

Range extension of helminth parasites of *Profundulus* spp. (Teleostei: Profundulidae) from southern Mexico and Central America

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ABSTRACT: In this paper we provide new records and range extensions for four intestinal helminth species parasites of profundulid fishes. Our data extends the known geographical distribution of these species from Guerrero, southern Mexico to nuclear Central American countries and southward to Honduras. Three of the helminth species here studied are specific to profundulids, the digenean *Paracreptotrema profundulusi* and the nematodes *Spinitectus humbertoi* and *Rhabdochona salgadoi*. Our data confirm that these species are distributed only with profundulids and within the geographical range of this fish family. Therefore, the data presented in this study partially contributes to empirically support the idea that each fish family has “its own” suite of parasites that are not shared with other fish families, and that freshwater fish parasites are distributed within the limits of the range of the fish family.

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The knowledge about taxonomic composition and geographical distribution of helminth parasites of freshwater fishes of Mexico has undergone a dramatic development during recent years (Luque and Poulin 2007; Scholz and Choudhury 2014). An accepted generalization about the helminth parasite fauna of freshwater fishes of Mexico states that the assemblages of helminth parasites of each fish family includes a suite of specialist helminths, and that this suite is characteristic for each given family (Vidal-Martínez and Kennedy 2000; Pérez-Ponce de León and Choudhury 2005; Salgado-Maldonado *et al.* 2005; Salgado-Maldonado 2006, 2008). Although generalist helminths can be shared between non related host species, the specialist helminths are not shared between fish species of different families. The helminth fauna of some freshwater fish families such as Cichlidae, Poeciliidae and Goodeidae, are relatively well known (Salgado-Maldonado 2006; Salgado-Maldonado and Quiroz-Martínez 2013 and references cited therein). But other freshwater fish families such as Profundulidae have been seldom examined for parasites.

The cyprinodontid family Profundulidae Hoedeman & Bronner (Teleostei) is a lineage with a limited geographical distribution that extends from southern Mexico to Central America (Miller 1955; Matamoros and Schaefer 2010; Matamoros *et al.* 2012); it is a low diversity group, and comprises a single genus *Profundulus* Hubbs,

1924 which currently has eight valid species (Matamoros and Schaefer 2010; Matamoros *et al.* 2012). *Profundulus* is one of the distinctive elements of the endemic fauna of Central America and Mexico (Miller 1955). The species of *Profundulus* originated in Central America have probably been in the region since the Pliocene and perhaps even the Miocene (Miller 1955). The family is distributed from the State of Guerrero, Mexico to the Río Nacaome in the Honduran Pacific versant, and from the Petlapa River sub-basin (Río Papaloapan drainage basin) in the boundary between the states of Oaxaca and Puebla to the Río Ulúa, Honduras on the Atlantic slope (Miller 1955; Martínez-Ramírez *et al.* 2004; Matamoros *et al.* 2012). Most species of *Profundulus* have restricted distributional ranges they are found only in a few adjacent river systems (Matamoros *et al.* 2012). These fishes are small, generally between 41 to 103 mm length (Matamoros *et al.* 2012) (Figures 1–5). Species of this genus typically inhabit mountain streams; they are found at altitudes ranging from 10 to 2300 m above sea level (a.s.l.) (Martínez-Ramírez *et al.* 2004), but they are most abundant at altitudes between 300 to 1500 m a.s.l. Very often, at higher elevations they constitute the only native fishes in Central American streams.

Two congeneric digenetic species have been recorded in fishes of this genus: *Paracreptotrema blancoi* Choudhury, Pérez, Brooks & Daverdin, 2006, and *Paracreptotrema profundulusi* Salgado-Maldonado, Caspeta-Mandujano,

& Martínez-Ramírez, 2011 (see Salgado-Maldonado *et al.* 2011). Additionally, three nematode species have also been described from profundulids: *Spinitectus mariaisabelae* Caspeta-Mandujano, Cabañas-Carranza & Salgado-Maldonado, 2007; *Spinitectus humbertoi* Caspeta-Mandujano & Moravec, 2000, and *Rhabdochona salgadoi* Caspeta-Mandujano & Moravec, 2000.

