
Prepelvic	561	539–557 (550)	550–576 (565)
Anal origin to caudal base	253	238–256 (247)	221–250 (241)
Body, greatest depth	217	215–251 (231)	212–240 (224)
Width	158	164–179 (172)	160–177 (168)
Caudal peduncle, length	151	150–164 (156)	141–167 (157)
Least depth	97	93–105 (100)	96–106 (101)
Head length	237	244–263 (254)	253–272 (263)
Depth	155	151–163 (158)	157–167 (162)
Width	162	165–174 (170)	165–183 (173)
Interorbital, bony width	87	92–99 (95)	95–105 (99)
Snout length	111	107–121 (114)	110–126 (118)
Orbit length	31	33–41 (37)	34–42 (39)
Lips, overall width	75	74–86 (79)	66–87 (79)
Overall length	54	59–70 (65)	61–73 (66)
Isthmus width	53	51–63 (56)	52–69 (59)
Suborbital, fleshy width	74	67–78 (72)	67–81 (74)
Dorsal fin, depressed length	259	246–270 (255)	219–228 (222)
Base	158	146–161 (155)	136–147 (141)
Anal fin, depressed length	243	236–267 (252)	206–238 (221)
Caudal fin length	149	139–155 (149)	145–169 (156)
Pectoral fin length	223	219–242 (226)	212–230 (220)
Pelvic fin length	186	163–185 (173)	150–158 (154)

[1]20 paratypes based on UMMZ 132150

Scale counts vary as follows: in lateral line 66(1), 67(1), 68(0), 69(2), 70(1), 71(0), 72(1), 73(2), 74(2), 75(9), 76(8), 77(8), 78 (7), 79 (3), 80 (2), 81(1), 82(2), 83(0), 84(0), 85(1) in 51, avg. 76.06; dorsal to lateral line 13(1), 14(13), 15(10), 16(1), in 25, avg. 14.44; anal to lateral line 9(1), 10(11), 11(13) in 25, avg. 10.48; scales around caudal peduncle 25(8), 26(11), 27(2), 28(2), in 23, avg. 25.91; predorsal scales 36(3), 37(2), 38(6), 39(6), 40(3), 41(2), 42(2), in 24, avg. 38.75; postdorsal scales 25(3), 26(7), 27(6), 28(1), 29(3), 30(2), in 25, avg. 27.12.

Gill rakers (total on first arch, including rudiments) 24(1), 25(6), 26(11), 27(5), 28(1), in 24, avg. 25.96.

Vertebrae (including the Weberian complex as four) 44(2), 45(20), 46(28), 47(6), 48(1), in 57, avg. 45.72.

In life the new species is mostly slate-colored and is often dusky across the abdomen, especially in nuptial males, with weak blue reflections on the sides. Occasionally an individual may be almost a uniform blackish slaty-blue. The paired fins show a wash of dull olive and the median fins (in some) have a faint wash of dull reddish amber. There is no trace of a red stripe on the sides of nuptial males.

Larval and Juvenile Stages.—On 29 June 1952, near the mouth of Whiskey Creek (tributary to the southwestern arm of Crowley Lake in Long Valley, Mono County), 697 prolarval to juvenile suckers (UMMZ 165010) were collected by Carl L. and Laura C. Hubbs and E. P. Pister. The following observations are condensed from detailed notes by Dr. Hubbs, whose terminology of early developmental stages (Hubbs, 1944) is used. Brief comparison is made with postlarvae of *Catostomus commersoni* (Stewart, 1926) and *Catostomus macrocheilus* (Macphee, 1960).

There are 679 prolarvae to postlarvae, 11–17 mm T.L., one of which is a teratological specimen (11 mm long). Of these, the prolarvae (with yolk the full length of the gut) measured 11 or 12 mm; most of those 12 mm long had fully transformed into postlarvae (Fig. 9, A and B). Transformation to the juvenile stage occurs between 19 and 22 mm; 1 juvenile, 25 mm long and showing no trace of the preanal fold, was taken. The larvae abounded in Whiskey Creek in quiet sedgy margins and little backwaters. A dense concentration of them occurred in one lateral recess about 45 cm deep, 45 cm wide, and 75 cm long (at right angle to bend in creek), where most of the sample was taken in one dip of a handkerchief.

