

OCCASIONAL PAPERS OF THE MUSEUM OF
ZOOLOGY
UNIVERSITY OF MICHIGAN

ANN ARBOR, MICHIGAN

RHINICHTHYS DEACONI, A NEW SPECIES
OF DACE (PISCES: CYPRINIDAE)
FROM SOUTHERN NEVADA

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ABSTRACT.— *Miller, Robert Rush, 1984. Rhinichthys deaconi, a new species of dace (Pisces: Cyprinidae) from southern Nevada. Occ. Pap. Mus. Zool. Univ. Michigan, 707: 1–21, figs. 1–5. Rhinichthys deaconi, an extinct species of dace of the Rhinichthys osculus complex, is described and illustrated from Las Vegas Creek (an extinct habitat) in the Colorado River basin of southern Nevada. It is based on 777 specimens collected between 1891 and 1940. The species probably disappeared around 1957 and definitely was gone before 1967. It is unique among its congeners in anal-fin shape (first and last rays about equal in length) and in having tiny pectoral fins. The scales are very large (40–52 in lateral line), there is no maxillary barbel, and the frenum is obsolescent to lacking. Detailed information is given on its historic (1844–1938) and prehistoric (15,000–30,000 years before present) habitats, including 1903 and 1984 photographs of the type locality. The new species is compared with an undescribed Utah dace and eight subspecies of *Rhinichthys osculus* (three unnamed) that are regarded as close relatives. Additional taxa will likely be recognized in this widely distributed complex, in addition to the undescribed species from Utah. *Rhinichthys osculus velifer* is shown to be confined to Pahrangat Valley, about midway in the Pluvial White River basin.*

Key words: *Dace, Rhinichthys, classification, taxonomy, Rhinichthys osculus complex, Pluvial hydrology, historical changes, extinction, Las Vegas, Nevada.*

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INTRODUCTION

Daces of the genus *Rhinichthys* are widely distributed in a variety of habitats in the fresh waters of Canada, the United States, and northern Mexico (see maps in Lee et al. 1980). Five species divisible into three groups are currently recognized (Hubbs et al. 1974:96; Robins et al. 1980:25; Matthews et al. 1982). These are the *Rhinichthys atratulus*, *R. cataractae*, and *R. osculus* complexes. Within the *R. atratulus* complex, recognition of *R. meleagris* Agassiz as a species distinct from *R. atratulus* Hermann is a strong possibility (Bailey and Smith 1981:1555). Three species—*R. evermanni* Snyder, *R. osculus* (Girard), and *R. falcatus* (Eigenmann and Eigenmann)—are confined to western North America of which one, *R. osculus*, is the most ubiquitous and one of the most variable fishes in that region (Hubbs et al. 1974:96–141; Moyle 1976:195–196). Hubbs et al. referred the *R. osculus* complex to the subgenus *Apocope* and felt (along with Carl E. Bond and J. D. McPhail, pers. comms.) that an additional species—*Rhinichthys umatilla* (Gilbert and Evermann), from the Columbia River basin—probably should be recognized, as was done by Schultz (1936:148) and Carl et al. (1973:126).

The *Rhinichthys osculus* complex (subgenus *Apocope*) is known from the Colorado River basin in Arizona, New Mexico, and extreme northwestern Mexico (where evidently now extinct) and from coastal southern California, northward discontinuously to the Columbia River basin in Idaho and British Columbia (Kettle River, 49°30'N—see Peden and Hughes 1981). Among the myriad of forms that have been referred to this complex is one well isolated Nevada population, now extinct, that is worthy of recognition at the species level. It possesses distinctive traits not found in any other populations of *R. osculus* examined from throughout the species' range. Still other western American demes, yet unnamed, remain to be described (e.g., see Smith 1978:24 and Table 2 herein).

The *Rhinichthys osculus* complex is distinguished from the two other groups of *Rhinichthys* by typically lacking nuptial tubercles on the first pectoral-fin ray as well as on all other fins, and by the weaker and often totally lacking frenum. The nuptial tubercles occur, one per segment usually in a single row, on the first several branched pectoral rays (at least rays 2–4).

SPECIES ACCOUNT

The new species of this complex may be known as:

Rhinichthys deaconi, new species
Las Vegas dace
Figs. 1–4

Rhinichthys (Apocope) nevadensis (misidentification).—Gilbert 1893:230 (paratype from Vegas Creek, Las Vegas, Nevada; USNM 46113, 62 mm standard length (SL), examined).

Rhinichthys sp.—Hubbs and Miller 1948:102 (noted its extreme form and indicated close approach to *R. o. nevadensis* of Ash Meadows).

Rhinichthys osculus.—La Rivers 1962:431 (Vegas Wash population referred to as “yet nondefinable”); Bradley and Deacon 1967:226 (reference to the Las Vegas Valley dace, then extinct, as a differentiated form of *R. osculus*).

DIAGNOSIS.—A species of *Rhinichthys* typically having the dental formula 1,4–4,1 that is distinguished from other members of the *R. osculus* complex (subgenus *Apocope*) by the following traits: a uniquely shaped anal fin of low profile with length of first ray about equal to that of last; pectoral fins tiny (rays 10–14), extending at most (in nuptial ♂) slightly more than half way to base of pelvic fins; caudal fin short, weakly forked; mandible long; mouth narrow and oblique, terminal to subterminal; maxillary barbel virtually lacking; premaxillary frenum usually lacking (a weak bridge noted in 8 of 40 specimens); scales large, 40–52 along the often incomplete lateral line; dorsal rays 6–8, usually 7 or 8, the fin positioned far back on body; anal rays 6–8, usually 7; pelvic rays typically 7.