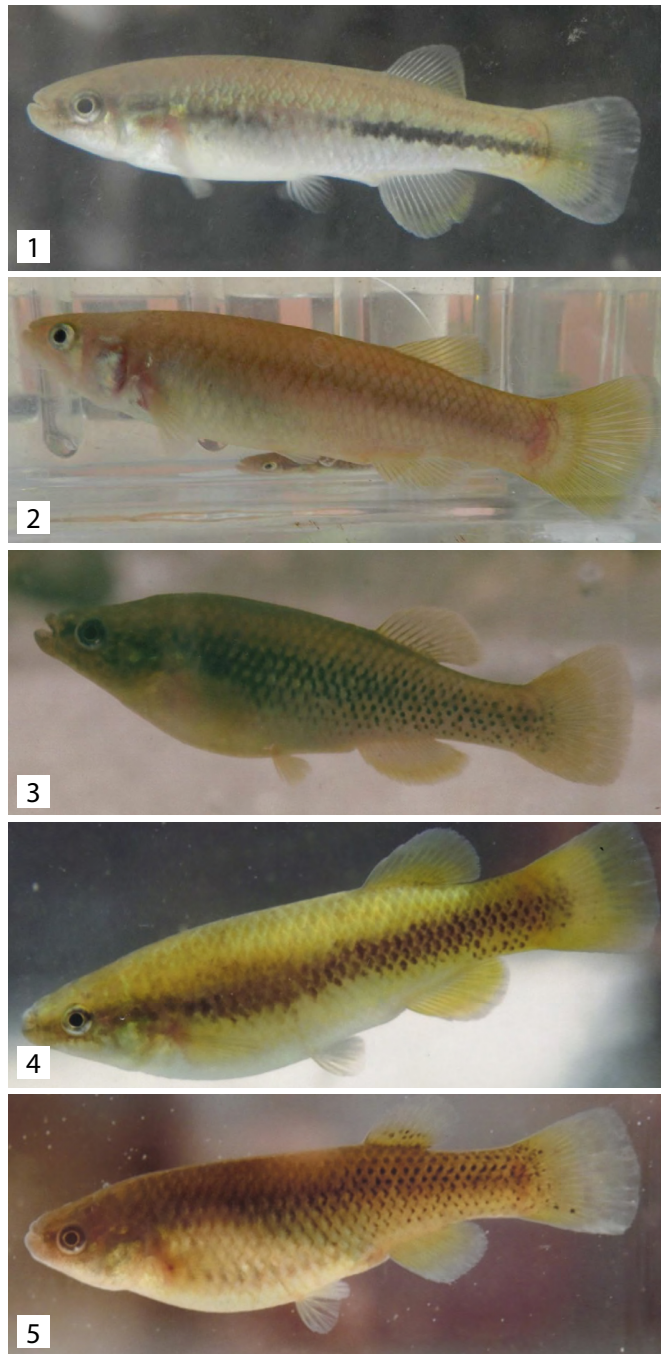
The aim of this contribution is to report new localities that represent range extensions for four species of helminth parasites of *Profundulus* spp. These new records are the result of survey work performed in the Mexican states of Guerrero, Oaxaca, and Chiapas, as well as in the

Central American countries of Guatemala, El Salvador and Honduras.

As part of a study of helminth parasites of profundulid fishes of Mexico and Central America, 435 *Profundulus* spp. were examined for helminths during February, March, and May 2013 in 14 Mexican localities, and 215 additional *Profundulus* spp. were examined in May, 2014 from nine localities in Central American countries (Table 1; Figures 6–9). Here, we treat *Profundulus balsanus*, *Profundulus* sp. 1 and *Profundulus* sp. 2 as three nominal taxa, based on the molecular results of Doadrio *et al.* (1999) in which they determined that these groups were distinctive organismal taxonomic units, however, we recognize that more taxonomic work needs to be done in order to formally elevate these taxa to the species level.

Fishes were caught using an electrofishing device and deep-nets, transported live to the laboratory and examined for helminths within 24 hours post-capture. Fishes were examined under a dissecting microscope, and helminths were fixed and processed using standard helminthological procedures (Salgado-Maldonado *et al.* 2005). Vouchers of the helminth species were deposited in the “Colección Nacional de Helminthos (CNHE)”, at the Instituto de Biología, Universidad Nacional Autónoma de México.

