

A REVISION OF THE *GAMBUSIA PUNCTICULATA*
COMPLEX (PISCES: POECILIIDAE)

by
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ABSTRACT

The *Gambusia puncticulata* species group is revised and five of the six subspecies are redescribed. Subspecies are defined on the basis of meristic, gonopodial and skeletal features. Several nominal species (*G. howelli*, *G. caymanensis*, *G. oligosticta* and *G. hubbsi*) are synonymized with the widespread and highly variable *G. p. puncticulata*.

INTRODUCTION

As defined by Rivas (1963), the *G. puncticulata* species group included *G. puncticulata* Poey, 1854; *G. oligosticta* Regan, 1913; *G. caymanensis* Regan, 1913; *G. yucatanana* Regan, 1914; *G. manni* Hubbs, 1927; *G. hubbsi* Breder, 1934; *G. bucheri* Rivas, 1944; *G. howelli* Rivas, 1944; and *G. baracoana* Rivas, 1944. Subsequent collecting resulted in the addition of *G. p. monticola* Rivas, 1971. Whereas Rivas considered these to be distinct species of the same species group, present evidence suggests that the species group is actually a widespread species consisting of several subspecies. This subspecies complex is distributed throughout the Bahamas, Greater Antilles (except Puerto Rico and Hispaniola), and Mexico from Yucatan south to Lake **Petén** in Guatemala. The group may be distinguished within the genus by gonopodial characters but other characters must be included in subspecies diagnoses. There is a great deal of overlap in meristic characters, but combinations of several characters allow identification of most individuals. As observed by Hubbs and Springer (1957), *Gambusia* varies widely in proportional characters while gonopodial characters remain relatively stable. Other characters (general pigmentation, subocular bar, etc.) are variable to a greater or lesser extent and are generally unreliable. For these reasons I have employed gonopodial and meristic characters for subspecies definition and have based my interpretations mainly on the observed variability in these characters. Five of the six subspecies are fully redescribed because the original descriptions were based primarily on proportional characters with little reference to gonopodial characters.

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METHODS

Gonopodial characters employed here are those of Hubbs (1926), Hubbs and Springer (1957) and Rivas (1963). Nomenclature of the gonopodial suspensorium follows that of Rosen and Bailey (1963). Other meristic counts are according to Miller (1948), except that the last two dorsal and anal rays are counted separately. First arch gill rakers were counted on the right side; counts of caudal fin elements on the hypural plate included only those elements actually touching the plate. Counts of caudal fin elements, vertebrae, and gonapophyses were made from radiographs or cleared and stained material. Color descriptions are based on alcoholic specimens.

Holotype or lectotype counts are given first in the descriptions followed by those of the study material in parentheses. In citing material examined, the number of specimens is indicated in parentheses; males first, followed by females. Unless otherwise noted, standard length is used throughout. All material examined is not included in the tables; tabulated specimens were all adults chosen over the size range of each lot.

Abbreviations used herein are as follows: SL—standard length; BMNH—British Museum (Natural History); GCRL—Gulf Coast Research Laboratory; MCZ—Museum of Comparative Zoology; UHMP—Museo Poey, University of Havana; UMMZ—Museum of Zoology, University of Michigan; USNM—United States National Museum.

DIAGNOSIS

Length of gonopodium about one-third of SL; ray 3 spines 7-13 (usually 10-12), tapering to a point, usually reaching slightly beyond terminal hook of ray 4p; longest ray 3 spine, including its inner process, about equal to or longer than the combined axial length of its segment and the three distal segments. Longest inner process of ray 3 spines shorter than combined axial length of its segment and the distal segment; longest spine of ray 3 (without inner process) equal to, or shorter than axial length of segments distal to ray 4p serrae (excluding the terminal hooked

segment). Segments distal to elbow 4-7 (usually 5-7), gradually reduced in width as compared to those proximal to elbow, none coalesced along their anterior margin. Width of first segment distal to elbow about equal to or greater than two-thirds the width of opposite segment of ray 4p. Elbow more or less triangular, entirely distal to most serrae of ray 4p. First and/or second segment distal to serrae of ray 4p conspicuously enlarged transversely, with ridgelike extensions on anterior and/or posterior margin. Ray 4a reaching beyond terminal hook of ray 4p. Terminal hook of ray 4p distally acuminate, its distal margin forming a more or less sharp point. Gonopodial suspensorium with two or three gonapophyses; the second gonapophysis always bears an uncinatoid process, the first and third sometimes bear uncini (see figures 1 and 7 for gonopodial characters). Predorsal contour slightly sigmoid in males, sigmoid to slightly convex in females; flat to convex transversely; body axis straight. Body deepest slightly anterior to or at anal fin origin in males, at or slightly anterior to pelvic fin insertion in females. Mandible width less than or equal to interorbital width; snout length less than interorbital width. Greatest overall width of mouth equal to or longer than snout width. Gonopodium reaching from before to beyond vertical from midlength of depressed last dorsal ray. End of anal base in advance of vertical from origin of dorsal fin in males, and at or in advance of vertical from middle of dorsal base in females. Appressed pectoral fin reaching to or beyond vertical from anal fin origin in males, reaching beyond vertical from insertion of pelvic fins in females; pectoral fin sigmoid along upper margin in males. Top of head and nape dark brown, the pigment extending as a predorsal streak. A suffuse stripe extends caudad from the upper rim of the orbit, where it merges with the pigment of the nape, becoming more diffuse as it passes beyond the pectoral fin. Scale pockets on the sides and back margined with small brown melanophores, forming a reticulate pattern. Suborbital dark bar present or absent. A faint dark line along the ventral edge of the caudal peduncle. Anal rays 11; scales around caudal peduncle 16; total caudal ray elements on hypural plate 8-10, usually 9.

The cephalic lateral line system is illustrated in part by Rosen and Mendelson (1960). Mandibular canal consists of two close-set grooves one behind the other. Preopercular canal is closed (with 2 or 3 pores) below the cheek but the ascending branch is open. The dentition consists of outer and inner rows of enlarged, incurved canines, separated by a middle band of smaller incurved canines.

This diagnosis is based, in part, on Rivas (1963, 1971).

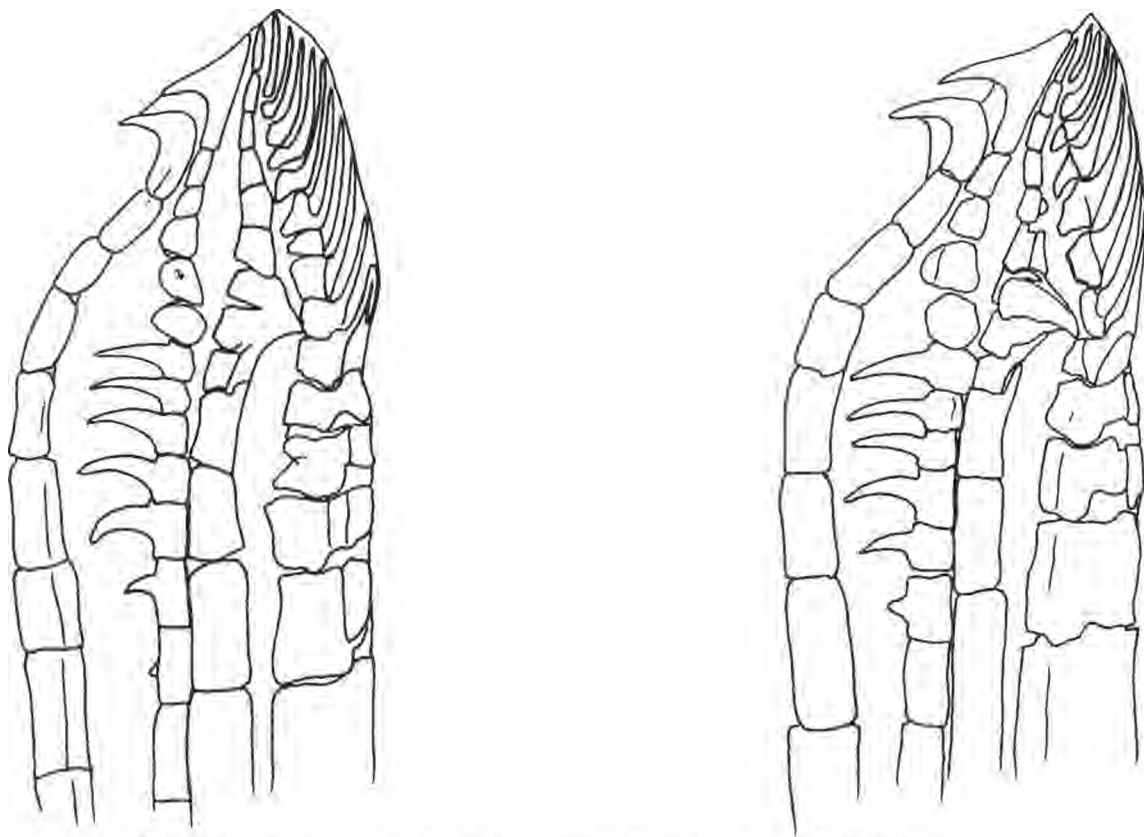


Figure 1. Gonopodia of the *G. punctulata* complex: Left - *G. p. punctulata*, lectotype. Right - *G. p. manni*, holotype.

