

NOTES ON A COLLECTION OF FISHES MADE BY DR.
EDGAR A. MEARNS FROM RIVERS TRIBUTARY TO THE
GULF OF CALIFORNIA.

By JOHN OTTERBEIN SNYDER.

Of Stanford University, California.

While in charge of the biological section of the survey of the Mexican boundary of the United States, from January, 1892, till September, 1894, Dr. Edgar A. Mearns, major and surgeon, United States Army, made a collection of fishes from the various streams encountered along the route. Those secured from the Gulf of California drainage are of particular interest, for although considerable has been written on the fishes of the region,¹ there are yet many questions regarding their habits, relationships, and distribution which are open to investigation.

The collection made by Doctor Mearns contains specimens from the Colorado River and some of its tributaries, from the headwaters of the Yaqui near the international boundary, and also from the Altar and Sonoyta Rivers, each of which runs an independent course to the Gulf of California. The following list will indicate the relationships of the streams examined:

Colorado River.

Gila River.

Verde River.

Oak Creek.

Beaver Creek.

Santa Cruz River.

San Pedro River.

Sonoyta River.

Altar River.

Bear Creek.

Yaqui River.

Bavispe River.

San Bernardino River.

Cajon Bonito Creek.

The faunas of the Sonoyta, Altar, and Yaqui Rivers are not yet well enough known to justify any very definite statements as to their relationships. It appears, however, that the fishes of the Yaqui have been largely derived from the Rio Grande. It also seems safe to infer that the barrier of salt water which now separates the Colorado and Yaqui Rivers has been continuous with the existence of the latter, thus preventing the Colorado fauna from extending

¹ Evermann and Rutter; Bull. U. S. Fish Comm., No. 14, 1894, pp. 473-486. Gilbert and Seofield; Proc. U. S. Nat. Mus., vol. 20, 1893, pp. 487-499. Meek, Seth Eugene; Field Columb. Mus. Publ. 93, zool. ser., vol. 5, Rio Yaqui System, p. XXXVIII. Ellis, Max M.; Univ. of Colorado Studies, vol. 11, No. 1, 1914.

to the Yaqui through a channel connection. At least two Colorado forms have succeeded in reaching the larger streams of southern California, where they are now represented by *Notolepidomyzon santanæ* and *Richardsonius orcutti*.

One species, *Notropis mearnsi* is described as new.

Quotations are made from the field notes of Doctor Mearns.

CATOSTOMUS INSIGNIS Baird and Girard.

The species described by Kirsch¹ as *Catostomus gila* is synonymous with *C. insignis*, no differences appearing when the types of both are compared. On carefully reading Kirsch's paper it appears probable that his collection included three specimens of *C. insignis*, which he described as *C. gila*, and two examples of *Notolepidomyzon clarki* with scales on the sides of moderate size, larger anteriorly than posteriorly * * *; the anterior scales are of circular outline * * * those of the back vary large.

One of the latter he lists as *C. insignis*, and the other as *C. clarki*.

There are four cotypes of *C. insignis* in the United States National Museum. They have from 54 to 58 scales in the lateral series, 11 or 12 between the lateral line and middle of back, 9 or 10 between the lateral line and base of ventral, 26 to 30 between occiput and dorsal fin. There are 11 or 12 dorsal rays. In a cotype of *C. gila* the scales are as follows: 56, 12, 11, 30.

The following notes on the scales are taken from specimens collected by Doctor Mearns:

Scales in lateral series.....	54	55	56	57	58	59	60	61	62
Number of specimens.....	1	1	6	6	2	0	2	2	2
Scales above lateral line.....	11	12	13	14	..	..	..	..	..
Number of specimens.....	1	8	11	2	..	..	..	..	..
Scales below lateral line.....	10	11	12	..	..	..	..	..	..
Number of specimens.....	10	10	2	..	..	..	..	..	..
Scales before dorsal.....	26	27	28	29	30	31	..	..	..
Number of specimens.....	3	2	6	3	3	5	..	..	..