Details for all localities (*i.e.*, latitude and longitude, and



FIGURES 1–5. 1: *Profundulus guatemalensis* from Río Nil, Guatemala; total length of the specimen 75 mm (photograph WM). 2: *Profundulus portillorum* from Ojojuna, Honduras, total length of specimen 36 mm (photograph WM). 3: *Profundulus* sp. 2 Río Chico, Oaxaca, México (photograph EMR). 4: *Profundulus punctatus* from Río Los Perros, Oaxaca, México (photograph EMR). 5: *Profundulus oaxacae* from Río Grande, Oaxaca, México (photograph EMR).

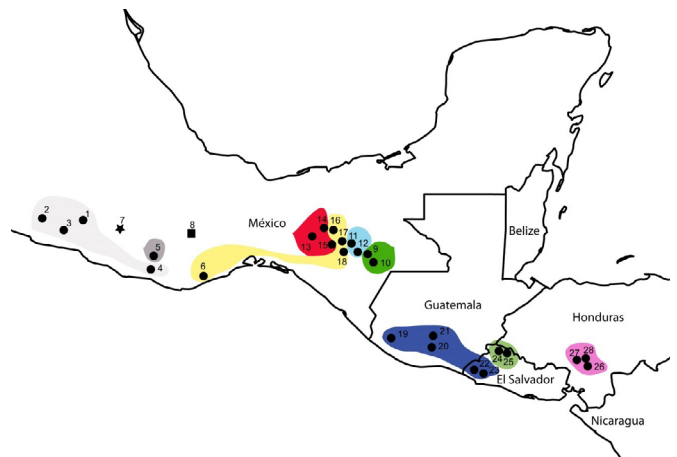


FIGURE 6. Map of Central America and Mexico depicting sampling localities. Numbers in sampling points are correlated with numbers in Table 1. Light gray = *P. balsanus*, dark gray = *P. oaxacae*, pale yellow = *P. punctatus*, green = *P. candalarius*, blue = *P. hildebrandi*, red = *P. labialis*, purple = *P. guatemalensis*, light green = *P. kreiseri*, pink = *P. portillorum*, the dark start represent *Profundulus* sp. 1 and the dark square *Profundulus* sp. 2.



FIGURE 7. Photograph of the habitat of *Profundulus guatemalensis* río Nil, Guatemala.

TABLE 1. Study sites and date of collections (first column, correlative number of localities as located in the map Figure 6).

