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*MOXOSTOMA AUREOLUM PISOLABRUM*, A NEW SUB-  
SPECIES OF SUCKER FROM THE OZARKIAN STREAMS  
OF THE MISSISSIPPI RIVER SYSTEM<sup>1</sup>

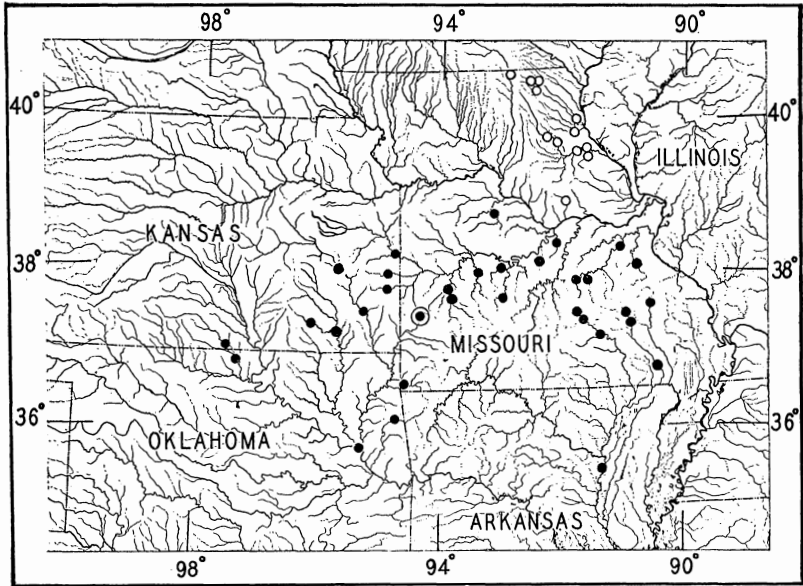
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IT has long been apparent that the Ozarkian upland is a region of marked endemism of fishes (Bailey, 1941: 1). A new subspecies of sucker, whose range is centered in the Ozark region (Map 1; see also outline by Fenneman, 1938: 631-34, and Fig. 177) is herein described under the name *Moxostoma aureolum pisolabrum*. It belongs to a subgroup of *Moxostoma* that is characterized by a reddish tail, short head, moderately heavy pharyngeal arches, and pronounced darkening of the scale bases. As indicated by Table I, *pisolabrum* is more closely allied to *M. aureolum aureolum* (LeSueur), with which it intergrades, than to *M. breviceps* (Cope), a species inhabiting the higher stream gradients of the Ohio River Basin.

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MAP 1. The type locality of *Moxostoma aureolum pisolabrum* is represented by a solid circle, ringed. Localities for the paratypes of *Moxostoma aureolum pisolabrum* are represented by solid circles. Localities for the intergrades, *Moxostoma aureolum: aureolum* × *pisolabrum*, are represented by hollow circles.

of Oklahoma Agricultural and Mechanical College (OAM), Kansas University Museum of Natural History (KU), Museum of the University of Oklahoma (UOMZ), University of Missouri Museum of Zoology (UMoMZ), and Ohio State University, Stone Institute of Hydrobiology (OSU).

*Moxostoma aureolum pisolabrum*, new subspecies

Pealip Shorthead Redhorse

(Pl. 1, Figs. 1-4)

TYPES.—The holotype, UMMZ 153363, a ♂, 230 mm. standard length, was collected by George V. Harry and Mitro Pellock, August 15, 1940, in Coon Creek, tributary to the North Fork of Spring River, one mile north of Jasper on U.S. Highway 71, Jasper Co., Missouri (Map 1).

