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A CONTRIBUTION
TO THE
ICHTHYOLOGY OF MEXICO.

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A CONTRIBUTION TO THE ICHTHYOLOGY OF MEXICO.

BY SETH EUGENE MEEK.

The following paper is based on a collection of fishes made in Mexico during April, May and June, 1901, by the writer and Mr. Frank Eugene Lutz, instructor in zoology in Chicago University, as volunteer assistant. The more important river systems were examined, chiefly with the view of discovering the southern range of our North American ichthyic fauna, and the northern range of the South and Central American faunas.

Most of the collecting was done with two $\frac{1}{4}$ -inch mesh seines, one being 25 feet in length, the other about 50 feet.

The central portion of Mexico is a plateau ranging from about 3,500 feet above the sea to about 8,000 feet. The streams vary much in size; many go quite or entirely dry during the dry season, while during the rainy season they become torrents. Our visit was made during the latter part of the dry season when the streams were very low. The collection secured is perhaps larger than all other collections combined from the fresh waters of Mexico. The fish fauna of Mexico is very interesting. In the northern part of the country we find a few species not found elsewhere, while a large portion of the fauna are species which have migrated south. The South American fauna predominates as far north as Mexico City, though a few of its forms extend into Texas.

In making this collection we would acknowledge the assistance of the following gentlemen: Mr. J. H. Hampson of the Cuernavaca & Pacific Railroad, Mr. W. Morcom of the Mexican Southern Railroad, Mr. E. A. White of the Interoceanic Railroad, Mr. Chas. Sheldon of the Chihuahua & Pacific Railroad, Mr. Jno. P. Ramsey of the Rio Grande, S. Madre and Pacific Railroad, Mr. H. R. Nickerson and Mr. T. R. Ryan of Mexican Central and to Mr. Ward, Superintendent of Wells, Fargo Express Co., and to the officials of the Atchison, Topeka & Santa Fe Railroad. We also received considerable aid from station agents on these various railroads where we stopped and also

larger; peritoneum black; alimentary canal shorter than the total length of the fish; origin of dorsal slightly in advance of anal, midway between tip of caudal and posterior margin of the orbit; base of dorsal $2\frac{1}{2}$ in head, its height slightly more than half head; pectoral $1\frac{5}{8}$ in head; ventral $2\frac{1}{2}$; caudal fin subtruncate.

Brownish olive, a dark spot in the middle of each scale. These spots are more prominent on the posterior half of the body of males which are from $1\frac{1}{2}$ to $1\frac{3}{4}$ inches in length. In these males there is usually a row of spots on base of dorsal and anal fins. Young specimens have a few faint dark cross bars on the sides, which, in the larger females, become a faint dark lateral band.

Largest specimens, 2.46 inches in length. This species resembles *Fundulus punctatus*, from which it differs in having a larger head, a more robust body, the more forward position of the dorsal fin, and larger scales. It is evidently a smaller fish. The larger specimens have no spots on dorsal and anal fins. The type of *Fundulus punctatus* was taken at Chiapas, Guatemala.

Oviparous; eggs quite mature, 100 eggs in a female 2.05 inches in length; diameter of eggs $\frac{1}{8}$ of an inch. Our specimens were collected May 4.

Time of spawning, about the third week in May. Oaxaca.

ZOOGONETICUS, gen. nov.

Type, *Pacilia quitzeoensis* B. A. Bean.

This genus has the general appearance of *Fundulus*, differing in the modification of the reproductive organs. The anal of the male has the first 5 or 6 rays short and stiff. The ovary is a strong membranous sack with several fold-like partitions. In this the young are hatched, and reach a comparatively large size, after which they are then born.

The body is usually deeper than in *Fundulus*, and the anal and dorsal fins are usually longer. The dorsal fin of the male is considerably higher than that of the female.

Zoogoneticus quitzeoensis (B. A. Bean).

This species was first known from a female collected in Lake Quitzeo by Mr. Nelson, and described by Mr. B. A. Bean. It has a short intestine, the length being $1\frac{1}{2}$ times total length of the fish. The teeth are conical and in more than one series, the dentition being that of *Fundulus*.

The females are lighter in color than the males; on the middle of the side of female to the tip of the pectoral are usually three faint dark spots, also four to six dark bars on lower half of caudal peduncle, and a dark spot on upper portion of caudal peduncle above the last bar. The color of the males is more uniform and much darker: the spots or bars so conspicuous on the female are scarcely noticeable on the male; dorsal and anal fins black, tipped with yellow; caudal and tips of ventrals blackish; pectorals light, as are all the fins of the female. The first six rays of anal short, and separated from the rest of the fin by a shallow notch.

The body of this fish is more compressed and less robust than that of others of this group. Head $3\frac{3}{4}$; depth 3; dorsal rays 13 or 14; anal 13 to 15. This species is viviparous. Their young had evidently been born a short time previous to our visit.

They apparently deposit their young during the first half of May. La Barca; Ocotlan.

Zoogoneticus dugesii (Bean).

Intestinal canal about equal to length of body. Peritoneum blackish.

A few specimens were taken at Patzcuaro and a few at Lagos. Viviparous; one female from Patzcuaro 2.22 inches in length contained 32 young; all were well formed and with egg absorbed; length of young .16 inch. These are by far smaller than the young from females of other species.

No males were taken. The longest specimen is from Lagos, 2.50 inches. This well marked species is apparently very scarce.

Patzcuaro specimens taken May 18 to 22; time for spawning evidently (last half of May. Lagos; Patzcuaro.

Zoogoneticus robustus (Bean).

This is one of the largest *Cyprinodonts* found in Mexico. It is known only from the Lerma Basin.

The largest specimen in our collection is a female 6.80 inches in length. It was taken in Lake Zirahuen on May 24.

The color of the few specimens from this lake is very dark. The species is viviparous. One female from Patzcuaro Lake, 4.26 inches in length, contained 20 young, each .67 inch in length. These young possess the markings of the smallest specimens collected.

A second female from Patzcuaro Lake, 4.65 inches in length,

contained 38 well developed young, each .75 inch in length. The young taken from a single fish are very uniform in size. These specimens were collected May 19 to 21. The specimens taken from Lake Chapala, May 31 to June 2, had all spawned out. Spawning time for this species is second and third weeks in May.

Alimentary canal scarcely as long as the body; peritoneum grayish; origin of dorsal fin midway between base of caudal and anterior margin of opercle. The young of this species much resembles the young of *Goodea atripinnis*, the small spots being smaller and more pale. A good sized *Gambusia infans* was taken from the stomach of one of the fishes taken in Ocotlan. Ocotlan; Patzcuaro; Zirahuen.

Zoogoneticus diazi, sp. nov.