	SPECIES	LOCALITY	COORDINATES	ALTITUDE (m)	DATE
1	<i>Profundulus balsanus</i>	Río La Laca (Río Papagayo basin), Guerrero	17°14'09.3" N, 98°39'55.7" W	1394	March 2013
2	<i>Profundulus balsanus</i>	Río Cahoapan, Guerrero	17°16'37.8" N, 99°35'04.7" W	422	March 2013
3	<i>Profundulus balsanus</i>	Río Tamarindo (Río Nexpa basin), Guerrero	17°00'36.5" N, 99°06'0.8" W	417	March 2013
4	<i>Profundulus balsanus</i>	Río del Aguacate, (Río Manialtepec basin) Oaxaca	16°07'19" N, 97°8'22.8" W	482	Feb 2013
5	<i>Profundulus oaxacae</i>	creek Los Sabinos (Río Atoyac-Verde basin), Oaxaca	16°25'39.9" N, 97°4'28.9" W	1106	Feb 2013
6	<i>Profundulus punctatus</i>	Río Chacalapa (Río Astata basin), Oaxaca	15°55'54.8" N, 95°56'00.3" W	207	Feb 2013
7	<i>Profundulus</i> sp. 1	Río Chicaguaxtla (Río Atoyac-Verde basin), Oaxaca	17°03'30.30" N, 97°51'32.52" W	867	Feb 2013
8	<i>Profundulus</i> sp. 2	Río Chico (Río Atoyac-Verde basin), Oaxaca	16°55'34.50" N, 96°12' 27.42" W	1316	Feb 2013
9	<i>Profundulus candalarius</i>	Chanel at Amatenango del Río (Río Grijalva basin), Chiapas	16°31'22.2" N, 92°25'10.7" W	1924	May 2013
10	<i>Profundulus candalarius</i>	Río Grande de Comitán, Chiapas	16°16'49.9" N, 92°07'21.1" W	1563	May 2013
11	<i>Profundulus hildebrandi</i>	Creek at ECOSUR. San Cristóbal de las Casas, Chiapas	16°42'27.3" N, 92°36'54.8" W	2134	May 2013
12	<i>Profundulus hildebrandi</i>	Creek at Teopisca, Chiapas	16°33'13.7" N, 92°28'34.9" W	1794	May 2013
13	<i>Profundulus labialis</i> and <i>Profundulus punctatus</i>	Río at rancho San Antonio, Chicoasén, Chiapas	16°58'30.9" N, 93°03'44.7" W	374	May 2013
14	<i>Profundulus labialis</i>	Creek Tres Picos, Copainalá, Chiapas	17°03'28.3" N, 93°11'50.7" W	325	May 2013
15	<i>Profundulus labialis</i> and <i>Profundulus punctatus</i>	Río Nandalumi, Chiapa de Corso, Chiapas	16°43'18.4" N, 92°58'52.4" W	486	May 2013
16	<i>Profundulus punctatus</i>	Arroyo Ojo de Agua, El Canelar, La Frailesca, Chiapas	16°32'08" N, 92°55'02.5" W	466	May 2013
17	<i>Profundulus guatemalensis</i>	Río Nil, Guatemala	14°33'54.4" N, 91°43'25.4" W	237	May 2014
18	<i>Profundulus guatemalensis</i>	Río El Cantil (Río Guacalate basin), Guatemala	14°21'22.6" N, 90°48'30.4" W	563	May 2014
19	<i>Profundulus guatemalensis</i>	Creek El Platanar (Río Guacalate basin), Guatemala	14°36'58.6" N, 90°46'37.9" W	1628	May 2014
20	<i>Profundulus guatemalensis</i>	Río Cauta (Río Lempa basin), El Salvador	13°46'42.6" N, 89°51'40.8" W	455	May 2014
21	<i>Profundulus guatemalensis</i>	Río Cauca (Río Lempa basin), El Salvador	13°46'41.6" N, 89°46'41.67" W	450	May 2014
22	<i>Profundulus kreiseri</i>	Quebrada Los Tecomates (Río Lempa basin), El Salvador	14°18'11.3" N, 89°09'40.8" W	983	May 2014
23	<i>Profundulus kreiseri</i>	Río Nonoalpa (Río Lempa basin), El Salvador	14°17'23.2" N, 89°09'10.7" W	1040	May 2014
24	<i>Profundulus portillorum</i>	Creek at Ojojona, Fco. Morazán (Río Nacaome basin), Honduras	13°55'43.7" N, 87°17'40" W	1391	May 2014
25	<i>Profundulus portillorum</i>	Lepaterique, Fco. Morazan (Río Nacaome basin), Honduras	14°03'42.9" N, 87°27'58.6" W	1462	May 2014
26	<i>Profundulus portillorum</i>	Lepaterique, Fco. Morazan (Río Nacaome basin), Honduras	14°04'14.4" N, 87°25'56.9" W	1656	May 2014
Records from localities listed below were taken from literature (Salgado-Maldonado <i>et al.</i> 2011):					
	<i>Profundulus balsanus</i>	Piedra Labrada (Río Papagayo basin), Guerrero	18°58'54" N, 99°14'12" W	419	
	<i>Profundulus balsanus</i>	Río La Soledad Carrizo (Río Atoyac- Verde basin), Oaxaca	16°25'0.4" N, 97°40'12.9" W	733	
	<i>Profundulus balsanus</i>	Río San José de las Flores (Río Atoyac- Verde basin), Oaxaca	16°24'21.5" N, 97°44'22.6" W	619	
	<i>Profundulus balsanus</i>	Río Santa Cruz Flores Magón (Río Atoyac- Verde basin), Oaxaca	16°21'6.1" N, 97°45'38.3" W	275	
	<i>Profundulus balsanus</i>	Río Pichuaca (short river opening to Pacific Ocean), Oaxaca	16°05'34.2" N, 97°24'18.1" W	139	
	<i>Profundulus balsanus</i>	Río La Reforma (Río Manialtepec basin), Oaxaca	16°08'33.5" N, 97°08'41.6" W	517	
	<i>Profundulus balsanus</i>	Río Pueblo Viejo (Río Colotepec basin), Oaxaca	16°06'22.3" N, 97°03'47.8" W	522	
	<i>Profundulus balsanus</i>	Río Santa María Huatulco (Río Colotepec basin), Oaxaca	15°50'14.2" N, 96°19'30.8" W	199	
	<i>Profundulus oaxacae</i>	Río Macuta, (Río Atoyac-Verde basin), Oaxaca			
	<i>Profundulus punctatus</i>	Ojo de Agua Creek (Río Tehuantepec basin), Oaxaca	16°13'38.6" N, 95°49'36.6" W	772	
	<i>Profundulus punctatus</i>	Río Templo (Río Tehuantepec basin), Oaxaca	16°53'56.3" N, 96°09'57.3" W	1152	



FIGURE 8. Photographs of the habitat of *Profundulus guatemalensis* creek El Platanar, Guatemala.



