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**FOUR NEW SPECIES OF VIVIPAROUS FISHES, GENUS
POECILIOPSIS, FROM NORTHWESTERN MEXICO**

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THE biosystematics of the fishes of the genus *Poeciliopsis*, family Poeciliidae, has been under investigation by myself and graduate students since 1955. In order to make names available for papers resulting from the experimental phases of this study, certain species are here diagnosed, figured, and briefly discussed (see also Table 1). In the proposed general revision of the genus there will appear a more extended description of these species, additional figures, distribution maps, synonymies, phylogeny, and other pertinent material. *Poeciliopsis* comprises approximately 16 species, of which about one-half are new. Its greatest diversity is attained on the Pacific slope of México. All of the material described below is deposited in the University of Michigan Museum of Zoology (UMMZ).

THE *Leptorhaphis* SPECIES GROUP.—*Leptorhaphis* was proposed as a genus by Regan (Proc. Zool. Soc. London, 1913: 998); its type species (by monotypy) is *Gambusia infans* Woolman. It is here regarded as a species group that may be distinguished from others in the genus *Poeciliopsis* (including *Poecilistes* Hubbs) by the following combination of characters: mature males jet-black at height of courtship; gonopodium with a small, retrorse hook at its tip; dentition of both sexes (other than the all-female strains of *P. lucida* and *P. "F"*) comprising an outer row of weakly implanted teeth arranged in an arc that curves backward laterally from a median indentation, behind which is a row or rows of similar but smaller teeth separated by a narrow gap from the outer series and generally following the contour of the outer tooth row (this row is sometimes developed only at the lateral margins and it may be obsolete or absent in *P. occidentalis*).

This group comprises *Poeciliopsis infans* (Woolman), *P. porosus* de Buen, *P. occidentalis* (Baird and Girard), and *P. lucida* (described below). *P. sonoriensis* (Girard) and *P. "F"* (see Miller and Schultz, Science, 1959, 130 (3389): 1656-57, 1 fig.) occur between

the ranges of *occidentalis* and *lucida*; whether either or both are distinct from *occidentalis* or from each other has not yet been conclusively determined.

***Poeciliopsis lucida*, new species**

(Pl. I, A-B)

DIAGNOSIS.—A species of *Poeciliopsis* (of the *Leptorhaphis* species group) characterized by having clear dorsal and anal fins; a fine axial line of dark pigment along each side and on the midline of the caudal peduncle; two types of females, of which one is unisexual (Miller and Schultz, *ibid.*, as *Poeciliopsis* "C"); the young small at birth, 7.0–8.5 mm. total length; a rhomboidal pigment pattern underlying the scales, especially on the sides; in females, this scale pattern often absent below the lateral axial line from above the anal fin posteriorly—to form a region of bicolored contrast (Pl. I, B); and males jet-black at height of nuptial color, with a small retrorse hook at tip of gonopodium.

DESCRIPTION.—Dorsal rays 7 (25), 8 (15); anal rays 9 (40); pectoral rays (both fins) 12 (9), 13 (71); pelvic rays invariably 6; principal caudal rays 14 (1), 15 (10), 16 (26), 17 (1). Scales in lateral series 27 (1), 28 (31), 29 (8); around caudal peduncle, 16 (40); around body 20 (33); and between dorsal origin and occiput 14 (1), 15 (12), 16 (23), 17 (4). Mandibular pores absent; preopercular pores (both sides) 2 (6), 3 (14), 4 (9), 5 (13), 6 (11), 7 (20), 8 (5), open groove (2); and preorbital pores absent. Gill rakers 14 (4), 15 (20), 16 (12), 17 (3), 18 (1); vertebrae (including hypural plate) 30 (1), 31 (49), 32 (1) in bisexual form; 29 (2), 30 (67), 31 (6), in unisexual form. This description is based solely on the type material; meristic characters of the species in the Sinaloa and Fuerte basins have not yet been extensively studied. Unisexual females have been experimentally demonstrated for both of those basins, however, and the populations of *lucida* from all three river systems are interfertile in the laboratory.

TYPES.—The holotype is a mature male, UMMZ 177266, 20.0 mm. s.l., from a small tributary of the Río Mocorito, 0.9 mile N of San Benito, Sinaloa; 107°, 46'W Long., 25°, 32'N Lat. The Río Mocorito, dry in its lower course before the close of the long dry season (October to May), enters the Gulf of California south of Guamúchil. San Benito is about 26 miles by road eastward from Guamúchil. The allotype, a female 29.0 mm. long (UMMZ 177267), was taken with the holotype on March 24, 1959, by R. R. Miller and R. J. Schultz. One hundred and eighty-three paratopotypes were taken with the holotype.

