FUNDULUS PHILPISTERI SP. NV. (TELEOSTEI: FUNDULIDAE) FROM THE RÍO SAN FERNANDO BASIN, NUEVO LEÓN, MÉXICO.

Fundulus ***philpisteri*** sp. nv. (Teleostei: Fundulidae) de la cuenca del Río San Fernando, Nuevo León, México.

MARÍA ELENA GARCÍA-RAMÍREZ[1], SALVADOR CONTRERAS-BALDERAS[2], AND MA. DE LOURDES LOZANO-VILANO[1]

[1]Facultad de Ciencias Biológicas, Universidad Autónoma de Nuevo León, Apartado Postal 425, San Nicolás de los Garza, Nuevo León, México 66450 megarcia@fcb.uanl.mx and marlozan@fcb.uanl.mx; [2]Bioconservación, A. C. Apartado Postal 405 San Nicolás de los Garza, Nuevo León, México 66450 saconbal@axtel.mx

ABSTRACT: *Fundulus* ***philpisteri*** sp. nv., is an endemic fundulid fish from the spring and marshes known as Baño de San Ignacio, Rio San Fernando basin, Nuevo Leon state, Mexico. Geologically the locality is on the province of the Tamaulipan platform. The isolation, and thermal waters habitat, rich in sulphur salts is an important factor in differentiation of this species. Its closest relative is *Fundulus grandis*, a coastal form. The new species is characterized by a high number of conspicuous bars, commonly in inverted V's or U's; dorsal profile very convex; head profile acute; eye larger than snout; head scales regular.

Key words: Fundulus ***philpisteri*** Baño San Ignacio, new species

RESUMEN. *Fundulus* ***philpisteri*** sp. nv, pez fundulido endémico del área de pantano conocida como Baño de San Ignacio, de la cuenca del Río San Fernando, Nuevo León, México. Geológicamente se ubica en la provincia de la plataforma de Tamaulipas. El aislamiento, y el hábitat de aguas termales ricas en compuestos azufrados es un factor importante en la diferenciación de esta especie. Su relación más cercana es con la especie costera *Fundulus grandis*. *F. philpisteri*

se caracteriza por la presencia de barras conspicuas; cuerpo con perfil dorsal convexo; perfil cefálico redondeado; las escamas de la cabeza presentan disposición regular; distancia ínter-orbital más amplia (2.4 en longitud cefálica); base aleta dorsal corta; barra gular amplia, base de las aletas pectorales por detrás del opérculo, bordes de las pectorales redondeados.

Palabras clave: *Fundulus* ***philpisteri***, Baño San Ignacio, especie nueva

INTRODUCTION

Fundulus is an euryhaline and eurythermic genus, with seven described species in México inhabiting freshwater, brackish or marine environments, *F. grandis* Baid & Girard, 1853, in NE and South Florida, USA, to the Gulf of Mexico to Campeche and Northern coasts of Cuba; *F. similis* (Baid & Girard, 1853), in NE and South Florida, USA, to Gulf of Mexico coast to Laguna Madre of Tamaulipas; *F. zebrinus* Jordan & Gilbert, 1883, from SE Montana, E Missouri and S Texas, USA, to Rio Bravo and portions of its tributary Río Conchos; *F. grandissimus* Hubbs, 1936, from Progreso, Yucatán, México; *F. persimilis* Miller, 1955, RíO Lagartos in Yucatán, México; *F. lima* Vaillant, 1894, endemic to the central Baja California oasis, México, and *F. parvipinnis* Girard, 1854, from Morro Bay, California, to Bahía Magdalena, Baja California Sur, México. Additionally there are two undescribed species, one from Rio Marmolejo, Tamaulipas (in process, M. E. García, Salvador Contreras-Balderas, & M. L. Lozano-Vilano) and *F. philpisteri* nv. sp. herein described from Baño de San Ignacio, Nuevo León, México.

MATERIAL AND METHODS.

Material examined is housed at the Fish Collection, Facultad de Ciencias Biológicas, Universidad Autónoma de Nuevo Leon (UANL, Leviton et al., 1988), Monterrey, and appears under catalog number, number of specimens, SL as minimum to maximum in mm, locality, basin, state, country, collectors, collecting dates and identifier person.

Meristic and morphometric data (in thousandths of SL) of examined specimens were analyzed with discriminant function (CDA) using SPSS (version 10.0), to identify characters that allow separation of samples between *F. philpisteri* and *F. grandis*. El CDA included 58 specimens from the Rio Bravo (n=20), Laguna Madre (n=20), and Baño de San Ignacio (n=18). Localities are marked in Fig. 1. Description of color of the new species was based on photos and material in isopropanol 50%.

