From the Amazonriver to the Amazon molly and back again

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RE-ESTABLISHMENT AND REDescription OF Poecilia Vandepolli VAN Lidth De Jeude, 1887 (PISCes: Poeciliinae), With Comments on Related Species

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Abstract

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 P. 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.

Keywords: 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 synonymised with Poecilia sphenops Valenciennes, 1846. They stated that the taxonomic status of these nominal taxa was uncertain. This list included P. mexicana Steindachner, 1863, P. vandepolli Van Lidth de Jeude, 1887, P. butleri Jordan, 1889, and P. cuneata Garman, 1895.

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 unicuspid 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 as subspecies of P. sphenops. He reported that gonopodial structures and colouration 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 as 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 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 encountered 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 recognised.

**Methods**

The vernier callipers used, record distances to 0.1 mm. All measurements are round 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 comparisons. Due to small sample size of individual populations and ecologically caused differences, some data can be overestimated or otherwise 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 *Poecilia vandepolli* (Table 3) is made following Miller (1975). In comparisons, mouth width, snout length, and orbital length have proved in accurate and are excluded (Tables 4-8). No specimens were cleared and stained, so no data are available of gillrakers and vertebrae.

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

Data from aberrant or damaged specimens, like one of the syntypes of *P. 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 is to be revised intensively (Rosen & Bailey 1963: 49-53).

Distribution: the complete range of this species remains uncertain. Formerly recorded from Sinalon (Mexico) to Venezuela (Regan 1913; Meek & Hildebrand 1916). Because of the re-establishment of *Poecilia 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, Colon, 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 comparison with *P. 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).

Pigmentation patterns of the other lots are different. Males from Nicaragua, lake Apayo (GCRL 6692) are larger than females, showing darker upper side of body and with spotted fins. Base of dorsal in both sexes with dark blotch. Specimens from Panama, Colon (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.

*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).


Distribution: Menzel & Darnell (1973: 225) reported that *P. mexicana* occurs from Mexico, from Rio San Juan of Nuevo Leon to Colombia, and the Colombian and Netherlands
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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 Leon, Monterey, 6-VIII-1960.
- GCRL 8738, 3 specimens, largest material examined: male 51.6 mm SL, female 56.4 mm SL, Colon, 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, Rio 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 membranous hook at the tip of ray 3. The distal segments of ray 4A are horizontally elongated (Fig. 2b). The males 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. 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, 1866; Regan, 1913 (: 1013).

*Poecilia cuneata* Garman, 1895: 1179, plate V (type locality: Panama, 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 Panama.

Material examined:
El Salvador:
RMNH 19812, 45 specimens, largest material examined: female 48.2 mm SL, Rio 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 colouration, except for inconspicuous 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 \textit{P. mexicana}. The dorsal and caudal fins are spotted, in the male more intense.

Gonopodium like \textit{P. mexicana mexicana}.


\textit{Poecilia vandepolli} Van Lidth de Jeude, 1887.

\textit{Poecilia vandepolli} Van Lidth de Jeude, 1887: 137, pl. 2, figs. 4 and 5 (type locality: Curaçao).

\textit{Poecilia vandepolli arubensis} Van Lidth de Jeude, 1887: 138, pl. 2, figs. 6-10 (type locality: Aruba).

\textit{Mollienisia sphenops}; Regan, 1913: 1012-1013.

\textit{Mollienisia sphenops vandepolli}; Hubbs, 1926: 77-78.


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 \textit{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);
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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. (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).

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**Figure 1.** Map of the Antilles, showing Aruba, Curaçao and Bonaire

*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 fin, 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 fin, 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 ray s, 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 & 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 being introduced by Dutch immigrants. It is lacking from collections made on other islands of the
Lesser Antilles, viz., Margarita, Tobago, Barbados, St. Lucia, Barbuda, and St. Thomas.

*Poecilia vandepolli* is a polymorphic species (Plate 1-4). The considerable variability of characters within *P. vandepolli* is explained by differences in habitat (Feltkamp & Kristensen 1969). Distinguishing characteristics in comparisons 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 unicuspids (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 a subspecies of *P. sphenops* on account of intergrades found in Panama (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* as a subspecies of *P. 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 *Poecilia vandepolli vandepolli* with this minute hook. This feature is encountered exclusively in adult males with complete pigmentation in all colour morphs; it probably represents a late phase in the process of maturation. Differences in colouration 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 seawater. The occurrence of large specimens in fresh water (e. g. ZMA 120.403) is explained by immigration from the sea (cf. Feltkamp & Kristensen 1969). These specimens are recorded in tables 1 and 2 as sea water.
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 as 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 (: 228, fig. 1.) shows an up stream to down stream 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 head water populations while lowland and coastal stocks show stronger affinities to the *mexicana* form"
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* Bloch & Schneider, 1801, as summarised 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 colouration approach *Poecilia vivipara*". Miller (1975) re-established *Molliesia* 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 encountered. 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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References