Developmental events in postlarval largescale suckers have been detailed by Macphee (1960: Table 1). The median fin fold that virtually encircles the trunk and tail (Fig. 9) disappears in the following sequence: the anal-caudal, dorsal-caudal, and pre-anal segments. In *C. fumeiventris* all three segments are still retained at nearly 18 mm, with no trace of pelvic fins although the anlage of these fins (a small, structureless bud) may be present at about 17 mm. In both *C. commersoni* and *C. macrocheilus*, the pelvic fins appear (as buds) by 15 or

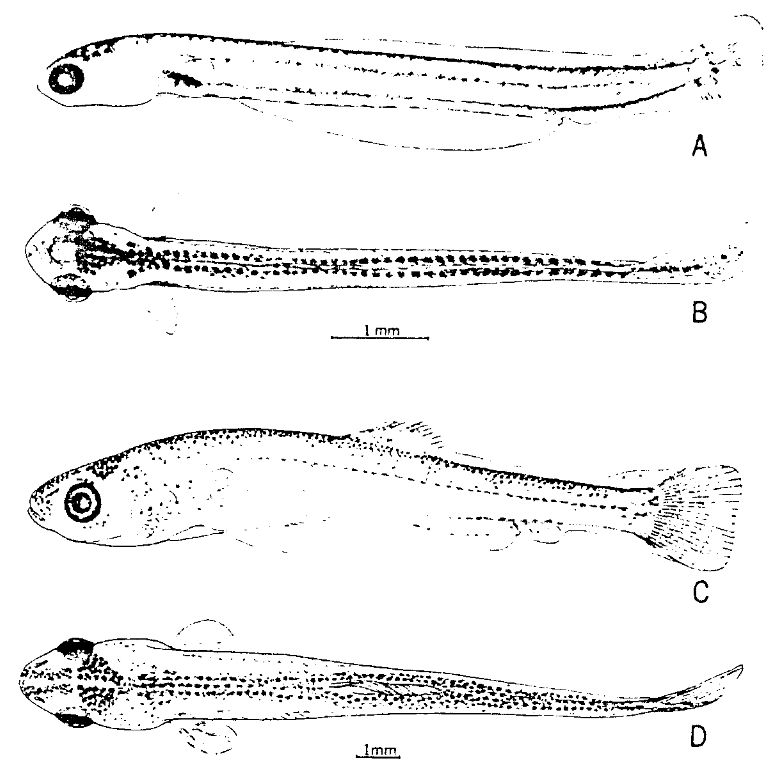

Fig. 9. Lateral and dorsal views of postlarvae of *Catostomus fumeiventris*, UMMZ 165010, Whiskey Cr., tributary of Crowley L., California. A, B, 12 mm total length; C, D, 17.5 mm T.L.

16 mm, and rays are present between 16 and 18 mm. Pelvic fin rays were noted in *C. fumeiventris* at about 21 mm but probably appear earlier since no specimens in the 18–21 mm size range were obtained. The other fins develop later in the new species than in *C. commersoni* in which Stewart reported the dorsal fin to be "defined" at 9 mm, the anal fin well developed at 18 mm when the caudal fin is well forked. This would seem to indicate a faster growth rate in the white sucker. Toward the end of the postlarval period, at a standard length of 16 or 17 mm, the caudal fin rays have become quite well developed, the dorsal rays next best, then the anal, pectoral, and pelvic rays. By 21

mm, well into the transitional stage toward the juvenile, the fin rays are all developed.

There is a heavy concentration of pigment, making a black canopy, over the anterior part of the gut, and this black curtain is extended backward more narrowly over the posterior two-thirds of the gut and on the lower surface of the whole urosome. Extending backward from the dorsal band and from this posterior ventral band there is a more or less distinct clouding of pigment over the rudimentary developing caudal rays.

At the size and time of transformation between prolarva and postlarva, there is a rather sudden increase in the melanophores. Commonly there is an increase on the lower side of the head, before many conspicuous ones form elsewhere. These on the lower side of the head usually appear first about the chin, and, frequently as a single melanophore on either side, at about the lower angle of the preopercle. In both prolarva and postlarva there is usually a black mark comprising several melanophores just behind the base of the pectoral fin (Fig. 9, A and B). These melanophores are more superficial than those above the gut, but sometimes seem to grade into that series.