Geographical, political and in general collection data were kept in their original language, Spanish or English.

Fundulus ***philpisteri*** sp. nv. (Fig. 3 A-B)

Synonymy. *Fundulus similis*, Meek (1904:105-106: Linares records only (Misidentification).

Material examined.

Holotype. UANL-16774; adult male, 67.9 mm LP, Baño de San Ignacio springs, Linares, Nuevo León, México, Río San Fernando (24° 52' 04"N y 99° 21' 07"); S. Contreras-Balderas y grupo de la Universidad Autónoma de Tamaulipas; 7 de Septiembre 2001.

Paratypes. UANL 15031 (26: 28-83.7 mm LP), same data as holotype, from this lot, male and female were

deposited at the following institutions: ENCB-IPN, TNHC, UMMZ, USNM, and UABC. UANL 9031(1: 63.4 mm LP) Manantial Baño de San Ignacio Linares Nuevo León, México. Colectores: S. Contreras-Balderas y A. Contreras-Arquieta; 6 agosto, 1988. UANL 11146 (5: 31.6-37.3 mm LP), S. Contreras-Balderas, M. L. Lozano-Vilano, M. E. García-Ramírez, y A. J. Contreras-Balderas, 12 octubre 1992. UANL-16147 (1: 56.1) Manantial Baño de San Ignacio Linares Nuevo León, México. M. L. Lozano-Vilano, A. J. Contreras-Balderas, Jorge A. Contreras-Lozano y J. E. Lozano-Vilano, 23 julio 2004.

Non-Type material. Specimens possibly representing this same species: UANL-665 (4: 40-53) Río Camacho en Hualahuises, Nuevo Leon, Mexico. Colectores: Salvador Contreras, J. Cano, A. Díaz, M. Landeros y A. G. Mtz, 3 de octubre de 1966. UANL-1150 (1:55) La Peña Colorada 18 km al NSW de Hualahuises. Colector: J.M Torres, abril 5 de 1971. UANL- 2200 (1:43) Río Camacho al WW de Linares. Colectores: Salvador Contreras y Gpo FCB, junio 12 de 1975. UANL- 2192 (10: 26-67) Río Pablillo al SE de Linares. Colectores: Salvador Contreras y Gpo FCB, 12 de junio de 1975. UANL- 2351 (6: 40-55) Río Pablillo al SE de Linares. Colectores: Salvador Contreras y Gpo FCB, 29 de julio de 1976. UANL-13612 (9: 39-56) Laguna de Labradores. Colectores: Salvador Contreras A. y Ana Espinoza, 1985. UANL-13616 (19: 43-53) Laguna de Labradores. Colectores: Alberto Conteras A., S. Sánchez y J. Luis Leyva, 23 de abril de 1985.

Diagnosis. *Fundulus* ***philpisteri*** nv. sp., is separable from its closest relatives by the following combination of characters: lateral bars 10-18, usually several pairs joined above in inverted Vs or Us shapes; head profile rounded, mouth opening slightly supraterminal; body with predorsal profile strongly convex. Proportions in SL: large head, 2.8-3.1; dorsal base, 7.0-8.8; snout – anal origin, 1.2-1.5; anal origin - hypural, 2.7-3.3; caudal peduncle length, 3.9-4.7; post-dorsal length, 2.8-3.1; dorsal origin - post anal end, 4.4-5.6. In head length: pectoral length, 1.7-2.2; pelvic length, 2.5-3.0; pectoral base 4.0-5.7

Description. General shape of male and female are shown in Fig. 3 A-B. Morphometric characters of holotype and 18 paratypes of *Fundulus* ***philpisteri*** nv. sp. Are presented in Tables 1-2, with those of holotype in bold. Both sexes: with wide interorbital space and gular bar; eye big, almost at the top of a squarish head; mandible big and strongly projected upward; rounded; dorsal fin insertion opposite to anal origin, reaching half on the caudal peduncle; pectorals inferior, inserted behind opercle, head scales regular. Males with more robust body, deeper than females; nuptial tubercles on dorsal and anal fins; dorsal fin long, highly pigmented posteriorly, with clear dots along membranes; pectoral margins rounded, its tip reaching or passing pelvic fin insertion, and extending to anus; dorsal fin extending back to 2/3 of caudal peduncle. Females less robust and deep than males; pelvic fins not reaching anus; dorsal fin extending just to the middle of caudal peduncle.