Type, No. 3618, F. C. M. Length, 2.60 inches.

Locality, Lago de Patzcuaro, Patzcuaro, Michoacan, Mexico.

Head $3\frac{3}{4}$; depth $3\frac{1}{4}$; D. 17; A. 14; scales 34-13. Body elongate, robust, more compressed than in *Z. robustus*; back much elevated, forming a prominent angle at the nape; top of head slightly convex; interorbital width $2\frac{1}{4}$ in head; snout bluntish; mouth large, lower jaw the longer; chin very prominent; snout 4 in head; eye moderate, its diameter $3\frac{1}{4}$ in the head. Dorsal fin slightly in advance of the anal, its origin midway between base of caudal and posterior margin of opercle.

Base of dorsal $1\frac{1}{2}$ in the head, its height 2 (in male $1\frac{1}{2}$) in head; anterior dorsal ray short, the anterior rays gradually increasing in length to the eighth or ninth, which is the longest. Pectoral fin $1\frac{3}{4}$ in the head; ventral $2\frac{3}{4}$.

Alimentary canal scarcely as long as the body; peritoneum light; teeth in a band in each jaw, all of them conical, the outer series being the larger.

Light olivaceous, much mottled with darker, which forms irregular cross bars on the sides; many of the larger specimens in life with a reddish tinge over the body, which fades to nearly a uniform light olive; fins all plain. The males are a little duller and of a more uniform color than are the females. Largest specimen, a female 3.60 inches in length. The few males obtained average smaller than the females.

This species is close to *Z. robustus*. It differs from that species in having larger scales, a less advanced and longer dorsal fin. The coloration is also much different and the flesh less firm.

Viviparous; One female 3 inches in length contained 28 young, each about .60 inch in length; another female 3.15 inches in length contained 47 young, each .43 inch in length; egg all absorbed. Specimens collected May 19 to 24. Spawning season about the last of May or early in June. Named for Porfirio Diaz, President of the Republic of Mexico. Patzcuaro; Zirahuén.

Zoogoneticus miniatus, sp. nov.

Type. No. 3680, F. C. M. Length, 1.60 inches.

Locality, Lago de Chalco, near Chalco, Mexico, Mexico.

Head $3\frac{1}{2}$: depth $3\frac{1}{4}$: D. 17: A. 14: scales 32-14. Body elongate, compressed; mouth rather large, very protractile, lower jaw slightly the longer; teeth conical, very large, in a band; eye $2\frac{2}{3}$: snout $4\frac{1}{2}$: interorbitals 3: pectorals short and broad, $1\frac{1}{2}$ in head: ventrals 3: origin of dorsal fin midway between base of caudal and middle of preopercle, and slightly in advance of origin of anal.

Intestinal canal short, about as long as body; anal fin modified, the first 7 rays short, the other 7 long, and the two groups of rays separated by a shallow notch.

Olivaceous, much mottled with darker. No distinct lateral band. The last blotch forms an indistinct black caudal spot. In general color and form this fish very closely resembles *Skiffia variegata*. Largest specimen (Type) 1.60 inches long.

Total number of specimens 5, in rather poor condition. Chalco.

This genus includes the following species:

Zoogoneticus quitzeensis (B. A. Bean). Lago de Quitzeo,

La Barca: Ocotlán.

Zoogoneticus dugesii (Bean). Guanajuato; Lagos; Patzcuaro;

Zoogoneticus robustus (Bean). Guanajuato; Ocotlán; Patzcuaro; Zirahuén.

Zoogoneticus guatemalensis (Gunther). Lake of Duenas;

Lake Amatitlán; Rio Guacalate, Western Ecuador.

Zoogoneticus pachycephalus (Gunther). Lake Atitlán.

Zoogoneticus labialis (Gunther). Rio San Geronimo; Guatemala; Yzabal.

Zoogoneticus diaz Meek. Patzcuaro; Zirahuén.

Zoogoneticus miniatus Meek. Chalco.

Girardinichthys innominatum Bleeker.

Body rather deep, somewhat compressed, the gravid females being particularly deep. Origin of dorsal fin in male midway between base of caudal and middle of opercle, and slightly in advance of origin of anal fin. Anal fin of male modified by having the first 6 rays about $\frac{1}{2}$ or $\frac{2}{3}$ the length of the next rays, and separated from them by a small notch. In this respect they are like *Characodon*, *Goodea*, etc. Teeth strong, in a band rather than in a single series, the dentition being much the same as that of *Fundulus*. Peritoneum spotted, not wholly black. Intestinal canal pressed to left side, not coiled, about the length of body; vertebrae $16+21=37$. Gill-rakers short and stiff, 15 on first gill-arch.

On fishes less than $1\frac{1}{2}$ inches in length there is a black spot between vent and anal fins, and usually a black spot on belly just at base of pectorals. On some small males these spots run together. Evermann and Goldsborough describe these spots on specimens large and small from Lago de Lerma. The dorsal and caudal fins of males very black; ventrals also black; caudal dusky. Some of the males are almost entirely black. Cross bars are prominent on all the larger specimens; in small specimens these gradually shade out to short lateral blotches. In general the specimens from Lago de Texcoco are much lighter in color than are those from Lago de Chalco.

Viviparous; a medium sized female from Chalco, quite plump, 2.24 inches long contained in the ovary 36 fishes. These were well developed, slaty blue, but not speckled, each about .56 inch in length, except one, which, though well developed, was only .40 inch in length. The young were closely crowded together and bent over each other in all sorts of shapes. The egg-yolk still persisted as a slender string attached to the abdomen. A female from Texcoco, 2.19 inches long, contained 52 embryos, each .55 inches in length. A large female from the same place, 2.69 inches long, contained 240 (white and slender) young. Male fish somewhat smaller than females.

The viviparity of this species was noticed in a recent paper by Evermann and Goldsborough. The peculiar modification of the anal of the male was overlooked, or all of their specimens were females. Viviparity is no doubt much more common in species of this family than was formerly supposed. Chalco; Texcoco; Nochomilcho.

CHARACODON Gunther.

This genus is characterized by having firmly fixed bicuspid teeth, and a short intestine which is from 1 to $1\frac{1}{2}$ times the total length of the fish. Anal fin with first 5 or 6 rays short and stiff. Species viviparous. The type of this genus is *C. lateralis*, from Central America. It is described as having the first rays of anal of male short and stiff. Origin of dorsal fin almost over origin of anal. It is a little in advance in *lateralis* and *variatus*, and slightly behind in *fuscidens*. Vertebra in *variatus* $14+18=32$.

This genus now includes three species found in Mexico and Central America.