COMPARISONS.—*Catostomus fumeiventris* is probably most closely related to the Tahoe sucker, *C. tahoensis* Gill and Jordan, a species widely distributed in the Lahontan basin to the north of Owens Valley. It can be readily distinguished from that species by its life colors (breeding male not bicolored, without red lateral stripe so prominent in *tahoensis,* and with dusky abdomen) and by the configuration of the mandible, pharyngeal arch, and tripus. In addition, the new species usually has fewer than 80 (rather than more than 80) scales in the lateral line. Comparison with the species of *Catostomus* in the Colorado River basin shows that *C. fumeiventris* is not closely related to any *Catostomus* south and east of the Owens River Basin.

ETYMOLOGY.—The Owens sucker is named *fumeiventris* from the Latin, genitive, *fumeus,* meaning smoky, and *venter,* belly, in reference to the smoky or dusky-colored abdomen.

ZOOGEOGRAPHY

The fish fauna of Owens Valley is noteworthy for its paucity (only two minnows, one sucker, and one killifish) and for the absence of trout *(Salmo),* common to the north and west of the area. Although Schreck and Behnke (1971: 996) speculated that the golden trout of California may have gained access to the Kern River via "annectent waterways between the lower Colorado River basin, Death Valley, and Owens Valley," which would require that the trout of Owens Valley were subsequently eliminated by some natural catastrophe (unexplained by them), there is no evidence that trout ever existed in the Owens River basin. Available fossils, dating from late Pleistocene to at least early Pleistocene and perhaps late Pliocene (5 sites: Mohave R. basin, Pluvial L. Searles, White Hills, near Owens L., and Mono basin—see Miller, 1965: Fig. 1, for 3 of these), reveal only representatives of the same families (Cyprinidae, Catostomidae, Cyprinodontidae) found in the Death Valley System today.

There is evidence, however, of dual invasions of the Owens River basin. The genus *Cyprinodon,* known today only to the east and southeast of Owens Valley, and represented in Death Valley (in the Pliocene?) by *Cyprinodon breviradius* Miller (1945), obviously was derived from an ancestral form in the area now occupied by the lower Colorado–Gila River basins. In contrast, both the chub (subgenus *Siphateles*) and sucker, and likely the dace *(Rhinichthys osculus),* originated from the north in what is now the Lahontan Basin. No Recent or fossil member of the subgenus *Siphateles* is known farther south than the Great Basin (Miller, 1946; see Morrison, 1965: Fig. 1, for basin boundary).

Mono Basin was part of the Death Valley System (Putnam, 1944: Pl. 2; Morrison, 1965: Fig. 1). In 1965 Carl L. Hubbs and I traced the outlet into Adobe Valley (which contained a pluvial lake that overflowed into the northern arm of Owens Valley). Lithoid tufa from the highest sharply marked beachline of Pluvial Lake Mono, only slightly below this outlet, has been dated as 21,900± 600 years before present (Hubbs et al., 1965: 92). This shoreline has been correlated by Putnam (1949: 1295–96) with the Tioga glacial stage of the adjacent Sierra Nevada, and Putnam correlated the actual outlet level of Lake Mono with the older Tahoe glacial stage. Mono Basin has been fishless since historic time; perhaps the eruption of the Mono Craters, formed subsequent to the overflow stage of Lake Mono, destroyed the fish fauna by a deluge of volcanic ash (Miller, 1946: 49). The detailed history of hydrographic connections and fish movements into and out of the Mono Basin would probably provide the explanation of the selective nature of this filter (excluding *Salmo, Cottus,* and certain other Lahontan fishes), but this history is yet to be deciphered.

ACKNOWLEDGMENTS

I am grateful to Carl L. Hubbs for allowing me to utilize his detailed notes on young-of-the-year suckers from Whiskey Creek and for suggesting the specific name for this fish. George S. Myers and Margaret H. Storey kindly loaned material from Stanford University (SU) and Pearl Sonoda answered queries regarding some of these specimens.

E. P. Pister generously provided the June Lake suckers that were used for osteological study and participated in the catch of larval specimens. Paul R. Needham and Carl E. Bond donated breeding material of the new sucker. Appreciation is also extended to Martha Lackey for the drawings and to Louis P. Martonyi, Clarence Flaten, and F. W. Ouradnik for the photographs.