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Van Lidth de Jeude, T.W., 1887. On a collection of fishes and reptiles from the West Indies. Notes Leyden Mus. 9: 129-139, pl. 2.
### Table 1

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<td>311</td>
<td>334</td>
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<tr>
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<td>286</td>
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<td>325</td>
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<td>182</td>
<td>211</td>
</tr>
<tr>
<td><strong>Interorbital least bony width</strong></td>
<td>136</td>
<td>150</td>
<td>148</td>
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<tr>
<td><strong>Mouth width</strong></td>
<td>109</td>
<td>111</td>
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<td><strong>Snout length</strong></td>
<td>66</td>
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<td><strong>Orbit length</strong></td>
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<tr>
<td><strong>Dorsal depressed length</strong></td>
<td>243</td>
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<tr>
<td><strong>Basal length</strong></td>
<td>115</td>
<td>106</td>
<td>119</td>
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<td><strong>Anal depressed length</strong></td>
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<td><strong>Pectoral length</strong></td>
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<td>217</td>
<td>230</td>
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<td><strong>Pelvic length</strong></td>
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<td>146</td>
<td>156</td>
</tr>
<tr>
<td><strong>Caudal length (middle ray)</strong></td>
<td>272</td>
<td>280</td>
<td>293</td>
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</table>
### Table 3
Means of measurements of *Poecilia vandepolli* expressed in thousands of the standard length

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<td>383</td>
</tr>
<tr>
<td>Anal origin to caudal base</td>
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<td>364</td>
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<td>Body depth</td>
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<td>319</td>
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<tr>
<td>Head length</td>
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<tr>
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<td>205</td>
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<td>322</td>
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<tr>
<td>Caudal peduncle least depth</td>
<td>203</td>
<td>198</td>
</tr>
<tr>
<td>Interorbital least bony width</td>
<td>146</td>
<td>143</td>
</tr>
<tr>
<td>Mouth width</td>
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<td>110</td>
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<tr>
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<td>114</td>
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<td>Anal depressed length</td>
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<tr>
<td>Caudal length (middle ray)</td>
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### Table 4
Means of measurements of males of *Poecilia vandepolli*, *P. mexicana*, *P. m. cuneata* and *P. sphenops* expressed in thousands of the standard length

<table>
<thead>
<tr>
<th></th>
<th><em>Poecilia vandepolli</em></th>
<th><em>Poecilia m. cuneata</em></th>
<th><em>Poecilia m. mexicana</em></th>
<th><em>Poecilia sphenops</em></th>
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<td>548</td>
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<tr>
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<td>518</td>
<td>555</td>
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<td>Head length</td>
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<td>257</td>
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<tr>
<td>Head width</td>
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<td>170</td>
<td>167</td>
<td>173</td>
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<td>480</td>
<td>517</td>
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<td>212</td>
<td>210</td>
</tr>
<tr>
<td>Interorbital least bony width</td>
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<td>127</td>
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<tr>
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<td>333</td>
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<tr>
<td>Anal Depressed length</td>
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<td>215</td>
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<td>Pectoral length</td>
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<td>233</td>
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<tr>
<td>Pelvic length</td>
<td>208</td>
<td>185</td>
<td>172</td>
<td>197</td>
</tr>
<tr>
<td>Caudal length (middle ray)</td>
<td>310</td>
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<td>283</td>
<td>304</td>
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</table>
TABLE 5
Means of measurements of females of *Poecilia vandepolli*, *P. mexicana*, *P. m. cuneata* and *P. sphenops* expressed in thousands of the standard length

<table>
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<tr>
<th></th>
<th><em>Poecilia vandepolli</em></th>
<th><em>Poecilia m. cuneata</em></th>
<th><em>Poecilia m. mexicana</em></th>
<th><em>Poecilia sphenops</em></th>
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<td>565</td>
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<td>316</td>
<td>364</td>
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<td>Interorbital least bony width</td>
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<td>147</td>
<td>139</td>
<td>143</td>
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<td>Caudal length (middle ray)</td>
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<td>269</td>
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TABLE 6
Means of measurements of males of *Poecilia vandepolli* and *P. vivipara* expressed in thousands of the standard length

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<tr>
<td>Anal origin to caudal base</td>
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<td>518</td>
</tr>
<tr>
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<td>319</td>
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<tr>
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</tr>
<tr>
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<tr>
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<td>Caudal peduncle least depth</td>
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</tr>
<tr>
<td>Interorbital least bony width</td>
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<td>141</td>
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<td>265</td>
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### Table 7
Means of measurements of females of *Poecilia vandepolli* and *P. vivipara* expressed in thousands of the standard length

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<td>Head width</td>
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### 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

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<td>269</td>
<td>259</td>
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<tr>
<td>Head width</td>
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<td>Pelvic length</td>
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<td>152</td>
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<tr>
<td>Caudal length (middle ray)</td>
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