KEY TO THE SUBSPECIES
OF THE *GAMBUSIA PUNCTICULATA* COMPLEX

1a.—Lateral scales 30 to 32, usually 31.

2a.—Dorsal rays 9 or 10, usually 10. Pectoral rays 15.
Rio Yao, Oriente, Cuba.

G. p. monticola Rivas

2b.—Dorsal rays 8 or 9, usually 9. Pectoral rays 13 to 15, usually 14.

3a.—Branched caudal rays 12 to 14, usually 13. Distinct black spots in rows above the lateral line. Rio Jicotea, Oriente, Cuba.

G. p. bucheri Rivas

(will also key out to 6a below).

3b.—Branched caudal rays 12 to 14, usually 12. Spotting not distinct as above (see figures). Rio Baracoa, Oriente, Cuba.

G. p. baracoana Rivas

(will also key out to 6b below).

1b.—Lateral scales 29 to 31, usually 29 or 30.

4a.—Gonapophyses 2 or 3, usually 2. Color pale goldish brown, spotting absent. Lake Cunningham, New Providence, Bahamas.

G. p. manni Hubbs

4b.—Gonapophyses 2 or 3, usually 3 (when 2 are present, coloration not as above). Color light brown or gray, spotting usually present.

5a.—Anal fin of female strongly falcate. Two or three rows of small spots usually present along sides. Yucatan, Mexico to northern Guatemala.

G. p. yucatanana Regan

5b.—Anal fin of female not strongly falcate. Spotting not in rows on sides, or, if in rows, the spots are fairly large and distinct.

6a.—Vertebrae 30 to 32, usually 32. Spotting large and distinct, branched caudal rays 12 to 14, usually 13. Rio Jicotea, Oriente, Cuba.

G. p. bucheri Rivas

6b.—Vertebrae 30 to 32, usually 32. Spots not large and distinct. Branched caudal rays 12 to 14, usually 12. Rio Baracoa, Oriente, Cuba.

G. p. baracoana Rivas

6c.—Vertebrae 30 to 32, usually 31. Spots not large and distinct. Cuba, Bahamas, Cayman Islands, Jamaica.

G. p. puncticulata Poey

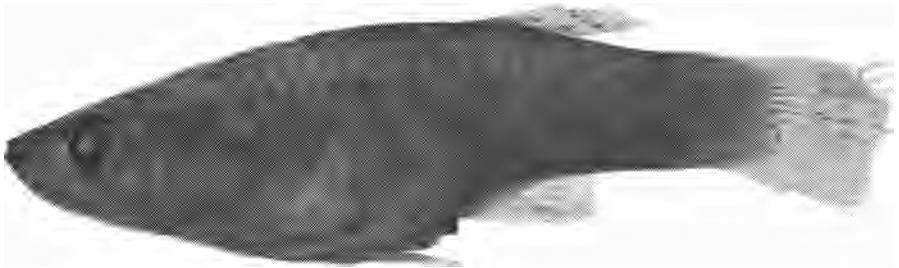


Figure 2. *Gambusia puncticulata puncticulata*. Top - Male lectotype, 24 mm (MCZ 46568). Bottom - Female paralectotype, 38 mm (MCZ 6391).

Gambusia puncticulata puncticulata Poey

(Fig. 2)

- Gambusia puncticulata*.—Poey, 1854: 386 (original description; Havana, Cuba), 390 (diagnosis), pl. 31, figs. 6, 7 (male; female). Bleeker, 1860: 485 (listed). Poey, 1861: 383 (listed). Gunther, 1866: 334 (description, after Poey; Cuba). Poey, 1868: 410 (comparison). Poey, 1876: 182 (listed). Jordan, 1887: 564 (listed). Garman, 1895: 87 (description; habits), pl. 8, fig. 7 (gonopodial suspensorium). Jordan and Evermann, 1896a: 315 (listed). Jordan and Evermann, 1896b: 679 (in key), 680 (description, after Poey). Eigenmann, 1903: 223 (comparison; records). Eigenmann, 1910: 456 (listed; habitat). Brown, in Nichols, 1912: 179 (listed), 180 (behavior). Nichols, 1912: 182 (listed). Langer, 1913: 278 (on gonopodium). Regan, 1913: 982 (meristics; distribution), 987 (description). Hubbs, 1924: pl. I, fig. 1 (gonopodium). Hubbs, 1926: 25 (in key), 37 (synonymy; description), pl. 1, fig. 1 (gonopodium). Hubbs, 1927a: 61-2 (comparison with *G. manni*). Jordan, Evermann, and Clark, 1930: 185 (listed). Breder, 1934a: 3 (comparison with *G. hubbsi*). Myers, 1935: 308-9 (comparison with *G. beebei*). Howell-Rivero, 1938: 177 (on type material). Rivas in Marie-Victorin and Leon, 1944: 236, 302, 305-6 (records). Rivas, 1944: 46 (comparison with *G. howelli*). Howell-Rivero, 1946: 139, figs. 1, 8 (gonapophyses discussed, photo of gonopodium, gonopodial suspensorium figured). Fowler, 1950: 4 (compared to *G. lematriei*). Krumholz, 1963: 203 (*G. manni*, not of Hubbs; ecology). Rivas, 1963: 335 (listed), 336 (gonopodium figured), 345 (*G. puncticulata* species group). Rosen and Bailey, 1963: 97 (listed; in *G. affinis* species group).
- Gambusia picturada*.—Poey, 1868: 410 (original description; La Catalina, San Diego de Los Banos, Cuba).
- Gambusia picturata*.—Poey, 1876: 141 (spelling corrected to *G. picturata*). Jordan, 1887: 564 (listed). Jordan and Evermann, 1896b: 679 (in key), 683 (description, after Poey). Regan, 1913: 981 (species doubtful)
- Gambusia nigropunctata*.—Regan, 1913: 982 (dorsal rays, lateral scales, distribution), 987 (original description; Havana, Cuba). Hubbs, 1926: 37 (not accepted as valid).
- Gambusia melanosticta*.—Regan, 1913: 982 (dorsal rays, lateral scales, distribution), 987 (original description; Fermina, Bemba, Cuba). Hubbs, 1926: 37 (not accepted as valid).
- Gambusia oligosticta*.—Regan, 1913: 982 (dorsal rays, lateral scales, distribution), 988 (original description; Jamaica), 990, fig. 169B (gonopodium figured), 1018, pl. XCIV (male; female). Hubbs, 1926:

25 (in key), 37 (listed). Jordan, Evermann, and Clark, 1930: 186 (listed). Myers, 1935: 304 (listed questionably from Haiti), 308 (compared with *G. beebei*). Fowler, 1952: 88 (listed). Rivas, 1944: 46 (compared with *G. howelli*). Rosen and Mendelson, 1960: 209, fig. 4f (sensory canals). Rivas, 1963: 335 (listed), 345 (in *G. puncticulata* species group). Rosen and Bailey, 1963: 98 (listed, in *G. affinis* species group). Caldwell, 1966: 34 (listed).

Gambusia caymanensis.—Regan, 1913: 982 (dorsal rays, lateral scales, distribution), 990-1 (original description; Grand Cayman). Hubbs, 1926: 24 (in key), 36 (listed). Jordan, Evermann, and Clark, 1930: 186 (listed). Myers, 1935: 308 (compared to *G. beebei*). Rivas, 1963: 335 (listed), 345 (in *G. puncticulata* species group). Rosen and Bailey, 1963: 98 (listed, in *G. affinis* species group).