C. lateralis Gunther, from Central America,

C. variatus Bean, from Central Mexico, and

C. fuscidens Jordan and Gilbert, from Lower California. The modification of the anal fin of the male in the last named has not been noticed, and we are not sure that it exists.

Characodon variatus Bean.

The male of this species has a distinct dark lateral band. The tips of the ventrals are usually black, and the dorsal and anal fins have yellow margins.

One male, 2.67 inches in length, from Ocotlan, is much lighter in color than the others: sides with black spots as large as eye. In general the coloration of this specimen is more like that of the female than the male: the caudal is not black with a yellow margin. The lateral band is broken up into a row of spots; below this on caudal peduncle is a second row of similar spots.

The lateral band of the adult female is more or less broken, the color more variegated, while the lower half of the caudal peduncle has several distinct dark spots irregularly arranged. The young are much spotted, resembling *Z. robustus*, except that the spots are larger and less numerous. Specimens from Huingo are lighter than those from the other localities.

The largest specimen of this species in our collection is a male from Aguas Calientes, 3.15 inches in length; longest female, 2.85 inches, was taken at Lagos.

The alimentary canal varies considerably; in some specimens, being scarcely longer than total length of the body, in others, $1\frac{1}{2}$ total length. Peritoneum blackish.

Viviparous; one female 2.20 inches in length, taken at Celaya on May 28, contained 11 young, well developed, show-

ing markings of quarter grown specimens; length of young .55 inch. A second female 2.50 inches in length, from the same place, contained 23 young, each .46 inch in length.

A female 2.70 inches in length, taken at Aguas Calientes, June 7, contained 37 young, each .40 inch in length.

Some of the females from Huingo collected May 26, are gravid. Aguas Calientes; Lagos; Celaya; Ocotlan; Huingo.

CHAPALICHTHYS, gen. nov.

Type. *Characodon encaustus* Jordan & Snyder.

Body rather deep, compressed; caudal peduncle long and slender. About three-fourths of the dorsal fin in front of the anal; origin of dorsal midway between base of caudal and anterior margin of orbit; anal fin of male with first 5 or 6 rays shorter and separated from the other rays by a shallow notch; teeth in two series; the outer enlarged, bicuspid and firmly attached; the inner series small, and in small patches.

Alimentary canal elongate, convolute, or irregularly in three coils on the right side, its length nearly twice the total length of the fish; peritoneum black; caudal fin truncate.

This genus has the long alimentary canal of *Goodea* and the firm bicuspid teeth of *Characodon*. The dorsal fin is considerably more advanced in this genus than in either *Goodea* or *Characodon*.

Gill-rakers long and slender, 24; vertebrae $18+19=37$.

Chapalichthys encaustus (Jordan & Snyder).

The dorsal fin of the male is higher than that of the female: longest dorsal ray of male $1\frac{1}{8}$ in head, of female $1\frac{1}{2}$ in head. Anal fin of male with its first rays short and stiff.

Longest female 3.50 inches; longest male 2.70 inches. The number of females greater in our collections than are the males.

Viviparous; one female 2.70 inches in length, contained 21 young; size of young very uniform, each .40 inch in length. Egg not entirely absorbed. La Barca; Ocotlan; La Palma.

Cyprinodon elegans Girard.

A comparison of a large series of specimens from Northern Mexico shows considerable variation in color and fin markings. Males from Chihuahua have a very pale dorsal; those from Miñaca, Jimenez and Santa Rosalia have the dorsal light, with some dusky on the base or on last rays. Males from Guzman

and Santa Maria have a dark dorsal fin, but in many specimens the outer anterior half is very light. In the darker males, from all places, all of the fins except the dorsal are margined with black, the broader margins being on caudal and last anal rays. I agree with Mr. Garman in uniting *C. eximius* with *C. elegans*.

The females have a black spot on middle of the last dorsal rays.

This species spawns during the first half of July.

Very abundant in Northern Mexico. Colonia Juarez: Guzman: Santa Maria: San-Jose: Ahumada: Chihuahua: San Andres: Miñaca: Santa Rosalia: Jimenez.

Pseudoxiphophorus bimaculatus (Heckel).

This species has the general appearance of *Gambusia*. It has a larger dorsal and the less advanced position of the anal fin than do species of *Gambusia*. It also reaches a larger size.

The largest female is 3.20 inches in length. The largest male is 2.24 inches in length. As in *Gambusia*, the males are reported to be much less numerous than the females. They are much smaller and much less liable to be captured than are the females, so that the proportion of males to females found in collections is no true indication of that which really exists.

Peritoneum blackish: intestine short, shorter than the length of the fish: teeth conical, curved backward and in broad bands in each jaw, those on the lower jaw being the larger: lower jaw the longer.

Viviparous: one female 2.71 inches in length contained 48 eggs, each about $\frac{1}{16}$ inch in diameter, 42 of which had the eye spots formed, 6 showed no eye spots. These specimens were taken May 9. The time of depositing their young is probably near the first to the middle of June.

This species was very abundant at Jalapa, where it was found with *Xiphophorus jalapa*. Jalapa.

GAMBUSIA Poey.

So far as known this genus is represented in Mexico by three species, *G. affinis* from the Rio Grande Basin, *G. infans* from the Lerma Basin, and *G. gracilis*, found in streams on both sides of the divide south of Mexico City.

Gambusia affinis (Baird & Girard).

A faint brownish band on sides: dorsal and especially the anal fin with much black, the anal being darker on the distal half.

One female specimen 1.91 inches in length contained 30 eggs in which the eyes and outline of young were formed.

A second female from Jimenez, 1.90 inches in length, contained 25 similar eggs, diameter of eggs $\frac{1}{2}$ of an inch. Abundant. Jimenez; Chihuahua; Santa Rosalia; San Andres.

Gambusia infans Woolman.

This species is much like *G. affinis*. It has a shorter head and larger scales, and is usually a little darker in color. Alimentary canal $\frac{1}{4}$ tines the total length of the body; peritoneum black. One female from Ocotlan contained 15 large eggs, in which the eyes and outline of the body were formed. A female 1.85 inches in length from Huingo contained 19 large eggs in which the eyes and outline of body of young were formed, 34 eggs not at all hatched, each $\frac{1}{5}$ inch in diameter, and 12 very small eggs, each about $\frac{1}{8}$ inch in diameter.

The specimens from Huingo are lighter in color than those from Ocotlan. A few small males were taken at Huingo, these are black, with the tip of the dorsal yellow. Two males were taken at Celaya; one of these is black, and the other one has the color of the females. Length of males 1.05 inches.

Specimens from Huingo were taken May 26; from Celaya, May 28, and from Ocotlan, June 2 and 3. The spawning time for this species is evidently about the middle of June.

