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RE-ESTABLISHMENT AND REDESCRIPTION OF *POECILIA* VANDEPOLLI VAN LIDTH DE JEUDE, 1887 (PISCES: POECILI-INAE), WITH COMMENTS ON RELATED SPECIES

by

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ABSTRACT

POESER, FRED. N. 1992. Re-establishment and redescription of *Poecilia vandepolli* Van Lidth de Jeude, 1887 (Pisces: Poeciliinae), with comments on related species. *Stud. Nat. Hist. Caribbean Region* 71, Amsterdam 1992: 79-98.

Poecilia vandepolli Van Lidth de Jeude, 1887 is re-examined and resurrected from synonymy as the Antillian representative of *P. sphenops* Valenciennes, 1846.

Comparisons of gonopodia, colour patterns, meristic and morphometric data are made with *Poecilia sphenops* Valenciennes, 1846, *P. mexicana mexicana* Steindachner 1863, and *P. mexicana cuneata* Garman, 1895. Subspecific status for *P. mexicana limantouri* Jordan & Snyder, 1900 is rejected.

Notes on aberrant male phenotypes in related species are included.

Key words: Poecilia sphenops-complex; zoogeography; female-to-male sex change.

INTRODUCTION

In their revision of the poeciliid fishes, ROSEN & BAILEY (1963) published a list of species with in their opinion doubtful validity, which they synonymized with *Poecilia sphenops* Valenciennes, 1846. They stated that the taxonomic status of these nominal taxa was uncertain. This list included *Poecilia mexicana* Steindachner, 1863, *P. vandepolli* Van Lidth de Jeude, 1887, *P. butleri* Jordan, 1889, and *P. cuneata* Garman, 1895.

 Institute of Taxonomic Zoology, University of Amsterdam, P.O. Box 4766, 1099 AT Amsterdam, The Netherlands. Based on geographical and partial reproductive isolation, SCHULTZ & MILLER (1971) resurrected *P. butleri* from synonymy of *P. sphenops*. These species are partly sympatrical on the Pacific side of Mexico, in which parts *P. sphenops* inhabits exclusively the upstream habitats, whereas *P. butleri* dominates in the lowland habitats.

MENZEL & DARNELL (1973) resurrected P. mexicana from synonymy of P. sphenops. They claimed that P. mexicana differed from P. sphenops, in a similar way as P. butleri. Both P. butleri and P. mexicana have unicuspic teeth in their inner jaw, whereas P. sphenops has tricuspid teeth (SCHULTZ & MILLER 1971: 283). MENZEL & DARNELL (1973: 233) mentioned that identification of specimens from allopatric lowland populations of P. mexicana and P. sphenops is difficult. The present paper does not intend to solve this problem. Its intention is to examine differences between P. vandepolli and these species. Therefore, the type specimens of P. mexicana and P. sphenops were not examined.

HUBBS (1926) considered *P. cuneata* and *P. vandepolli* to be subspecies of *P. sphenops*. He reported that gonopodial structures and coloration in *P. sphenops* cuneata show geographical variation. However, in the original description, GARMAN (1895: Pl. V) described *P. cuneata* with unicuspid teeth. Therefore, I regard *P. cuneata* to be a subspecies of *P. mexicana*.

P. vandepolli is also unicuspid. However, the differences in gonopodial structures, colour pattern, morphometric and meristic characters of *P. vandepolli* are sufficiently convincing to reinstate it as a distinct species. No mixing of characters is found with continental forms of *Poecilia*, indicating a complete geographical isolation.

Ecologically determined differences in *P. vandepolli*, as mentioned by FELTKAMP & KRISTENSEN (1969) are also found by MENZEL & DARNELL (1973) in *P. mexicana*. Because these differences, viz., a slender body and more pronounced pigmentation in upstream populations, are phenotypical, the nominal subspecies *P. mexicana limantouri* JORDAN & SNYDER, 1900 is not recognized.