Proportional measurements follow:

	Cotypes of <i>C. insignis</i> .			<i>C. insignis</i> Verde R., Arizona.					
	187	125	113	181	180	162	134	138	185
Length of body.....mm..	.187	.125	.113	.181	.180	.162	.134	.138	.185
Length head.....	0.27	0.28	0.27	0.245	0.255	0.26	0.27	0.255	0.26
Depth body.....	.21	.24	.25	.25	.23	.235	.23	.25	.25
Depth caudal peduncle.....	.105	.11	.10	.11	.10	.10	.11	.11	.11
Length caudal peduncle.....	.16	.17	.155	.165	.155	.155	.15	.16	.15
Length snout.....	.13	.13	.13	.10	.115	.115	.12	.12	.12
Diameter eye.....	.05	.05	.052	.05	.05	.05	.05	.05	.05
Interorbital width.....	.12	.11	.11	.11	.105	.11	.11	.10	.11
Depth head.....	.185	.195	.195	.18	.17	.19	.18	.18	.185
Snout to occiput.....	.22	.23	.22	.20	.21	.22	.21	.21	.21
Snout to dorsal.....	.535	.53	.51	.51	.51	.53	.51	.52	.515
Snout to ventral.....	.595	.58	.56	.565	.575	.59	.59	.59	.58
Length base of dorsal.....	.15	.155	.16	.17	.155	.17	.17	.175	.175
Length base of anal.....	.08	.08	.075	.08	.08	.08	.08	.08	.085
Height dorsal.....	.17	.20	.20	.19	.19	.20	.19	.19	.20
Height anal.....	.195	.21	.18	.19	.20	.19	.19	.205	.20
Length pectoral.....	.21	.22	.19	.20	.22	.19	.19	.215	.20
Length ventral.....	.16	.18	.16	.165	.17	.165	.17	.18	.17
Length caudal.....	.235	.255	.24	.25	.245	.25	.24	.245	.255

¹ Proc. U. S. Nat. Mus., vol. 11, 1888, p. 555.

The color of the ventral surface varies from pure white to a beautiful yellow. The upper surface is dark, the line of division between dark and light being sharply defined and located 3 to 5 scales below the lateral line.

This is a large scaled sucker with elongate head, large lips, and deep caudal peduncle. It has been reported from the lower parts of the Colorado system, its range evidently not extending up into the swift-flowing streams of the mountains.

Doctor Mearns secured specimens from the Verde and Santa Cruz Rivers and from Beaver Creek near Fort Verde.

CATOSTOMUS SONORENSIS Meek.

Some small suckers from San Bernardino Creek are identified as *C. sonorensis*. These are somewhat more slender than that described by Meek,¹ and the scales and fin rays are similar to those of *C. insignis*. No examples of the latter of similar size are available for comparison.²

San Bernardino Creek near the international boundary.

NOTOLEPIDOMYZON CLARKI (Baird and Girard).

A comparative study of the species usually assembled in the genus *Pantosteus* discloses the fact that they are separable into two well-defined, natural groups, one characterized by a thick cranium in which the parietals and frontals meet in a close, strong suture (fig. 1), and another by a relatively thin cranium where the parietals and frontals are separated by a long, often very narrow, fontanelle which apparently does not close even in very old individuals. For the first group the name *Notolepidomyzon*³ is available, while *Pantosteus* must be retained for the second.

Catostomus has a broad, usually rectangular fontanelle (fig. 3), and the lips are not armed with a horny sheath as in *Notolepidomyzon* and *Pantosteus*.

Recent authors recognize three species of *Pantosteus* in the Colorado system, namely, *P. clarki* (Baird and Girard), *P. arizonae* Gilbert, and *P. delphinus* (Cope).⁴

Specimens measuring about 240 mm. from Beaver Creek near Fort Verde, are referable to *P. clarki*, as they possess the very large and somewhat rounded scales of the anterior upper parts which characterize that species. The scales in the first row above the lateral line are

¹ Field Columb. Mus. Publ. 93, Zool. Ser., vol. 5, p. 32, pl. 6.

² The type of *Catostomus bernardini* No. 174, U.S.N.M., a specimen measuring 193 mm., has 12 rays in the dorsal, 7 in anal, 74 scales in lateral series, 15 in series between lateral line and middle of back, 12 below lateral line, and 33 between occiput and dorsal fin.

³ Fowler, Henry W., Proc. Acad. Nat. Sci., Phila., 1913, p. 47, *Notolepidomyzon* type *arizonae*. Cope and Yarrow; Wheeler's Explor. west of the 100th merid., vol. 5, 1875 (1876), p. 673, *Pantosteus* type *platyrhynchus*. It will be noted that *Notolepidomyzon* was characterized by the size of the scales, while the type of *Pantosteus* has a large fontanelle.

⁴ Proc. Acad. Nat. Sci. Phila., 1854, p. 27, *Catostomus clarki*; U. S. and Mex. Bound. Surv. Ichthyol., p. 38, pl. 22, *Minomus clarki*; Bull. 47, U. S. Nat. Mus., p. 170, *Pantosteus arizonae*; Proc. U. S. Nat. Mus., vol. 20, p. 488, pl. 36; U. S. Geol. Surv. Wyoming, Fourth Ann. Rept., 1870 (1871), p. 435, *Minomus delphinus*.