The origin of the dorsal fin in the female of this species is well behind that of the anal. This is the only *Gambusia* so far known from Central Mexico. It has been found only in the Lerma Basin. Celaya; La Barca; Ocotlan; Huingo.

Gambusia gracilis Heckel.

This species is very different from *G. infans* and *G. affinis*. It has a dark lateral band made up of short irregular cross bars. The dorsal fin is also more posterior than in the other two species. With some doubt I identify our specimens with *G. gracilis*, which was originally described from Orizaba, Mexico.

One female, 1.66 inches in length, from Balsas, contained 31 young, each coiled around the egg, 21 eggs in which eye spots were present, 15 large eggs without eye spots, and 8 small eggs. The large eggs are about $\frac{1}{5}$ inch in diameter. This specimen was collected April 22. Spawning time evidently early in May. The males are 1.19 inches in length, being much smaller than the female. Taken by us at Balsas and at Puente de Ixtla.

KEY TO THE MEXICAN SPECIES OF GAMBUSIA.

a. Body without a dark lateral band made up of short vertical bars: origin of dorsal fin over middle of anal, and slightly nearer base of caudal than base of pectoral fin.

A. Scales in the lateral line 30; head $3\frac{1}{4}$ to $3\frac{1}{2}$ in the length of the body.

AFFINIS.

Ab. Scales in the lateral line 26; head $4\frac{1}{2}$ in the length of the body.

INFANS.

aa. Body with a dark lateral band, made up of short vertical bars: origin of dorsal behind origin of anal fin, its origin midway between base of caudal and middle of pectoral fin; scales 29.

GRACILIS.

GOODEA Jordan.

The genus *Goodea* was proposed by Jordan in 1879. It was based on *G. atripinnis*, a Fundulus-like fish taken from a salt lake in a volcanic basin near Guanajuato, Mexico. The teeth were erroneously described as tricuspid. In 1900 Jordan and Snyder proposed the genus *Xenendum* to include the Fundulus-like species with long intestines and bicuspid teeth. At my request Mr. B. A. Bean re-examined the dentition of the types of *Goodea atripinnis* and found the teeth were bicuspid. He also kindly sent one of the cotypes to the Field Columbian Museum. In all of the specimens the teeth are decidedly bicuspid. The genus *Xenendum* therefore becomes a synonym of *Goodea*. Gill-rakers long and slender, 37 to 40 on the first gill-arch. Vertebrae $19+17=36$. Outer series of teeth bicuspid; behind these are villiform teeth.

Goodea caliente (Jordan & Snyder).

This species appears to be very widely distributed, being found over a large portion of the Lerma Basin, as well as in the Río Moctezuma, a river which empties its water into the Atlantic. It inhabits the rivers and smaller lakes.

The specimens from Lake Quitzeo are very light in color, a feature characteristic of all the fishes taken from this and Patzcuaro Lake. Specimens from other places are quite dark, especially is this true of those taken from the streams.

The color of the male is more uniform than that of the female. The young are speckled with brownish, much resembling the young of *Zoconeticus robustus* and the young of *Characodon variatus*.

The dorsal of the male is considerably higher than that of the

female. Peritoneum black, intestinal canal elongate, coiled on ventral and right side, its length three times the total length of the body. Mr. Beans kindly sent me one of the types of *Goodea atripinnis*. It is more slender than the specimens of this species in our collection. A study of the material in hand leads me to believe that all specimens listed below belong to one species.

Huingo, longest specimen 3.20 inches in length, average length 2 to 2.50 inches. Head about $3\frac{1}{2}$; depth 3. These specimens are very light in color; collected May 26, had evidently spawned a short time previously. Gill-rakers 37 on first gill-arch; vertebrae $17+19=36$. Viviparous.

Celaya, a few gravid females collected May 28.

Acambaro, females all spawned. Collected May 27.

Lagos, females all spawned. Collected June 6.

San Juan del Río, one female 3.50 inches in length contained 44 young, each .53 inch in length, evidently near spawning time. Collected May 16.

Aguas Calientes, females spawned. Collected June 7. Gill-rakers 38, vertebrae $19+17=36$.

Goodea luitpoldi (Steindachner).

In general appearance this species resembles a Fundulus. It reaches a length of 7.75 inches, and is perhaps the largest Mexican species of the family to which it belongs.

I have compared a large series of specimens from Lake Zirahuén, Patzcuaro and Chapala, and find but one species. *G. xalisco*, described by Jordan and Snyder from Lago de Chapala, is evidently this same species.

The specimens from Lago de Zirahuén are much darker than those from other localities, and those from Patzcuaro are much the lightest.

Alimentary canal three times the total length of the fish; peritoneum black; gill-rakers 40 on the first arch.

This species is viviparous; one female from Patzcuaro 5.15 inches in length contained 31 young of about equal length, longest 1.14 inches. There was no modification of the anal fin in any of these young, as found in the adult male. This modification of the anal fin is a sexual character, which probably appears when the sexual organs develop.

Specimens from Patzcuaro were collected May 19 to 22, Zirahuén May 24, and those from Chapala, June 2. The latter had spawned before our arrival.

This species deposits its young the latter part of May. Ocotlan; La Palma; La Barca; Patzcuaro.

KEY TO THE SPECIES OF GOODEA.

a. Dorsal fin slightly behind ventral; distance from base of caudal to origin of dorsal 2 in distance from origin of dorsal to anterior margin of orbit.

b. Body slender, its depth $3\frac{3}{4}$ in length of body; scales 37 to 40-13. D. 12; A. 13.

ATRIPINNIS.

bb. Body deep, its depth 3 in length of body; scales 37-14; D. 13; A. 14.

CALIENTE.

aa. Dorsal fin slightly in advance of anal, distance from base of caudal to origin of dorsal $1\frac{1}{2}$ (small specimens), $1\frac{3}{4}$ (in larger specimens) in distance from origin of dorsal to the tip of the snout; scales 41-16; D. 13; A. 14.

LUTTPOLDI.

SKIFFIA, gen. nov.

Type *lermæ*.

Body compressed, deep; dorsal in advance of anal, its middle over origin of anal; origin of dorsal fin midway between base of caudal and eye; teeth loose, outer series large, bicuspid, behind which are small villiform teeth. Alimentary canal elongate, its length 2 to $3\frac{1}{2}$ times the total length of the body; peritoneum black; gill-rakers long, rather stiff, about 20 on the first arch; vertebræ $16+18=34$. A group of small fishes with compressed bodies and a short distended abdominal region. I have placed *Carachodon bilineatus* Bean in this genus. It has an alimentary canal a little more than twice the total length of the body. The teeth are bicuspid and loose, though scarcely as much so as in the other three species. The alimentary canal is elongate though less so than in the other species. It is possibly deserving of sub-generic rank, but our material is too scant to warrant any such disposition of it being made at present. This genus is named for Mr. F. J. V. Skiff, Director of the Field Columbian Museum.