METHODS

The vernier callipers used, record distances up to 0.1 mm. All measurements are rounded off upwards; all measurements between 0.1 mm and 0.2 mm are recorded as 0.2 mm, between 0.2 mm and 0.3 mm as 0.3 mm, etc. The systematic error thus made (less than 0.2% for specimens of 30 mm) is considered negligible for our purpose. Owing to small sample

size of individual populations and ecologically caused differences, some data can be overestimated or otherwise be inaccurate. The data presented in Tables 1 and 2 give the proportional measurements of individual populations. These data are considered to comprise the complete species range. In all other tables, the mean from tables 1 and 2 is used.

Proportional measurements are given in thousands of standard length.

Detailed drawings of tips of the gonopodia are given of all examined species.

Redescription of *P. vandepolli* (Table 3) is made following MILLER (1975). In comparisons, mouth width, snout length, and orbital length have proved to be inaccurate and are therefore excluded (Tables 4-8). No specimens were cleared and stained, so no data are available of gill rakers and vertebrae.

Only part of the material of *P. vandepolli* is recorded in the tables, although all specimens of the lots recorded have been examined. Measurements and descriptions were made of preserved adult specimens only.

Data from aberrant or damaged specimens, like one of the syntypes of *Poecilia vandepolli*, are considered to distort comparisons between species and thus are not taken in account.

DESCRIPTIONS

Poecilia sphenops Valenciennes, 1846

Poecilia sphenops VALENCIENNES, 1846: 130 (type locality: Veracruz, Mexico). The synonymy of this species is far too long to be recorded here; it has to be revised intensively (ROSEN & BAILEY 1963: 49-53).

Distribution: The complete range of this species remains uncertain. Formerly recorded from Sinaloa (Mexico) to Venezuela (REGAN 1913; MEEK & HILDEBRAND 1916). Because of the re-establishment of *P. vandepolli*, *P. sphenops* is not considered to occur on the Antilles.

Material examined:

NICARAGUA: GCRL 6725, 10 specimens, largest specimens examined: male 87.7 mm SL, female 44.8 mm SL, Rio Tepetate, 13-VI-1960; GCRL 6692, 11 specimens, largest specimens examined: male 82.7 mm SL, female 52.1 mm SL, lake Apayo, no date. PANAMA: GCRL 10278, 5 specimens, largest specimens examined: male 59.0 mm SL, female 65.3 mm SL, Colón, 14-XI-1973.

Description is based on the specimens from Nicaragua, Rio Tepetate (GCRL 6725). The body is high. Body pigmentation weak, showing a light cross-hatching. On the dorsal and caudal fins faint spots are present. This lot contains three males, one large specimen (76.4 mm SL), with an incompletely developed gonopodium containing thin fin rays, and two smaller individuals (45.8 mm and 41.5 mm SL) with fully developed gonopodia. The smaller specimens are considered 'typical' males and are used in the com-



FIGURE 1. Map of the northeastern part of South America and the Lesser Antilles.

parison with Poecilia vandepolli. For notes on the large male see discussion.

The gonopodium has the terminal segments of fin ray 4A and 4P vertically elongate and banana-shaped, as to give support to the membranous hook on fin ray 3 (Fig. 2c).

Colour patterns of the other lots are different. Males from Nicaragua, lake Apayo (GCRL 6692) are larger than females, showing darker upper side of

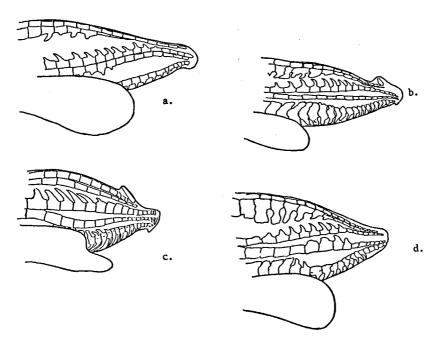


FIGURE 2. Distal tips of gonopodia. a – P. vandepolli; b – P. mexicana; c – P. sphenops; d – P. vivipara.

body and with spotted fins. Base of dorsal in both sexes with dark blotch. Specimens from Panamá, Colón (GCRL 10278) are less pigmented, whereas males possess an elongated dorsal fin, extending to caudal fin. The body is high.