The other recognized Colorado species has been considered synonymous with *P. bardus* and *P. virescens*, described by Cope.¹ The types of *P. delphinus* and *P. bardus* are lost, and the locality from which these and *P. virescens* came is not known with certainty. The descriptions of all are equally brief. The type of *P. virescens* (No. 16758, U.S.N.M.) remains. It is apparently of the same species as others in the United States National Museum identified by late investigators as *P. delphinus*. It measures 370 mm., being by far the largest specimen of the genus which the writer has seen.² There is some reason to suspect that this is not synonymous with *P. delphinus* (Cope), for that authority distinguishes the latter by its short, wide head and thick body. He also says that the scales are subequal. The type of *P. virescens* is relatively slender and the scales of the anterior dorsal surface are much smaller than the others, a fact which Cope records. However, as no more important reason appears for distinguishing between *P. delphinus* and *P. virescens*, they are here regarded as synonymous. The skull of this species is relatively thin and the fontanelle constantly remains open.

Unless the present treatment of these nominal forms is at fault it is evident that there are but two species of *Pantosteus* (*Pantosteus* and *Notolepidomyzon*) in the Colorado system. Both are easily distinguished from species of *Catostomus* by the structure of the lips, and they differ markedly from each other in the size of the scales. When the crania of both are compared, it is observed that the heavy, firm skull of *N. clarki*, with its closely fitting frontals and parietals, contrasts strongly with the comparatively light, thin skull of *P. delphinus*, the sharp-edged frontals and parietals of which are separated by an elongate and narrow fontanelle.

With these Colorado forms in mind it will be of interest to examine similar catostomids of the Bonneville Basin, where three species have been described, *Catostomus generosus* Girard, *Minomus platyrhynchus* Cope, and *Minomus jarrovi* Cope,³ only one of which has been generally recognized. The cotypes of *C. generosus* and *M. platyrhynchus* are preserved in the Museum. The former represents a species with a short, robust body and a very thick skull without fontanelle, hence belonging to *Notolepidomyzon*, while *M. platyrhynchus* is relatively slender and has a thin skull with an elongate, narrow fontanelle,⁴

¹ U. S. Geol. Surv. Wyoming, Fourth Ann. Rept. for 1870 (1871), p. 436, *Minomus bardus*. Wheeler's Explor. West of the 100th Merid., vol. 5, 1875 (1876), p. 675, *P. virescens*.

² Numerous specimens of *Pantosteus* measuring from 230 to 395 mm., the largest of which weighed 1½ pounds, were lately collected by the writer while engaged in a survey of the Bonneville system under the direction of the United States Bureau of Fisheries. In these the fontanelle is present.

³ Proc. Acad. Nat. Sci. Phila., 1856, p. 174. Proc. Amer. Philos. Soc. Phila., 1874, pp. 134, 135.

⁴ The fontanelle, covered or closed as usual with a tough membrane, must have escaped the attention of Cope, as *M. platyrhynchus* is the first species mentioned and described under his diagnosis of the genus *Pantosteus*, which he characterizes by "a complete union of the parietal bones which obliterates the fontanelle so universal among the suckers."

a member of the genus *Pantosteus*. The cotypes of *jarrovi* can not be found. Cope remarks that this is a less elongate species than *platyrhynchus*, thus lending color to the supposition that his observations were made on an example of *generosus*. It is also worth while to note that the original description refers only to "several specimens from near Provo. Messrs. Yarrow and Henshaw." There can then be no mistake as to the type-locality, and apparently no good reason to assume that any cotypes came from the Rio Grande.¹

The Lahontan system has one species, *P. lahontan* Rutter,² which is related to *P. platyrhynchus*, each resembling the other closely both in cranial structure and external characteristics. One form, *P. jordani*³ Evermann described from the upper part of the Missouri Basin, seems to be a representative of *P. platyrhynchus*, although the fontanelle is reduced to a very narrow slip. But one species seems to be known from the Rio Grande, *Catostomus plebeius* Baird and Girard.⁴ It has the thick skull without fontanelle characteristic of *Notolepidomyzon*. Santa Ana River, a coastal stream of southern California, contains one species *santa-anae*, a member of the same genus. Its describer was mistaken in its relationships, having compared it with wrongly identified specimens.⁵

The relationships here indicated, and which are believed to be in harmony with both the structure and geographic distribution of the species in question, may be indicated as follows:

Lips with a horny cutting edge; cranium thin; a narrow and usually slitlike fontanelle present (fig. 2):

Pantosteus—

delphinus Colorado.

platyrhynchus Bonneville.

jordani Columbia.

lahontan Lahontan.

