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Two new species of *Urocleidoides* Mizelle et Price, 1964 (Monogenoidea) from the gill lamellae of profundulids and poeciliids from Central America and southern Mexico

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Abstract: During investigations of gill ectoparasites (Platyhelminthes) parasitising freshwater fish from Central America (Guatemala, Honduras, El Salvador and Panama) and southeastern Mexico (Guerrero, Oaxaca and Chiapas), the following dactylogyrid monogenoidean were found: *Urocleidoides simonae* sp. n. from *Profundulus punctatus* (Günther) (type host), *Profundulus balsanus* Ahl, *Profundulus guatemalensis* (Günther), *Profundulus kreiseri* Matamoros, Shaefer, Hernández et Chakrabarty, *Profundulus labialis* (Günther), *Profundulus oaxacae* (Meek), *Profundulus* sp. 1 and *Profundulus* sp. 2 (all Profundulidae); *Urocleidoides vaginoclaustroides* sp. n. from *Pseudoxiphophorus bimaculata* (Heckel) (type host) and *Poeciliopsis retropinna* (Regan) (both Poeciliidae); and *Urocleidoides vaginoclaustrum* Jogunoori, Kritsky et Venkatanarasaiah, 2004 from *P. labialis*, *Profundulus portillorum* Matamoros et Shaefer and *Xiphophorus hellerii* Heckel (Poeciliidae). *Urocleidoides simonae* sp. n. differs from all other congeneric species in having anchors with well-differentiated roots, curved elongate shaft and short point. *Urocleidoides vaginoclaustroides* sp. n. most closely resembles *U. vaginoclaustrum*, but differs from this species mainly in the shape of its anchors (i.e. evenly curved shaft and short point *vs* curved shaft and elongate point extending just past the tip of the superficial anchor root). The complexity of potential hosts for species of *Urocleidoides* and their effect on its distribution on profundulid and poeciliid fishes are briefly discussed.

Keywords: Dactylogyridae, *Profundulus*, *Pseudoxiphophorus*, *Poeciliopsis*, *Xiphophorus*, Guerrero, Oaxaca, Chiapas, Guatemala, Honduras, El Salvador, Panama

This article contains supporting information (Tables S1, S2) online at http://folia.paru.cas.cz/suppl/2015-62-059.pdf

Urocleidoides Mizelle et Price, 1964 (*sensu* Kritsky et al. 1986) (Monogenoidea: Dactylogyridae) currently contains up to 20 accepted species, which exhibit a broad host specificity on Neotropical freshwater fishes of different genera, including *Brachyhypopomus* Mago-Leccia (Hypopomidae), *Characidium* Reinhardt (Characidae), *Ctenolucius* Gill (Ctenoluciidae), *Curimata* Bosc (Curimatidae), *Hoplias* Gill (Erythrinidae), *Hypopomus* Gill (Hypopomidae), *Piabucina* Valenciennes (Lebiasinidae), *Poecilia* Bloch et Schneider, *Rhytiodus* Kner (Anostomidae), *Saccodon* Kner (Parodontidae) and *Xiphophorus* Heckel (Poeciliidae) from Argentina, Brazil, Colombia, Panama and Trinidad (Kritsky et al. 1986, Moreira et al. 2015). Although species of *Urocleidoides* have a broad distribution in the tropics, there are still few published studies documenting monogenoidean diversity in host species from these 10 families.

During a study on fish ectoparasites found in rivers from Central America (Guatemala, Honduras, El Salvador and Panama) and southeastern Mexico (Guerrero, Oaxaca and Chiapas), two undescribed species of *Urocleidoides* were discovered on the gill lamellae of species of *Profundulus* (Miller) (Profundulidae), *Pseudoxiphophorus bimaculata* (Heckel) and *Poeciliopsis retropinna* (Regan) (both Poeciliidae). An additional species was also identified as *Urocleidoides vaginoclaustrum* Jogunoori, Kritsky et Venkatanarasaiah, 2004 from *Profundulus portillorum* Matamoros et Shaefer, *P. labialis* (Günther) and *Xiphophorus hellerii* Heckel.