DISTRIBUTION.—This species is known only from the basins of the Río Mocerito, Río Sinaloa, and Río del Fuerte, from northwestern Sinaloa to extreme southeastern Sonora.

COMPARISONS.—This species is related to *P. occidentalis*, *P. infans*, *P. porosus*, and *P. sonoriensis* and *P. "F"* (if valid)—which occur from southern Arizona to the Río Lerma system of the Mexican Plateau. It may be readily separated from all of these by the clear dorsal and anal fins in combination with the pigmentary features and biology described in the diagnosis. From all other known species it may be distinguished by the black nuptial males and the retrorse hook at the tip of the gonopodium.

ETYMOLOGY.—The specific name is from the Latin, *lucidus*, meaning clear or bright, in reference to the clear dorsal and anal fins.

***Poeciliopsis monacha*, new species**

(Pl. I, C-D)

DIAGNOSIS.—A species of *Poeciliopsis* characterized by having the inner teeth with tricuspid tips; black nuptial males; coarse pigmentation on the lower sides and venter; small and rounded dorsal and anal fins; 3 scales between the axial series and the midline row on the back (2 in the other species treated here); the tip of the gonopod unmodified; the head short and rectangular in side view; a black, wedge-shaped mark above the base of the gonopod; the periproct blackened in adult females; the back strongly arched; and the cephalic canal system reduced or absent.

DESCRIPTION.—Dorsal rays 7 and anal rays 9 in 30 specimens; pectoral rays (both fins) 13 (60); pelvic rays invariably 6; principal caudal rays 14 (1), 15 (13), 16 (12), 17 (4). Scales in lateral series 27 (13), 28 (17); around caudal peduncle 16 (30); around body 22 (16), 23 (6), 24 (8); and between dorsal origin and occiput 15 (28), 16 (2). Mandibular pores undeveloped in 30 specimens, preopercular pores (both sides) 0 (56), 2 (4), and preorbital pores represented only by an open groove or absent. Gill rakers 12–14, varying with sex (probably as a function of size) as follows: males, 12 (1), 13 (4), 14 (10); females, 14 (1), 15 (14). Vertebrae 29 (2), 30 (28).

TYPES.—The holotype (UMMZ 177268), a mature male 18.5 mm. s.l., was taken from Arroyo San Benito, about 1.5 miles ESE of Rancho Guirocoba, Sonora, by R. R. and Malcolm Miller on February 16, 1957; 108° 40'W Long., 26° 56'N Lat. The elevation is about 1300 feet above sea level. Rancho Guirocoba is about 18 airline miles ESE

of Alamos. Arroyo San Benito is a tributary of Arroyo del Cobre which flows into the Río del Fuerte near the boundary between Sonora and Sinaloa. The allotype, a female 28.0 mm. long (UMMZ 177269), was taken with the holotype, as were 380 paratopotypes.

DISTRIBUTION.—This species appears to have a very restricted distribution. It is known thus far only from a few small streams in the vicinity of Rancho Guirocoba, in extreme southeastern Sonora.

COMPARISONS.—The relationships of *P. monacha* are not obvious. It may be most closely related to *P. viriosa*, described below, as the two species have in common tricuspid inner teeth, a wedge-shaped mark above the base of the gonopod, and the gonopodium unmodified at the tip. The jet-black breeding male, however, might ally it with the *Leptorhaphis* group, but the tip of the gonopodium lacks the retrorse hook and the dentition is different from that found in the species belonging to that line. *P. monacha* has a number of characters peculiar to it, such as the small, rounded fins, the short rectangular head, the degenerate cephalic canals, and the additional scale row between the midside and back. Hybridization experiments designed to test its affinity with the other species of *Poeciliopsis* in northwestern México are in progress and may eventually provide valuable clues.

ETYMOLOGY.—The specific name is from the Greek, *monachos*, meaning single or solitary, in reference to the isolated and restricted distribution of this fish.

***Poeciliopsis viriosa*, new species**

(Pl. II, A-B)

DIAGNOSIS.—A species of *Poeciliopsis* characterized by having tricuspid tips on the maxillary teeth of the inner rows; ctenii on the scales on head and nape of the nuptial male; the tip of the gonopod unmodified; dense melanophores on the membranes between the first two dorsal rays of both sexes and on those between the first three anal rays of the female; nuptial males orange to greenish-yellow to bronze; periproct blackened in the female; usually 6 or 7 preopercular pores and 2 or 3 preorbital pores; and the mature male with a blackened area (often wedge-shaped) lying above and behind the base of the gonopod.