Lips with a horny cutting edge; cranium thick; no fontanelle (fig. 1):

Notolepidomyzon—

clarki Colorado.

santa-anae Santa Ana.

generosus Bonneville.

plebeius Rio Grande.

The center of distribution of each genus is the Bonneville Basin.

¹ Bull. U. S. Fish. Comm., No. 12, 1892, p. 56. List of specimens of *Pantosteus* now found in the U. S. National Museum.

² Bull. U. S. Fish Comm., No. 22, 1902, p. 146.

³ Bull. U. S. Fish Comm., No. 12, 1892, p. 51. The writer follows Jordan and Evermann in identifying *P. columbianus* Eigenmann (Amer. Naturalist, February 4, 1893, p. 151) with *P. jordani*, not having sufficient material for a careful comparison. A few poorly preserved specimens from the Columbia indicate that this identification should be accepted provisionally, for the two may be distinct species. There is danger of confusing this form with *C. catostomus*. The latter has a narrow, rectangular fontanelle.

⁴ Proc. Acad. Nat. Sci. Phila., 1854, p. 28.

⁵ Proc. U. S. Nat. Mus., vol. 34, 1908, p. 33.

One is justified in looking forward to the possible discovery of one or even more undescribed forms, or at least to the extension of the range, of known species. It is quite within reason to presume that *N. generosus* is represented in the upper Columbia Basin. The status of *platyrhynchus*, *jordani*, and *columbianus* should be carefully investigated.

The specimens here used for comparison were about 6 inches long, perhaps the average size of mature individuals. In very old examples of *Pantosteus* the fontanelle becomes linear. In the large type of *P. virescens* the parietals and frontals nearly meet.

The smallest specimen of *N. clarki* examined measured 70 mm. in length. No fontanelle was present, but the parietals and frontals were not very firmly united along the median line.

Beaver Creek, Santa Cruz River.

XYRAUCHEN TEXANUS Abbott.¹

This species is remarkable for the high and narrow dorsal hump or keel which rises abruptly from the rather low, flat head, and extends to the dorsal fin. The bony structure of this keel is formed by the junction of an enlarged occipital crest and a series of fused or closely apposed and modified spines and interneurals. The anterior and stronger part of the crest is supported by the complex of vertebrae over which the chain of Weberian ossicles extends (fig. 6). This complex involves 3 developed vertebrae, no trace of another appearing in the mature skeleton. The first of these is represented by a thin centrum without lateral processes, above which is the spine (*S.1*), narrow and knife-like, with a heavy, thick base, closely apposed to the first interneural (*i.1.*), the base of the second vertebral spine and the neural arch. The second vertebra is not ankylosed with either the first or third. Its neural arch is large, and the spine (*S. 2*) above it is massive. With the second spine are firmly coossified the broad, leaf-like interneurals between the first and fifth spines. This spine-interneural complex is the "trapezoidal interneural" of Lockington² and the "large, interneural formed by a thick central pillar with anterior and posterior wings" of Kirsch.³ The third spine (*S. 3*) is broad and low, closely joined to the base of the second, or ankylosed with it. The fourth is slender, short, and supplied with a bifid tip which clasps the lower edges of the last fused interneurals. Five other interneurals (one of which is occasionally absent or partly developed) with thin, broad tips and narrow, pointed bases, together with the first interneural of the dorsal fin finally complete the bony crest.

¹ Fowler finds that *X. cypho* of authors is *C. texanus* Abbott. Proc. Acad. Nat. Sci. Phila., 1913, p. 54.

² Proc. Acad. Nat. Sci. Phila., 1880, p. 237.

³ Proc. U.S. Nat. Mus., vol. 11, 1888, p. 556, description of *Xyrauches* Eigenmann and Kirsch, new genus.

An osseous crest not much unlike this is present in *Carpiodes* and *Ictiobus*, the elements being especially distinct in the latter (fig. 5). It is rather feebly represented in *Catostomus*, where the coosified part of the crest involves the spines and interneurals anterior to and including the sixth vertebra. The fourth, fifth, and sixth spines only are easily distinguished, their tips extending upward astride a knife-like blade formed by the ankylosed interneurals.