MATERIAL.—Holotype: UMMZ 125007, adult female 58.3 mm SL, Las Vegas Creek, 0.4 km below US Hwy 91–93, T20N, R16E, elev. 2000 ft. (610 m), Las Vegas, Clark County, Nevada, C. L. Hubbs & family, 30 August 1938. Allotype: UMMZ 211169, mature male 42.0 mm SL, taken with holotype. Seven hundred thirty-four paratypes (including 3 cleared and stained), UMMZ 125008, young to adult 7–56 mm SL, taken with holotype. The following are paratypes: UMMZ 105549 (36, 12–44 mm), stream running through Las Vegas, C. M. Bogert, 3 Sept. 1935; UMMZ 131018 (4, 16–18 mm), Lorenzi Ranch on Hwy 95 ca. 6.4 km W of Las Vegas, R. E. Towle, 30 July 1940. USNM 46113 (♀, 62 mm), Vegas Creek, Vernon Bailey, 13 Mar. 1891 (paratype of *Rhinichthys (Apocope) nevadensis* Gilbert).

DESCRIPTION.—Body form and color pattern are shown in Figures 1 and 2 and proportional measurements are given in Table 1. In the following meristic data, values for the holotype are marked by an

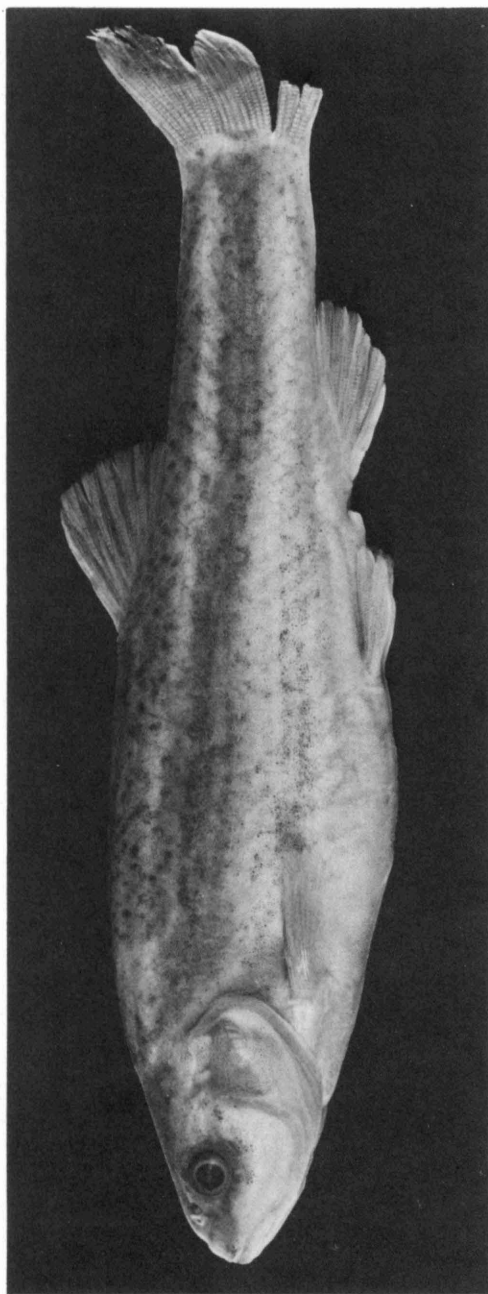


FIG. 1. Holotype of *Rhimichtlys deaconi*, adult female, 58.3 mm SL, UMMZ 125007.