Following are all of the paratypes, together with data:

*Missouri River Drainage*

*Osage River System.*—UMoMZ 7242: 1 juv., 152 mm.,<sup>2</sup> Maries River, T 43N, R 10W, sec. 35, Osage Co., Mo., May 7, 1949. UMMZ 152736: 2 juv., 52 and 64 mm., Big Tavern Cr., NE. Miller Co., Mo., Sept. 14, 1940. UMMZ 150722: 3 juv., 37, 38, and 39 mm., Little Niangua R., T 37N, R 19W, sec. 19, Camden Co., Mo., July 20, 1940. UMoMZ 7221: 4 juv., 73, 77, 134, and 143 mm. and OSU 9190: 1 juv., 137 mm., Niangua R., T 35N, R 18W, sec. 36, Dallas Co., Mo., Oct. 21-25, 1949. UMoMZ 7244: 1 juv., 181 mm., 7235: 1 ad. ♀, 215 mm., 7236: 1 ad. ♂, 218 mm., Pomme de Terre R., T 37N, R 22W, sec. 34, Hickory Co., Mo., Oct. 27, 1949. UMoMZ 7245: 1 ad. ♂, 235 mm., Sac R., T 34N, R 26W, sec. 4, Cedar Co., Mo., May 21, 1949. UMoMZ 7246: 1 ad. ♀, 230 mm., same loc., Oct. 29, 1948. UMoMZ 7247: 1 juv. ♂, 197 mm., same loc., Nov. 1, 1949. KU 238: 1 juv., 128 mm., 239: 1 juv., 142 mm., 240: 1 juv., 95 mm., 241: 1 juv., 104 mm., Marais des Cygnes (Osage) R., Linn Co., Kan., June 20, 1911. KU 233: 1 ad., 180 mm., 234: 1 ad., 200 mm., 235: 1 ad., 205 mm., 236: 1 ad., 195 mm., Little Osage R., Bourbon Co., Kan., June 24, 1911. KU 1756: 1 ad., 223 mm., Marmaton R., Bourbon Co., Kan., June 28, 1911.

*Lamine River System.*—UMMZ 153366: 1 ad. ♀, 270 mm., Lamine R., T 45N, R 19W, Cooper Co., Mo., Sept. 12, 1940.

*Mississippi River Drainage*

*Meramec River System.*—UMoMZ 7243: 1 juv., 80 mm., Big R., T 38N, R 3E, sec. 22, Washington Co., Mo., Sept. 8, 1942. UMoMZ 7248: 1 ad. ♀, 260 mm., Meramec R., T 41N, R 1E, sec. 7, Franklin Co., Mo., Nov. 27, 1949. UMoMZ 7249: 1 juv., 193 mm., Meramec R., T 35N, R 5W, sec. 13, Dent Co., Mo., Oct. 13, 1948. UMMZ 149577: 2 juv., 64 mm., and 63 mm., Dry Fork Cr., Phelps Co., Mo., Aug. 24, 1941.

*St. Francis River System.*—UMoMZ 6015: 1 juv., 165 mm., St. Francis R., T 34N, R 5E, sec. 4, Madison Co., Mo., Sept. 10, 1949.

*Arkansas River Drainage*

*White River System.*—UMMZ 128439: 2 juv., 51 mm., and 58 mm., White R., Prairie Co., Ark., Aug. 3, 1939. UMoMZ 7237: 1 ad. ♀, 285 mm., Black R., T 25N, R 6E, sec. 16, Butler Co., Mo., Oct. 11, 1949. UMoMZ 7252: 1 ad., 233 mm., Black R. T 25N, R 6E, sec. 16, Butler Co., Mo., July 23, 1948. UMoMZ 7250: 1 ad. ♀, 292 mm., 7251: 1 ad. ♀, 263 mm., Clearwater Reservoir, Black R., T 29N, R 2E, sec. 30, Reynolds Co., Mo., Aug. 13, 1948. UMoMZ 7253: 1 ad., 293 mm., Current R., T 29N, R 2W, secs. 8, 16, Shannon Co., Mo., July 14, 1948. UMoMZ 7254: 1 ad. ♂, 305 mm., Jack's Fork, trib. Current R., T 29N, R 5W, sec. 25, Shannon Co., Mo., Apr. 4, 1949. UMoMZ 7255: 1 ad. ♂, 245 mm., Current R., Shannon Co., Mo., Sept. 8, 1941. UMoMZ 7256: 1 ad. ♂, 270 mm., Current R., T 32N, R 7W, secs. 24, 25, Dent Co., Mo., Sept. 15, 1948. UMoMZ 7257: 1 ad., 300 mm., 7258: 1 ad., 277 mm., same loc., June 29, 1949.