Gambusia hubbsi.—Hubbs, 1927b: 92 (misidentified as *G. manni*). Breder, 1932: 3 (listed as *G. manni*). Breder, 1933: 59 (photograph labeled *G. manni*). Breder, 1934a: 1 (original description, figured), 2, fig. 2 (gonopodium figured), 3 (relationships). Breder, 1934b: 74 (listed). Myers, 1935: 310 (compared to *G. beebei*). Fowler, 1947: 2 (listed). Rivas, 1963: 335 (listed), 345 (in *G. puncticulata* species group). Rosen and Bailey, 1963: 98 (synonymized with *G. manni*). Böhlke and Chaplin, 1968: 136 (figured as *G. manni*).

Gambusia howelli.—Rivas, 1944: 41 (location of holotype), 44-46 (original description, relationships; Isle of Pines, Cuba). Rosen and Mendelson, 1960: 209, fig. 4H (sensory canals). Rivas, 1963: 335 (listed), 345 (in *G. puncticulata* species group). Rosen and Bailey, 1963: 98 (listed, in *G. affinis* species group).

TYPES.—Type material of *G. p. puncticulata* consists of several lots, numbered MCZ 6391, 6397, 6401, and USNM 120259 (from MCZ 6401). I have examined several specimens from these lots and, since Poey chose no holotype and none of the specimens could be identified with Poey's figures, I have selected a male 24.3 mm (MCZ 46568) as the lectotype (figs. 1, left; 2, top; 7, bottom). All other members of the type lots are designated paralectotypes. Poey stated that the type locality was the moats of the old city wall of Havana, Cuba.

The syntypes of *G. nigropunctata* Regan (1913) (BMNH 1879-10-20:2-4; 2 females 27.5-39.4 mm; male, 19.7 mm) were examined. The gonopodium of the male was removed to prepare Regan's figure. These fish were considered a species on the basis of supposed differences in proportional characters, but all fall well within the range of *G. p. puncticulata* and I follow Hubbs (1926) in considering *G. nigropunctata* a junior synonym of *G. p. puncticulata*. I find no reference in the original description to mouth width, although Hubbs partly based his synonymization on mouth width variation.

The two female syntypes of *G. melanostica* Regan (BMNH 1884-7-7:158-160) were examined and found to be identical in all characters with *G. p. puncticulata*. Paratypes of *G. howelli*, syntypes of *G. oligosticta* and topotypes of *G. caymanensis*, and *G. hubbsi* were also examined.

NAME.—The name refers to the small spots often present on sides of the body.

GONOPODIAL CHARACTERS.—Ray 3 spines 11 (7-13, usually 10 to 12); segments distal to elbow 6 (5-8, usually 6); ray 4p serrae 6 (3-8, usually 6); segments distal to serrae 5 (3-8, usually 5). Proximal half of longest serra variable, either perpendicular to axis of gonopodium or directed obliquely towards its tip.

GONOPODIAL SUSPENSORIUM.—Examination of 86 adult males shows the number of gonapophyses to be two or three. Any single collection may have a mode of two, two with an incipient third, or three gonapophyses. A large uncinatoid process is always present on the second gonapophysis, sometimes on the first and third. Parapophyses are often present on the first gonapophysis. The lectotype has three gonapophyses, with uncini on the second and third (fig. 7, bottom).

MERISTIC CHARACTERS.—Vertebrae 31 (30-32, usually 31); dorsal rays 9 (8-9, usually 9), some Bahamas and Cayman Brac populations modally 8; branched caudal rays 14 (12-16, usually 14); pectoral rays 14 (12-16, usually 14), some Cuban populations modally 15; lateral scales 30 (29-31, usually 30), some Bahamas populations modally 29; gill rakers 13 (12-17, usually 14).

MORPHOLOGICAL CHARACTERS.—Head slightly shorter to slightly longer than distance between dorsal and anal fin origins. Lateral gape about half of front gape. Origin of dorsal fin nearer insertion of pectoral fin than caudal base in males, nearer caudal base in females. Depressed dorsal fin shorter than distance between tip of snout and insertion of pectoral fin. Anal fin of female subtriangular or rounded; caudal fin often asymmetrical in females.

COLORATION.—Ground color light brown, darker above, lighter below. Lips edged with dark brown; suborbital dark bar usually present, lighter in females. Spotting of body in irregular rows, varies from fairly prominent in Bahamas fish to nearly absent in some Cuban and Jamaican specimens. Caudal and dorsal fins with two to three irregular rows of black spots; other fins colorless, although the anal fin is sometimes dusky. Rivas (1944) stated that females of *G. howelli* have a subbasal row of anal fin spots and that this is unique among Cuban *Gambusia*. These spots are however faint, usually dusky streaks, and similar streaks are found on other *G. p. puncticulata*.

SIZE.—Males ranged from 13.3-34.8 mm, females from 17.0-54.7 mm.

DISTRIBUTION and ECOLOGY.—*Gambusia p. puncticulata* occurs in coastal and lowland waters throughout Cuba, Isle of Pines, Jamaica, Cayman Islands, and the Bahamas (fig. 8). It is found in fresh, brackish, and salt water but available collections suggest preference for brackish habitats. It is usually a surface feeder, and preys on small invertebrates and fishes, including its own young. Krumholz (1963) did a comprehensive ecological study of *G. p. puncticulata* on the island of Bimini. Where both occur in the same Cuban waters, *G. p. puncticulata* has complementary distribution with *G. punctata* Poey. Where *G. punctata* is most abundant (in fresh water), *G. p. puncticulata* is scarce, but the situation is reversed in saltier waters. This is also true in Jamaica where *G. p. puncticulata* is complementary with species of the *G. nicaraguensis* group.

REMARKS.—*Gambusia picturata* was held as "a doubtful species of uncertain position" by Regan (1913). Rivas (pers. comm.) states that the species was probably based on a melanistic *G. p. puncticulata*. *Gambusia picturata* was erroneously referred to the synonymy of *G. punctata* by Jordan, Evermann, and Clark (1930).

I have discussed the status of *G. nigropunctata* and *G. melanosticta* under "Types". *Gambusia howelli* is considered synonymous with *G. p. puncticulata* due to wide overlap of characters; apparent differences from Cuban mainland populations do not warrant even subspecific status. This is also the case with Cayman Islands and Bahamas populations (*G. caymanensis* and *G. hubbsi*). The nominal species *G. oligosticta* differs only slightly from Cuban *G. puncticulata*, primarily in the number of ray 3 spines of the gonopodium; the overlap of meristic characters is such that *G. oligosticta* is here considered a junior synonym of *G. p. puncticulata*. I regard the one report (Myers, 1935) of *G. oligosticta* from Haiti as erroneous. Examination of the material at the U. S. National Museum shows that there are several lots of *Limia vittata* (Guichenot), known only from Cuba, included in Henderson's collections and the Museum records indicate that the Henderson collection included Cuban specimens. I have examined the *Gambusia* in question (USNM 78247) and they are *G. p. puncticulata*; I must assume that an error was made in labeling some of Henderson's lots.

Gambusia p. puncticulata seems to be a direct descendant of the ancestral stock of the species complex. This species or its immediate ancestor has evidently given rise to most members of the group through isolation. Isolated forms often show a loss of a gonapophysis, as in the Cayman Island populations, or an increase in lateral scales and vertebrae, as in all isolated Cuban subspecies. *Gambusia p. puncticulata* shows great variation in color and meristics from population to population, especially in the Bahamas.