FIGURE 9. Photograph of the habitat of *Profundulus guatemalensis*, Río El Cantil, Guatemala.

drainage basins) referred for each data record are found in Table 1.

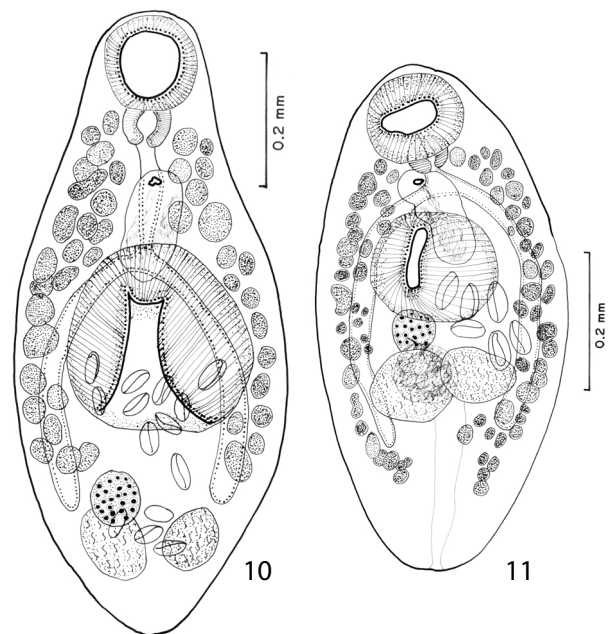
Paracreptotrema blancoi Choudhury, Pérez-Ponce de León, Brooks & Daverdin, 2006

The specimens were identified as *P. blancoi* according to the original description (Choudhury *et al.* 2006), and the work by Salgado-Maldonado *et al.* (2011). These digenea have a spinose body, widest in midregion, with rounded ends, oral sucker and acetabulum well developed, with oral sucker smaller than ventral sucker; intestinal bifurcation in forebody, caeca blind, reaching around testes, two testes symmetrical; well developed cirrus sac containing sacciform seminal vesicle, pars protatic, ejaculatory duct, and unarmed cirrus; median genital pore located near intestinal bifurcation; vitellarium follicular extending from the level of esophagus to level of testes; excretory vesicle

I-shaped, in hindbody (Figure 10). Measurements of 10 gravid specimens: total length 0.505–0.982 (mean 0.732) mm, maximum width 0.262–0.445 (mean 0.341) mm, oral sucker length $\times$ width 0.095–0.120 (0.116) $\times$ 0.107–0.120 (0.122) mm, acetabulum length $\times$ wide 0.217–0.287 (0.239) $\times$ 0.212–0.287 (0.239) mm, pharynx length $\times$ wide 0.042–0.080 (0.056) $\times$ 0.050–0.080 (0.065) mm, eggs ($n = 15$ measured) 50–64 (56) $\times$ 25–36 (29) μ .

Paracreptotrema blancoi was first recorded from poeciliids (Teleostei, Poeciliidae) in Costa Rica by Choudhury *et al.* 2006. Salgado-Maldonado *et al.* (2011) reported this species from profundulids from southern Mexico locations, including: from *P. balsanus* from the Río Papagayo, at Piedra Labrada, Guerrero; and Río La Soledad Carrizo, Río San José de las Flores, Río Santa Cruz Flores Magón, Oaxaca; and also from the Río Pichuaca, Río La Reforma, Río Pueblo Viejo, and Río Santa María Huatulco, Oaxaca. Specimens of *P. blancoi* were also found in *P. oaxacae* collected at Río Macuta, Oaxaca, and in *P. punctatus* collected Ojo de Agua Creek and Río Templo, Oaxaca.