Meristics of 18 paratypes of *Fundulus* ***philpisteri*** are as follows (holotype in parenthesis): Fin rays: dorsal 10-11(10); anal 9-11 (10); pectorals 13-18 (16); pelvics 5-6 (6); caudal 17-20 (18). Scales: lateral line 32-34 (32); dorsal to anal 12-14 (13); dorsal to pelvic insertion 12-14 (13); predorsals 20-24 (21); around caudal

peduncle 19-21 (21); gill rakers 12-15 (9); head pores: mandibulars 5-5 (5-5); cephalic 8-9 (8-8), lachrymals 4-4 (4-4); preoperculars 7-8 (7-7).

Biometric Analysis. Thirty three biometric variables on 18 specimens of *F.* ***philipsteri*** and 40 of *F. grandis* were compared through Canonical Discriminant Analysis. Values of Wilk's Lambda varied from 0.007 to 0.391, interpreted as firm discrimination between species, with an F approximately = 130.336, $p<0.000$. Table of Classification shows that 98.3% of specimens examined were correctly assigned to their respective populations as *F. philpisteri* or *F. grandis*. Canonical function 1 explained 72.1% of total variation, while functions 2 and 3 gave 20.5% and 7.4% separation, respectively. The most significant morphometrical characters for canonical function 1 were DO, 1.711; DP1, 1.441; PDPA, 0.833; PDA, -0.685; and BP1, -0.658, whereas for function 2 were PDH, 0.789; LM1, -0.787; and LC, -0.779.

Results of morphological analysis are detailed in Table 1. Figure 2 illustrates simple separation of the involved populations, showing the notable difference between *F.* ***philpisteri*** and *F. grandis*.

Comparison. *Fundulus grandis* (Fig.3 C-D). Body compressed; mandible small, upturned; dorsal fin long, with clear dots posteriorly; with angular profile; eyes smaller than snout; high on head sides; dorsal fin opposed to anal origin; top head scales irregular pectorals inferior, inserted behind opercle; pelvic fins do not reach anus; head scales irregular. Male dorsal fin extends over ½ of caudal peduncle. Females with compressed body, less deep than males; anal fin falling short of middle point of caudal peduncle.

Color in alcohol. Males with well pigmented body dorsally and yellowish in posterior half: dorsal, anal and caudal fins with clear dots. Body bars conspicuous and better marked in young than in adults. Females with head and body well pigmented anteriorly, somewhat yellowish with metallic luster. Ten to 18, mostly splitting in 2 and joined above in Us and Vs shapes.

Sexual dimorphism. Males generally with dorsal, anal and pectoral fins longer than on females, females with shorter fins, presenting a membranous sac extending to the third or fourth anal ray.

Habitat and Associates. The marsh Baño de San Ignacio is the lowest intermontane valley located 22 km E. from municipality of Linares N. L, in the physiographical subprovince of plains and hills (SPP, 1985). It covers a surface 8 km. long in a East-West position, and a width of 800 m. Average altitude of the valley floor is 250 masl (Barbarín et al., 1988). It is located in a zone of transition between climate types (A)C(Wo) and BSI(h¨)hw, following the climate classification of Koeppen modified by Garcia (1973). In the region there are the formations Mendez and San Felipe, and there are terraces composed of quaternary gravels of the Reynosa conglomerate. The local fish assemblage of *Fundulus* ***philpisteri*** is composed of the local endemic *Cyprinodon bobmilleri*, and *Astyanax mexicanus*, *Gambusia speciosa*, *Poecilia formosa* and *Herichthys cf. cyanoguttatus* (under study). The locality is a big thermal spring, rich in sulphur compounds. The main spring has an area with a width of 20 m and depth 1.4 m (Lozano-Vilano and Contreras-Balderas, 1999).

Etymology. The specific epithet ***philpisteri*** is patronymic for Edwin Philip "Phil" Pister, in recognition to his dedication to study and teaching of ichthyology, especially in regard of his magna opus in divulgation

of knowledge and philosophy of conservation of the desert fishes and their ecosystems.

Distribution. *Fundulus* ***philpisteri*** nv. sp. is an endemic species known only from Baño de San Ignacio and nearby springs, Linares, N. L., México. (24° 52´04"N y 99° 21´07") Río San Fernando basin.