Caudal fin rays, 17 (1), 18 (5), 19 (1), 20 (8); mean 19.1. Dorsal fin rays, 8 (1), 9 (8), 10 (6); mean 9.3. Anal fin rays, 8 (1), 9 (6); mean 8.9. Ventral fin rays, 6 (10). Pectoral fin rays, 12 (1), 13 (6), 14 (6), 15 (2); mean 13.6. Scales in lateral series, 26 (1), 28 (4), 29 (4), 30 (4); mean 28.8. Predorsal scales, 12 (8), 13 (1), 14 (1); mean 12.4. Scales around body, 16 (1), 17 (1), 18 (2), 19 (3), 20 (2), 21 (1), 22 (1), 23 (1); mean 19.3. Scales around caudal peduncle, 14 (1), 15 (1), 16 (4), 17 (3), 18 (2), 19 (1); mean 16.6.



PLATE 1. Male of *P. vandepolli* from a fresh water population.



PLATE 2. Female of *P. vandepolli* from a fresh water population.

Poecilia mexicana mexicana Steindachner, 1863

Poecilia mexicana STEINDACHNER, 1863: 178 (type locality: Oribaza, Mexico). Poecilia mexicana limantouri JORDAN & SNYDER, 1900: 116-117, 129-131; MENZEL & DARNELL, 1973: 227.

Poecilia sphenops; ROSEN & BAILEY, 1963: 49 (in part).

Distribution: MENZEL & DARNELL (1973: 225) reported that *P. mexicana* occurs from Mexico, from Río San Juan of Nuevo León to Colombia, and the Colombian and Netherlands West Indies. In this study no evidence is found for its occurrence on the Netherlands West Indies, where *P. vandepolli* thrives instead.

Material examined:

MEXICO: GCRL 6705, 10 specimens, largest material examined: male 48.2 mm SL, female 64.3 mm SL, Tamaulipas, 8-VIII-1960; GCRL 6723, 25 specimens, largest specimens examined: male 44.0 mm SL, female 45.7 mm SL, Nuevo León, Monterey, 6-VIII-1960.

PANAMA: GCRL 8738, 3 specimens, largest material examined: male 51.6 mm SL, female 56.4 mm SL, Colón, Creek mouth off Portobelo Road, coll. Dawson, 27-VI-1970, GCRL 8748, 32 specimens, largest material examined: male 42.3 mm SL, female 44.3 mm SL, Panama, 6-II, 1971.

NICARAGUA: GCRL 6697, 1 specimen, male 44.9 mm SL, Río Tisla at Pan Am highway, coll. RIVAS & ASTORGUI, 18-VI-1960.

The specimens from Mexico, Monterey (GCRL 6723) resemble the upstream specimens of *Poecilia mexicana* (see MENZEL & DARNELL 1973: 229, fig. 2). The upper side of the body is dark, the sides with a reticulate pattern becoming lighter downwards. In dorsal and anal fins of the females, spots are weak or absent. Some males show the same pattern, combined with a weakly developed gonopodium. Other males have a dark striped body, combined with black caudal and dorsal fins from the base to at least halfway. Pigment sometimes occurs in the entire fin. Gonopodium with retrorse segment on gonopodial ray 5 and a membraneous hook at the tip of ray 3. The distal segments of ray 4A are horizontally elongated (Fig. 2b). The male from Nicaragua (GCRL 6697) lack the retrorse spine on gonopodial ray 5.

Caudal fin rays, 17 (1), 18 (18), 19 (4), 20 (2); mean 18.3. Dorsal fin rays, 6 (1), 8 (3), 9 (12), 10 (5); mean 8.9. Anal fin rays, 7 (1), 8 (8), 9 (3), 10 (1); mean 8.3. Ventral fin rays, 6 (12). Pectoral fin rays, 11 (1), 12 (2), 13 (8), 14 (10), 15 (4); mean 13.6.