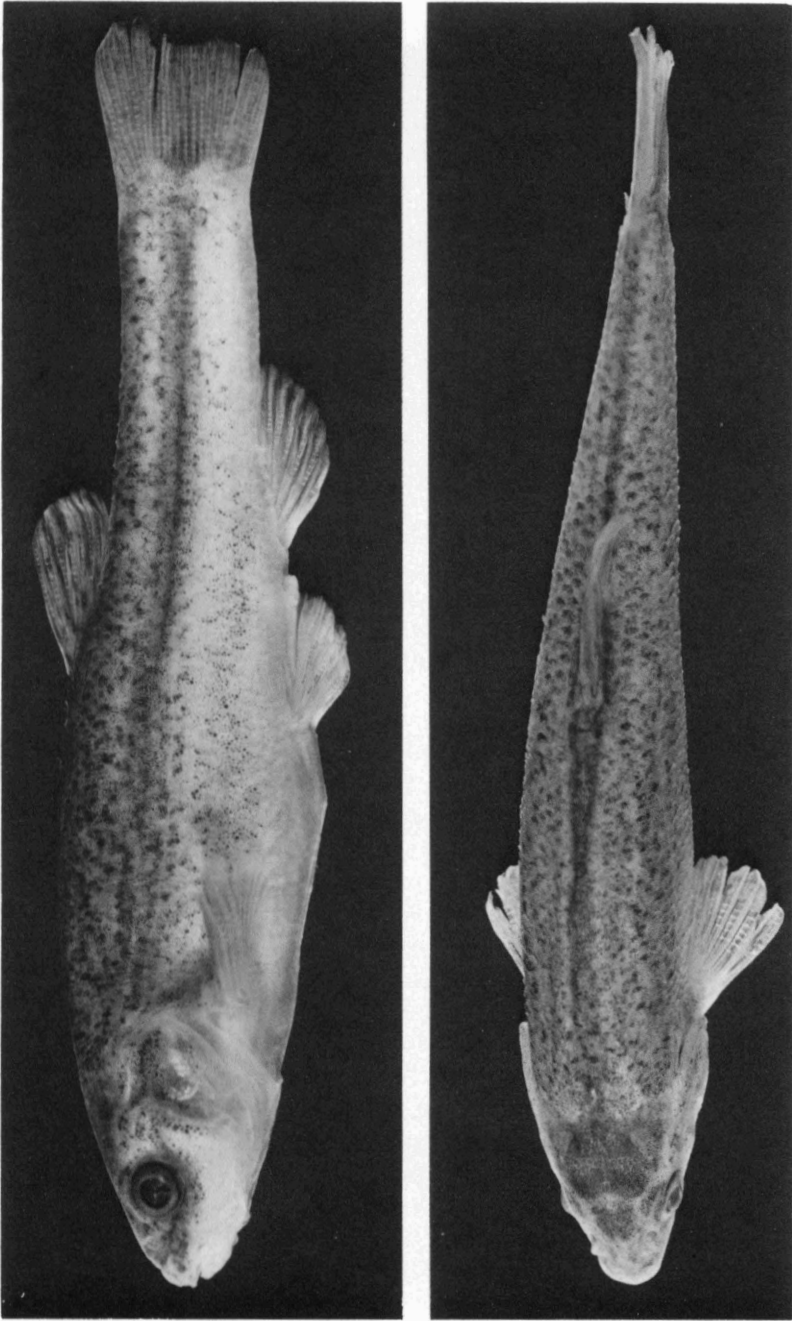


FIG. 2. Lateral and dorsal views of adult male paratype of *Rhinichthys deaconi*, 37.5 mm SL, UMMZ 125008.

asterisk. Body rather slender and terete, heaviest well forward, eye and mouth generally small; predorsal profile nearly straight to slightly convex from dorsal origin to vertical from tip of opercle, then rather evenly rounded to snout tip; body tapering gently from dorsal-fin origin to caudal-fin insertion. Head cone-shaped, snout blunt; mouth terminal to subterminal, slightly oblique; mandible relatively long, its proximal tip lying below middle of pupil, its distal end with a strong symphyseal knob. Dorsal-fin origin well behind that of pelvic-fin insertion, the depressed fin terminating over anterior part of anal fin; posterior margins of dorsal and anal fins rounded; posterior rays of anal fin elongate, about same length as anterior ones; pectoral fin very short (larger in male than in female), varying from slightly more than half (males) to less than half head length; caudal fin short, weakly forked, length of middle rays about one-third that of head, both lobes broadly rounded. Adult females attain a maximum SL of 62 mm, males only 42 mm.

Dorsal-fin rays 6(1), 7(17), 8*(25); anal-fin rays 6(3), 7*(38), 8(2); pectoral-fin rays (both fins counted) 10(2), 11(13), 12(18), 13(26), 14*(11); pelvic-fin rays (both fins counted) 6(5), 7*(55), 8(4); caudal-fin rays 18(5), 19*(25), 20(2). Lateral-line scales 40(1), 41(1), 44(2), 45(8), 46*(7), 47(3), 48(2), 49(3), 50(4), 51(1), 52(1); predorsal scales 31(1), 32(2), 33(2), 34*(2), 35(5), 36(3), 37(1), 38(3), 39(1); scales around body 44(1), 45(1), 46*(5), 47(1), 48(7), 49(2), 50(3); scales around caudal peduncle 22(1), 23(2), 24(10), 26*(6), 28(1). As typical of *Rhinichthys*, the scales have radii well developed on all fields. A tiny barbel is present on the right side in one and on the left side in another among 40 specimens (80 counts). Only 8 of 40 specimens have a weak frenum. In 41 specimens, the lateral line was complete in 16, almost complete in 6, and incomplete in 19; it usually extends at least beyond the anal-fin base but may be disrupted before the middle of the dorsal-fin base or, in one example, before the origin of this fin. Vertebrae (Weberian + precaudal + caudal = total) 4 + 14 + 16 = 34(1), 4 + 14 + 17 = 35*(6), 4 + 14 + 18 = 36(9), 4 + 15 + 16 = 35(1), 4 + 15 + 17 = 36(9), 4 + 15 + 18 = 37(5), 4 + 16 + 19 = 39(1) or 34(1), 35*(7), 36(18), 37(5), 39(1) in 32 specimens. Gill rakers rudimentary, usually undeveloped toward anterior end of arch, numbering 1–4 on upper and 4–7 on lower limbs for a total of 5(2), 6(10), 7(12), 8*(6), 9(2) in 30.

Pharyngeal dentition: 1,4–4,0(1), 1,4–4,1(13), 2,4–4,1(1) in 15, teeth conical or hooked: the anteriormost tooth of the main row conical, largest, and nearly equalled in size but not robustness by the second tooth; the latter and the remaining two posterior teeth are strongly