The skull of *Xyrauchen* differs greatly from that of *Catostomus*, as will be seen by a comparison of the illustrations (figs. 3 and 4). The fontanelle in *Xyrauchen* is broad anteriorly, narrow posteriorly, almost triangular in shape, the posterior part continued backward and upward as a narrow trough on the base of the occipital crest. In *Catostomus* (*insignis*, *commersoni*, *macrocheilus*, *mnioiltus*, *tahoensis*) the foramen is broad, oblong, and more or less rectangular.

This and other peculiar cranial characteristics of *Xyrauchen* indicate no very close relationship between it and *Catostomus*.

The dorsal crest of the species is exaggerated in old age by the flattening of the head, the dorsal contour of which becomes strongly concave in contrast to the convex skulls of *Catostomus*, *Carpiodes*, and others.

Doctor Mearns notes that the flesh of this species is excellent and of fine flavor.

Specimens were collected in the Colorado at Yuma, where one example with a peculiar abnormal squamation appeared, the scales being only about half the usual size, except in several very restricted areas, where a few normal ones were found.

Very large specimens, refusing to take a hook, were snared in deep holes among the rocks. A line with several hooks attached was allowed to sink to the bottom and when a school moved over it the line was brought out with a sharp swish of the pole, a sucker usually being hooked.

The entire ventral surface is orange yellow; pectoral and ventral fins very slightly dusky, their upper surface marked basally with dusky olive; iris yellow, with greenish-yellow granulation; lower third of head, including end of snout, orange yellow, in strong contrast with the flesh-colored mouth; sides salmon color, granulated with dusky olive; dorsal surface, including top of head, dark olive brown; anterior ridge of hump pale olive. Dorsal fin olivaceous; anal orange yellow, indistinctly marked with dusky; caudal yellowish olive. In some examples the fins are rather rosy, and the scales of the sides are tipped with silvery. An occasional example has the dorsal surface dark olive brown, and there is a strong pinkish tint below the lateral line.

Colorado River at Yuma; Gila River at Gila City.

GILA ELEGANS Baird and Girard.

There is one example in the collection which measures $15\frac{3}{4}$ inches in length. The head is greatly flattened and a broad, rounded, nuchal hump is developed.

The very narrow caudal peduncle, the depressed and elongate head, and the dorsal hump of *G. elegans* calls to mind the fact that

these peculiarities are characteristic of other Colorado forms. An unusually narrow caudal peduncle distinguishes *C. latipinnis* and *G. elegans*, the depressed head is found in *Ptychocheilus lucius*, *G. robusta*, and *X. texanus*, and the dorsal crest is conspicuous in *X. texanus* and *G. robusta*. These characters become fully developed only in old individuals.

Gila River at Gila City; Colorado River, Yuma; Salton River, Colorado Desert, Lower California.

GILA ROBUSTA Cope.

In large individuals the back is greatly arched, the head flattened, and concave in outline. The maxillary appears longer, the tip extending beyond anterior margin of eye, which it does not reach in small specimens.

*G. seminuda*¹ seems to be synonymous with this species. In the ventral region the scales are small, thin, and not securely embedded. The observations of Ellis,² "Specimens of this subspecies differ from the typical *G. robusta* in having no scales in the midventral portion of the body as far posterior as the base of the ventrals and no scales on the mid-dorsal region as far back as the middle or last ray of the dorsal fin," are not applicable to this form, as the cotypes of *G. seminuda* from the Rio Virgen have the entire ventral surface scaled, where the scales have not been displaced by accident, in which case the pockets remain. The same is also true of the mid-dorsal region.

Fishes of this species may be caught with baited hook, "the flesh of a bird or minnows of its own species answering equally well. The stomach of one specimen contained a frog."

An example measuring 9½ inches from the Verde was colored in life as follows:

Dorsal aspect dark, dotted with gold and silver; sides with obsolete blackish bands, most distinct toward the tail; below, silvery white; iris, golden; peritoneum, black. A smaller specimen was lighter colored and had a gold band extending from the superior extremity of the opercular opening to the base of the tail. In many specimens the ventral surface ranges in color from pure white to rosy salmon.

The species is locally known as bony-tail or Verde trout, and when taken from cool water the flesh has an excellent flavor.

Verde River at Fort Verde; Gila River at Gila City.

PTYCHOCHEILUS LUCIUS Girard.

Colorado River at Yuma; Gila River.

RICHARDSONIUS GIBBOSUS (Baird and Girard).

In determining the identity of specimens collected by Doctor Mearns it became necessary to examine the types of *Gila gibbosa*

¹ Wheeler's Explor West of the 100th Merid., vol. 5, 1875 (1876), p. 666, pl. 31, figs. 1, 1a.