DESCRIPTION.—Dorsal rays 7 (29), 8 (2); anal rays 9 (31); pectoral rays (both fins) 11 (5), 12 (53), 13 (4); pelvic rays (both fins) 5 (1), 6 (61); principal caudal rays 15 (2), 16 (16), 17 (8), 18 (4), 19 (1).

Scales in lateral series 26 (2), 27 (26), 28 (3); around caudal peduncle 16 (31); around body 19 (3), 20 (28); and between dorsal origin and occiput 14 (4), 15 (26), 16 (1). Mandibular pores (counted on both sides) represented by an open groove (37), 0 (10), 2 (15); preopercular pores (typically 7 on both sides) 6 (13), 7 (49); and preorbital pores represented by an open groove (24), 2 (7), 3 (31). Gill rakers 12 (1), 13 (16), 14 (8), 15 (4), 16 (1). Vertebrae 29 (3), 30 (25). This description is based on the types, but 30 specimens from Arroyo Sonolona (18.5 mi. E of Culiacán—see description of *P. prolifica*), Sinaloa, about 300 airline miles to the northwest, agree very closely, differing chiefly in the slightly higher average number of dorsal and pectoral rays and gill rakers and somewhat fewer head pores.

TYPES.—The holotype, a mature male (UMMZ 177270) 23.0 mm. long, was collected on March 21, 1955, by R. R. Miller and J. T. Greenbank, from a spring-fed creek about 4.5 miles SW of Las Palmas, on the road to Ixtapita, Jalisco; 105° 10'W Long., 20° 48'N Lat.; elevation about 180 feet above sea level. This creek is tributary to the Río Ameca which drains the plateau country west of Guadalajara and south of Tepic and enters the Pacific at the Bahía de Banderas. The allotype (UMMZ 177271), a female 30.0 mm. long, was secured with the holotype, as were 320 paratotypes.

DISTRIBUTION.—*Poeciliopsis viriosa* is widely distributed at low to high (3900 feet) elevations from the Río Ameca basin of northern Jalisco and southern Nayarit to the Río Mocorito, Sinaloa. Complete interfertility has been demonstrated in the laboratory between a stock from the coastal plain near Mazatlán and one from Tepic (3,000 feet).

COMPARISONS.—The immediate relationships of this species are not yet apparent, but it is presumably most intimately allied with *Poeciliopsis lucida*, of the *Leptorhaphis* group. This is the only species with which we have been able to hybridize *P. viriosa*, and but one young (a female) has resulted (July, 1960). This hybrid, backcrossed to a male of *viriosa*, has thus far produced 16 offspring.

ETYMOLOGY.—The specific name is derived from the Latin, *viriosus*, meaning robust or strong, in reference to the exceptional hardiness of this species in the laboratory and its wide ecological tolerance in nature.

***Poeciliopsis prolifica*, new species**

(Pl. II, C-D)

DIAGNOSIS.—A species of *Poeciliopsis* distinguished by the long, slender body; a conspicuous dark streak along the midside set off by

lighter areas above and below; very small males (11.5–18.0, average 15.6 mm. s.l.); two prominent dark blotches on the ventral surface of the head below the preorbital region; outer jaw teeth very small, conical, numerous, and followed immediately by a similar row behind, both rows arranged in an arc following the curvature of the jaws; gonopodium unmodified at the tip; nuptial male not blackened; female in life with abdomen or, sometimes, only the region about vent, bright lemon yellow to yellow orange; young few, born at short intervals (2–10 days at height of reproductive activity), and very small at birth (6.5–8.0 mm.); lateral scales typically 29; gill rakers 11–14.

DESCRIPTION.—Dorsal rays 7 (29), 8 (1); anal rays 9 (30); pectoral rays (both fins) 10 (1), 11 (31), 12 (28); pelvic rays (both fins) 5 (1), 6 (59); principal caudal rays 13 (1), 14 (20), 15 (6), 16 (3). Scales in lateral series 28 (6), 29 (21), 30 (3); around caudal peduncle 16 (30); around body 19 (1), 20 (24), 21 (5); and between dorsal origin and occiput 14 (1), 15 (16), 16 (13). Mandibular pores lacking (represented by an open groove in about 20 of the 30 specimens examined); preopercular pores 0 (55), 2 (5); and preorbital pores represented by an open groove or neuromasts only. Gill rakers 11–14; fewer in males, 11 (5) or 12 (9), than in females, 12 (4), 13 (11), 14 (1). Vertebrae 30 (1), 31 (24), 32 (4). The data given on standard length of males in the diagnosis are based on measurements of 100 topotypes.