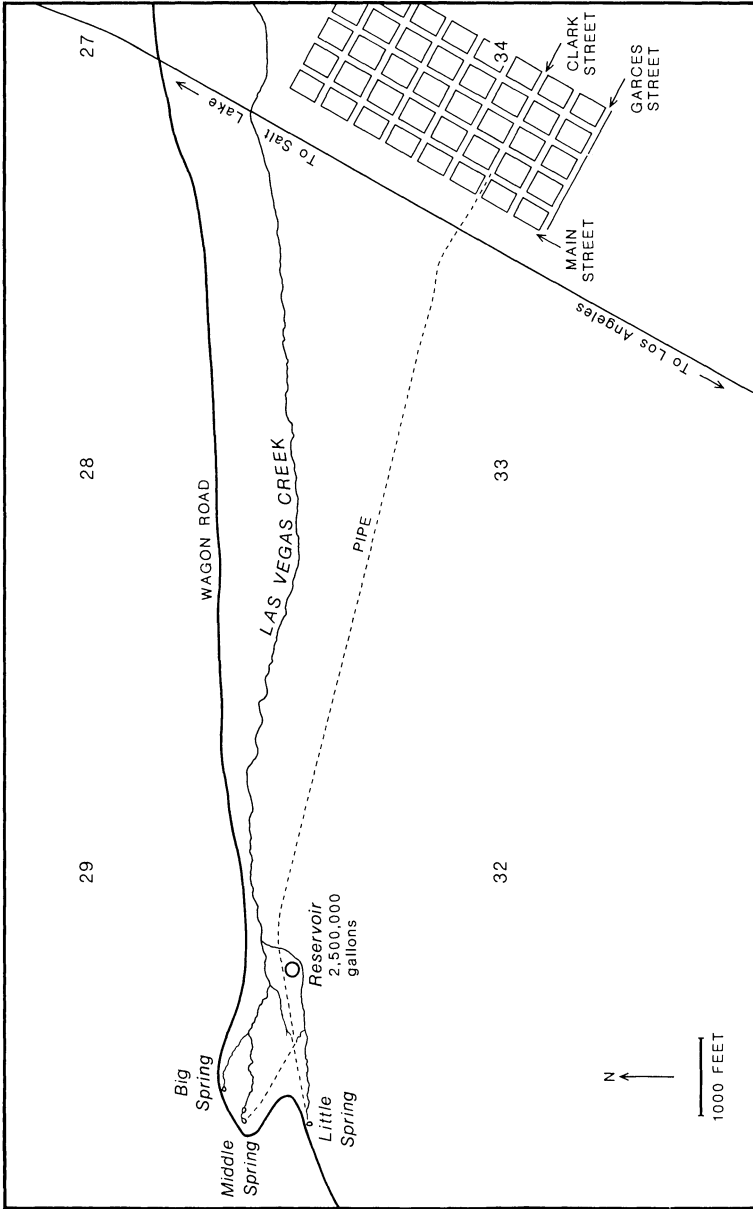


FIG. 3. Sketch map of Las Vegas Creek and spring sources as they appeared in 1929; modified from endpapers in Jones (1975).



FIG. 4. Las Vegas Creek in 1903, at a point 3.2 km below the three spring sources (see Fig. 3). Courtesy Nevada Historical Society; from Jones and Cahlan (1975: Fig. 4).

hooked. The ala is expanded posteriorly. The dorsal and anterior limbs of the arch are moderately long and slender. At the anteroventral part of the arch, between the two limbs and opposite the dentigerous portion, the arch usually forms a sharply recurved angle.

Peritoneum brown, with scattered punctulations. Gut simple, with two flexures, type I of Kafuku (1958).

SEXUAL DIMORPHISM.—There are significant differences between the sexes in certain measurements, in size at maturity, in life colors (see below), and in the development of nuptial tubercles. The latter were noted only in males (as described below). Dimorphic measurements are the distance between the anal-fin origin and the base of the caudal fin, length of the caudal-fin rays, length of pectoral and pelvic fins, and the length of the depressed anal fin. Males consistently had greater values than females (Table 1). The standard lengths of 34



FIG. 5. Las Vegas Creek today (dry). Photo taken from below the main spring pool in January 1984; courtesy of Tom Baugh.

mature males (as judged by the longer pectoral fin and/or development of tubercles) varied from 27.4 to 42.0 mm, with a mean value of 31.6. Females attained a maximum SL of 62 mm, with 13 fish (Table 1) having a mean SL of 45.3 mm.

Nuptial tubercles: These were detected only on rays 2–4 of the pectoral fin of mature males. The first 3–4 rays of this fin are thickened and the outer half of rays 2–4 may have a single or double file of rather weak tubercles. Tubercles are lacking on the first ray, as is

TABLE 1
 PROPORTIONAL MEASUREMENTS OF *Rhinichthys deaconi* IN PERMILLAGE OF THE STANDARD LENGTH¹

Measurements	13 Females			10 Males		
	Holotype	Range	\bar{x}	Allotype	Range	\bar{x}
Standard length, mm	58.3	31.7–58.3	45.3	42.0	28.4–42.0	35.2
Predorsal length	566	545–576	566	557	547–585	561
Anal origin to caudal base	309	295–323	313	329	321–344	334
Body depth	262	244–285	263	269	236–278	263
Caudal peduncle least depth	125	107–128	120	143	107–143	130
Head length	262	262–297	271	271	253–282	269
Head depth over occiput	175	164–205	177	181	173–197	184
Head width	177	159–192	173	174	159–183	170
Snout length	82	70–87	78	71	65–76	72
Orbit length	43	43–66	50	48	48–63	57
Upper jaw length	75	63–82	73	67	67–77	72
Mandible length	108	104–123	116	112	101–127	113
Interorbital width	86	78–101	88	88	77–93	85
Suborbital width	46	40–49	44	40	40–45	42
Depressed dorsal length	190	172–237	196	224	197–224	209
Depressed anal length	175	159–202	174	190	179–205	189
Length middle caudal rays	137	104–174	127	171	130–180	154
Pectoral-fin length	139	101–164	123	162	146–191	168
Pelvic-fin length	122	87–154	116	143	121–144	135

¹Data for the holotype included with females, allotype with males; UMMZ 125007, 125008, 210169.

characteristic for subgenus *Apocope*. In 28 males, 19 have tubercles in a single row on rays 2–3 and, occasionally, 4; 9 have two rows of tubercles on the outer, branched portions of rays 2–3 and 4. The tubercles are uniformly weak although the breeding season had not terminated (females were ripe and young only 7 mm SL were collected on August 30).

Color: Life colors, as noted in the field by Carl L. Hubbs for UMMZ 125008 (includes the holotype and allotype), were as follows: males with orange in axils of paired fins and along base of anal fin; those with strongest tubercles (extremely developed males) had this color extended backward to base of caudal fin, which commonly was orange near its lower edge. Some with red suffused over abdomen and an orange fleck at upper edge of gill opening. The general color in both sexes was olive, with blackish markings around scales near middle of body (back and sides); dorsal black spots often tend to occur, one per scale.