<sup>2</sup> Standard Length: This measurement is more desirable for preserved specimens than is fork or total length because of frequency of broken tails in preserved suckers.

*Neosho River System.*—OAM 543: 1 ad., 285 mm., Illinois R., T 20N, R 24E, sec. 35, Delaware Co., Okla., Aug. 15, 1946. OAM 4114: 1 juv., 55 mm., Neosho (Grand) R., Muskogee Co., Okla., Aug. 13, 1949. UOMZ 26150: 1 ad., 185 mm., Grand Lake, Delaware Co., Okla., Aug. 13, 1949. UMMZ 135894: 2 ad., 205 mm., 214 mm., Elk R., T 22N, R 34W, sec. 23, McDonald Co., Mo., July 22, 1942. UMMZ 97066: 1 juv., 88 mm. (4 smaller specimens not included as paratypes) Neosho R., Neosho Co., Kan., Sept. 9, 1930. KU 237: 1 juv., 123 mm., Neosho R., Coffey Co., Kan., June 27, 1912. KU 227-32: 6 ad., 175-90 mm., Verdigris R., Montgomery Co., Kan., July 25, 1911. KU 242-43: 2 ad., 198, 200 mm., Elk R., Elk Co., Kan., July 11, 1912.

*Arkansas River System.*—OAM 2744: 1 ad. ♀, 295 mm., Chickaskia R., Kay Co., Okla., Mar. 5, 1949. UMMZ 144963: 1 ad., 195 mm., and 1 juv., 105 mm., Chickaskia R., Sumner Co., Kan., July 10, 1940.

**DIAGNOSIS.**—Differs from all known catostomids in the peculiar enlargement of the tip of the upper lip (Pl. 1, Fig. 2), which in adults is developed into a prominent bulbous knob (hence colloquial name "pealip sucker"). Often in large adults, especially males, the knob becomes partly cornified and when greatly enlarged forces the ventral surface of the lower lip to tilt so that its tip slips under the knob of the upper lip, giving the mouth a "sucked in" appearance. Moderate- or large-sized specimens may be identified at a glance because of the prominence of the knob. Identification of small specimens is more difficult, but in those longer than 37 mm. standard length an incipient knob in the form of a slight swelling at the tip of the upper lip may be seen. In these small fishes the swollen anterior third of the upper lip is noticeably wider in cross section than are the posterior two-thirds. In *M. a. aureolum* and *M. breviceps* the width of the upper lip is uniform throughout, or in some specimens is, at most, barely perceptibly wider at the tip (Pl. 1, Figs. 1 and 3).

Similar to *M. a. aureolum* and to *M. breviceps* in having a short head (usually contained less than 4.5 times in standard length in young less than 100 mm. long; usually more than 4.2 times in specimens over 200 mm. long); prominent darkening of the scale bases of the back and sides; a conspicuous, deep pink, red, or carmine caudal fin (usually absent in preserved specimens and sometimes absent in small young in life); posterior edges of the halves of the lower lip forming a straight line or, at most, a very slight angle; pharyngeal arches moderately heavy.

**COMPARISONS.**—*Moxostoma aureolum pisolabrum* differs notably from *M. a. aureolum* and *M. breviceps* only in the formation of the upper lip, as indicated in Plate I, Figures 1-3, and Table I. The width

or thickness of the upper lip, divided into other body parts, shows the greatest differences. When width of upper lip is divided into gape width; the average for *pisolabrum* is 3.5, for *aureolum* is 5.2, and for *breviceps* is 5.9; when width of upper lip is divided into head length, the average for *pisolabrum* is 13.7, for *aureolum* is 20.0, and for *breviceps* is 26.2.

Differences are slight when body depth is divided into standard length, with *pisolabrum* (4.1) averaging the most slender, *aureolum* (3.9) intermediate, and *breviceps* (3.7) the least slender. The more streamlined appearance of *pisolabrum* is particularly evident in large adults, for *aureolum* and *breviceps* show a greater tendency to become deep-bodied with age.