Skiffia lermæ, sp. nov.

Type, No. 3616, F. C. M. Length, 2.05 inches.

Locality, Lago de Patzcuaro, Patzcuaro, Michoacan, Mexico.

Head 4; depth $2\frac{1}{2}$ to $3\frac{1}{4}$; D. 13; A. 14; scales 37-14. Body deep, much compressed; head small; snout pointed; mouth small;

lower jaw the longer; snout 4 in head; eye large, 3 in head; interorbital slightly convex, its width $2\frac{1}{2}$ in head; dorsal fin slightly in advance of anal, midway between base of caudal and posterior margin of orbit.

Gill-rakers rather stout, 20 on the first arch. Vertebræ $16+18=34$. Base of dorsal 2 in head, its height $1\frac{1}{2}$ in females, slightly higher in the males; length of pectoral $1\frac{1}{2}$ in head; ventral 2. Alimentary canal coiled on right side, its length $3\frac{1}{2}$ times the total length of the body; peritoneum black; teeth bicuspid, loose.

Females light olivaceous above, much mottled with darker, nearly plain on lower half of body; young with a few faint brownish bars on lower half of caudal peduncle, a narrow dark lateral band and a prominent black bar at base of caudal. The color of the males is a nearly uniform dark olivaceous, the anterior half of some specimens being nearly black; the black caudal bar much less conspicuous than on the females; a dark line on underside of caudal peduncle in both sexes; anterior rays of dorsal much shorter than posterior rays. The fourth ray is less than half the ninth; longest dorsal ray $1\frac{1}{2}$ in head. The body of the males is very much compressed, as that of the females. This fish bears such resemblance to *S. multipunctata* from Ocotlan, from which it differs in having fewer dorsal rays, the anterior portion of the fin shortened, the less prominent caudal bar and the different coloration.

Largest specimen, a female, is 2.50 in length. The males are scarcely smaller than the females.

Viviparous; one female 2.50 inches in length contained 30 young with egg not quite all absorbed. Length of young .34 inch. These fishes were taken May 19 to 21. Their time for spawning evidently about one week later. Celaya; Patzcuaro.

Skiffia multipunctata (Pelligrin).

Head 4; depth $2\frac{1}{2}$; D. 16; A. 15; scales 33-12. Body deep, much compressed, snout short, rather pointed, its length 4 in head; mouth small; lower jaw slightly the longer; eye large, 3 in head.

Dorsal slightly in advance of anal, its origin midway between base of caudal and eye; interorbital slightly convex, its width 2 in head.

Base of dorsal $1\frac{1}{2}$ in head; height $1\frac{1}{2}$ in female, slightly higher in the male. The anterior portion of the dorsal fin is not shortened as in the male of the preceding species. Pectoral $1\frac{1}{2}$ in

the head: ventral 2; alimentary canal elongate, $3\frac{1}{2}$ times the total length of the body, coiled on the right side; peritoneum black.

Outer series of teeth loose, bicuspid, behind which are villiform teeth; gill-rakers long, rather stout, 20 on first gill-arch: vertebrae $16+18=34$.

Female light olivaceous, a dark spot on hinder margin of each scale on upper half of body; these spots forming lines along the rows of scales as in *Mollienisia*. A prominent black caudal bar at base of caudal fin.

Male nearly uniform; anal and dorsal fins black, margined with yellow; black caudal bar indistinct.

Longest specimen a female, length 2.50 inches. Males not quite so large as the females.

Viviparous. The females all spawned out. They were collected June 2. Spawning time evidently the latter half of May.

Skiffia variegata, sp. nov.

Type, No. 3612, F. C. M. Length, 1.95 inches.

Locality, Lago de Zirahuen; Zirahuen, Michoacan, Mexico.

Head $3\frac{1}{2}$; depth $2\frac{1}{2}$; D. 14; A. 13; scales 34-13. Body deep, compressed; top of head convex: interorbital $2\frac{1}{2}$ in head: mouth small, lower jaw the longer, chin rather prominent; snout 4 in head; eye large, its diameter 2 in head; dorsal slightly in advance of anal, its origin midway between base of caudal and posterior margin of orbit; base of dorsal fin $1\frac{1}{2}$ in the head; height $1\frac{1}{2}$ (in male $1\frac{1}{4}$) in head; anterior dorsal rays short, the rays gradually increasing in length to eighth or ninth, which is longest; caudal truncate; pectoral $1\frac{1}{2}$ in head; ventral 2; alimentary canal three times the total length of the body, coiled on right side; peritoneum black. Olivaceous, much mottled, an indistinct dark lateral band more or less broken in some specimens; four or five light brownish spots on lower portion of caudal peduncle, the under surface of which is dark. The color of the male is more uniform and darker than that of the female; no black caudal bar at base of caudal; chin black.

This species resembles *S. lerma* from Patzcuaro from which it differs in absence of black caudal bar, in being more slender and in coloration. Longest male, 1.70 inches in length. The longest specimen (a female) 2.25 inches in length, contained 18 young, well formed and with spots on their sides; length of young .53 inch.

A second female, 1.54 inches in length, contained 10 young, each .45 inch in length.

A third specimen, 2.15 inches in length, contained 25 young, each .55 inch in length. These specimens were collected at Zirahuen, May 24. Spawning time for this species about the middle of May. This is the smallest species of the genus. Zirahuen; Chalco.

Skiffia bilineatus Bean.

A few specimens from Huingo. Longest female, 1.60 inches in length. One female, 1.50 inches in length, contained 27 young, which were very slender, white, and .32 inch in length. Collected May 26.

Dorsal fin of males much higher than that of females. Posterior half of lateral band broken into 12 to 15 short irregular bars, a few of which extend almost to the dorsal fin. The upper half of the body has a few fine punctulations. The male is more slender than the female. Longest male, 1.10 inches.

Spawning time about third and fourth weeks in May.

Alimentary canal slightly less than $2\frac{1}{2}$ times the total length of body. Peritoneum black. The teeth are bicuspid and less firm than in other species of *Skiffia*.

Dorsal in advance of anal fin, its origin midway between base of caudal and middle of opercle. Huingo.

KEY TO THE SPECIES OF SKIFFIA.

a. A black bar at base of caudal (inconspicuous in some males of *lerma*, which have a uniform coloration and a very dark head).