In preservative (70% ethanol), adult females have a prominent, dark lateral stripe, about width of orbit, extending from just behind tip of opercle to base of caudal fin, with a weak subbasal spot (Fig. 1); above this is a much narrower pale stripe and below it an indefinite pale stripe (somewhat wider than that above) that broadens anteriorly; it is only weakly set off from remainder of side and abdomen by two horizontal, discontinuous pigment lines that fade out above anal fin. In dorsal view the entire back is splotched with dark pigment spots with a strong predorsal and a weaker postdorsal dark stripe that terminates anteriorly just before occiput. Ventral surface of body immaculate. Irregular discontinuous stripes and spots on snout; upper lip with only one spot on each side of midline. Dark "brain" pigment with a lateroventral extension on each side to dorsal margin of opercle. Adult male (Fig. 2) similar to female but with much weaker midlateral stripe and with weaker indications of subsidiary light stripes above or below it; a black blotch occurs near base of caudal fin that is separated from midlateral stripe by a distinct gap; sides with scales more heavily splotched with melanophores than in female. Dark predorsal stripe stronger than in female, not stopping at dorsal-fin origin but extending prominently along base of dorsal fin; dark markings on snout less prominent and more irregular.

HISTORIC AND PREHISTORIC HABITAT.—On 3 May 1844, Frémont camped in a place called ". . . *las Vegas*—a term which the Spaniards use to signify fertile or marshy plains, in contradistinction to *llanos*, which they apply to dry and sterile plains. Two narrow streams of clear water, four or five feet deep, gush suddenly with a quick cur-

rent, from two singularly large springs; these, and other waters of the basin, pass out in a gap to the eastward. The taste of the water is good, but rather too warm to be agreeable; the temperature being 71° in one and 73° in the other. They, however, afforded a delightful bathing place." (Frémont 1845:266).

In his journal notes of 9 March 1891 (on file in USNM), Vernon Bailey described the small creek (which he called Vegas Creek) and the springs that produced it, commenting that "there were lots of little fish in the springs and streams. Mr. Stewart says it is not improbable that the water runs from these springs down Vegas Wash to the Colorado R. after very heavy rains, but that he has not known it to do so. He has lived here a good many years. The stream from the springs runs about 6 miles down the wash besides irrigating a large ranch." He recorded one of the springs as 73°F. Cottonwoods and some willows grew along its banks. "The part of the valley below the springs is of a firm, fine soil that is black and rich when watered. There are large meadows along the stream. . . . They say the Vegas Ranch in low part of valley is 1870 ft. from R.R. survey. The springs are probably about 100 feet higher." The distance from Vegas Ranch down Las Vegas Wash to the Colorado is about 25 miles (40 km).

In 1934, Walter R. Bracken, Vice President and Agent of the Las Vegas Land and Water Company, wrote (see Jones and Cahlan 1975:72) in response to criticism of the water purity of these streams, "Our water supply is one of the best and purest of any city in the west. It is a fact that occasionally, but very seldom, a small fish about one-half inch in size and as large as the thickness of a lead pencil will get through one of the three screens which we have at the intake and head of the pipeline, but even this cannot in any way injure the water or make it filthy. . ." By 1947, flow down Las Vegas Creek was apparently restricted to the winter months (Jones and Cahlan 1975:139).

It is surprising that other seemingly suitable habitats for fish life to the northwest, in both Las Vegas Valley and Indian Spring Valley (an endorheic basin), apparently did not contain fishes when examined before the turn of the century. Vernon Bailey wrote (1891 journal) of one of these localities as follows: "Corn Creek [ca. 36 airline km NW Las Vegas] is a little stream flowing from a large spring in the [Las Vegas] valley. The stream is a foot wide & 3 inches deep & flows about 40 rods." [Bailey mentioned no aquatic life here but did say he collected frogs, toads, and shells from a spring 12 miles (19.2 km) above Vegas Ranch.] The spring-fed pond at Corn Creek, at present part of the Desert Game Range of the U.S. Fish and Wildlife Service, is now a

TABLE 2
COMPARISON AMONG *Rhinichthys deaconi* AND ITS QUIET-WATER RELATIVES, *Rhinichthys osculus* SUBSP. AND *Rhinichthys* N. SP.¹

Trait	<i>deaconi</i>	<i>nevadensis</i>	<i>reliquus</i>	<i>oligoporus</i>	<i>lethoporus</i>	<i>lariversi</i>	subsp., Pahrnagat Valley	subsp., White R. Valley	subsp., Meadow Valley Wash.	n. sp., Tooele Co., Utah
Maxillary barbel	lacking	well developed	lacking	lacking	lacking	present or absent ²	obsolescent	usually lacking	well developed	lacking
Scales, lat. line	40-52, 46	46-65, 50	60-74, 66	54-66, 58 or 59	50-62, 56	62-70, 65 or 66	45-60	52-62	55-70	50-55
P ₁ fins	tiny, 10-14 rays	normal, 13-15	normal, 12-14	normal, 12 or 13	normal, 12 or 13	normal, 13 or 14	normal, 12 or 13	normal, 12-14	normal, 13-15	normal, 11-13
D rays	7 or 8	8	8 or 9	7 or 8	8	8	7 or 8	7 or 8	7 or 8	7
A rays	7	7	7	7	7	7	6 or 7	7, occas. 6	6 or 7	6
P ₂ rays	7	7	7 or 8	7	7	7 or usu. 8	7 or 8	7	7 or 8	7
Lateral line	incomplete	incomplete	very reduced	very reduced	very reduced	complete or incomplete	incomplete	if present, anterior only	essentially complete	almost obsolete
Dentition ³	1,4-4,1	1,4-4,1	1,4-4,1	1,4-4,1	1,4-4,1	1,4-4,1	2,4-4,2	2,4-4,2	1,4-4,1	2,4-4,2
Frenum	obsolescent to lacking	lacking	lacking	lacking	lacking	lacking	virtually absent	present or usually absent	present	lacking
Vertebrae ⁴	35-37, 36	35-38, 36 or 37	36 or 37	37 or 38	37	35-38, 37	36-38, 37	36-39, 37	37-39, 38	35-38, 36 or 37
Maximum SL	62 mm	56 mm	82 mm	59 mm	39 mm	68 mm	53 mm	61 mm	71 mm	57 mm

¹All single counts represent modal values.