MATERIAL EXAMINED.—CUBA—Pinar del Rio: USNM 204391, Rio Los Palacios, at town of Los Palacios (20, 30). USNM 204392, Rio del Pinar (20, 22). USNM 204393, Pond off old stream bed off Rio San

Cristobal, at city of San Cristobal (20, 30). USNM 204394, Laguna de Piedros, south of town of Pueblo Nuevo (6,25). Oriente: USNM 204395, Rio Portillo, Sierra Maestra (6,27). USNM 204396, Rio Seco, Guanatanamo (19, 17). USNM 204397, Rio Guaro at village of Guaro (20, 30) . Matanzas: USNM 204398, Rio Hatiguanico at Los Cristales, Zapata Swamp (9, 30). USNM 204399, Rio Los Arabos, 0.5 km N of Central Highway, at road from Los Arabos to Macagua Vieja (6, 17). BMNH 1879-10-20:2-4, Fermina, Bemba (1, 2). Las Villas: USNM 204400, Rio Monasterio, about 2 km E of Manaco, at pumping station of Central Wasington (4, 30). Habana: USNM 204401, Rio Quibo, at bridge on road from Plaza Mananao to Jaimanitas (20, 30). USNM 204402, creek emptying into Jaimanitas Cove, E of mouth of Rio Jaimanitos (0, 20). USNM 204403, "Blind" branch (sand bar) of Rio Jibacoa, near its mouth, Jibacoa (15, 25). MCZ 6397-6391, MCZ 6401 (= USNM 120259), moats of old city of Havana (7, 8). BMNH 1884-7-7:158-160, Havana (0, 3). Isle of Pines: USNM 204404, Punta del Este (SE corner of island), (20, 30). **?HAITI—USNM 78247, Thomazeau (5, 13). JAMAICA—USNM 204405, Port Henderson (20, 30). USNM 204406, Dry River (20, 30). USNM 204407, stream on road from Kingston to Old Harbour, 5 mi E of Old Harbour (20, 30). USNM 204408, Rio Cobre at road from Kingston to Spanish Town (20, 30). USNM 204409, Salt River at road from Old Harbour (20, 30). USNM 204410, Milk River at road from Alley to Rest (20, 30). BMNH 1905-8-16:11-12 (USNM 151460), Jamaica (1, 1). BAHAMAS—Grand Bahama: USNM 204411, Bully Bay, about 4 mi SE of West End Settlement (20, 30). USNM 204412, small, inland brackish pond in pine grove about 500 yds NW of Thomas Town (20, 30) . Abaco: USNM 204413, Duck Pond, about 1 mi SE of Rocky Point Settlement (20, 30). Russell Island: USNM 204414, freshwater pond at Russell Island about 2 miles W of Spanish Wells (20, 30). Bimini: USNM 204415, freshwater well at sugar cane plantation on South Bimini (19, 27). USNM 204416, South Bimini, salt water (3, 30). USNM 204417, shallow sea water in mangrove situations along South Bimini shore of Bimini Harbour (20, 30). USNM 204418, Bimini (7, 9). Andros: USNM 204419, Little Twin Lake at Pump House (middle N shore inlet), Twin Lake Farm, North Andros (6, 30). USNM 204420, Big Twin Lake, middle N shore, Twin Lake Farm, North Andros (20, 30). USNM 204421, Lake Forsythe, middle S shore, North Andros (7, 8). USNM 204422, ocean hole at Twin Lake Farms, headwaters of Fresh Creek, about 15 mi WSW of Andros Town (20, 30). USNM 204423, rocky fresh water pond at road from Nichols Town to Stafford Creek, about 5 mi SW of Nichols Town (20, 30). USNM 204424, mangrove swamp, Long Keys, Andros (7, 30). New Providence: USNM 204425, pond at Adelaid Beach (7, 30). USNM 204426, small brackish pond at road, at entrance to Adelaid (20, 30). USNM 204427, freshwater pond (Botanical Garden Lake) about 0.5 mi SE of intersection of Coral Harbour Rd. and Adelaid Rd. (10, 16). Cat Island: USNM 204428, Big Spring pond (fresh water), about 2.5 mi**

NW of Arthur's Town (18, 30). San Salvador: USNM 204429, Great Lake, about 1 mi SE of Cockburn Town (20, 30). Eleuthera: USNM 204430, Oyster Pond (salt water) at road from Governor's Harbour, 5 mi S of Governor's Harbour (3, 24). **CAYMAN ISLANDS**—. Grand Cayman: USNM 204431, Doctors Cave Pond, off main road about 5 mi W of Bodden Town (20, 13). USNM 204432, small brackish-water holes in coral rock formation near Town Hall of West Bay (Hell), (9, 30). USNM 204433, Meager Bay Pond (Tarpon Lake), on main road about 3 mi E of Bodden Town (20, 30). USNM 204434, freshwater sink hole ("well") at Boden Town (20, 30). USNM 204435, Fish Pond, off S shore road about 2 mi SE of Georgetown (20, 30). USNM 204436, shallow lagoon, off main N island road, about 2 mi W of Old Man Bay (11, 30). USNM 204437, fresh-water wells about 0.5 mi WNW of Northside Village (3, 23). Little Cayman: USNM 204438, fresh-water well about 1 mi ENE of Anchorage Bay (1, 30). USNM 204439, brackish lake at Blossom Point (17, 30). Cayman Brac: USNM 204440, brackish-water lagoon near Southwest Point (20, 30). USNM 204441, brackish-water pool W of Southwest Point on N side of road (0, 15).

Gambusia puncticulata yucatan Regan

(Fig. 3)

Gambusia yucatan.—Regan, 1914: 66 (gonopodium figured), 67 (original description; Progresso, Yucatan). Hubbs, 1926: 35 (synonymized with *G. nicaraguensis*). Hubbs, 1936: 162 (faunal relationships), 163-4 (relationships with Antillean fauna), 165 (distributions), 226-8 (accepted as valid species, relationships), pl. 7 (photograph of male and female, gonopodium figured). de Buen, 1940: 38 (listed). Rivas, 1963: 335 (listed), 345 (in *G. puncticulata* species group). Rosen and Bailey, 1963: 97 (listed, in *G. affinis* species group). Miller, 1966: 790 (listed, range).

TYPES.—No holotype was designated by Regan. Syntypes (BMNH 1914-3-23:12-15) consist of two males and two females collected by A. Rachow. These were examined and a lectotype (male 37.6 mm, BMNH 1914-3-23:12) is here designated (fig. 3, top). The gonopodium of the lectotype is figured on page 66 of the original description; remaining specimens are designated paralectotypes.

NAME.—The name refers to the type locality, Progresso, Yucatan.

GONOPODIAL CHARACTERS.—Ray 3 spines 12 (8-13, usually 11); segments distal to elbow 6 (4-6, usually 5; ray 4p serrae 5 (4-10, usually 6), the abnormally wide range is caused by a collection from Lake **Petén**, Guatemala, wherein serrae ranged from 5-10, while all other populations usually had 5-7; segments distal to serrae 5 (4-7, usually 5).

Proximal half of longest ray 4p serrae variable, directed obliquely towards base of gonopodium, perpendicular to axis, or obliquely towards tip of gonopodium.

GONOPODIAL SUSPENSORIUM.—There were usually three gonapophyses in the twenty adult males examined. An uncinatoid process is always present on the second gonapophysis, usually on the third, that on the second is much the longer. The first gonapophysis always bears a parapophysis; parapophyses are lacking on the second and third gonapophyses. The lectotype has two gonapophyses, with uncini on the second.

MERISTIC CHARACTERS.—Vertebrae 31 (30-32, usually 31); dorsal rays 9 (8-10, usually 8), the Lake **Petén** population differs in having 9 dorsal rays; branched caudal rays 15 (12-15, usually 14); pectoral rays 14 (13-15, usually 14); lateral scales 29 (29-31, usually 30); gill rakers 15 (13-18, usually 15).

MORPHOLOGICAL CHARACTERS.—Head slightly shorter than distance between origins of dorsal and anal fins in males, slightly longer in females (except in large pregnant females). Orbit diameter slightly less than snout width in males, less than snout width in females; lateral gape about half of front gape. Dorsal fin origin slightly nearer pectoral

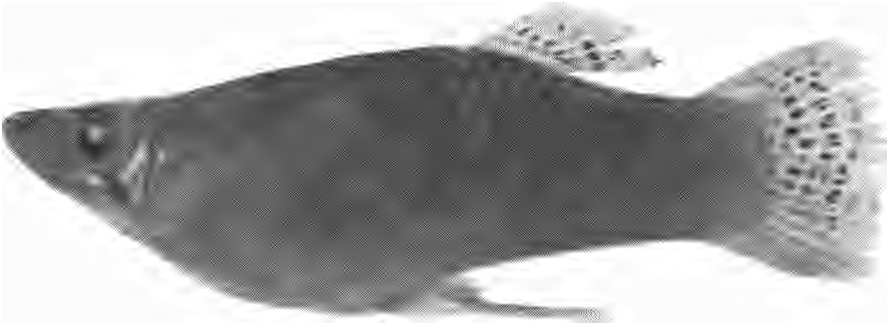


Figure 3. *Gambusia puncticulata yucatana*. Top - male lectotype, 38 mm (BMNH 1914-3-23:12). Bottom - Female paralectotype, 36 mm (BMNH 1914-3-23:12-15).

fin insertion than middle of caudal base in males, nearer caudal base in females. Depressed dorsal fin shorter than distance between tip of snout and pectoral fin insertion, reaching to or slightly beyond a point midway between end of dorsal fin base and a vertical from middle of caudal base. Anal fin strongly falcate in females.