In the following characters there are no or few average differences between *pisolabrum* and *aureolum*, but both forms differ significantly from *breviceps*. When upper jaw length is divided into head length, the average for both *pisolabrum* and *aureolum* is 4.6, for *breviceps* the mean is 5.2; when gape width is divided into head length, both *pisolabrum* and *aureolum* average 3.9, *breviceps* 4.5<sup>3</sup>. The number of rays in the left and right pelvic fins is normally 9 in *pisolabrum* and *aureolum*; it is more often 10 than 9 (9.6) in *breviceps*. The dorsal rays more often number 13 than 12 in *pisolabrum* (12.7) and *aureolum* (13.0); there are usually 12 (12.1) in *breviceps*.

No significant differences in the three forms are noted in maximum length attained, head length, number of scales above or below the lateral line, and in size of eye. As is customary with most of the species of *Moxostoma* there is considerable variation in size of eye within each form and among specimens of the same length. Also, there are slight sexual differences in head length and eye size within each species, especially in the largest specimens; in these there is a tendency in the males toward larger heads and smaller eyes.

**COLOR DESCRIPTION.**—From the brief color description by George V. Harry for UMMZ 153396, and from our own observations, it is evident that the colors and color pattern of adult *pisolabrum* do not differ materially from those of *aureolum* and *breviceps*.

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<sup>3</sup> The width of the lips, general shape and size of oral opening, and appearance of the mouth vary greatly among individuals within a given form; some specimens, generally adults, have unusually thick heavy lips, whereas others of the same size have very thin lips.

TABLE I

MEASUREMENTS OF THE TWO SUBSPECIES OF *Moxostoma aureolum*, INTERGRADES BETWEEN THESE SUBSPECIES, AND *M. breviceps*.  
In the body of the table figures without parentheses for each rubric are extremes, those immediately following in parentheses are averages.

Length class (mm.)	0-99	100-149	150-199	200-299	300-399	0-399
Maturity	Juvenile	Juvenile	Juvenile and adult	Adult	Adult	Juvenile and adult
Specimens*						
<i>psolabrum</i> .....	15	8	16	24	2	65
Intergrades .....	7	5	..	6	..	18
<i>aureolum</i> .....	7	1	1	7	4	20
<i>breviceps</i> .....	6	1	..	4	3	14
Standard length (mm.):†						
<i>psolabrum</i> .....	37-95 (62)	104-143 (127)	152-198 (185)	200-295 (245)	300-305 (302)	37-305 (176)
Intergrades .....	89-99 (94)	100-148 (112)	....	260-288 (271)	....	89-288 (158)
<i>aureolum</i> .....	65-87 (79)	101	194	205-288 (256)	302-370 (346)	65-370 (201)
<i>breviceps</i> .....	34-96 (64)	134	....	263-288 (279)	300-310 (305)	34-310 (182)
Body depth in standard length:						
<i>psolabrum</i> .....	3.8-4.5 (4.1)	3.9-4.5 (4.1)	3.8-4.6 (4.1)	3.5-4.8 (4.1)	4.2-4.4 (4.3)	3.8-4.8 (4.1)
Intergrades .....	3.9-4.2 (4.0)	3.9-4.1 (4.0)	....	3.7-4.0 (3.8)	....	3.7-4.2 (3.9)
<i>aureolum</i> .....	3.7-4.3 (4.0)	4.0	3.7	3.5-4.1 (3.8)	3.9-4.0 (4.0)	3.5-4.3 (3.9)
<i>breviceps</i> .....	3.8-4.2 (4.0)	3.7	....	3.3-3.5 (3.4)	3.4-3.7 (3.5)	3.3-4.2 (3.7)
Head length in standard length:						
<i>psolabrum</i> .....	3.6-4.2 (3.9)	3.7-4.6 (4.4)	4.3-5.2 (4.7)	4.4-5.1 (4.7)	4.6-4.7 (4.7)	3.6-5.2 (4.4)
Intergrades .....	3.8-4.2 (4.0)	4.2-4.5 (4.2)	....	4.4-4.6 (4.5)	....	3.8-4.6 (4.2)
<i>aureolum</i> .....	4.3-4.6 (4.3)	4.3	4.8	4.3-4.9 (4.8)	4.3-5.3 (4.8)	4.3-5.3 (4.6)
<i>breviceps</i> .....	3.4-4.4 (4.1)	4.6	....	4.6-4.9 (4.7)	4.9-5.2 (5.0)	3.4-5.2 (4.5)
Eye length in head length:						
<i>psolabrum</i> .....	3.1-4.8 (3.4)	4.1-4.5 (4.4)	4.1-4.8 (4.4)	4.0-5.6 (4.8)	4.6-5.1 (4.8)	3.1-5.6 (4.3)
Intergrades .....	3.3-4.0 (3.6)	3.4-4.3 (3.8)	....	5.0-5.3 (5.2)	....	3.3-5.3 (4.2)
<i>aureolum</i> .....	3.3-3.9 (3.8)	3.9	4.8	4.8-5.9 (5.1)	5.0-6.1 (5.4)	3.3-6.1 (4.6)
<i>breviceps</i> .....	3.2-4.1 (3.7)	4.4	....	5.0-5.5 (5.2)	5.5-5.5 (5.5)	3.2-5.5 (4.5)
Upper jaw length in head length:‡						
<i>psolabrum</i> .....	4.4-5.1 (4.6)	4.3-5.1 (4.6)	4.2-5.3 (4.8)	4.0-5.6 (4.4)	4.3-4.5 (4.4)	4.0-5.6 (4.6)
Intergrades .....	4.2-5.1 (4.6)	4.6-5.0 (4.7)	....	4.4-4.0 (4.6)	....	4.2-5.1 (4.6)