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PLATE 3. Male of *P. vandepolli* from a sea water population.



PLATE 4. Female of *P. vandepolli* from a sea water population.

Scales in lateral series, 27 (3), 28 (3), 29 (4), 30 (1); mean 28.3. Predorsal scales, 12 (5), 13 (6); mean 12.5 Scales around body, 18 (1), 19 (1), 20 (6), 21 (2), 22 (1); mean 20.1. Scales around caudal peduncle, 16 (2), 17 (6), 18 (1), 19 (1), mean 17.1.

Poecilia mexicana cuneata Garman, 1895

Mollienisia elongata GÜNTHER, 1869; REGAN, 1913 (: 1013). Poecilia cuneata GARMAN, 1895: 1-179, plate V (type locality: Panamá, Darien). Mollienisia sphenops cuneata HUBBS, 1926: 77.

Distribution: Except from El Salvador, from which the material in the present study is taken, this subspecies is only known from Panamá.

Material examined:

EL SALVADOR: RMNH 19812, 45 specimens, largest material examined: female 48.2 mm SL, Río near Lomas de la Coyotera, coll. M. BOESEMAN, 16-IV-1953, RMNH 19816, 38 specimens, largest material examined: male 47.3 mm SL, female 76.0 mm SL, Laguna Verde, coll. M. BOESEMAN, 11-VI-1953.

The body does not show a conspicuous coloration, except for inconspicious vertical stripes on males and 2-3 horizontal rows of spots on large females. Both sexes possess a blotch at the base of the caudal fin, which is typical for *P. mexicana*. The dorsal and caudal fins are spotted, in the male more intense. Gonopodium like *P. mexicana mexicana*.

Caudal fin rays, 18 (10), 19 (1), 20 (1); mean 18.3. Dorsal fin rays, 9 (5), 10 (7); mean 9.6. Anal fin rays, 7 (1), 8 (10); mean 7.9. Ventral fin rays, 6 (12). Pectoral fin rays, 13 (4), 14 (5), 15 (3); mean 13.9.

Scales in lateral series, 26 (1), 27 (1), 28 (4), 29 (4), 30 (2); mean 28.4. Predorsal scales, 12 (2), 13 (9), 14 (1); mean 12.9. Scales around body, 19 (3), 20 (2), 21 (2), 22 (3), 24 (1); mean 20.8. Scales around caudal peduncle, 15 (1), 16 (5), 17 (5), 19 (1); mean 16.6.

Poecilia vandepolli Van Lidth de Jeude, 1887

Poscilia vandepolli VAN LIDTH DE JEUDE, 1887: 137, pl. 2, figs 4 and 5 (Type locality: Curaçao).

Poecilia vandepolli arubensis VAN LIDTH DE JEUDE, 1887: 138, pl. 2, figs 6-10 (Type locality: Aruba).

Mollienisia sphenops; REGAN, 1913: 1012-1013.

Mollienisia sphenops vandepolli; HUBBS, 1926: 77-78.

Poecilia sphenops: ROSEN & BAILEY, 1963: 49 (in part).

Distribution: Fresh waters and sea shores of the Netherlands West Indies (Aruba, Curaçao, and Bonaire), and St. Maarten/St. Martin (Fig. 1).

Material examined (number of specimens in parentheses):

ARUBA: RMNH 5156 (6 syntypes of *Poecilia vandepolli arubensis*), RMNH 9313, 9314 (51), RMNH 23559 (1); ZMA 100.600 (49), ZMA 100.606 through 100.609 (44), ZMA 100.615 (7), ZMA 100.617 (1), ZMA 100.624 (29), ZMA 102.212 (12), ZMA 120.412 through 120.415 (106), ZMA 120.421 through 120.423 (85), ZMA 120.425, 120.426 (124 specimens), 120.436, 120.437 (29);