Comparative materials. *Fundulus grandis*. MATERIAL EXAMINED: Río Bravo: UANL 2138 (34:35.2-71.0) Presa Falcón cerca de Nueva Cd. Guerrero, Salvador Contreras y Gpo. de Fac. de Biología, 29 julio de 1975. UANL 1523 (4:31.3-48.4) Presa Marte R. Gómez, 6 km. NNW de Comales, S. Contreras B. y Gpo. FCB, 24 de Sept. 1973. UANL 6154 (25:50.6-61.3) Río Bravo en Miguel Alemán, S. Contreras B. y Gpo. FCB, 30 de julio de 1982. UANL 6097 (1:31.6) Río Bravo en Matamoros, S. Contreras y Gpo. FCB, 28 de julio de 1982. UANL 5320 (9:61.7-95.5) Río San Juan en el Salto, 6 km NE de los Aldabas, N.L. C. Moisés Villarreal T., MEOM y JFLM, 3 de mayo de 1982. UANL 11454 (13:66.5-81.4) Río San Juan bajo puente Carr. México 2 km W de Camargo, Armando Contreras, Pedro Julio Rodríguez y J. A. Bernal, 1 de abril, 1977. UANL 2126 (1:35.0) Boca del Río Bravo, Salvador Contreras y Gpo. FCB, 28 de Julio de 1975. UANL 4181 (1:47) Río Alamo en la desembocadura al Río Bravo, Gorgonio Ruíz Campos, HCS, HTM, DJCR, 18 de Diciembre, 1981. UANL 6128 (3:21.6-47.0) Río Bravo en Parque Anzaldúas. Salvador Contreras B., Salvador Contreras A., Arturo Contreras y Alberto Contreras, 29 de julio 1982. LAGUNA MADRE (Tamaulipas): UANL 7936 (7:57.4-83.8) Punta de la Media Luna (Not San Luis Potosi). Araceli Gómez Soto, Carmen Rosario, JRC, 24 de mayo de 1986. UANL 10466 (18:37.2-50.8) Laguna Almagre. Salvador Contreras, Araceli Gómez-S. y Gpo. Biol. de Campo, 8 de Sept. de1990.

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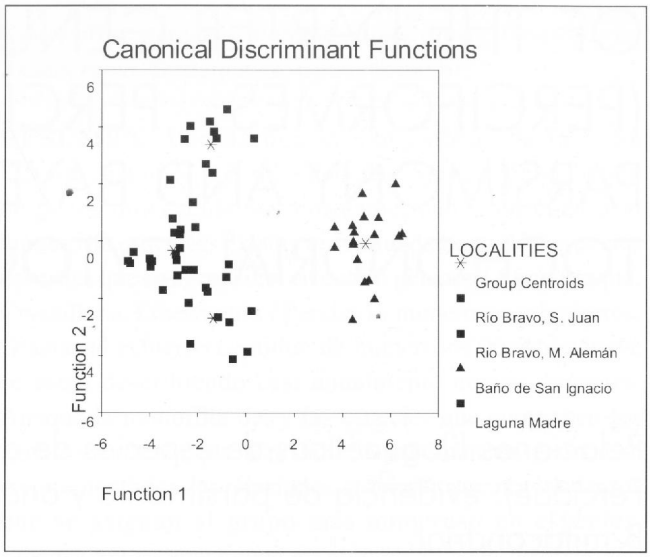
Table 1. Comparison of morphometric characters of *F. **philpisteri*** nv. sp.; H = holotype, N = Number of specimens. Min and Max and X = mean in parenthesis are morphometric measurements in thousandths of the Standard Length