Intergrades	3.8-4.2 (4.0)	3.6-4.1 (3.8)	.....	3.8-4.2 (4.0)	.....	3.6-4.2 (3.9)
<i>aureolum</i>	3.5-4.0 (3.8)	3.8	4.7	3.5-4.3 (4.0)	3.3-3.9 (3.6)	3.5-4.7 (3.9)
<i>breviceps</i>	3.6-4.9 (4.3)	4.3	.....	4.0-4.7 (4.4)	4.5-5.1 (4.8)	3.6-5.1 (4.5)
Upper lip width (thickness) in head length:						
<i>pisolabrum</i>	11.2-16.3 (14.0)	13.6-16.0 (14.7)	12.7-15.3 (14.2)	10.5-16.0 (13.0)	12.3-13.0 (12.6)	10.5-16.3 (13.7)
Intergrades	13.9-24.0 (19.2)	15.7-19.6 (17.3)	.....	14.7-19.3 (15.8)	.....	13.9-24.0 (17.5)
<i>aureolum</i>	17.5-20.3 (19.5)	15.5	27.0	17.7-26.0 (21.7)	17.7-18.3 (18.0)	15.5-27.0 (20.0)
<i>breviceps</i>	19.3-27.0 (21.8)	24.4	.....	24.5-30.5 (28.5)	30.5-35.3 (32.6)	19.3-35.3 (26.2)
Eye length in gape width:						
<i>pisolabrum</i>	.7-1.3 (1.0)	1.0-1.2 (1.1)	1.0-1.2 (1.1)	1.1-1.6 (1.3)	1.1-1.2 (1.2)	.7-1.3 (1.1)
Intergrades	.9-1.1 (.9)	.9-1.1 (1.0)	.....	1.3-1.4 (1.3)	.....	.9-1.4 (1.1)
<i>aureolum</i>	.9-1.1 (1.0)	1.0	1.0	1.1-1.5 (1.3)	1.4-1.5 (1.5)	.9-1.5 (1.2)
<i>breviceps</i>	.7-1.0 (.8)	1.0	.....	1.0-1.2 (1.2)	1.1-1.2 (1.2)	.7-1.2 (1.0)
Head length in body depth:						
<i>pisolabrum</i>	.8-1.1 (1.0)	.9-1.1 (1.1)	1.0-1.2 (1.1)	1.0-1.4 (1.2)	1.1-1.1 (1.1)	.8-1.4 (1.1)
Intergrades	1.0-1.1 (1.0)	1.0-1.1 (1.1)	.....	1.1-1.2 (1.2)	.....	1.0-1.2 (1.1)
<i>aureolum</i>	1.0-1.2 (1.1)	1.1	1.3	1.2-1.4 (1.3)	1.1-1.3 (1.3)	1.0-1.4 (1.2)
<i>breviceps</i>	.8-1.2 (1.0)	1.2	.....	1.4-1.5 (1.4)	1.4-1.5 (1.4)	.8-1.5 (1.2)
Upper lip width in gape width:						
<i>pisolabrum</i>	2.9-4.7 (3.6)	3.0-4.2 (3.7)	3.0-4.0 (3.5)	2.8-4.0 (3.4)	2.9-3.2 (3.0)	2.8-4.7 (3.5)
Intergrades	3.7-6.0 (4.9)	3.9-5.2 (4.5)	.....	3.6-4.6 (4.2)	.....	3.6-6.0 (4.5)
<i>aureolum</i>	4.6-5.4 (5.1)	4.1	5.7	4.5-6.8 (5.5)	4.7-5.4 (5.0)	4.2-6.9 (5.2)
<i>breviceps</i>	4.4-5.8 (5.0)	5.6	.....	6.2-6.7 (6.4)	6.3-7.8 (6.9)	4.4-7.8 (5.9)