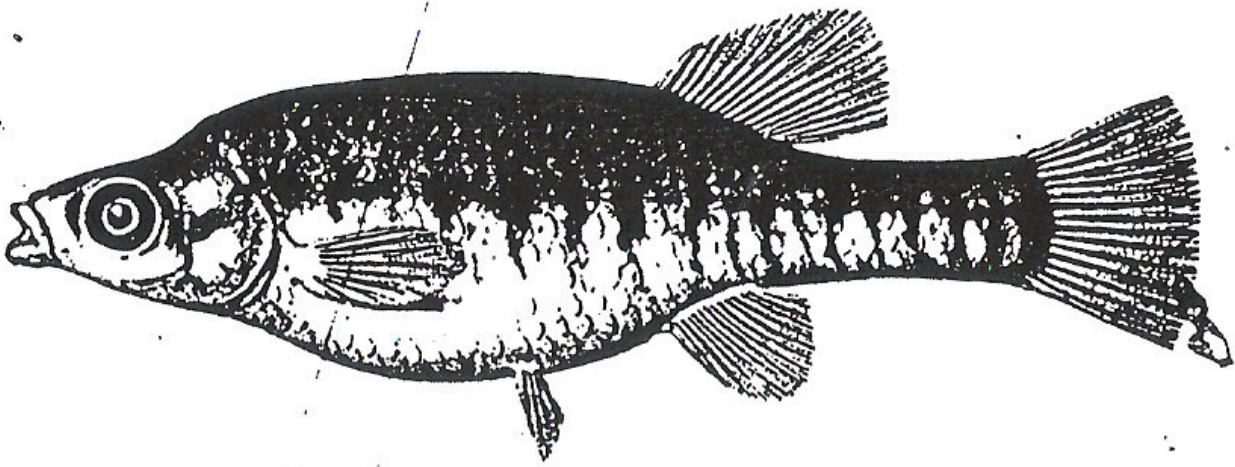
b. Body light olivaceous in females, mottled with dark, nearly plain on lower half of body; males nearly plain; head usually quite dark; D. 13; A. 14; scales 37-14. LERMAE.

bb. Light olivaceous in females, a dark spot on hinder margin of each scale on upper half of the body; these spots forming lines along the rows of scales; males nearly uniform; dorsal fin black margined with yellow; D. 16; A. 15; scales 33-12. MULTIPUNCTATA.

aa. No black bar at base of caudal.

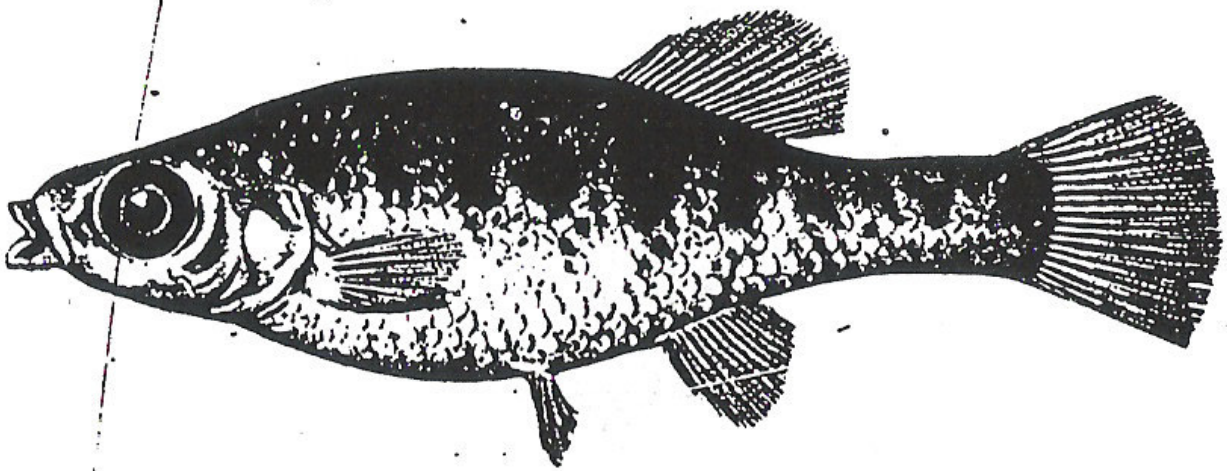
c. Body much variegated, D. 14 or 15; A. 13 to 14; scales 34-13; alimentary canal three times total length of the body. VARIEGATA.

cc. Color uniform with a dark lateral band, which is divided on anterior third of body. D. 16; A. 16; scales 32-11. Alimentary canal 2 to $2\frac{1}{2}$ times total length of body, origin of dorsal midway between base of caudal and nape. BILINEATA.