New records: *Profundulus balsanus* Río Caohapán, and Río Tamarindo, Guerrero; Río del Aguacate, Oaxaca; *Profundulus oaxacae*, arroyo Los Sabinos, Oaxaca; *Profundulus punctatus*, Río Chacalapa, Oaxaca; Río Nandalumi, Chiapas; *Profundulus* sp. 2, Río Chico, Oaxaca; *Profundulus guatemalensis*, Río Nil, and Río El Cantil, Guatemala; *Profundulus kreiseri* Río Cauca, and Quebrada Los Tecomates, El Salvador. Voucher specimens, catalog number CNHE 9286.



FIGURES 10–11. 10: *Paracreptotrema blancoi*. Ex.: *Profundulus balsanus*, Río Caohapán, Guerrero. 11: *Paracreptotrema profundulusi* Ex.: *Profundulus oaxacae*, arroyo Los Sabinos, Oaxaca.

Paracreptotrema profundulusi Salgado-Maldonado, Caspeta-Mandujano & Martínez-Ramírez, 2011

Salgado-Maldonado *et al.* (2011) described *P. profundulusi* placing it in the family Allocreadiidae. The specimens collected during this survey were identified as *P. profundulusi* according to the original description. It is closely similar to *P. blancoi* as they share the generic structural diagnostic characteristics (see above). However,

the caeca extend beyond the testes in *P. profundulusi* and do not extend beyond the level of the testes in *P. blancoi*. In the same way, the vitelline follicles are denser and extend until post-testicular area in *P. profundulusi*, as opposed to *P. blancoi* where vitelline follicles reach only to anterior edge of the testes. Moreover, the uterus of *P. profundulusi* is mostly pretesticular, forming short transversal loops over the testes, well separated from posterior body end. On the contrary, the uterus of *P. blancoi* projects a loop between the testes, and in many specimens eggs can be observed at the posterior body end (compare Figures 10 and 11). Measurements of 10 gravid specimens: total length 0.725–0.775 (mean 0.758) mm, maximum width 0.357–0.387 (mean 0.367) mm, oral sucker length $\times$ wide 0.122–0.150 (0.133) $\times$ 0.147–0.160 (0.149), acetabulum length $\times$ wide 0.162–0.217 (0.189) $\times$ 0.175–0.237 (0.203), pharynx length $\times$ wide 0.045–0.050 (0.048) $\times$ 0.055–0.062 (0.056) mm, eggs (n = 14 measured) 50–67 (58.9) $\times$ 25–37 (29.2) μ .

Paracreptotrema profundulusi was first reported from the intestine of *Profundulus punctatus* from Río Templo, Oaxaca, and from *P. balsanus* from Ojo de Agua Creek, and Río San José de las Flores, Oaxaca.

New records: *Profundulus balsanus* Río Cahoapán, Guerrero; *Profundulus oaxacae* arroyo Los Sabinos, Oaxaca; *Profundulus punctatus*, Río Chacalapa, Oaxaca; *Profundulus* sp. 2, Río Chico, Oaxaca. Voucher specimens, catalog numbers CNHE 9287, 9288.

Spinitectus humbertoi Caspeta-Mandujano & Moravec, 2000

The specimens were identified as *S. humbertoi* according to the original description by Caspeta-Mandujano and Moravec (2000). They are small, whitish nematodes, having characteristic transverse denticulate rings of spines on the body. Rings of spines interrupted at anterior end of body by two lateral, one dorsal and one ventral longitudinal lines, dividing each ring into four distinctly separated dorsal and ventrolateral sectors. Rings of spines more or less regularly spaced. First ring consisting of a total of 36–38 spines, 8–10 spines placed in each of the four sectors, in both males and females. Cephalic end rounded, with two slightly elevated lateral pseudolabia. Excretory pore just posterior to the seventh ring of spines. Male, four pairs