\* Measurements of *pisolabrum* are from the paratypes mentioned above; measurements of *aureolum* intergrades were taken of specimens from the UMMZ and UMoMZ collections; measurements of *aureolum* and *breviceps* were taken of specimens from the Ohio State University collections.

† All measurements and counts were taken under low power magnification, the measurements to the nearest tenth of a mm.; all were taken by the senior author. The division of the measurement of one body part into a larger body part was done with the aid of a calculating machine and therefore is an arithmetic ratio, not a "step" measurement. (Step measurement is taken with dividers by measuring a body part, then "stepping off" with dividers this part into a larger part, such as head length into standard length.) In this group of fishes the arithmetic ratio can be used as a step measurement for identification of the average specimen of moderate or large size.

‡ Upper jaw length was measured carefully by inserting one point of the dividers through the skin to the posterior-most point of the maxillary and then firmly pressing the other point against the tip of the upper lip (with mouth closed) so that it pressed against the anterior-most point of the premaxillary; formerly this measurement was known as "length of maxillary." See Hubbs and Lagler, 1947: 15.

§ The greatest transverse distance across the lower lips, taken from the outside edge of one of the halves of the lower lip, across to the outside edge of the other half of the lower lip.

|| The width, or thickness, of the upper lip taken at the tip with dividers.

The dorsal third of the head and body of subadults and adults is basically olive-yellow, usually with a pronounced golden overcast, especially in the largest adults. The sides are progressively more silvery ventrally, becoming silvery white on the lower sides and milk-white on the belly. The spots on the basal part of the scales are most distinct on back and upper sides, less apparent on lower sides, and are absent from belly.

The dorsal fin is a deep pink, red, or carmine (fire-red according to George V. Harry), and is brightest on the distal third; the webbing of the basal third contains minute melanophores which give that part a bluish slate cast. There is sometimes a narrow band of melanophores along the distal edge of the fin (Pl. 1, Fig. 4). The caudal fin is more brilliant and of a deeper pink or carmine, darkest basally where it merges into the yellow-olive of body; its distal edge may contain a narrow band of melanophores, especially on the upper lobe. The central section of anal fin is almost as brilliant as is the caudal fin, but the crimson becomes lighter, with considerable yellow, about the free edges of the fin. The color of the pelvic fins ranges from yellowish pink to crimson; the pectorals are sometimes slightly flushed with yellow or crimson.

**BREEDING TUBERCLES.**—In the breeding male the tubercles are whitish and are confined to the rays of the anal and caudal fins. They are larger and are in a single row on the basal halves of the rays, branching into two rows on the distal halves. The tubercles are largest on the anal fin, moderate in size on the lower lobe of the caudal fin, and minute or absent on the upper lobe.