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Herein, the new species are described, parameters of infection as well as new morphometric data and supplemental observations for *U. vaginoclaustrum* are provided.

MATERIALS AND METHODS

Fish specimens were captured from June 2012 to May 2014 from 10 localities in Central American countries (Guatemala, Honduras, El Salvador and Panama) and 10 localities in the states of Guerrero, Oaxaca and Chiapas in Mexico using an electrofishing device and deep-nets, transported alive to the laboratory and examined for monogenoideans within 24 hours post-capture (see Salgado-Maldonado et al. 2014). The collection methods, preparation and study of monogenoideans found on profundulid and poeciliid fishes follow Mendoza-Franco et al. (2013).

Measurements are given in micrometres (μm) and correspond to the straight-line distance between the extreme points of structures. All measurements are expressed as the mean, followed by the range and number (n) of structures measured in parentheses. Body length measurements include the haptor. Type and voucher specimens of helminths were deposited in the Institute of Parasitology, České, Budějovice, Czech Republic (IPCAS) and the Colección Nacional de Helmintos, Institute of Biology, National Autonomous University of Mexico, Mexico (CNHE).

For comparison, the following specimens were examined: 3 paratypes of *U. vaginoclaustrum* (Natural History Museum, London – BMNH 2003.9.14.13-20) and 6 paratypes of *Urocleidoides flegomai* Mendoza-Franco, Aguirre-Macedo et Vidal-Martinez, 2007 (IPCAS M-433). Definitions of ecological terms are those suggested by Bush et al. (1997). The scientific names of the hosts are those provided by Doadrio et al. (1999) and host body lengths are expressed as total length (TL) in mm.

RESULTS

Class **Monogenoidea** Bychowsky, 1937

Subclass **Polyonchoinea** Bychowsky, 1937

Order **Dactylogyridea** Bychowsky, 1937

Dactylogyridae Bychowsky, 1933

Urocleidoides simonae sp. n. Figs. 1–10

ZooBank number for species:
urn:lsid:zoobank.org:2DBB4F1E-054E-4391-9267-AE97594372DC

Diagnosis (based on 32 stained specimens with Gomori's trichrome and on 6 specimens remounted from a mixture of lactic-acid and glycerin-ammonium picrate to Canada balsam – see Mendoza-Franco et al. 2013): Body fusiform, greatest width near level of gonads. Cephalic lobes moderately developed; 3 bilateral pairs of head organs; cephalic glands indistinct. Eyespots 4, subequal in size, members of respective pairs equidistant. Pharynx subovate. Peduncle broad, tapered posteriorly; haptor subtrapezoidal. Anchors similar in shape, each with well-differentiated roots, curved elongated shaft, short point (shaft and point of ventral anchor extending posteriorly from haptor). Ventral bar from straight to slightly arched on its medial portion with notable expanded ends. Dorsal bar broadly V-shaped. Hooks similar in shape, each with protruding thumb, delicate shaft and point, dilated shank; hook pair 1, 5 reduced in size; filamentous hooklet loop nearly 50% of shank length. Male copulatory organ (MCO) a coiled tube of about 4–5 counterclockwise rings with spherical base surrounded by lateral flange. Accessory piece comprising a sheath along distal shaft of the MCO. Vaginal pore sinistral, submarginal; vaginal canal distally coiled; seminal receptacle subspherical, lying on anterior margin of the germarium. Gonads overlapping. Testis dorsal, slightly visible at end of germarium; proximal portion of vas deferens not observed; seminal vesicle a V-shaped dilation (located right below of the MCO) of distal vas deferens; prostatic reservoir lying posterior to base of MCO; oviduct, ootype and uterus not observed. Vaginal sclerite composed of grooved rod with distal hook, subterminal short projection. Vitellarium dense, coextensive with gut. Measurements from different hosts and localities provided in Table 1.