TYPES.—The holotype (UMMZ 177272) is a mature male 14.9 mm. s.l., taken from Arroyo Sonolona, 18.5 miles by road E of Culiacán, Sinaloa, by R. R. Miller and J. T. Greenbank, on April 2, 1955; 107° 08'W Long., 24° 48'N Lat. Arroyo Sonolona is a tributary of the Río Culiacán. The allotype, an adult female 30 mm. long (UMMZ 177273), and 461 paratopotypes were taken with the holotype.

DISTRIBUTION.—*Poeciliopsis prolifica* is distributed from the lower Río Yaqui, Sonora, southward along the coastal plain to San Blas, Nayarit; the species enters brackish water.

COMPARISONS.—This species is one of the most distinctive in the genus; its immediate relationships are not yet apparent.

ETYMOLOGY.—The specific name is from the New Latin *prolificus*, meaning producing abundantly or freely, in reference to the production of frequent broods (as many as six per month).

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TABLE I
COMPARISON OF FOUR SPECIES OF *Poeciliopsis*

Character	<i>lucida</i>	<i>monacha</i>	<i>viriosa</i>	<i>prolifera</i>
Tip of gonopod	With retrorse hook	Unmodified	Unmodified	Unmodified
Nuptial male	Black	Black	Yellow to bronze	Like female
Mark above gonopod	Present	Present	Present	Absent
Ctenii on scales of male	Absent	Absent	Present	Absent
Unisexual female	Present	Absent	Absent	Absent
Size of young at birth, in mm.	7.0-8.5	7.5-9.5	8.7-10.3	6.5-8.0
Scales between axial row and back	2	3	2	2
Inner jaw teeth	Conical	With tricuspid tips	With tricuspid tips	Conical
Dorsal and anal fins	Clear	Clear	Blackened anteriorly	Clear
Dark streak on midside	Narrow, but well developed	Narrow, but well developed	Faint	Broad and strong
Cephalic canal system	Preopercular pores only developed	Vestigial	Relatively well developed	Vestigial

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PLATE I

A, Holotype of *Poeciliopsis lucida*, UMMZ 177266, 20.0 mm. s.l., from 0.9 mi. N of San Benito, Sinaloa.

B, Allotype of *P. lucida*, UMMZ 177267, 29.0 mm. long, from same locality.

C, Holotype of *Poeciliopsis monacha*, UMMZ 177268, 18.5 mm. long, from Arroyo San Benito, Sonora.

D, Allotype of *P. monacha*, UMMZ 177269, 28.0 mm. long, from same locality.