²Also true of *R. o. robustus* (Hubbs et al., 1974).

³Based on at least ten specimens.

⁴Based on a minimum of 15, usually 30, specimens.

sanctuary for the endangered Pahrump killifish, *Empetrichthys latos* Miller.

Actually there were three original springs (Fig. 3) spread over 40 acres that provided the principal sources for Las Vegas Creek. A photograph of Little Spring, the most westerly, is shown as the frontispiece in Jones and Cahlan (1975); the other two, Middle Spring and Big Spring, appear in the same publication (pp. 5 and 7, respectively) and Las Vegas Creek, below the junction of these three springs (Fig. 3), is depicted on page 4 as it looked in 1903 (herein reproduced in Fig. 4) when it had a flow of 5.74 ft³/sec. In 1938 this clear creek was 3–20 ft. (1–6 m) wide with virtually no aquatic vegetation other than dense cattails, with a bottom of sand, gravel, and mud (with some oil and other pollution); the temperature was 78° F, air 80° F (25.5 and 26.6° C, respectively); the current was generally moderate, varying from quiet to swift, and depth of water was mostly 6–12 in., up to 18 in. (15.2–30.5, 45.7 cm). The creek was said to head in two large springs (“Big Springs”), neither warm nor cold, and in several deep artesian wells. Most of this source water, 1.7 miles (2.7 km) above Las Vegas, was used for city supply, but some was supplied to the Stewart Ranch below. The creek picked up small springs along its course, including one on the Stewart property just above the old ranch. That spring had a temperature of 71° (air 84°) F (approximately 21.6° and 29° C, respectively) at 0900 hours. The main creek at the campground of “Old Ranch” (Las Vegas Ranch) had the same temperature after a fairly warm night. Immediately below the campground the creek was diverted into ditches for the meadows on the ranch. The minnows did occur at the ranch (individuals seen), where they were largely fished out by boys; also at the spring head, according to George Hansen, County Commissioner. Today, nothing is left of this spring-fed system but a hole in the ground with stagnant water at the bottom (James E. Deacon and Thomas M. Baugh, pers. comms. 1983; see Fig. 4). Little Spring had a flow in 1908 of 2700 to 3150 gals/min, Middle Spring of 2580 gpm in 1912, and Big Spring flowed 2390 gpm in the same year (Maxey and Jameson 1948:79).

Carpenter (1915:10) indicated that Las Vegas Wash was at one time “a stream of considerable size,” which Hubbs and Miller (1948:100) named Pluvial Las Vegas River. Haynes (1967:77) wrote of this river, “The ancestral Las Vegas occupied a channel nearly 700 feet wide that was incised in caliche and alluvium of an earlier, more extensive valley fill. . .”. “Springs along the river were frequented by Pleistocene horses, camels, sloths, bison and mammoths and their predators. . .” Subsequently, Pluvial Las Vegas Lake, a shallow body that persisted

from about 30,000 to 15,000 years before present (BP), formed north of Las Vegas to occupy most of the Las Vegas Valley.

Pollen records from Las Vegas Valley indicate a major trend toward warmer and drier conditions, marked by the change from juniper-sagebrush to sagebrush-shadscale about 12,000 BP. By 7,000 BP, “. . . the vegetation was probably similar to the present lower elevation Mohave Desert” (Mehringner 1977:135). “Between 4,000 and 1,000 years ago, the Las Vegas River became a dry wash. . .” (Haynes 1967:79). It is noteworthy, as well as puzzling, that an abundance of fossils from the Tule Springs archeological site (Mawby 1967; Taylor 1967) includes no trace of fishes. Mawby (1967:108) remarked, “This is a rather surprising absence for, if there was continuous through drainage from Las Vegas Valley into the Colorado River in the Late Pleistocene, fish presumably would have inhabited the stream, and one might expect to find a few vertebrae to mark their presence in stream and pond deposits.”

The last known collection of the Las Vegas dace was made in 1940. The fish probably survived in one of the springs and outflows until 1955 to 1957, when the policy regarding the amount of water that could be withdrawn from the artesian basin beneath Las Vegas was drastically changed (Jones 1975:48). It was extinct before 1967 (Bradley and Deacon 1967).

COMPARISONS.—The Las Vegas dace seems to find its closest relatives among the quiet-water representatives of speckled dace that inhabit springs, their outflows, ponds, and marshes in western Utah (Smith 1978:24), Nevada, and adjacent parts of California—especially in and near that section of the Colorado River basin (including Pluvial tributaries) that lies below Grand Canyon and above Hoover Dam. These populations share a rather chubby body, small rounded fins with reduced ray counts, weak or no barbels (except in *R. o. nevadensis* and Meadow Valley Wash = MVW), no frenum or at most a weak one (MVW excepted), a posteriorly placed dorsal fin, a moderately large and often oblique mouth, an obsolescent lateral line (except MVW), and relatively large and comparatively loosely imbricated scales (except White River Valley)—all characteristic of desert spring isolates (Hubbs 1941:187). These contrast sharply with rheophilic Colorado River forms such as *Rhinichthys osculus yarrowi* Jordan and Evermann, *R. o. velifer* Gilbert, *R. o. moapae* Williams (1978), and undescribed relatives—all of which occur in flowing water and are characterized by having: elongate, slender bodies; large, falcate dorsal and anal fins; the frenum often or usually well developed; the barbel invariably present; generally small, closely imbricated scales; a more anteriorly

placed dorsal fin; and a large, deeply forked caudal fin. In the following comparisons, the unique anal fin of *R. deaconi* is not considered. The new species is contrasted with certain quiet-water forms of *Rhinichthys osculus* (including all named Southwestern subspecies and one closely related species) in Table 2. It will be noted that *R. deaconi* has the largest scales (closely approached by *R. o. nevadensis* which differs sharply in having well developed barbels) and fewest vertebrae in addition to its tiny pectoral fins (which are completely diagnostic—compare pectoral-fin length in Table 3 with this character in Table 13 of Hubbs et al. 1974:112).