Type host: *Profundulus punctatus* (Günther) (Teleostei: Profundulidae).

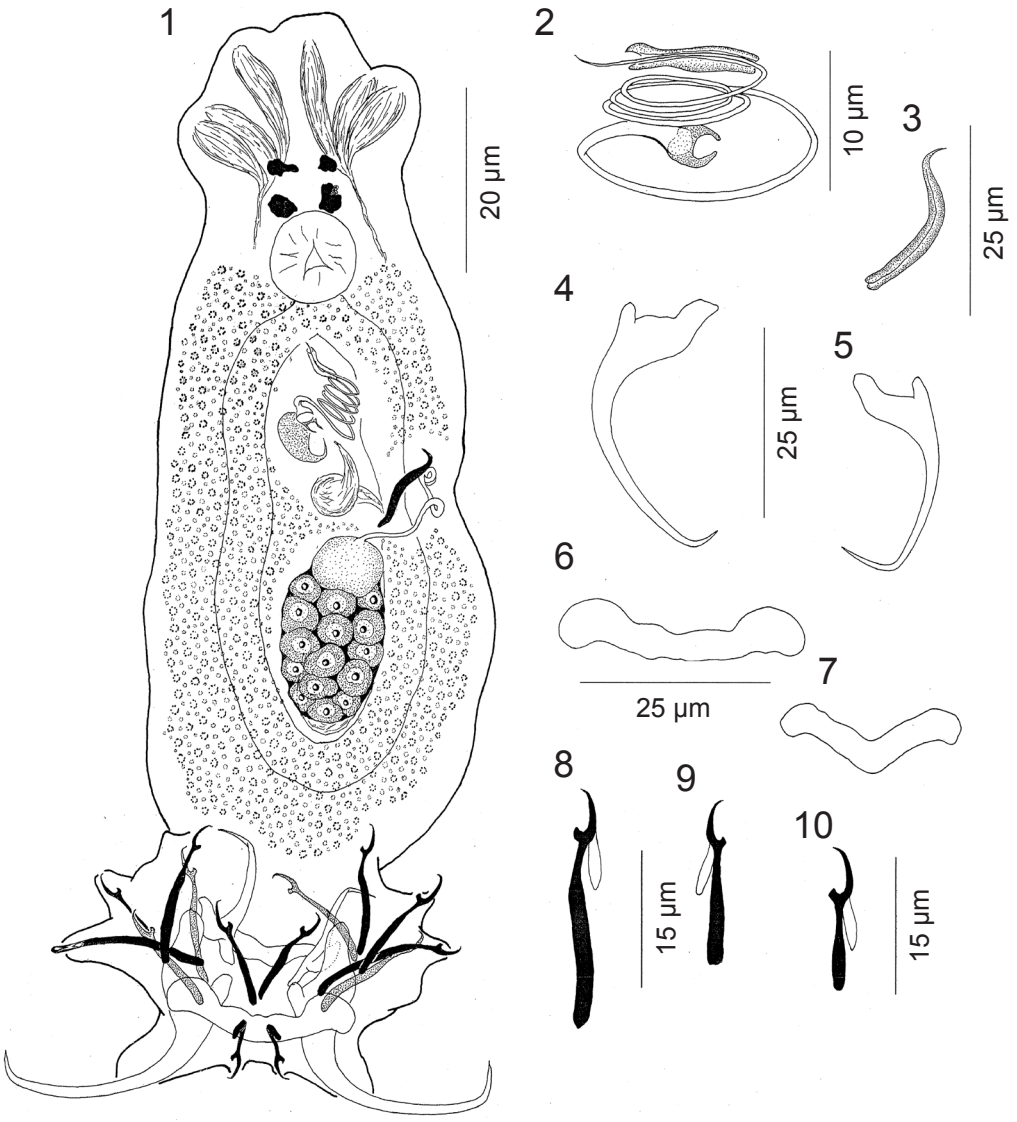
Type locality: Río Nandalumi, Chiapa de Corso, Chiapas, Mexico (16°43'18"N; 92°58'52"W; altitude 486 m), 28 May 2013.