² Fishes of Colorado, Univ. of Colorado Studies, 1914, p. 57, *Gila robusta seminuda*.

Baird and Girard,¹ *Tigoma intermedia* Girard,² and *Gila nigra* Cope.³ It was found that they represent the same species.

The type of *G. gibbosa*, No. 223, U.S.N.M., is from the Rio Santa Cruz, a tributary of the Gila. The following measurements of the specimen are recorded in hundredths of the length to base of caudal fin. Length, 170 mm.; length head, 0.285; depth caudal peduncle, 0.105; length caudal peduncle, 0.20; length snout, 0.08; diameter eye, 0.055; interorbital width, 0.09; depth head, 0.19; snout to occiput, 0.20; to dorsal, 0.58; to ventral, 0.54; length base of dorsal, 0.18; base of anal, 0.09; height dorsal, 0.16; anal, 0.145; length pectoral, 0.16; length ventral, 0.12; number dorsal rays, 8; anal, 8; scales in lateral series, 74; between lateral line and middle of back, 19; between occiput and dorsal fin, 36.

One of the cotypes of *T. intermedia*, No. 232, U.S.N.M., has 76 scales in the lateral series, 20 above the lateral line, and 39 between occiput and dorsal fin. There are about 8 small, short gillrakers.

The cotypes of *G. nigra*, No. 16987, U.S.N.M., are from Ash Creek, Arizona. Specimens from San Carlos are also recorded by Cope, but they should not be regarded as cotypes⁴ as the original description is based on larger examples, "7¼ inches," those from San Carlos being much smaller.

Specimens from Clear Creek about 20 miles above its confluence with the Verde were examined about July 2. The back was dark olive green, the sides golden yellow; sides of head brassy yellow granulated with black; ventral region yellow; iris yellow. Fins orange, the area around their bases vermilion.

Santa Cruz River, Verde River near Fort Verde.

A few fishes from Bear Creek, a tributary of Altar River, are provisionally identified as *R. gibbosus*. They appear to differ in form and scale characters from members of the genus taken in the Colorado and in the Yaqui. Material for a careful comparison is not available, however.

RICHARDSONIUS PURPUREUS (Girard).

This species has a robust body, large head, and very short snout. The gillrakers are very short, scarcely evident in some specimens. The scales in the lateral series number from 55 to 60; above lateral line, 15 or 16; between lateral line and ventral, 8 or 9; between occiput and dorsal, 34 to 36. Dorsal rays, 8; anal rays, 8.

San Bernardino River.

NOTROPIS MEARNSI, new species.

Five specimens of a *Notropis*, which apparently belongs to an unknown form, were collected in the Yaqui Basin. The species

¹ Proc. Acad. Nat. Sci. Phila., 1854, p. 28; U. S. and Mex. Bound. Surv. Ichthyol., p. 64, pl. 33, figs. 1-4.

² Proc. Acad. Nat. Sci. Phila., 1856, p. 206.

³ Wheeler's Explor. West of the 100th Merid., vol. 5, 1876, p. 663, pl. 30, fig. 3.

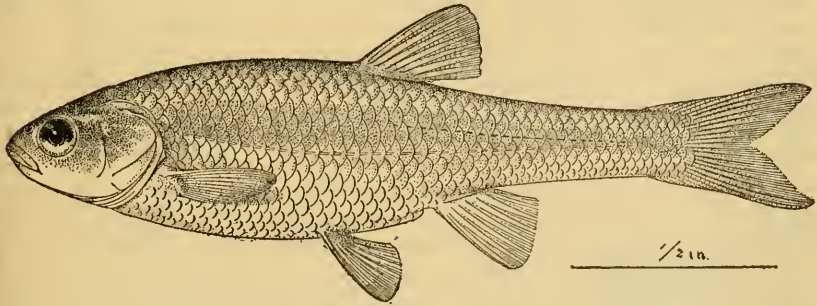
⁴ Bull. 47, U. S. Nat. Mus., p. 235, synonymy of *L. niger*.

which is named in honor of its discoverer is characterized by the rather rounded and elongate body, slender caudal peduncle, posterior position of the dorsal fin, large scales, large eye, teeth 4-5, short alimentary canal, almost complete lateral line, and the absence of dark bars or spots.

On comparison with other forms the exact relationships of the species do not appear. It is probably allied to some form indigenous to the Rio Grande.