COLORATION.—Ground color ranges from light brown to gray, lighter on abdomen. With four or five irregular rows of lateral spots, concentrated on posterior half of body, sometimes extending forward to pectoral fin base. Both sexes with darkly rimmed mandible and maxillary, suborbital bar faint but usually present. Female anal fin often with a dusky streak anteriorly, dorsal fin with one or two rows of small black spots, caudal fin with two or three irregular rows of spots, fins otherwise transparent. One female was partly melanistic; Regan (1961) reported melanism in male *Gambusia*.

SIZE.—Examined males ranged from 20.4–33.0 mm, females from 20.4–43.5 mm.

DISTRIBUTION AND ECOLOGY.—*Gambusia p. yucatanana* is found in lakes and ponds ranging from fresh to salt water. It is found (fig. 8) from near Coatzacoalcos, Veracruz, Mexico, to the outer part of the Yucatan Peninsula, the Lake **Petén** region of Guatemala, and northern British Honduras (Rosen and Bailey, 1963).

REMARKS.—This form may be close to the ancestral stock of the species group. Based on vertebral, gonapophysis, and gonopodial characters, it seems closely allied to *G. p. puncticulata* but the falcate anal fin of the female is unique within the group.

MATERIAL EXAMINED.—**MEXICO.**—**Yucatán:** USNM 204446, **ciénaga** at Sisal (20, 30). USNM 204447, **ciénaga** at village of Rio Lagartos (8, 30). USNM 204448, **ciénaga** alongside road from Mérida to Progreso, about 0.5 km S of Progreso (6, 30). BMNH 1914-3-23:12-15, Progreso (1, 2). BMNH 1914-3-23:12, Progreso (1, 0). **GUATEMALA.**—USNM 204449, Lake **Petén** at Flores, **Petén** (12, 25). USNM 204450, pond off road from Mérida to Muna, 12 km N of Muna (20, 30).

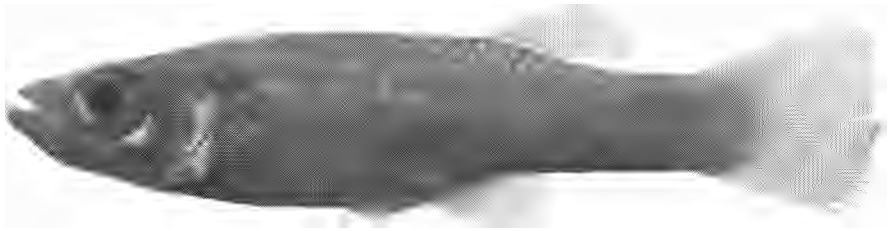
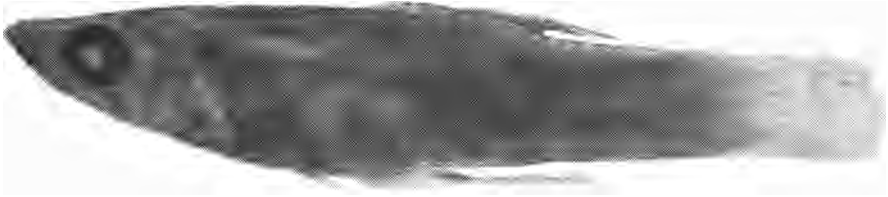


Figure 4. *Gambusia puncticulata manni*. Top - Male holotype, 24 mm (UMMZ 72183). Bottom - Female topotype, 21 mm (USNM 204445).

Gambusia puncticulata manni Hubbs

(Fig. 4)

Gambusia affinis (not of Baird and Girard).—Rosen, 1911: 19, 49.

Gambusia manni.—Hubbs, 1927a: 61-65 (original description; New Providence, Bahamas). Hubbs, 1927b: 92 (in part). Jordan, Evermann, and Clark, 1930: 186 (listed). Breder, 1934a: 23 (compared to *G. bubbsi*, gonopodium figured). Breder, 1934b: 69 (listed). Myers, 1935: 308 (compared to *G. beebei*). Hubbs and Miller, 1942: 6 (Lake Cunningham). Fowler, 1947: 2 (in part). Rivas, 1963: 335 (listed), 345 (in *G. puncticulata* species group). Rosen and Bailey, 1963: 98 (listed, in *G. affinis* species group). Mae and Chaplin, 1968: 136 (in part).

TYPES.—"The type specimen is a male 23.5 mm long to caudal fin, Cat. No. 72183, Museum of Zoology, University of Michigan. A male and two female paratypes are in the same institution, and two others are in the National Museum" (Hubbs, 1927a). The type locality noted by Hubbs is "a fresh-water lake on New Providence." I have examined the holotype and the paratypes (UMMZ 72184, USNM 88500) and found them to be identical to specimens from Lake Cunningham. The population in this lake has the unmarked light goldish color and pectoral counts of the paratypes. I therefore restrict the type locality of *G. p. manni* to Lake Cunningham, New Providence Island, Bahamas.

NAME.—The subspecies is named for the late William M. Mann, former director of the Zoological Park in Washington.

GONOPODIAL CHARACTERS.—Ray 3 spines 8 (8-11, usually 10); segments distal to elbow 6 (4-6, usually 6); ray 4p serrae 6 (4-6, usually 5); segments distal to serrae 4 (4-6, usually 5), see fig. 1.

Proximal half of longest ray 4p serra variable, pointing obliquely to the tip, to the base, or perpendicular to axis of gonopodium.

GONOPODIAL SUSPENSORIUM.—There are two gonapophyses, occasionally with an incipient third in the forty-three adult males examined. Only two specimens, including the holotype, had three gonapophyses. Uncini always present on the second gonapophysis, also on the first in 23 percent of those examined. The holotype has three gonapophyses (the third poorly developed) with uncini on the second and third.

MERISTIC CHARACTERS.—Vertebrae 31(30-32, usually 31); dorsal rays 9 (8-9, usually 9); branched caudal rays 13(12-14, usually 14); pectoral rays 13 (13-15, usually 15); lateral scales 30 (29-31, usually 30); gill rakers 12-14, usually 13.

MORPHOLOGICAL CHARACTERS.—Head equal to or longer than distance between origins of dorsal and anal fins in males, longer in females.

Orbit diameter equal to or greater than snout width in males, slightly less in females. Lateral gape greater than half of front gape. Origin of dorsal fin nearer pectoral fin insertion than middle of caudal base in males, nearer caudal base in females. Depressed dorsal fin much shorter than distance from tip of snout to pectoral fin insertion in males, and shorter than distance from snout tip to posterior edge of orbit in females; reaching to or beyond a point midway between end of dorsal fin base and a vertical from middle of caudal base in males, shorter in females. Anal fin rounded in females.

COLORATION.—Ground color goldish tan, slightly darker above, lighter below. Body unspotted, sides of body and opercle silvery, sub-orbital dark bar usually lacking in both sexes, mouth unpigmented, or slightly rimmed with brown. Dorsal fin with two faint rows of spots, caudal fin may have one or two very faint rows of spots (these may be no more than dusky areas), other fins colorless.

SIZE.—Examined males ranged from 19.2-25.6 mm, females from 21.3-30.3 mm.

DISTRIBUTION and ECOLOGY.—*Gambusia p. manni* is found in two land-locked brackish lakes, Lakes Cunningham and Killarney on New Providence Island, Bahamas. An analysis of Lake Cunningham water is given by Hubbs and Miller (1942).

REMARKS.—*Gambusia p. manni* seems to be a descendant of *G. p. puncticulata* that remained isolated for a sufficient length of time for differentiation into a new subspecies. The population in Lake Killarney seems to be intermediate between *G. p. manni* and *G. p. puncticulata* in body shape, coloration, pectoral ray counts, and gonopodial characters. Only one of twenty specimens radiographed from this population had three gonapophyses. Pending determination of the status of the Lake Killarney population by breeding studies, I consider it best allocated to *manni*.

Breder (1934a, b) stated that he observed *G. manni* and *G. hubbsi* together on Andros Island and that there are behavioral as well as color differences between these forms. I have found only one subspecies in Andros collections and Rivas (pers. comm.) observed neither color nor behavior differences in *Gambusia* on the island.