CURAÇAO: RMNH 5155 (6 syntypes of *Poecilia vandepolli vandepolli*), RMNH 23548 (3); ZMA 100.603 (7), ZMA 100.623 (3), ZMA 100.625 (11), ZMA 120.056 (83), ZMA 120.403 through 120.407 (79), ZMA 120.411, 120.412 (58), ZMA 120.420 (12), ZMA 120.427 (1), ZMA 120.429 through 120.433 (106);

BONAIRE: ZMA 100.601, 100.602 (14), ZMA 100.605 (3), ZMA 100.610 (110), ZMA 100.622 (6), ZMA 120.428 (3);

ST. MAARTEN/ST. MARTIN: ZMA 120.408 through 120.410 (101), ZMA 120.416 (14), ZMA 120.418, 120.419 (78), ZMA 120.434 (39).

Poecilia vandepolli is a small species, although rarely large specimens are encountered: a female, 72.7 mm SL and a male, 51.9 mm SL, both ZMA 120.403. Nuptial females normally measure 30-45 mm SL; males 25-35 mm SL.

The colour of the body is variable. Recently preserved specimens are still orange-coloured on the ventral side of the body. Some males show ill-defined dark pigmentation at the base of the dorsal and caudal fins, in addition to dark spots. The body has vertical bars, and a conspicuous humeral blotch. Other males only have spots on the dorsal and caudal fins, the bars on the body, if present, being much fainter. Moreover, some specimens do not show pigmentation. The females have the same colour patterns, although they tend to be paler. Pigmentation, and meristic and morphometric characters are greatly influenced by salinity (FELTKAMP & KRISTENSEN 1969).

The gonopodium has no external spines or hooks. Usually 10-11 serrae are found on fin ray 4P, normally from the 6th or 7th segment, counted from the tip. When fully developed, a little membranous bulge is found on gonopodial ray 3, covering extruding serrae (Fig. 2a).

Caudal fin rays, 15 (1), 16 (10), 17 (7), 18 (15), 20 (2); mean 17.3. Dorsal fin rays, 7 (3), 8 (18), 9 (10); mean 8.2. Anal fin rays, 7 (4), 8 (22), 9 (2); mean 7.9. Ventral fin rays, 6 (20), Pectoral fin rays, 11 (6), 12 (17), 13 (6), 14 (1); mean 12.1.

Scales in lateral series, 25 (1), 26 (2), 27 (4), 28 (3); mean 26.9. Predorsal scales, 12 (3), 13 (7), 14 (1); mean 12.8. Scales around body, 21 (2), 22 (2), 23 (1), 25 (3), 26 (1); mean 23.4. Scales around caudal peduncle, 14 (1), 15 (2), 16 (3), 17 (4); mean 16.0.

DISCUSSION AND CONCLUSIONS

Poecilia vandepolli is examined from the Leeward group of the Lesser Antilles (Aruba, Curaçao, and Bonaire), and from St. Maarten (= St. Martin, on the French side of the island) of the Windward group (Fig. 1). Its occurrence on St. Maarten is best explained as having been introduced by Dutch immigrants. It is absent in collections made on other islands of the Lesser Antilles, viz., Margarita, Tobago, Barbados, St. Lucia, Barbuda, and St. Thomas.

P. vandepolli is a polymorphic species (Plates 1-4). The considerable variability of characters within *P. vandepolli* is explained by differences in habitat (FELT-KAMP & KRISTENSEN 1969). Distinguishing characteristics in comparison with the other species examined are the more posterior position of the dorsal and anal fins, a prominent humeral blotch, the lack of external spines or bulges on the gonopodium, and the smaller number of fin rays in the dorsal and caudal fins. The inner jaw dentition is unicuspid (VAN LIDTH DE JEUDE 1887: plate 2). The relatively small size of *P. vandepolli* accounts for differences in head measurements. Because of the small sample size of the other taxa, no comments can be made on the phylogenetic relationship of *P. vandepolli*.