Description of *Notropis mearnsi*, type No. 76163, U.S.N.M., from San Bernardino River, Mexico, near monument 77 of the international boundary; Dr. E. A. Mearns, collector; October 6, 1893.

Head 4.1 in length to base of caudal; depth, 3.9; depth caudal peduncle, 10; scales lateral series, 40; between lateral line and middle of back, 8; between occiput and insertion of dorsal, 19; dorsal rays, 8; anal, 8.



NOTROPIS MEARNSI.

Snout rather pointed, the length about equal to diameter of eye. Cleft of mouth oblique, extending slightly beyond anterior border of orbit. Dorsal inserted behind a vertical through base of ventral. Caudal deeply notched, the lobes pointed; 4 or 5 upper and lower rays not fully developed. Edges of dorsal, anal, and ventrals convex; pectorals obtusely pointed. Teeth 4 on the right side, 5 on the left; strong, pointed, with hooked tips; a narrow grinding surface present. Peritoneum silvery; a few dusky spots on its dorsal surface; lining of opercle silvery. Alimentary canal shorter than body, folded once and back. (Viscera and teeth from paratype.) Pseudobranchiae very large; 4 or 5 very short stubby gill rakers.

Scales large and regular. Lateral line complete or nearly so; slightly decurved anteriorly.

Color silvery, darker and with little luster on the dorsal surface; a broad, lateral, silvery stripe present, which gradually narrows on caudal peduncle; no bars or spots; a linear, black stripe, not parallel with the lateral line, extends from below dorsal fin nearly to base of caudal.

The paratypes exhibit some variation, as illustrated in the annexed table. The pores of the lateral line fail to develop on occasional scales, especially on the caudal peduncle.

Notropis mearnsi.—Measurements of type and paratypes.

Length of body.....	mm..	41	40	35
Length head.....		0.26	0.25	0.255
Depth body.....		.27	.28	.28
Depth caudal peduncle.....		.10	.10	.11
Length caudal peduncle.....		...	.21	.25
Length snout.....		.06	.07	.07
Diameter eye.....		.065	.065	.07
Interorbital width.....		.075	.085	.085
Depth head.....		.19	.18	.19
Snout to occiput.....		.21	.20	.21
Snout to dorsal.....		.55	.58	.55
Snout to ventral.....		.50	.50	.51
Length base of dorsal.....		.12	.13	.14
Length base of anal.....		.115	.13	.12
Height dorsal.....		.20	.21	.21
Height anal.....		.17	.16	.19
Length pectoral.....		.19	.20	.22
Length ventral.....		.17	.14	.17
Length caudal.....		.26	.27	...
Dorsal rays.....		8	8	8
Anal rays.....		8	9	9
Scales lateral line.....		40	37	38
Scales above lateral line.....		8	8	8
Scales below lateral line.....		5	4	4
Scales before dorsal.....		19	18	17

AGOSIA CHRYSOGASTER Girard.

The teeth of 10 specimens were examined and found to have a well-developed grinding surface. They were sharp and distinctly hooked at the tips. There were 4 on each side. The fins are unusually short and rounded in some cases, the ventrals not reaching the anal opening. Tubercles are present on the heads of the males taken in January, and the females contain many eggs in various stages of development, some very large, apparently ripe. The peritoneum is dark; almost black.

Doctor Mearns observes of the color:

Blackish above, greenish olive on the sides, and white below. Steel-blue reflections on sides of head.

Sonoyta River.

PLAGOPTERUS ARGENTISSIMUS Cope.

Three specimens of this interesting spined minnow bear rudimentary scales on the anterior dorsal parts of the body. On the throat, just posterior to the lower lip, is a mass of papillae like those on the lips of *Catostomus*.

Gila River, near Gila City.

SALMO IRIDEUS Gibbons.

A specimen $8\frac{1}{2}$ inches long from Oak Creek appears to represent fishes that have been introduced from some California stream. It is a beautiful trout with a very deep body and small head. The adipose dorsal is short and unusually high. The dorsal half of the body is closely covered with spots, sharply outlined and perfectly round on the head where they are about half as large as the pupil; smaller and irregular in outline on the body, many of them somewhat X-shaped. The dorsal and caudal are closely covered with very small spots, the dorsal with a row of elongate ones along the base. Lower half of head and body, pectorals, ventrals, and anal immaculate. No teeth occur on the tongue posterior to those of the glossohyal. There are 140 rows of scales in the lateral series.

Specimens of this same trout with 116 to 120 scales in the lateral line and measuring about 15 inches are recorded by Doctor Mearns from Clear Creek.