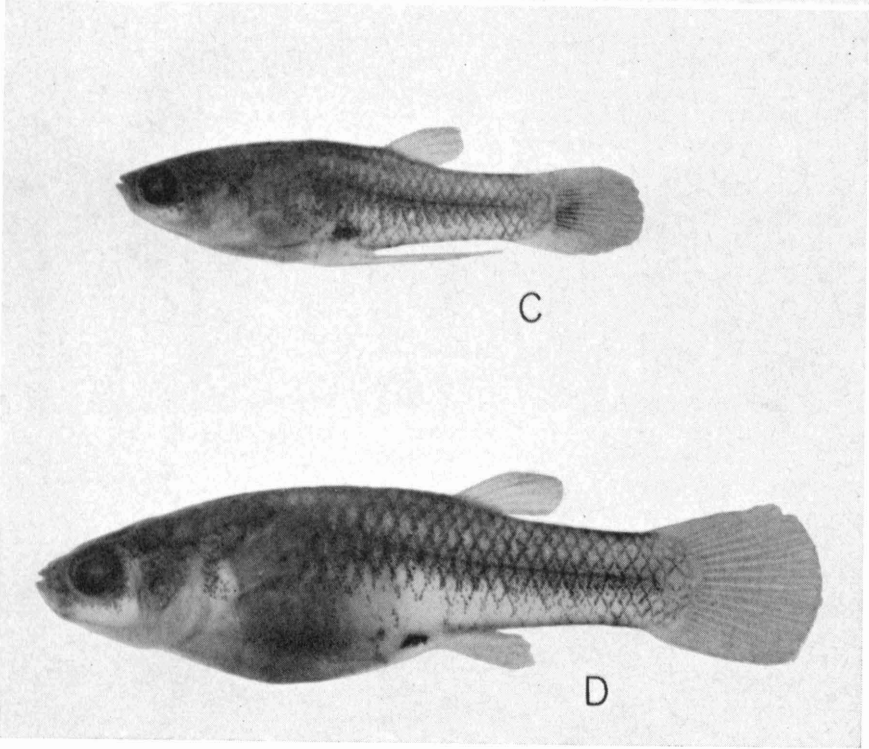
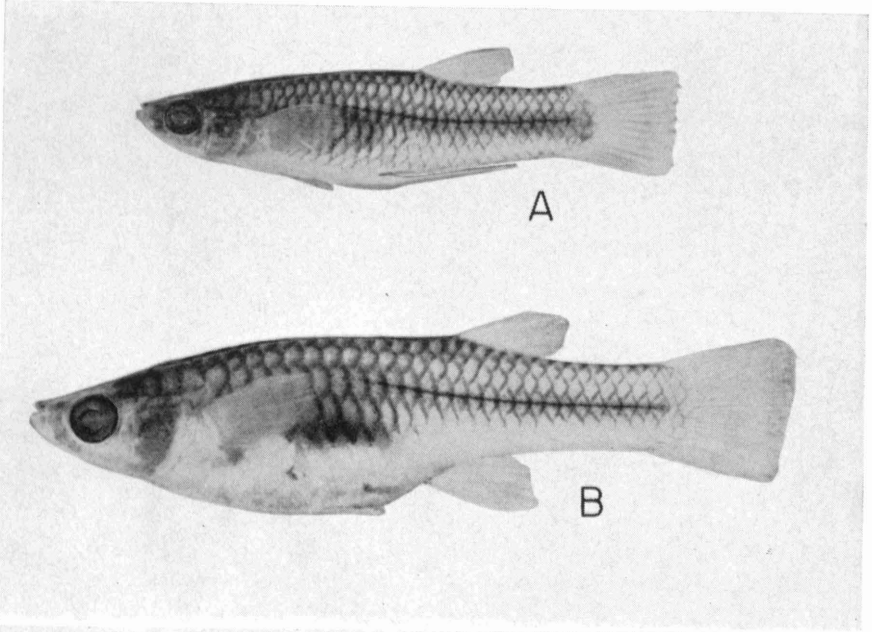


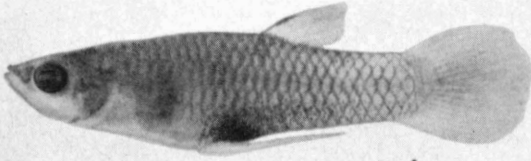
PLATE II

A, Holotype of *Poeciliopsis viriosa*, UMMZ 177270, 23.0 mm. s.l., from SW of Las Palmas, Jalisco.

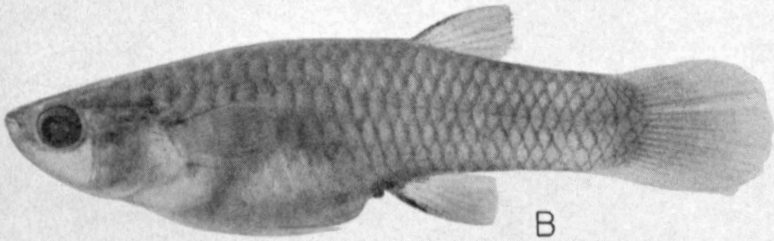
B, Allotype of *P. viriosa*, UMMZ 177271, 34.5 mm. long, from same locality.

C, Holotype of *Poeciliopsis prolifica*, UMMZ 177272, 14.9 mm. long, from Arroyo Sonolona, Sinaloa.

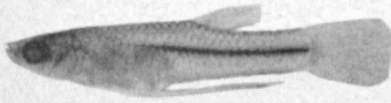
D, Allotype of *P. prolifica*, UMMZ 177273, 30.0 mm. long, from same locality.



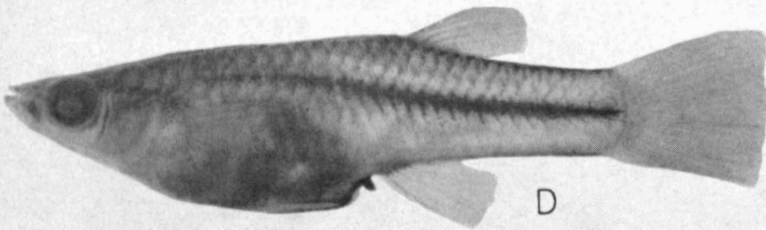
A



B



C



D