P. cuneata GARMAN, 1895, geographically the closest relative of *P. vandepolli*, was considered to be a subspecies of *P. sphenops* on account of intergrades found in Panamá (HUBBS 1926: 77). The material of *P. cuneata* recorded in this study (Tables 4-5) is from El Salvador, collected by BOESEMAN (1956: 83-84), later identified by him as *Mollienesia sphenops cuneata*. The present paper considers *P. cuneata* to be a subspecies of *Poecilia mexicana* on account of inner teeth dentition (GARMAN 1895: Pl. V) and identical gonopodia. There is evidently sufficient gene-flow along the oceanic coasts of Central- and South America to enable remarkable similarity between the different populations of *P. mexicana*.

Neither intergrades between *P. mexicana cuneata* and *P. vandepolli* were previously reported, nor were they found in this study. The Caribbean Sea,

separating Venezuela from the Lesser Antilles, forms a sufficient geographical barrier between the two taxa, preventing any gene-flow.

Following METZELAAR (1919) and FELTKAMP & KRISTENSEN (1969), I do not recognise the subspecies *P. vandepolli arubensis*; it remains a synonym of *P. vandepolli*. One slight difference, however, was encountered in the structure of the gonopodium, which occurs more frequently in specimens from Aruba than in specimens from other islands. In some specimens a small hook protrudes from gonopodial ray 3; in other specimens such a hook is absent. In the original description, VAN LIDTH DE JEUDE (1887: plate 2, fig. 5) illustrates the gonopodium of *P. vandepolli vandepolli* with this minute hook. This feature is found exclusively in adult males with complete pigmentation in all colour morphs; it probably represents a late phase in the process of maturation.

Differences in coloration and morphometric characters are caused by ecological conditions (FELTKAMP & KRISTENSEN 1969). Salinity was found to be a determining factor in the development of colour intensity, dorsal fin length and morphometric characters, influencing the general appearance greatly. Specimens from marine localities are larger, have longer dorsal fins and a more intense pigmentation, than specimens from fresh or super saline water. The colour pattern is more complete in specimens from fresh water, showing more often the humeral blotch and a complete fin pigmentation. These characters seem to blur when specimens develop in sea water. The occurrence of large specimens in fresh water (e.g. ZMA 120.403) is explained by immigration from the sea (of. FELTKAMP & KRISTENSEN 1969). These specimens are recorded in Tables 1 and 2 as sea water specimens.

The same differences in colouration and morphometric characters were encountered by MENZEL & DARNELL (1973) in *P. mexicana*. They considered the upstream populations and the coastal populations to be subspecies and named the lowland form *P. mexicana mexicana* STEINDACHNER, 1863, and the upstream form *P. m. limantouri* JORDAN & SNYDER, 1900. The differences between these two forms are the same as those encountered between fresh water and sea water populations of *P. vandepolli*. MENZEL & DARNELL'S map (p. 228, fig. 1), shows an upstream to downstream gradient, with a zone of intergradation at an intermediate geographical level indicating ecophenotypical variability. About heterogeneous populations they report: "In general, *limantouri*-like characteristics tend to prevail among headwater populations while lowland and coastal stocks show stronger affinities to the *mexicana* form" (p. 234). The fact that they found (partial) genetic stability in the two morphs is not surprising, nor convincing. Restriction in gene-flow is not found, so both forms are considered ecotypes and trinominal nomenclature is unwarranted.

Similarities between P. vandepolli and P. vivipara BLOCK & SCHNEIDER, 1801, as summarized by HUBBS (1926: 77), seem to indicate that they share a common ancestor. HUBBS mentioned: "Poecilia sphenops vandepolli is like P. sphenops cuneata, but gonopodial structure, size, position of fins, general appearance and coloration approach Poecilia vivipara". MILLER (1975) re-established Mollienesia as a subgenus of Poecilia, separating P. vivipara and P. vandepolli. On account of the obvious similarities between these two species found (Fig. 2; Table 6-7), this classification is doubtful.