LITERATURE CITED

GILBERT, CHARLES H. 1893. Report on the fishes of the Death Valley Expedition collected in southern California and Nevada in 1891, with descriptions of new species. N. Amer. Fauna, 7:229–234.

HUBBS, CARL L. 1944. Terminology of early stages of fishes. Copeia, 1943 (4): 260.

HUBBS, CARL L., GEORGE S. BIEN, and HANS E. SUESS. 1965. La Jolla natural radiocarbon measurements IV. Radiocarbon, 7:66–117.

HUBBS, CARL L., LAURA C. HUBBS, and RAYMOND E. JOHNSON. 1943. Hybridization in nature between species of catostomid fishes. Contrib. Lab. Vert. Biol., Univ. Mich., 22:1-76.

HUBBS, CARL L., and ROBERT R. MILLER. 1943. Mass hybridization between two genera of cyprinid fishes in the Mohave Desert, California. Pap. Mich. Acad. Sci., Arts, and Letters, 28 (1942) :343-378.

——— 1948. The zoological evidence: correlation between fish distribution and hydrographic history in the desert basins of western United States. Bull. Univ. Utah, 38 (20) :17–166.

——— 1951. *Catostomus arenarius*, a Great Basin fish, synonymized with *C. tahoensis*. Copeia, 1951 (4) :299–300.

HUBBS, CARL L., ROBERT R. MILLER and LAURA C. HUBBS. 1973. Hydrographic history and relict fishes of the North-Central Great Basin. Mem. Calif. Acad. Sci. 7.

MACPHEE, CRAIG. 1960. Postlarval development and diet of the largescale sucker, *Catostomus macrocheilus*, in Idaho. Copeia, 1960 (2) :119–125.

MILLER, ROBERT R. 1945. Four new species of fossil cyprinodont fishes from eastern California. Jour. Wash. Acad. Sci., 35 (10) :315–321.

——— 1946. Correlation between fish distribution and Pleistocene hydrography in eastern California and southwestern Nevada, with a map of the Pleistocene waters. Jour. Geol., 54 (1) :43–53.

——— 1948. The cyprinodont fishes of the Death Valley system of eastern California and southwestern Nevada. Misc. Publ. Univ. Mich. Mus. Zool., 68:1–155.

——— 1965. Quaternary freshwater fishes of North America. *In:* The Quaternary of the United States. E. H. Wright and D. G. Frey, editors. Princeton Univ. Press, pp. 569–581.

——— 1969. Conservation of fishes of the Death Valley system in California and Nevada. Trans. Calif.-Nev. Sec. Wildlife Soc., 1969:107–122.

MILLER, ROBERT RUSH, and EDWIN P. PISTER. 1971. Management of the Owens pupfish, *Cyprinodon radiosus*, in Mono County, California. Trans. Am. Fish. Soc., 100 (3) :502–509.

MORRISON, ROGER B. 1965. Quaternary geology of the Great Basin. *In:* The Quaternary of the United States. E. H. Wright and D. G. Frey, editors. Princeton Univ. Press, pp. 265–285.

PUTNAM, WILLIAM C. 1949. Quaternary geology of the June Lake district of California. Bull. Geol. Soc. Amer., 60 (8) :1281–1302.

SCHRECK, C. B., and R. J. BEHNKE. 1971. Trouts of the upper Kern River basin, California, with reference to systematics and evolution of western North American *Salmo*. Jour. Fish. Res. Bd. Can., 28 (7) :987–998.

SHAPOVALOV, LEO. 1941. The fresh-water fish fauna of California. Proc. Sixth Pac. Sci. Congress, 3:441–446.

SNYDER, JOHN OTTERBEIN. 1917. An account of some fishes from Owens River, California. Proc. U.S. Nat. Mus., 54:201–205.

STEWART, NORMAN HAMILTON. 1926. Development, growth, and food habits of the white sucker, *Catostomus commersonii* Lesueur. Bull. U.S. Bur. Fish, 42:147–184.

VESTAL, ELDEN H. 1943. Creel returns from hatchery trout in June Lake, California. Calif. Fish and Game, 29 (2) :51–63.