Prevalence and mean intensity of infection: 25 fish (mean TL 54 mm) infected of 31 examined (81%), mean intensity 13.4, range 2–30 worms per infected fish.

Site of infection: Gill lamellae.

Other localities in Chiapas Mexico and parameters of infection: Río at rancho San Antonio, Chicoasén, Chiapas (16°58'31"'N; 93°03'44"W; 375 m), 6 fish (mean TL 56 mm) infected of 8 examined (75%), mean intensity 17.6, range 1–66 worms per infected fish. Arroyo Ojo de Agua, El Canelar, La Frailesca, Chiapas (16°32'08"N; 92°55'03"W; 466 m), 5/7 (mean TL 61 mm) (71%), 14 (worms not measured), 2–46 (see Table 1).

Other hosts in Mexican localities: **Guerrero state** – *Profundulus balsanus* Ahl from Río La Laca (Río Papagayo basin) (17°14'09"N; 98°39'56"W; 1 394 m), 21/30 (mean TL 57 mm) (70%), 3.4, 1–11, March 2013. Río Cahoapan (17°16'38"N; 99°35'05"W; 422 m), 11/30 (mean TL 72 mm) (37%), 1.4, 1–2, March 2013. Río Tamarindo (Río Nexpa basin) (17°00'37"N; 99°06'01"W; 417 m), 23/30 (mean TL 55 mm) (77%), 9.7 (worms not measured), 2–28, March 2013 (see Table S1). **Oaxaca state** – *Profundulus oaxacae* (Meek) from Creek Los Sabinos (Río Atoyac-Verde basin) (16°25'40"N; 97°04'29"W; 1 106 m), 4/30 (mean TL 54 mm) (13%), 1.7, 1–4, February 2013. *Profundulus* sp. 1 from Río Chicaguaxtla, Concepción del Progreso (Atoyac-Verde basin) (17°03'30"N; 97°51'33"W; 867 m), 20/31 (mean TL 56 mm) (64%), 4.3, 1–10, February 2013. *Profundulus* sp. 2 from Río Chico, San Lorenzo Albarradas (Atoyac-Verde basin) (16°55'35"N; 96°12'27"W; 1 316 m), 20/30 (mean TL 63.8 mm) (67%), 4.5, 1–22, February 2013. *Profundulus balsanus* from Río del Aguacate, Juquilá, Río Manialtépec basin (16°07'19"N; 97°08'23"W; 482 m), 15/31 (mean TL 56.9 mm) (48%), 6.4, 2–18, February 2013 (see Table S2). **Chiapas state** – *Profundulus labialis* (Günther) from Río at rancho San Antonio, Chicoasén (16°58'31"N; 93°03'45"W, 375 m), 1/20 (TL



Figs. 1–10. *Urocleidoides simonae* sp. n. from *Profundulus punctatus* (Günther) from Río Nandalumi, Chiapas, Mexico. **Fig. 1.** Composite (ventral view). **Fig. 2.** Copulatory complex (ventral). **Fig. 3.** Vaginal sclerite. **Fig. 4.** Ventral anchor. **Fig. 5.** Dorsal anchor. **Fig. 6.** Ventral bar. **Fig. 7.** Dorsal bar. **Fig. 8.** Hook (pair 2). **Fig. 9.** Hook (pair 1). **Fig. 10.** Hook (pair 5).

Table 1. Comparative measurements of *Urocleidoides simonae* sp. n. (Monogenoidea) from the gill lamellae of two species of *Profundulus* Miller (Profundulidae) from different localities in the state of Chiapas, Mexico.