The occurrence of aberrant male phenotypes

In two species recorded in this paper, viz., P. sphenops and P. mexicana, two male phenotypes are found. One phenotype is obviously masculine, showing the most pronounced sexual dimorphism in pigmentation and in morphometric characters, and with a fully developed gonopodium. The other phenotype has the same size as females, is less pigmented and has a gonopodium with weakly developed rays.

HUBBS & SPRINGER (1957) reported a similar phenomenon in Gambusia. They offered two explanations: (1) it is caused by late maturation of the males, or (2) by change of sex from female to male. The latter explanation is probably correct. In *P. sphenops*, intersexual specimens are the size of females, larger than males in GCRL 6725, smaller than males in GCRL 6692. Examination of a population of *P. mexicana* (GCRL 6723) revealed one female, with the onset of masculine characters (Table 8). Dorsal origin to caudal base, least depth of caudal peduncle, depressed length and basal length of anal fin are intermediate between females and aberrant males. However, anal origin to caudal base, body depth, caudal peduncle length, and length of dorsal and pelvic fins, modified in sex changed individuals, do not differ from other females.

Sex changed individuals were not encountered among the many specimens examined of *P. vandepolli*.

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TABLE I
Means of measurements of males of different populations of Poecilia vandepolli
expressed in thousands of the standard length

	CURAÇAO fresh water	Curação sea water	Aruba	BONAIRE
Number of specimens	6	8	7	7
Standard length	25.0	40.2	29.7	26.8
Predorsal length	583	584	585	580
Dorsal origin to caudal base	376	363	381	401
Anal origin to caudal base	490	450	4 60 [·]	465
Body depth	317	311	314	317
Head length	290	284	278	283
Head width	211	204	210	193
Caudal peduncle length	436	455	429	425
Caudal peduncle least depth	193	201	206	209
Interorbital least bony width	155	141	152	139
Mouth width	119	114	103	-
Snout length	81	77	65	-
Orbit length	101	85	93	-
Dorsal depressed length	258	330	309	339
Basal length	127	119	122	148
Anal depressed length	244	217	239	237
Basal length	_	-	-	-
Pectoral length	225	227	240	259
Pelvic length	211	183	226	216
Caudal length (middle ray)	306	304	296	336

TABLE 2 Means of measurements of females of different populations of Poecilia vandepolli expressed in thousands of the standard length

\$ A	Curação	ARUBA	Bonaire
Number of specimens	13	8	8
Standard length	56.1	35.9	33.3
Predorsal length	616	620	607
Dorsal origin to caudal base	393	369	380
Anal origin to caudal base	375	350	361
Body depth	314	311	334
Head length	256	281	286
Head width	202	208	208
Caudal peduncle length	334	299	325
Caudal peduncle least depth	199	182	211
Interorbital least bony width	136	150	148
Mouth width	109	111	-
Snout length	66	71	-
Orbit length	70	88	-
Dorsal depressed length	243	222	234
Basal length	115	106	119
Anal depressed length	169	186	175
Basal length	67	64	62
Pectoral length	225	217	230
Pelvic length	142	146	156
Caudal length (middle ray)	272	280	293

 TABLE 3

 Means of measurements of *Poecilia vandepolli* expressed in thousands of the standard length

· · · ·	males	females
Number of specimens	28	29
Standard length	31.0	44.2
Predorsal length	583	615
Dorsal origin to caudal base	380	383
Anal origin to caudal base	465	364
Body depth	314	319
Head length	283	271
Head width	204	205
Caudal peduncle length	437	322
Caudal peduncle least depth	203	198
Interorbital least bony width	146	143
Mouth width	113	110
Snout length	75	68
Orbit length	98	77
Dorsal depressed length	312	235
Basal length	129	114
Anal depressed length	233	175
Basal length	-	65
Pectoral length	238	224
Pelvic length	208	147
Caudal length (middle ray)	310	280

TABLE 4Means of measurements of males of Poecilia vandepolli, P. mexicana, P. m.cuneata and P. sphenops expressed in thousands of the standard length