The populations (three examined) along Meadow Valley Wash are included in Tables 2–3 because these fish do not exhibit adaptations to fluvial existence. The Meadow Valley Wash drainage system (which some 10,000 years BP comprised Pluvial Carpenter River—Hubbs and Miller 1948:98–100) is a widely fluctuating, highly stressed habitat such that its dace often occurs in tributary springs or survive periods of low flow in sheltered pools. Thus they retain the small rounded dorsal and anal fins and relatively chubby body of the quiet-water populations. A case in point is Clover Creek, flood tributary to Meadow Valley Wash, where a collection of 101 dace (UMMZ 177093) was made on 4 July 1959, 21–22 km NE of Caliente, Lincoln County, in water described as having the current “moderate to slight or none.” Quoting further from my field notes:

“This creek is fed by cold springs (Little Sprs., Big Sprs.) and is stocked with rainbow trout. It was dry at the lower end near Caliente, the first surface flow appearing about 3 miles NE of Caliente. It is intermittent until about 12 miles above Caliente, where the canyon narrows and the volume of water increases markedly. It is probably permanent from a short distance below tunnel 13 to a couple or more miles above. We checked at least 3 miles of the creek (above and below tunnel 13) and found it to be permanent.”

Carl L. and Laura C. Hubbs collected (UMMZ 160725) in the same creek, one mile below Barclay, at the head of the canyon, on 26 June 1950, and described the current as “almost none.”

MISCELLANEOUS TAXONOMIC NOTES.—Lugaski (1972) described *Rhinichthys lariversi* from Big Smoky Valley, Nevada. Hubbs et al. (1974:15, fn. 2) regarded it as “a rather weakly differentiated subspecies of *R. osculus*.” They did, however, use the name *R. o. lariversi* (ibid.:123–125) and I have included it in Table 2 but reserve judgment on its validity. The taxon was inadequately compared with relatives (why *Gila bicolor obesa* was included is enigmatic) and the data presented by Lugaski fail to support even subspecific recognition and

TABLE 3

PECTORAL-FIN LENGTH IN PERMILLAGE OF THE STANDARD LENGTH IN *Rhinichthys deaconi* AND ITS QUIET-WATER RELATIVES, *Rhinichthys osculus* SUBSP. AND *Rhinichthys* SP.¹

Sex Taxon	No.	SL	Pectoral length
MALES			
<i>R. deaconi</i>	10	28.4–42.0(35.2)	146–191(162)
<i>R. o. nevadensis</i>	15	30.8–39.1(34.7)	215–251(229)
<i>R. o. reliquus</i>	20	34–47(40)	229–269(249)
<i>R. o. oligoporus</i>	15	28–44(39)	198–242(221)
<i>R. o. lethoporus</i>	12	28–34(30)	217–252(232)
<i>R. o. lariversi</i>	10	34.4–45.1(39.1)	231–274(254)
<i>R. o.</i> subsp. (Pahranagat Valley)	9	34.9–42.2(37.5)	208–258(229)
<i>R. o.</i> subsp. (White River Valley)	10	31.5–47.4(41.0)	238–264(247)
<i>R. o.</i> subsp. (Meadow Valley Wash)	10	34.9–47.5(42.5)	210–247(232)
<i>R. sp.</i> (Utah)	6	30.6–38.3(34.9)	210–228(221)
FEMALES			
<i>R. deaconi</i>	13	31.7–58.3(45.3)	101–164(123)
<i>R. o. nevadensis</i>	18	31.9–45.8(41.2)	164–205(187)
<i>R. o. reliquus</i>	20	35–82(60)	166–205(182)
<i>R. o. oligoporus</i>	19	28–59(51)	163–190(176)
<i>R. o. lethoporus</i>	12	32–39(36)	168–193(180)
<i>R. o. lariversi</i>	10	41.0–60.7(47.8)	197–212(204)
<i>R. o.</i> subsp. (Pahranagat Valley)	11	36.0–50.2(39.6)	175–193(187)
<i>R. o.</i> subsp. (White River Valley)	10	37.4–62.7(50.2)	181–201(194)
<i>R. o.</i> subsp. (Meadow Valley Wash)	8	49.7–61.9(53.7)	174–203(193)
<i>R. sp.</i> (Utah)	10	36.4–53.5(46.0)	168–183(175)

¹Means are in parentheses.

are fraught with errors (e.g., barbels said to be always absent, anal rays 8 or 9—compare with Table 2); great importance seems to have been attached to the black spots on “head, body and fins,” but these spots look suspiciously like ectoparasites and do not occur among 494 specimens (UMMZ 124902) collected on 8 August 1938 from Charnock Springs, the type locality.

Williams (1978) and Williams and Williams (1982), evidently misled by La Rivers (1962:434–435), assigned the name *R. o. velifer* Gilbert to the White River speckled dace from Preston Spring. There is only one

morph in the (upper) White River Valley, whereas in Pahrnagat Valley there are two morphs, the swift-water ecotype confined to outflows of the springs. *Rhinichthys o. velifer* is a slender, terete fish with large, falcate dorsal and anal fins (the dorsal anterior in position), a well developed frenum, 8 dorsal and pelvic rays, and the maxillary barbel almost invariably present; in contrast, the dace in Preston Spring (and other upper White River habitats) is a chubby, small-finned fish, with dorsal and anal fins rounded (the dorsal posteriorly placed), typically lacking either a frenum or a barbel, and with 7 dorsal and pelvic rays (see Table 2). The *Rhinichthys* populations of the White River and Pahrnagat Valley basins need thorough study, but it is clear that the only current-adapted form in those areas is *R. o. velifer*.