	Profundulus punctatus (Günther)*		*Profundulus labialis* (Günther)		
	Río Nandalumi†	Río Chicoasen	Río Nandalumi	Río Chicoasen	Creek Copainalá
Body length	154 (115–205; n = 19)	149 (93–215; n = 18)	163 (115–205; n = 19)	142 (75–210; n = 8)	141 (105–170; n = 9)
Greatest width	55 (34–65; n = 12)	44 (26–55; n = 10)	50 (38–63; n = 18)	48 (42–55; n = 4)	51 (42–62; n = 8)
Pharynx	13 (12–15; n = 4)	-	-	-	-
Haptor width	47 (38–60; n = 24)	54 (42–67; n = 13)	50 (40–70; n = 19)	51 (40–65; n = 9)	50 (38–65; n = 11)
Ventral anchor length	32 (30–33; n = 40)	31 (30–33; n = 22)	31 (29–33; n = 26)	29 (25–32; n = 16)	30 (27–32; n = 19)
Base width	12 (11–13; n = 19)	11 (11–12; n = 10)	11 (10–12; n = 18)	10 (9–11; n = 14)	11 (10–12; n = 13)
Dorsal anchor length	26 (25–27; n = 37)	26 (24–28; n = 20)	26 (24–29; n = 27)	21 (20–23; n = 11)	25 (23–27; n = 19)
Base width	11 (10–11; n = 8)	10 (10–11; n = 8)	10 (9–11; n = 13)	10 (9–10; n = 8)	10 (10–11; n = 11)
Ventral bar length	28 (25–31; n = 19)	28 (26–30; n = 15)	26 (25–28; n = 18)	23 (21–25; n = 5)	25 (21–28; n = 10)
Dorsal bar length	20 (18–21; n = 10)	20 (18–22; n = 8)	19 (18–21; n = 6)	22 (20–23; n = 3)	18 (n = 1)
Hook pair 1	15 (n = 2)	14 (14–15; n = 9)	14 (14–15; n = 5)	13 (11–14; n = 7)	13 (13–15; n = 4)
Hook pair 5	10 (10–11; n = 4)	10 (10–11; n = 68)	10 (n = 3)	-	10 (n = 3)
Hook pairs 2–4, 6 and 7	20 (19–22; n = 9)	21 (18–22; n = 9)	20 (18–21; n = 8)	18 (16–20; n = 8)	18 (n = 2)
First ring of the MCO	11 (10–12; n = 3)	13 (11–16; n = 7)	12 (10–13; n = 6)	142 (75–210; n = 8)	13 (12–14; n = 5)
Germarium length	24 (16–28; n = 6)	-	30 (25–35; n = 6)	-	-
Germarium width	14 (12–17; n = 6)	-	13 (12–16; n = 5)	-	-
Testis length	-	-	-	-	-
Testis width	-	-	-	-	-
Vaginal sclerite length	11 (10–13; n = 16)	12 (11–13; n = 7)	11 (10–12; n = 9)	11 (n = 3)	-

* = type host; †= type locality.

25 mm) (5%), 9; Creek Tres Picos, Copainalá (17°03'28"N; 93°11'51"W; 325 m), 6/30 (mean TL 52.5 mm) (20%), 14, 3–35; and Río Nandalumi, Chiapa de Corso, 1/16 (TL 42 mm) (6%), 23, May 2013 (see Table 1).

Other hosts, localities, parameters of infection and dates in Central American localities: **Guatemala** – *Profundulus guatemalensis* (Günther) from Río Nil (Río Guacalate basin) (14°33'54"N; 91°43'25"W; 237 m), 30/30 (mean TL 53 mm) (100%), 9, 3–29; Río El Cantil (Río Guacalate basin) (14°21'23"N; 90°48'30"W; 563 m), 26/30 (mean TL 62 mm) (87%), 6.3, 2–25; and Creek El Platanar (Río Guacalate basin) (14°36'59"N; 90°46'38"W; 1 628 m), 11/20 (mean TL 52 mm) (55%), 5.2, 1–10, May 2014. **El Salvador** – *Profundulus guatemalensis* from Río Cauta (Río Lempa basin) (13°46'43"N; 89°51'41"W; 591 m), 24/30 (mean TL 52 mm) (80%), 4.4, 1–14 and Río Cauca (Río Lempa basin) (13°46'42"N; 89°46'42"W; 450 m), 29/30 (mean TL 56 mm) (97%), 9, 2–33, May 2014. *Profundulus kreiseri* Matamoros, Shaefer, Hernández et Chakrabarty from Río Nonoalpa (Río Lempa basin) (14°17'23"N; 89°09'11"W; 1 040 m), 5/5 (mean TL 43 mm) (100%), 8.2, 4–14, May 2014. Quebrada Los Tecomates (Río Lempa basin) (14°18'11"N; 89°09'41"W; 983 m), 28/30 (mean TL 57 mm) (93.3%), 9.3, 2–36, May 2014.