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	Poecilia vandepolli	Poecilia m. cuneata	Poecilia m. mexicana	Poecilia sphenops
Number of specimens	28	1	9	10
Standard length	31.0	46.5	43.8	59.7
Predorsal length	583	570	519	548
Dorsal origin to caudal base	380	452	428	434
Anal origin to caudal base	465	508	518	555
Body depth	314	312	288	-
Head length	283	267	244	257
Head width	204	170	167	173
Caudal peduncle length	437	531	480	517
Caudal peduncle least depth	203	209	212	210
Interorbital least bony width	146	127	119	127
Dorsal depressed length	312	335	314	333
Basal length	129	146	161	148
Anal Depressed length	233	217	223	215
Basal length		-	-	-
Pectoral length	238	245	225	233
Pelvic length	208	185	172	197
Caudal length (middle ray)	310	301	283	304

	Poecilia vandepolli	Poecilia m. cuneata	Poecilia m. mexicana	Poecilia sphenops
Number of specimens	29	13	17	8
Standard length	44.2	49.3	43.0	57.0
Predorsal length	615	587	582	565
Dorsal origin to caudal base	383	406	401	404
Anal origin to caudal base	364	386	385	421
Body depth	319	312	311	296
Head length	271	262	257	265
Head width	205	196	194	180
Caudal peduncle length	322	316	316	364
Caudal peduncle least depth	198	185	174	172
Interorbital least bony width	143	147	139	138
Dorsal depressed length	235	239	232	227
Basal length	114	134	130	126
Anal depressed length	175	183	179	181
Basal length	65	75	80	90
Pectoral length	224	221	207	215
Pelvic length	147	147	139	143
Caudal length (middle ray)	280	274	252	269

TABLE 5Means of measurements of females of Poecilia vandepolli, P. mexicana, P. m.cuneata and P. sphenops expressed in thousands of the standard length

TABLE 6

Means of measurements of males of *Poecilia vandepolli* and *P. vivipara* expressed in thousands of the standard length

	Poecilia	Poecilia
	vandepolli	vivipara
Number of specimens	28	3
Standard length	31.0	33.8
Predorsal length	583	563
Dorsal origin to caudal base	380	402
Anal origin to caudal base	465	518
Body depth	314	319
Head length	283	275
Head width	204	198
Caudal peduncle length	437	509
Caudal peduncle least depth	203	210
Interorbital least bony width	146	141
Dorsal depressed length	312	265
Basal length	129	115
Anal depressed length	233	210
Basal length	-	-
Pectoral length	238	243
Pelvic length	208	204
Caudal length (middle ray)	310	286

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TABLE 7 Means of measurements of females of Poecilia vandepolli and P. vivipara expressed in thousands of the standard length

	Poecilia	Poecilia
	vandepolli	vivipara
Number of specimens	28	9
Standard length	44.2	35.6
Predorsal length	615	607
Dorsal origin to caudal base	383	390
Anal origin to caudal base	364	369
Body depth	319	333
Head length	271	284
Head width	205	217
Caudal peduncle length	322	309
Caudal peduncle least depth	198	189
Interorbital least bony width	143	152
Dorsal depressed length	235	207
Basal length	114	109
Anal depressed length	175	181
Basal length	65	82
Pectoral length	224	217
Pelvic length	147	161
Caudal length (middle ray)	280	260

TABLE 8

Means of measurements of Poecilia mexicana (GCRL 6723) expressed in thousands of the standard length.

1 = females, 2 = female intersex, 3 = intersex males, 4 = males			es	
	1	2	3	
Number of specimens	9	1	3	
Standard length	43.0	40.9	39.5	
Predorsal length	582	597	576	
Dorsal origin to caudal base	401	413	420	
Anal origin to caudal base	385	384	466	
Body depth	311	323	305	
Head length	257	269	259	
Head width	194	203	191	
Caudal peduncle length	316	315	430	
Caudal peduncle least depth	174	183	191	
Interorbital least bony width	139	137	132	

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Dorsal depressed length

Anal depressed length

Caudal length (middle ray)

Basal length

Basal length

Pectoral length

Pelvic length