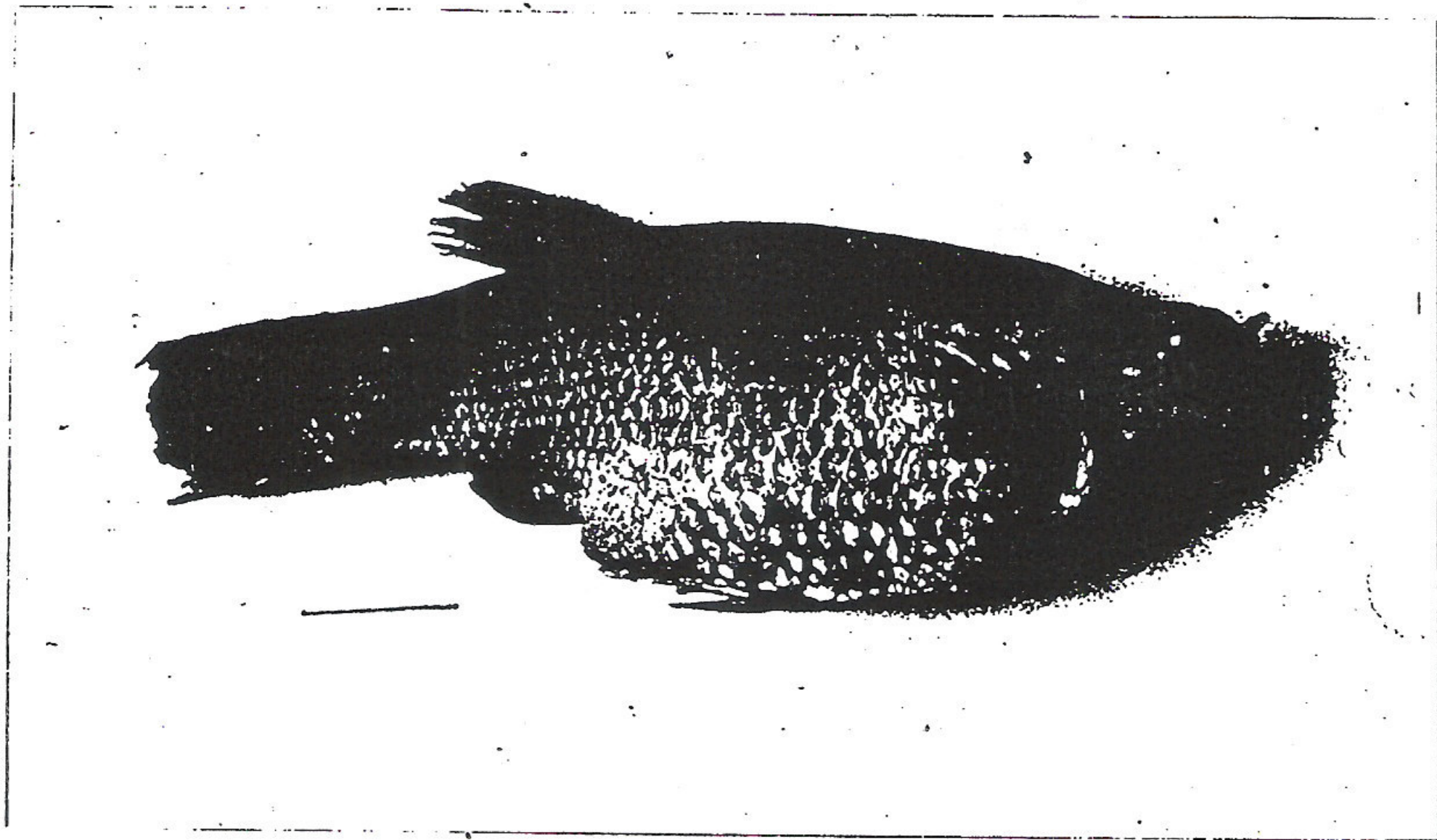
W. D. DAVIS '11

ZOOGONETICUS DIAZI, ♀, Page 93.



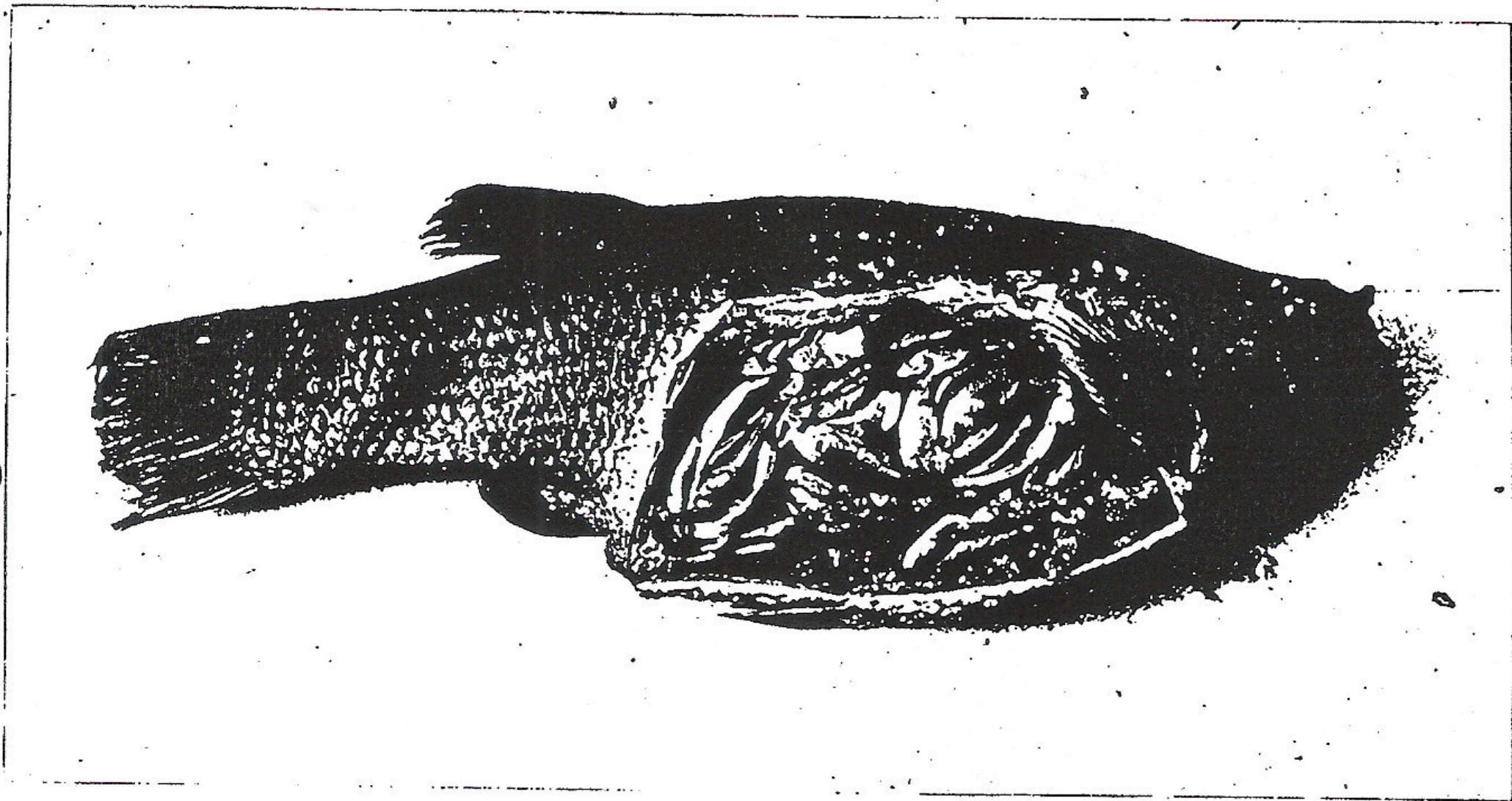
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ZOOGONETICUS MINEATUS, ♀, Page 94.



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GOODEA LUTPOLDI, ♀, Page 101.