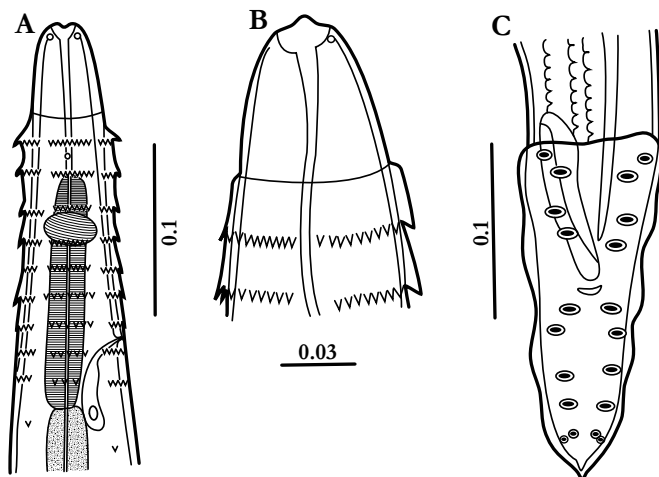


FIGURE 12. *Spinitectus humbertoi* Caspeta-Mandujano, Moravec, 2000. A. Anterior end. B. Anterior region, larger magnification. C. Posterior end of male, ventral view.

of preanal papillae arranged in two couples, six pairs of postanal papillae; left spicule slender, right spicule longer than wide. Length of males 2.96 to 3.20 mm, females 3.67 to 4.29 mm; eggs oval, smooth, containing larvae, 0.033 $\times$ 0.019 mm (Figure 12)

Spinitectus humbertoi, was first reported from *Profundulus labialis* from Río Papagayo, Guerrero (Caspeta-Mandujano and Moravec, 2000).

New records: *Profundulus balsanus* Río La Laca, Río Cahoapán, and Río Tamarindo, Guerrero; *Profundulus labialis* Arroyo Rancho San Antonio, Arroyo Tres Picos, and Río Nandalumi, Chiapas; *Profundulus punctatus*, Río Chacalapa, Oaxaca; Arroyo Rancho San Antonio, Chiapas; *Profundulus* sp. 1 Río Chicaguaxtla, Oaxaca; *Profundulus guatemalensis*, Río Nil, and Río El Cantil, Guatemala; *Profundulus kreiseri* Río Cauta, Río Cauca, and Río Nonoalpa, El Salvador. Voucher specimens, catalog number CNHE 9289.

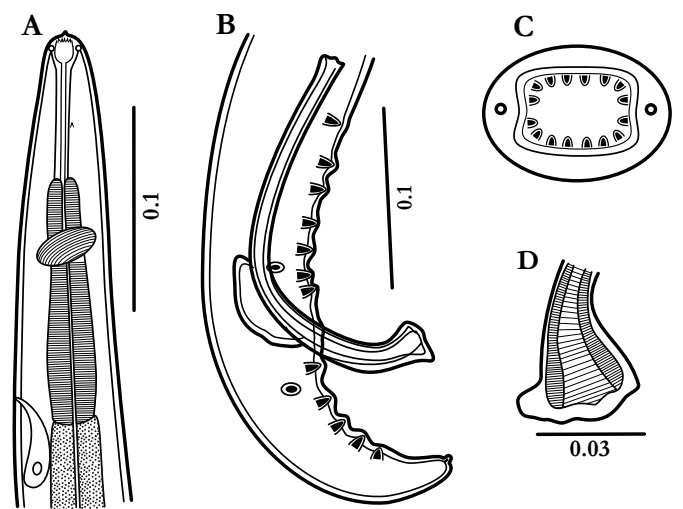


FIGURE 13. *Rhabdochona salgadoi*. Caspeta-Mandujano, Moravec, 2000. A. Anterior end. B. Posterior end of male, lateral view. C. Cephalic end, apical view. D. Distal tip of larger spicule.

Rhabdochona salgadoi Caspeta-Mandujano & Moravec, 2000.

The specimens were identified as *R. salgadoi* according to the original description by Caspeta-Mandujano and Moravec (2000). They are medium size nematodes with smooth cuticle. Oval mouth opening surrounded by four minute cephalic papillae and two lateral amphids. Prostom funnel-shaped, wide, with basal teeth, anterior margin of prostom armed internally with 16 teeth. Tail of both sexes conical. Male, anal papillae, six pairs, second pair lateral, remaining pairs subventral. Length of males 1.98–2.29 mm, females 3.33–4.08 mm; larvated eggs 0.029–0.033 $\times$ 0.016–0.019 mm surface of eggs smooth (Figure 13).