Rosen and Bailey (1963) synonymized *G. hubbsi* with *G. manni* stating "We have compared materials from New Providence, North and South Andros Islands, and Bimini and are unable to distinguish more than a single species." Evidently their New Providence material was from the perimeter of the island, where *G. p. puncticulata* is common

MATERIAL EXAMINED.—BAHAMAS—New Providence: USNM 204444, Lake Cunningham, N shore at end of road leading to lake (20, 30). USNM 204445, Lake Killarney, SW corner at end of dirt road leading to lake from Coral Harbour Road (20, 30). UMMZ 72183, New Providence (1, 0). UMMZ 72184, New Providence (2, 1). USNM 88500, New Providence (0, 2).

Gambusia puncticulata bucheri Rivas

(Fig. 5)

Gambusia bucheri.—Rivas, 1944: 42 (original description; Cuba). Rivas, 1963: 335 (listed), 345 (in *G. puncticulata* species group). Rosen and Bailey, 1963: 98 (listed, in *G. affinis* species group). Rivas, 1969: 202 (holotype in U. S. National Museum).

TYPES.—"The holotype is an adult male 30.5 mm in standard length, collected . . . in Rio Jicotea, of the Moa system, at the bridge of the road between Asserio de Moa and Punta Gorda, Prov. of Oriente, Cuba" (Rivas, 1944). The type (29.6 mm SL), originally in Rivas' private collection, is now USNM 203149 (Rivas, 1969). The following description is based on the holotype and paratypes (USNM 204443).

NAME.—The subspecies was named for Mr. George C. Bucher, who assisted the collector.

GONOPODIAL CHARACTERS.—Ray 3 spines 11 (7-11, usually 10); segments distal to elbow 7 (6-7, usually 6); ray 4 p serrae 6 (5-7, usually 5); segments distal to serrae 6 (4-6, usually 5).

Proximal half of longest ray of 4p serra directed somewhat obliquely towards tip of gonopodium.

GONOPODIAL SUSPENSORIUM.—There are usually three gonapophyses (55 percent), occasionally two fully formed with an incipient third (20 percent), sometimes only two fully formed (25 percent) in the twenty adult males examined. An uncinatoid process is always present on the second gonapophysis, often on the third, that on the second is much the longer. The first gonapophysis usually bears a parapophysis; parapophyses lacking on the second and third gonapophyses.

MERISTIC CHARACTERS.—Vertebrae 30-32, usually 32; dorsal rays 9 (8-9, usually 9); branched caudal rays 14 (12-14, usually 13); pectoral rays 14 (13-15, usually 14); lateral scales 30 (30-31, usually 30); gill rakers 13 (11-14, usually 13).

MORPHOLOGICAL CHARACTERS.—Head slightly shorter or equal to distance between origins of dorsal and anal fins in males, slightly longer in females. Orbit diameter equal to or slightly less than snout width in males, less than snout width in females. Lateral gape about half of front gape. Origin of dorsal fin slightly nearer pectoral fin insertion than caudal base in males, either midway between or nearer caudal base in females. Depressed dorsal fin longer or shorter than distance from snout tip to pectoral fin insertion in males, shorter in females; dorsal fin reaches to or well beyond a point midway between end of its base and a vertical from middle of caudal base, often with distal rays prolonged into a short filament. Anal fin of females subtriangular to slightly falcate.

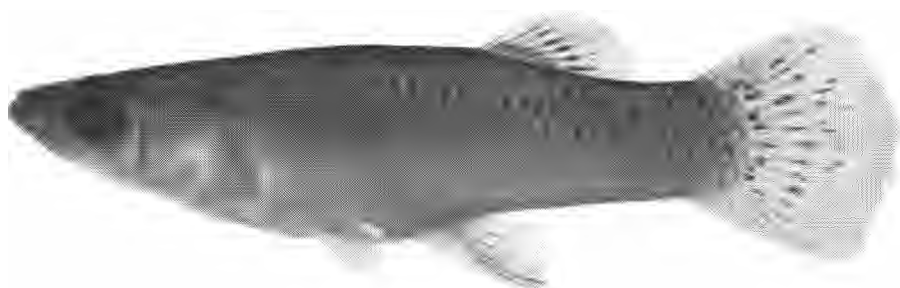


Figure 5. *Gambusia puncticulata bucheri* (USNM 204443). Top - Male paratype, 23 mm. Bottom - Female paratype, 27 mm.

COLORATION.—Ground color light brown, darker above, lighter below. Lips edged with dark brown, a faint brown suborbital bar usually present in both sexes. There are one or two irregular rows of distinct black spots above the lateral stripe, sometimes extending forward to pectoral fin insertion. Caudal and dorsal fins with two or three rows of black spots and with some irregularly placed spots between; often with a dusky stripe on the anal fin of females; other fins colorless.

SIZE.—Examined males ranged from 21.4-29.5 mm, females from 23.2-43.3 mm.

DISTRIBUTION and ECOLOGY.—This subspecies is known only from the fresh water type locality: Jicotea Creek, Moa River system, Oriente Province, Cuba.

REMARKS.—*Gambusia p. bucheri* is one of the isolated Cuban subspecies. It has evidently become separated from the *G. p. puncticulata* gene flow and has developed a higher average number of lateral scales and vertebrae. *Gambusia p. bucheri* is the least distinct of the Cuban subspecies as it shows less divergence from *G. p. puncticulata* than either *G. p. baracoana* or *G. p. monticola*. *Gambusia p. bucheri* is partly characterized by the rows of lateral spots which are shared, though somewhat smaller, by *G. p. puncticulata*.

MATERIAL EXAMINED.—CUBA—Oriente: USNM 203149, Rio Jicotea, Moa system at bridge of road between Aserrio de Moa and Punta Gorda (1, 0). USNM 204443, Jicotea Creek near village of Moa (20, 30).

***Gambusia puncticulata baracoana* Rivas**

(Fig. 6)

Gambusia baracoana.—Rivas, 1944: 46 (original description; Cuba).
Rivas, 1963: 335 (listed), 345 (in *G. puncticulata* species group).
Rosen and Bailey, 1963: 98 (listed, in *G. affinis* species group. Rivas, 1969: 202 (holotype in U. S. National Museum).

TYPES.—"The holotype is an adult male 28 mm in standard length, collected in a small fresh-water pond near the mouth of Rio Miel, in the vicinity of the city of Baracoa, Prov. of Oriente" (Rivas, 1944). The present description is based on the holotype (USNM 203150), now 26.9 mm SL, and paratypes (USNM 204442); another lot of paratypes (UHMP 456) was not examined.

NAME.—The species was named for the City of Baracoa, Cuba, near the type locality.

GONOPODIAL CHARACTERS.—Ray 3 spines 10 (8-13, usually 11); segments distal to elbow 6 (5-6, usually 5); ray 4p serrae 6 (4-6, usually 5); segments distal to serrae 5 (4-6, usually 5).



Figure 6. *Gambusia puncticulata baracoana* (USNM 204442). Top - Male paratype, 21 mm. Bottom - Female paratype, 28 mm.

Proximal half of longest serra variable, directed perpendicular to axis of gonopodium or obliquely towards base of gonopodium.

GONOPODIAL SUSPENSORIUM.—There are three gonapophyses in the twenty adult males examined (fig. 7, top). An uncinatoid process is usually present on all gonapophyses; one individual had uncini only on the second and third gonapophyses, another had an uncinatoid process on only the second gonapophysis. Parapophyses are usually present on the first gonapophysis.

MERISTIC CHARACTERS.—Vertebrae 31-32, usually 32; dorsal rays 9 (8-9, usually 9); branched caudal rays 14 (12-14, usually 12); pectoral rays 14 (13-14, usually 14); lateral scales 31 (30-31, usually 31); gill rakers 12 (11-13, usually 13).

MORPHOLOGICAL CHARACTERS.—Head shorter than distance between dorsal and anal fin origins, similar or slightly longer in females. Width of orbit equal to or slightly less than snout width in males, less than snout width in females. Lateral gape about half of front gape. Dorsal fin origin nearer pectoral fin insertion than to middle of caudal base in males, nearer caudal base in females. Depressed dorsal fin length equal to or shorter than distance from snout tip to pectoral fin insertion in males, much shorter in females, fails to reach midway between end of its base and vertical from middle of caudal base in either sex. Anal fin of female usually subtriangular, sometimes slightly convex.