This creek runs in a canyon with walls over a thousand feet high. At the bottom along the stream is a forest of Douglas spruce, willow, aspen, walnut, maple, box-elder, pine, and hackberry. There is a dense growth of hop and grape vines together with shrubs, annuals and ferns. The canyon walls are of limestone above, sandstone below.

Color above, a dark vinaceous olive, becoming silvery below the lateral line and yellowish beneath and on the opercles. Dorsal yellowish olive, thickly spotted; paired fins reddish orange, obscurely spotted with dusky. Back and sides densely spotted with black, the spots on head, back, and adipose fin being rounded, those on sides and posterior parts irregularly X-shaped. The iris is golden, as are the opercles and preopercles in places. On August 13 a female full of large eggs and measuring $19\frac{1}{4}$ inches was taken in Oak Creek. The color was similar to that described above. Peritoneum whitish or colorless. A smaller one, 13 inches long, differed only in being whitish below. Other trout from Oak Creek were pure white below between the pectoral and ventral fins; the sides to or above the lateral line, greenish yellow; above lateral line the ground color was olivaceous; iris yellow; mottled with black; sides of head brassy yellow; dorsal and caudal greenish yellow.

The stomachs often contained quantities of sand and small pebbles. Wasps, grasshoppers, and grubs were frequently found there also. The largest trout caught weighed somewhat more than 3 pounds. June is the best month for fishing, when the trout are found high up toward the source of the brook.

Oak Creek.

POECLIA OCCIDENTALIS (Baird and Girard).

Specimens collected by Herbert Brown in Santa Cruz River near Tucson, November 20, 1893, contained eyed embryos. In one example, measuring $2\frac{1}{2}$ inches, there were 15 such young, besides many embryos and eggs in various stages of development.

Gila River near Gila City and Adonde Siding; Santa Cruz River; San Bernardino River; Cajon Bonito Creek.

CYPRINODON MACULARIUS Baird and Girard.

Examples collected in the Sonoyta February 1 are thus described by Doctor Mearns.

The females of this species are beautifully banded with black on a ground of greenish olive above and white below. The posterior portion of the opercle is bright steel-blue. The males are not sharply banded and the colors are plainer. They are very tenacious of life, and ascend small streams, entering cold springs whenever possible.

Gila River at Gila City and Adonde Siding; Sonoyta River; spring near Sonoyta River.

EXPLANATION OF PLATES.

PLATE 76.

Crania of catostomids.

- Fig. 1. *Notolepidomyzon clarki* X 2. Beaver Creek, Arizona.
2. *Pantosteus lahontan* X 3. Humboldt River, Nevada.
3. *Catostomus insignis* H 1. Colorado River, Arizona.
4. *Xyrauchen cypho* X $\frac{3}{4}$. Rio Verde, Arizona.

PLATE 77.

Osseous structure of the dorsal crests of

- Fig. 5. *Ictiobus bubalus*
6. *Xyrauchen texanus* Colorado River, Arizona.



1



2



3



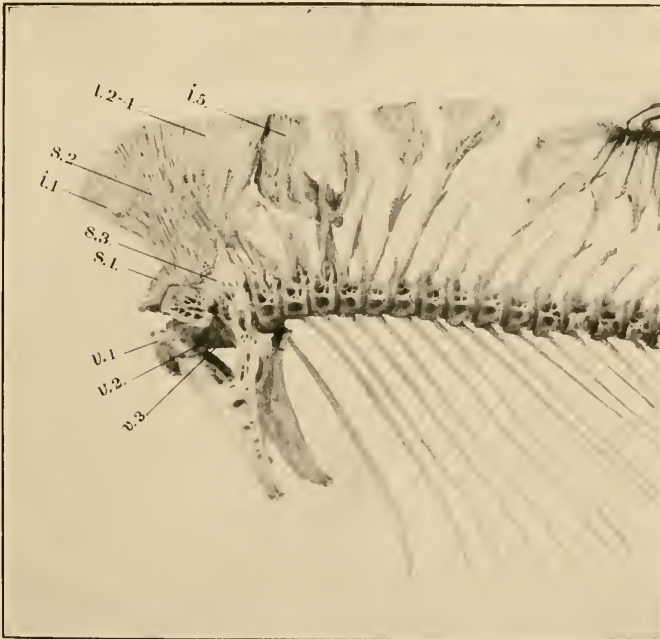
4

OSTEOLOGY OF FISHES.

FOR EXPLANATION OF PLATE SEE PAGE 586.



5



6

OSTEOLOGY OF FISHES.

FOR EXPLANATION OF PLATE SEE PAGE 586.