**INTERGRADATION.**—Although typical *pisolabrum* south of the Missouri River is spectacularly different in lip structure from *aureolum* from the northern part of its range, the two forms intergrade in Missouri north of the Missouri River. In that region marked variations in development of the upper lip occur. One small specimen from northern Missouri, Schuyler County, has the lip as greatly developed, for its size, as does any specimen south of the Missouri River; others, taken farther south, have lips only moderately developed. Specimens from north-central Iowa, north-central Nebraska, and central Illinois are as thin- and uniformly-lipped as are specimens from Lake Erie. Intergrades, therefore, appear to be restricted chiefly to those streams in the state of Missouri north of the Missouri River.



The following comparisons indicate intergradation between the two forms. The width of upper lip, measured into width of gape, averages in *pisolabrum*, 3.5 (2.8–4.7); in intergrades north of the Missouri River, 4.5 (3.6–6.0); in *aureolum* from Lake Erie waters, 5.2 (4.2–6.9). Likewise, the width of upper lip, measured into length of head, shows intermediacy, with *pisolabrum* averaging 13.7 (10.5–16.3); intergrades 17.5 (13.9–24.0); and *aureolum* 20.0 (15.5–27.0). Other slighter differences, of possible statistical value, are: scales in lateral line, *pisolabrum* averages 42.5 (40–45), intergrades 42.8 (42–44), *aureolum* 43.2 (42–44); dorsal fin rays, *pisolabrum* 12.7 (11–14), intergrades 12.9 (12–14), *aureolum* 13.0 (12–14). See Map 1 for localities, represented by hollow circles, whence came the intergrades.

It seems pertinent here to discuss briefly the relationship of *M. aureolum* to *M. breviceps*. *M. a. aureolum* has been taken in the Ohio River from its confluence with the Mississippi River upstream to the mouth of the Wabash River. *M. breviceps* occurs in the Ohio River and its larger tributaries above the mouth of the Wabash River and in the upper Wabash and Tennessee systems. The characters separating the two species are slight. *M. aureolum* differs from *breviceps* in having a longer jaw, wider gape, wider upper lip, 9 pelvic rays instead of 9 or 10, and a less strongly falcate fin in adults. (In *breviceps*, especially males, the tip of the strongly falcated dorsal fin may extend beyond end of last ray; in *aureolum* it never does.)

Unfortunately, specimens appear to be lacking from that part of the Ohio River where the two forms should occur together or intergrade. Until such specimens are obtained, it seems advisable to accept the current opinion that the two forms are specifically distinct.

HABITAT.—The largest populations of *pisolabrum* inhabit those parts of the medium- and large-sized Ozarkian streams, the waters of which normally have little turbidity and the gradients of which are more than three feet per mile. Like other species of *Moxostoma*, the adults usually migrate upstream to spawn in higher gradients than those in which they winter. Smaller populations and strays occur in more turbid waters or in streams of lower gradient within the Ozarkian upland and about its periphery.

The name *pisolabrum* is derived from *Pisum*, the generic name of the cultivated pea, and from *labrum*, a lip; referring to its colloquial name, pealip sucker.

## LITERATURE CITED

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## PLATE I

FIG. 1. *Moxostoma aureolum aureolum*: ventral surface of head, showing relative size of mouth and upper lip of a specimen from Sandusky Bay, Ottawa Co., Ohio, 230 mm. in standard length, No. 1506 in the Ohio State University, Stone Institute of Hydrobiology collection.

FIG. 2. *Moxostoma aureolum pisolabrum*: ventral surface of head, showing relative size of mouth and upper lip of the holotype.

FIG. 3. *Moxostoma breviceps*: ventral surface of head, showing relative size of mouth and upper lip of a specimen from the Scioto River, Scioto Co., Ohio, 275 mm., OSU 1084.

FIG. 4. *Moxostoma aureolum pisolabrum*: side view of the holotype.

PLATE I

FIG. 1

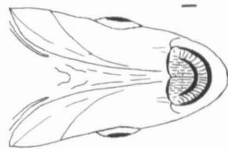


FIG. 2

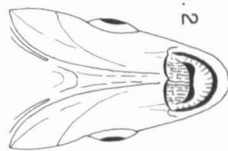


FIG. 3

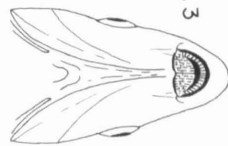


FIG. 4