COLORATION.—Ground color light brown, darker above, lighter below. Males with a faint brown suborbital bar, very faint or obsolete in females. Usually with two irregular rows of spots on caudal and dorsal fins, other fins colorless.

SIZE.—Examined males ranged from 20.6-25.6 mm, females from 23.1-33.3 mm.

DISTRIBUTION and ECOLOGY.—This form has been found only at the type locality: a backwater near the mouth of the Rio Baracoa, a fresh-water river in an isolated canyon on the northeastern coast of Cuba.

REMARKS.—*Gambusia p. baracoana* is probably a product of isolation. It evidently developed from *G. p. puncticulata* that was dispersed across unsuitable habitats on either side of the mouth of the Rio Baracoa. It is a slender form with fewer branched caudal rays, and more vertebrae and lateral scales. Increased numbers of vertebrae and lateral scales also occur in the other isolated Cuban subspecies, *G. p. bucheri* and *G. p. monticola*. The gonapophyses of *G. p. baracoana* are generally similar to those of *G. p. puncticulata* but are more sharply angulate.

The holotype has 14 branched caudal rays rather than 12 as noted by Rivas (1944).

MATERIAL EXAMINED.—CUBA—**Oriente:** USNM 203150, fresh-water pond near mouth of Rio Miel, vicinity of city of Baracoa (1, 0). USNM 204442, Pedro Montiel ponds at city of Baracoa (20, 30).

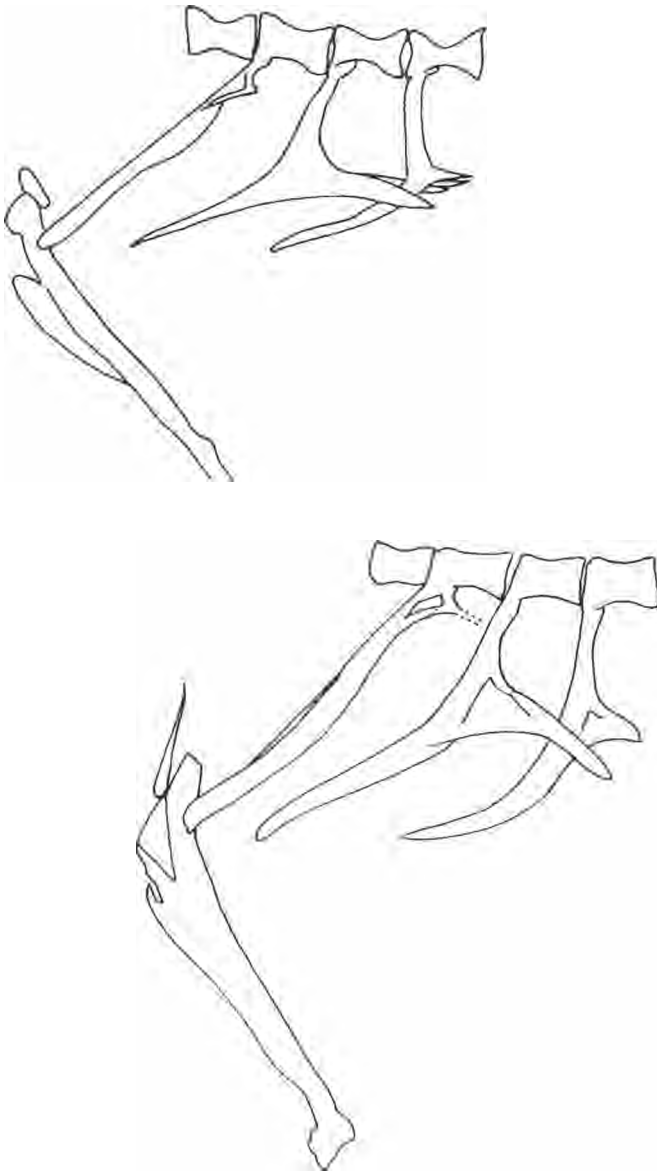


Figure 7. Gonopodial suspensoria of the *G. puncticulata* complex. Top - *G. p. baracoana*, paratype. Bottom - *G. p. puncticulata*, lectotype.

***Gambusia puncticulata monticola* Rivas**

Gambusia puncticulata monticola.—Rivas, 1971.

Gambusia p. monticola is not redescribed as it has been recently described in the form used here. Pertinent information is provided for purposes of comparison.

TYPES.—"The holotype (USNM 203913) is an adult male, 29.0 mm in standard length (SL), collected by Luis R. Rivas in Rio Yao, a left tributary of Rio Cauto, 15 km upstream from Bueycito, Municipality of Bayamo, Province of Oriente, Cuba, on December 29, 1942" (Rivas, 1971). Paratypes, collected with the holotype, are USNM 203914 and GCRL 3636.

GONOPODIAL CHARACTERS.—Ray 3 spines 10-11, usually 10; segments distal to elbow 5-6, usually 6; segments distal to ray 4p serrae 3-5, usually 4; ray 4p serrae 6-8, usually 7.

GONOPODIAL SUSPENSORIUM.—There are three gonapophyses, with uncinatoid processes always present on the second, usually present on the first and third. Parapophyses are usually present on the first and second gonapophyses.

MERISTIC CHARACTERS.—Vertebrae 32-33, usually 32; dorsal rays 9-10, usually 10; pectoral rays 15; branched caudal rays 14; lateral scales 31-32, usually 31; gill rakers 12-14, usually 14.

DISTRIBUTION and ECOLOGY.—According to Rivas (1971), *G. p. monticola* is known only from the type locality: a cool, clear, mountain stream with rapids; elevation 1250 ft. This is the only member of the complex known to occur in a mountain-stream habitat.

MATERIAL EXAMINED.—CUBA—Oriente: USNM 203914, USNM 203913, GCRL 3636, Upper Rio Yao (see types), (5, 2).

DISCUSSION

The *G. puncticulata* complex is probably derived from a Central American ancestor. Isolation on the continent and the Antilles and Bahamas has given rise to several distinct population groups (fig. 8). The members of these groups exhibit a great deal of variability from locality to locality in both meristics and color pattern, particularly in the Bahamas and Cuba. However, I believe that the differences between the distinct population groups warrant recognition (*eg.* the falcate anal fin of the *yucatanana* female; the large spots of *bucheri*). I have given these forms subspecific status for two primary reasons. The differences between other species of *Gambusia* are greater than the differences between the *puncticulata* forms, even considering the great variability of the latter. Also, all *Gambusia* species have a unique gonopodial configuration and although the gonopodium may be generally similar to that of other species, there are specific differences. In the *G. puncticulata* complex, gonopodia are virtually the same for all forms, allowing slight, but inconsistent meristic differences.

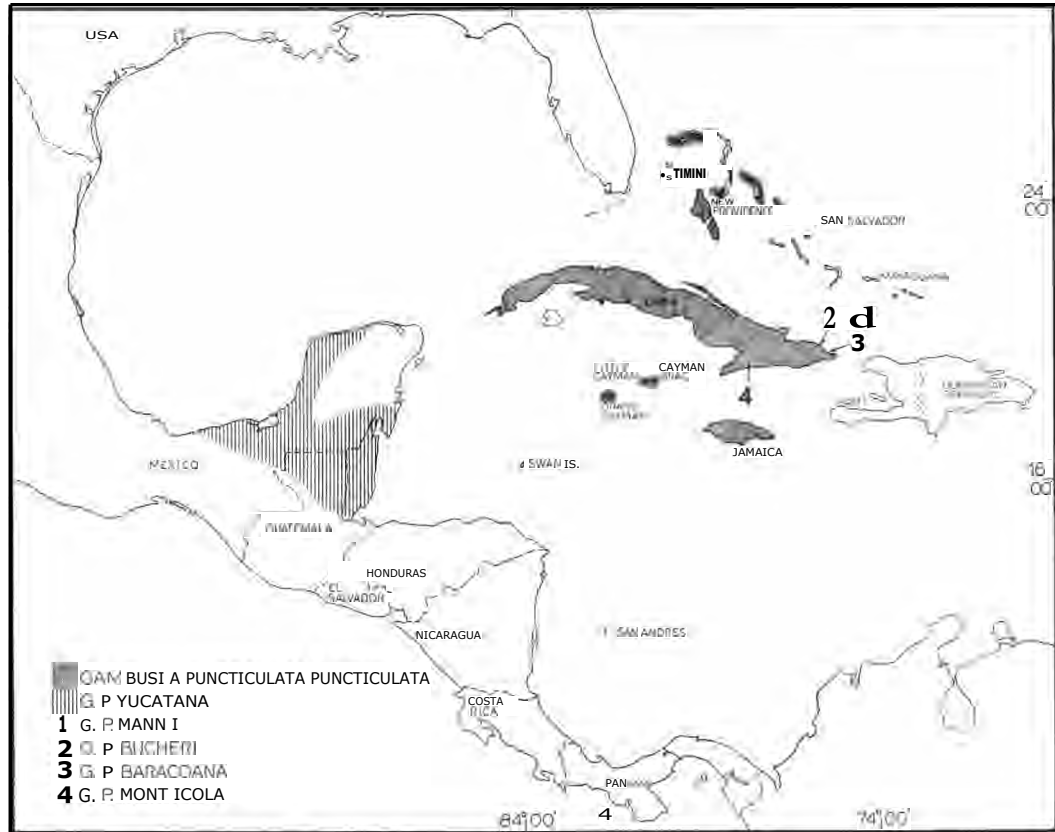


Figure 8. Distribution of the *G. puncticulata* complex.