Rhabdochona salgadoi, was first reported from *Profundulus labialis* from Río Papagayo, Guerrero (Caspeta-Mandujano and Moravec, 2000)

New records: *Profundulus balsanus* Río del Aguacate, Oaxaca; Río La Laca, Río Cahoapán, and Río Tamarindo, Guerrero; *Profundulus candalaria* Río Grande de Comitán, Chiapas; *Profundulus labialis* Arroyo Rancho San Antonio, and Arroyo Tres Picos, Chiapas; *Profundulus oaxacae*, Arroyo Los Sabinos, Oaxaca; *Profundulus punctatus*, Río Chacalapa, Oaxaca; Arroyo rancho San Antonio, and Arroyo

Ojo de Agua, Chiapas; *Profundulus* sp. 1 Río Chicaguaxtla, Oaxaca; *Profundulus* sp. 2, Río Chico, Oaxaca; *Profundulus guatemalensis*, Río Nil, Guatemala; *Profundulus kreiseri* Río Nonoalpa, and Quebrada Los Tecomates, El Salvador; *Profundulus portillorum* Lepaterique, Honduras. Voucher specimens, catalog number CNHE 9290.

In this paper, we provide new records and range extensions for four intestinal helminth parasites species of profundulid fishes. Our data extends the geographically known distribution of these species from Guerrero, southern Mexico to nuclear Central American countries, reaching their southernmost distribution in the Río Nacaome in Honduras.

The digenean *P. blancoi* was recorded along *Profundulus* spp. subgenus *Profundulus* ("punctatus" group sensu Miller, 1955), including *P. balsanus*, *P. guatemalensis*, *P. kreiseri*, *P. punctatus*, and *P. oaxacae*, from rivers of South Mexico in the states of Guerrero, Oaxaca, and Chiapas, to Guatemala and El Salvador. *Paracreptotrema blancoi* was originally reported from a poeciliid fish from the Área de Conservación Guanacaste in the Pacific versant of Costa Rica (Choudhury et al. 2006). This original and only record in a poeciliid fish prevents the qualification of this species as a specialist of profundulids. Therefore, the geographic distribution of *P. blancoi* extends from Guerrero, Mexico, southward to the Pacific slope of Costa Rica. The congeneric species *P. profundulusi* is known only from profundulids; it is indeed a specialist of this family as far as the available or current data has shown. Based on our results, this species is geographically limited to southern Mexico, specifically to Guerrero and Oaxaca. It parasitizes only *Profundulus* species of the subgenus *Profundulus* ("punctatus" group), including *P. balsanus*, *P. oaxacae*, *Profundulus* sp. 2 and *P. punctatus*.

As far as the current available data has demonstrated both nematode species are strictly specific to profundulid fishes: *Spinitectus humbertoi* parasitizes *P. balsanus*, *P. labialis*, *P. guatemalensis*, *P. kreiseri*, *P. punctatus*, and *Profundulus* sp. 1 from the south Mexican states of Guerrero, Oaxaca, and Chiapas to Guatemala and El Salvador. The species with the most widespread distribution range recorded in our sampling was *R. salgadoi* that was present in most profundulid species examined including *P. balsanus*, *P. candalariai*, *P. guatemalensis*, *P. kreiseri*, *P. labialis*, *P. oaxacae*, *P. portillorum*, *P. punctatus*, and *Profundulus* sp. 1 and *Profundulus* sp. 2 extending its geographical distribution along the entire range of the host fish family, from Guerrero, Oaxaca and Chiapas in Mexico to El Salvador and Honduras.

Concerning the helminth parasites of freshwater fishes of Mexico, each fish family has its own assemblage of specialist parasites, that are not shared with fishes from other families; these specialist species disperse along with the host family (Salgado-Maldonado, 2006, 2008), meaning that the suite of helminths characteristic to each fish family, is geographically distributed within the limits of the range of the distribution of the fish family. Data presented in this work partially contributes additional empirical support to these ideas, because, three of the helminth species here studied are specialist of profundulids, the trematode *P. profundulusi* and the nematodes *S.*

humbertoi and *R. salgadoi*. Our data clearly show that these species are distributed with the Profundulidae, and within the geographical range of this fish family. These specialist species seem to use species *Profundulus* available in a given locality, but no other sympatric fish species. However, current available data does not allow the classification of the other digenetic species, *P. blancoi*. During the present survey, this species was recorded only from profundulid fish, even when sympatric poeciliids, as for example *Poeciliopsis pleurospilus*, or *Poecilia mexicana*, were examined from the same locality.

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