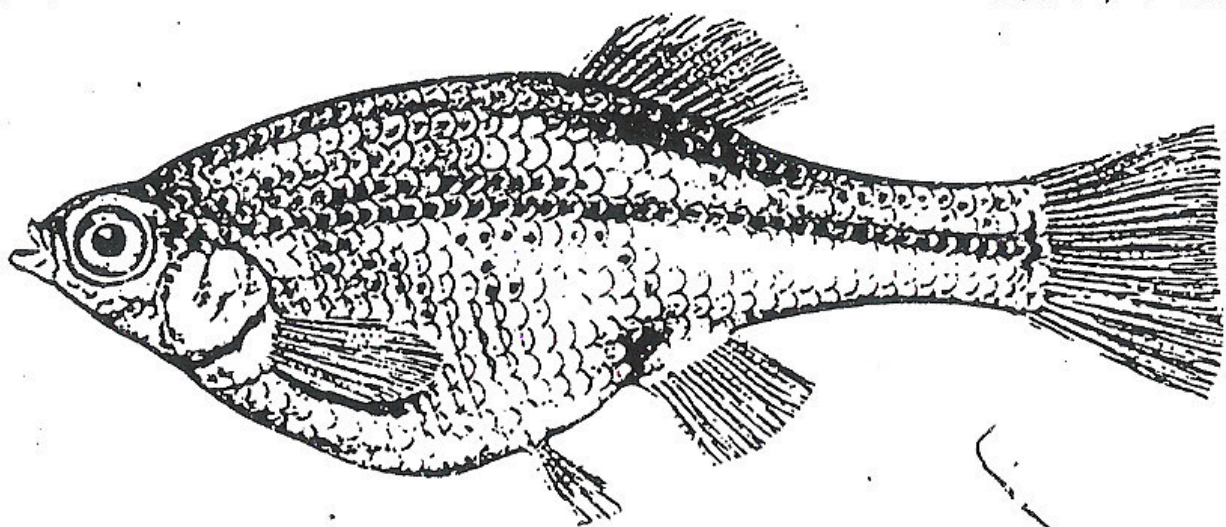


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GOODEA LUITPOLDI, WITH OVARY CONTAINING YOUNG, Page 101.

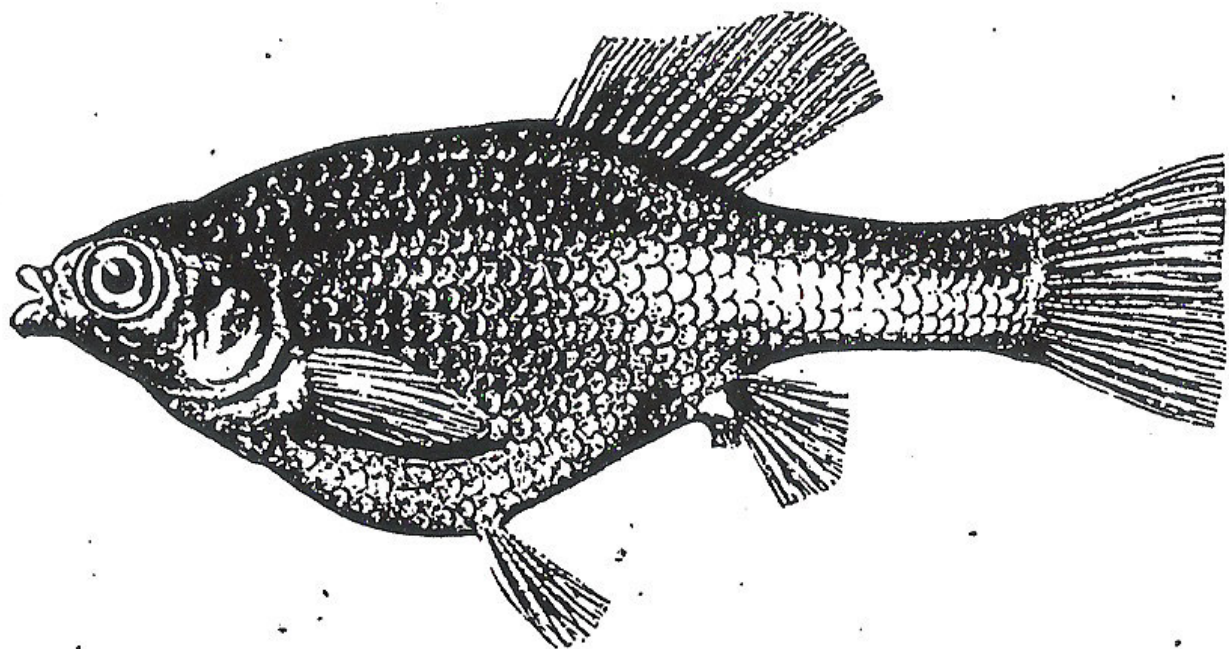


OVARIES OF GOSHAUK LUTEOLUS, Page 101



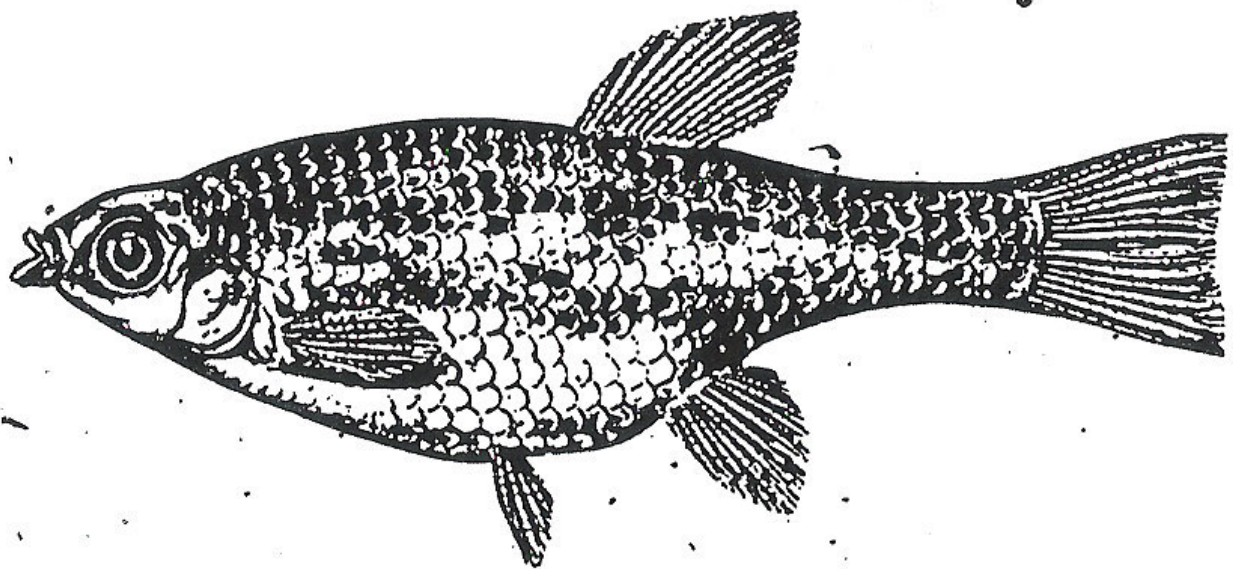
W. D. DRUGER DEL.

SKIFFIA LERMÆ, ♀, Page 102.



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SKIFFIA LERMÆ, ♂, Page 102.



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SKIFFIA VARIEGATA, ♀, Page 102.