ETYMOLOGY.—I take pleasure in naming this dace for Dr. James E. Deacon, whose concern about the conservation status of many fishes from the Southwest has aroused interest on their behalf and whose ecological studies have provided the necessary biological information needed to aid their survival.

OTHER MATERIAL EXAMINED

All catalog numbers are UMMZ except as noted.

Rhinichthys osculus nevadensis: NEVADA: 132253 (51), 132254 (31), 132901 (21), 140463 (36), 140466 (25), 140480 (39), 158429 (49), USNM 46111 (4 syntypes), Ash Meadows, Nye Co. *Rhinichthys osculus reliquus*: NEVADA: 124906–7 (474, incl. holotype), Grass Valley, Lander Co. *Rhinichthys osculus oligoporus*: NEVADA: 132192–3 (92, incl. holotype), Clover Valley, Elko Co. *Rhinichthys osculus lethoporus*: NEVADA: 186519 (96), 186905 (1, holotype), Independence Valley, Elko Co. *Rhinichthys osculus* subsp. (Pahrnagat Valley): NEVADA: 124816 (64), 24 km S Alamo, Lincoln Co.; 136096 (180), spr. N side Maynard L., Lincoln Co.; 172495 (11), 193317 (12), Rogers Spr. S Overton, Clark Co.; 177089 (141), spring-fed ditch S side Maynard L., Lincoln Co. *Rhinichthys osculus* subsp. (White R. Valley): NEVADA: 124978 (42), creek from Preston Big Spr. & Nicholas Spr., White Pine Co.; 124981 (207), Preston Big Spring, White Pine Co.; 132181 (750), White River, 8 km NW Preston, White Pine Co. *Rhinichthys osculus* subsp. (Meadow Valley Wash): NEVADA: 124792 (113), Camp Valley Wash headwaters, Lincoln Co.; 124798 (312), Big Spring near Panaca, Lincoln Co.; 124801 (33), near Caliente, Lincoln Co.; 124826 (1624), lowest permanent water, above Moapa near Lincoln-Clark Co. line; 160725 (102), Clover Cr. 1.6 km below Barclay, Lincoln Co.; 177093 (101), Clover Cr., NE Caliente, Lincoln Co.; 177460 (56), Beaver Dam Wash, Lincoln Co. *Rhinichthys* sp.: UTAH: 141421 (542), Willow Springs, just N Callao, Snake Valley, Tooele Co. *Rhinichthys osculus robustus*: NEVADA: 124932 (189), Birch Cr., Eureka Co. *Rhinichthys osculus moapae*: NEVADA: 141381 (15), Moapa R. near Moapa, Clark Co.; 141646–7 (6), Moapa R., Glendale, Clark Co.; 203328 (28), Moapa R. below Lowhead Dam, Clark Co. *Rhinichthys osculus velifer*: NEVADA: 125003 (254), 177090 (151), Ash Spring, Pahrnagat Valley, Lincoln Co. *Rhinichthys osculus yarrowi*: COLORADO: 136915 (72), Dry Cr., trib.

Gunnison River, Montrose Co.; CAS-SU 8218 (30 syntypes), USNM 63279 (122), Tomichi Cr., Gunnison; UTAH: 141693 (379), Muddy Cr., trib. Dirty Devil R., Emery Co.; 163910 (74), Escalante R., 6.5 km W Escalante, Garfield Co.; 176914 (12), Middle Fk. White R., Wasatch Co.; 178654 (134), Nine Mile Cr., Duchesne Co.; 178657 (130), Dry Gulch Cr., ca 5 km SW Roosevelt, Duchesne Co.; 182537 (6), Hideout Canyon, Daggett Co. *Rhinichthys osculus*: ARIZONA: 121653 (46), Hayground Cr., trib. Black R., Apache Co.; 178696 (335), Little Colorado R. N Springerville, Apache Co.; 180091 (41), 180093 (11), Spencer Cr., Mohave Co.; 180094 (21), Meriwhitica Spr., Mohave Co.; 187715 (39), Little Colorado R., 11 km above Colorado R., Coconino Co.; 188961 (248), E. Clear Cr., Coconino Co.; 189217 (118), Bright Angel Cr., Coconino Co.; 189219 (207), Shinumo Cr., trib. Colorado R., Coconino Co.; 189227 (43), Diamond Cr., near Colorado River, Coconino Co.; 190899 (24), Little Colorado R. above Blue Springs, Coconino Co. NEVADA: 124932 (189), sprs. E side Diamond Valley, Eureka Co.; 125014 (32), Virgin R. W Bunkerville, Clark Co.; 141643 (745), Amargosa R. below Beatty, Nye Co.; 141642 (400), sprs. S of Springdale, Nye Co.; 188858 (195), 15 km N of Beatty, Nye Co.; 196956 (3), 7 km N Beatty, Nye Co. UTAH: 124758 (177), E. Fk. Virgin R. and trib., N Glendale, Kane Co.

ACKNOWLEDGMENTS

I am grateful to James E. Deacon and David W. Greenfield for loan of pertinent literature, Mike Wallen (Las Vegas Valley Water District) for helpful information, and Susan L. Jewett (U.S. National Museum of Natural History) for loan of type specimens. William M. Pelletier provided the fine fish photographs, Margaret Van Bolt prepared the map of Las Vegas Creek and springs, and Michael D. Carlton (Smithsonian Institution) sent copies of Edward N. Nelson's field notes. I am indebted to the late Carl L. Hubbs for detailed field notes on the dace and its habitat in 1938. Radiographs were taken and plates prepared by Douglas W. Nelson, Alexandra M. Snyder, and Gerald A. VanDeKoppel. The Nevada Historical Society provided Figure 4. Frances H. Miller recorded data and typed, proofread, and edited all stages of the manuscript. Three reviewers improved the manuscript.

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Accepted for publication February 16, 1984