Table. 1. Frequency distribution of dorsal fin-rays and branched caudal rays in the *Gambusia puncticulata* complex.

Subspecies	N	Dorsal Rays					N	Caudal Rays					Mean
		7	8	9	10	Mean		12	13	14	15	16	
<i>puncticulata</i>													
Bahamas	806		267	512	27	8.7	799	120	251	422	6		13.4
Cuba	512	1	32	457	22	9.0	502	6	53	433	10		13.9
Isle of Pines	50			45	10	9.1	49		1	38	9	1	14.2
Jamaica	291		60	231		8.8	299	1	22	274	2		13.9
Haiti ?	19		2	17		8.9	2			2			14.0
Grand and Little Cayman	367		55	311	1	8.8	366	23	66	274	3		13.7
Cayman Brac	50		36	14		8.3	46	1	8	37			13.8
<i>manni</i>	100		3	97		9.0	100	21	41	38			13.2
<i>bucheri</i>	50		8	42		8.8	50	7	27	16			13.2
<i>baracoana</i>	50		17	33		8.7	50	45	4	1			12.1
<i>monticola</i>	7			1	6	9.8	7			7			14.0
<i>yucatanana</i>	211	1	114	94	2	8.4	209	2	27	178	2		13.9

Table 2. Frequency distribution of pectoral fin-rays and lateral scales in the *Gambusia puncticulata* complex.

Subspecies	N	Pectoral Rays						Mean	N	Lateral Scales						Mean
		12	13	14	15	16	28			29	30	31	32			
<i>puncticulata</i>																
Bahamas	806	1	86	620	98	1	14.0	806	2	181	535	85	4	29.9		
Cuba	508		14	471	23		14.0	505	4	55	400	45	1	30.0		
Isle of Pines	50			16	34		14.7	49			33	16		30.3		
Jamaica	199	1	4	285	9		14.0	300		6	251	43		30.1		
Haiti ?	19		1	18			14.0	18		2	16			29.9		
Grand and Little Cayman	369	1	12	318	38		14.1	367		41	313	13		29.9		
Cayman Brac	50			42	8		14.2	50		6	41	3		29.9		
<i>manni</i>	100			37	63		14.6	100		4	88	8		30.0		
<i>bucheri</i>	50		1	47	2		14.0	50			28	22		30.4		
<i>baracoana</i>	50		1	49			14.0	50			18	32		30.6		
<i>monticola</i>	7				7		15.0	6				5	1	31.2		
<i>yucatanana</i>	210		1	177	32		14.1	209		28	165	16		29.9		

Table 3. Frequency distribution of number of ray 3 spines and segments distal to elbow in the gonopodia of the *Gambusia puncticulata* complex.

Subspecies	N	Ray 3 spines								Mean	N	Segments distal to elbow				
		7	8	9	10	11	12	13	5			6	7	8	Mean	
<i>puncticulata</i>																
Bahamas	280	1	2	75	175	27				9.8	280	76	190	14		5.8
Cuba	165		1	10	74	61	15	4		10.5	165	35	92	37	1	6.0
Isle of Pines	20					3	9	8		12.2	20		7	13		6.6
Jamaica	120					27	75	18		11.9	120	1	85	34		6.3
Haiti ?	5			1	2	2				10.2	5		3	2		6.4
Grand and Little																
Cayman	121				29	68	18	6		11.0	121	5	88	27	1	6.2
Cayman Brac	34				3	14	14	3		11.5	37		13	23	1	6.6
<i>manni</i>	38			10	23	5				9.9	39	5	30	4		6.0
<i>bucheri</i>	19				14	4	1			10.3	19		14	5		6.3
<i>baracoana</i>	20			2	8	10				10.4	20	11	9			5.4
<i>monticola</i>	5				3	2				10.4	5		4	1		6.2
<i>yucatanana</i>	66			3	27	31	5			10.6	66	18	47	1		5.7

Table 4. Frequency distribution of serrated segments and segments distal to serrae in the gonopodia of the *Gambusia puncticulata* complex.

Subspecies	N	Serrated segments								Mean	N	Segments distal to serrae								Mean
		3	4	5	6	7	8	9	10			3	4	5	6	7	8			
<i>puncticulata</i>																				
Bahamas	280	1	39	120	104	15	1			5.3	280	4	108	156	11	1		4.6		
Cuba	167		7	69	78	10	3			5.6	167	1	38	109	18	1		4.9		
Isle of Pines	20			10	9	1				5.5	20			3	17			5.8		
Jamaica	120			21	66	31	2			6.1	120		43	68	9			4.7		
Haiti ?	5				1	4				6.8	5	1	4					3.8		
Grand and Little Cayman	121		16	66	33	5	1			5.4	121		22	68	29	2		5.1		
Cayman Brac	37		8	18	17					5.1	37				15	21	1	6.6		
<i>manni</i>	39		10	24	5					4.9	39		3	31	5			5.0		
<i>bucheri</i>	20			12	7	1				5.4	20		2	12	6			5.2		
<i>baracoana</i>	20		2	15	3					5.0	20		6	13	1			4.7		
<i>monticola</i>	5				2	1	2			7.0	5	1	3	1				4.0		
<i>yucatanana</i>	66		1	20	31	10	2	1	1	6.0	66		4	48	13	1		5.2		

Table 5. Frequency distribution of gill rakers and total vertebrae in the *Gambusia puncticulata* complex.

Subspecies	N	Gill Rakers									Mean	Total Vertebrae						
		11	12	13	14	15	16	17	18	N		29	30	31	32	33	Mean	
<i>puncticulata</i>																		
Bahamas	832		11	189	453	149	29	1		14.0	99	1	16	62	18	2	31.0	
Cuba	505	16	64	166	210	46	2	1		13.4	70		6	61	3		31.0	
Isle of Pines	50			3	19	24	4			14.6	19			8	11		31.5	
Jamaica	300		1	80	181	37	1			13.9	42		2	28	12		31.2	
<i>Haiti ?</i>	7				3	2	2			14.9	6		1	5			30.8	
Grand and Little Cayman	369		7	118	206	38				13.7	17		1	14	2		31.1	
Cayman Brac	50				11	33	6			14.9	11		2	8	1		30.8	
<i>manni</i>	100		2	47	48	3				13.5	68		3	61	4		31.0	
<i>bucheri</i>	50	2	15	29	4					12.7	20		1	6	13		31.5	
<i>baracoana</i>	50	6	19	25						12.4	17			1	16		31.9	
<i>monticola</i>	8			5	2	1				13.5	4				2	2	32.5	
<i>yucatanana</i>	216			4	53	107	43	8	1	15.0	20			18	2		31.1	

Table 6. Frequency distribution of gonapophyses in the *Gambusia puncticulata* complex. (+ = an incipient gonapophysis).

Subspecies	N	Gonapophyses			
		4	3	2+	2
<i>puncticulata</i>					
Bahamas	79	2	34	18	25
Cuba	74		36	17	21
Isle of Pines	20	1	5	4	10
Jamaica	41		21	15	5
Haiti ?	6		5	1	
Grand and Little Cayman	17			10	7
Cayman Brac	12		1	3	8
<i>manni</i>	43		2	4	37
<i>bucheri</i>	20		12	4	4
<i>baracoana</i>	20		20		
<i>monticola</i>	4		4		
<i>yucatanana</i>	20		18	2	

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