			Min	Max	X
Standard Length	68.8		31.6	82.8	(57)
Head Length	355		316	355	(336)
Predorsal Length	685		641	717	(681)
Posdorsal Length	350		326	382	(353)
Mouth Width	113		76	138	(108)
Eye Width	77		68	103	(85)
Interorbital Width	134		122	164	(140)
Preorbital Length	105		82	114	(101)
Postorbital Length	183		154	184	(171)
Pupil Width	35		29	46	(39)
Upper Jaw length	131		101	140	(116)
Dorsal Fin Base	141		115	146	(129)
Depressed Dorsal Fin	269		193	257	(222)
Dorsal Fin origin- Anal Fin Origin	249		202	256	(232)
Postdorsal Fin- Anal fin Origin	237		197	247	(225)
Dorsal Fin Origin- Postanal Fin	241		199	229	(215)
Postdorsal Fin-PostAnal Fin	183		158	180	(167)
Dorsal Fin Origin- Pectoral Fin	398		345	439	(394)
Posdorsal-Hypural Base	365		202	366	(285)
Anal Base	97		72	115	(99)
Snout-Anal Fin Origin	755		652	755	(698)
Depressed Anal Fin	172		161	247	(198)
Origin Anal Fin-Hypural Base	333		287	370	(335)
Caudal Peduncle Length	221		212	271	(237)
Anal Origin-Pelvic Fin Base	207		140	220	(179)
Body Deph	277		236	284	(266)
Caudal Peduncle Depth	158		139	166	(151)
Pectoral Fin Base	77		61	79	(68)
Pectoral Fin Length	170		155	204	(176)
Pelvic Fin Length	129		110	131	(121)
Snout-Pelvic Fin Base	549		496	561	(530)
Pectoral Fin Base-Pelvic F. Length	238		188	275	(231)
Pelvic Fin Base-Postdorsal F Base	376		304	381	(349)

Table 2. Comparison between *Fundulus* ***philpisteri*** nv. sp. and *F. grandis*. TSL= times in Standard Length; TCL= times in Cephalic Length.

	F. philpisteri	*F.grandis*
1. Cephalic Length in TSL	2.8 (3.0) 3.1	3.0 (3.2) 3.4
2. Dorsal Fin Base in TSL	7.0 (7.8) 8.8	6.2 (7.0) 7.9
3. Snout-Anal Fin Origin in TSL	1.2 (1.4) 1.5	1.5 (1.5) 1.6
4. Origin Anal Fin-Hypural Base in TSL	2.7 (3.0) 3.3	2.4 (2.6) 2.8
5. Caudal Peduncle Length in TSL	3.9 (4.2) 4.7	3.4 (3.8) 4.1
6. Posdorsal Length in TSL	2.8 (2.8) 3.1	2.5 (2.6) 2.7
7. Dorsal Fin Origin-Postanal Fin in TSL	4.4 (4.7) 5.6	3.9 (4.2) 4.5
8. Pectoral Fin Length in TCL	1.7 (1.9) 2.2	1.5 (1.7) 1.7
9. Pelvic Fin Length in TCL	2.5 (2.8) 3.0	2.3 (2.3) 2.4
10. Pectoral Fin Base in TCL	4.0 (4.9) 5.7	3.9 (4.1) 4.2
11. Depressed Anal Fin in TCL	1.3 (1.6) 2.1	1.3 (1.3) 1.4



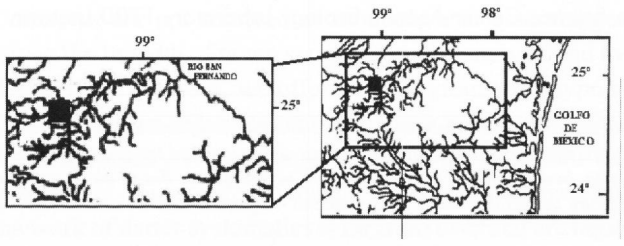


Figure 1.- Type locality (square) of *Fundulus philpisteri,* Baño de San Ignacio, (24° 52´04"N and 99° 21´07"W) San Fernando River Tamaulipas, México.

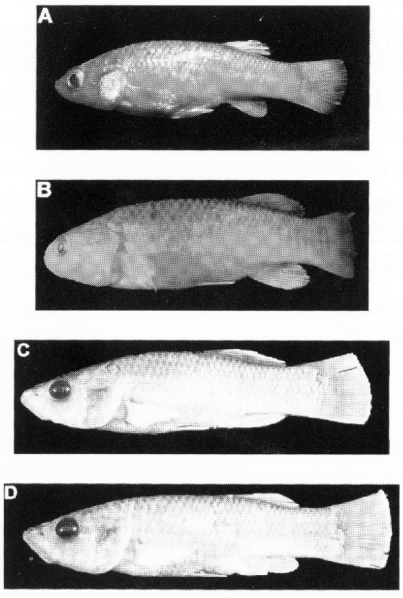


Figure 3. *Fundulus* ***philpisteri*** nv. sp. From Baño de San Ignacio, Nuevo León México, UANL 15031. A Male 68.8 mm SL. B female 47.9 mm SL; and *Fundulus grandis* Baird & Girard. UANL 7636. C. Male 74.4 mm SL. D. female, 89.4 mm SL. From Laguna de la Media Luna (no San Luis Potosi), Laguna Madre, Tamps., México. Photos José Luis Gibaja.