Specimens deposited: Holotype and 21 paratypes in the CNHE (9854 and 9855, respectively), 15 paratypes in IPCAS (M-615); 214 vouchers in CNHE (9856).

Etymology: The species is named after A.R. Simon Saavedra, a wonderful girl that left us unexpectedly at the age of 20, before fulfilling all her potential as a student of biology.

Differential diagnosis. Based on comparisons of the reproductive organs and copulatory complex morphology, *U. simonae* sp. n. most closely resembles *U. vaginoclaustroides* sp. n. from *Pseudoxiphophous bimaculata* and *U. vaginoclaustrum* from *Xiphophorus hellerii* (Poeciliidae) and *Profundulus labialis* (present study). The morphology of the copulatory complex and the vagina in these species are similar, differing only in the morphology of anchors (see differential diagnosis for *U. vaginoclaustroides* sp. n.).

Urocleidoides simonae can easily be differentiated from the remaining 20 members of the genus by having anchors with well-differentiated roots, curved elongated shaft and short point (see Figs. 4, 5). *Urocleidoides simonae* is the species which exhibits the most widespread distribution from Mexico to Central America.

Urocleidoides vaginoclaustroides sp. n. Figs. 11–21

ZooBank number for species:
urn:lsid:zoobank.org:049C041C-D3F9-4224-B2D7-1F8F668BEEFF

Diagnosis (based on 6 stained specimens and 14 specimens remounted from a mixture of lactic-acid and glycerin-ammonium picrate): Body fusiform, greatest width near level of gonads. Cephalic lobes moderately developed; 3 bilateral pairs of head organs; cephalic glands indistinct. Eyespots 4, subequal in size, members of respective pairs equidistant. Pharynx subovate. Peduncle broad, tapered posteriorly; haptor subtrapezoidal. Anchors similar in shape, each with variable and slightly appressed roots, evenly curved shaft and short point. Ventral bar slightly arched on its medial portion with notable expanded ends. Dorsal bar variable, broadly U-shaped with extremities directed laterally. Hooks similar in shape, each with protruding thumb, delicate shaft and point, dilated shank; hook pair 1, 5 reduced in size; filamentous hooklet loop nearly 50% of shank length. Male copulatory organ (MCO) a coiled tube of about 3–4 counterclockwise rings with spherical base surrounded by lateral flange. Accessory piece comprising a sheath along distal shaft of MCO. Vaginal pore sinistral, marginal; vaginal canal distally coiled; seminal receptacle subspherical, lying on anterior margin of germarium. Gonads overlapping. Testis dorsal, slightly visible at end of germarium; seminal vesicle and route of vas deferens not observed; prostatic reservoir lying posterior to base of MCO; oviduct, ootype, uterus not observed. Vaginal sclerite composed of grooved rod with distal hook, subterminal short projection. Vitellarium dense, coextensive with gut. Measurements from different hosts and localities provided in Table 2.

Type host: *Pseudoxiphophorus bimaculata* (Heckel) (Cyprinodontiformes: Poeciliidae).

Type locality: Río Danta (16°06'50"N; 90°56'03"W; 200 m), a tributary of the Río Lacantún basin in the Biosphere Reserve of Montes Azules (BRMA), Chiapas, Mexico, 12 June 2012.

Prevalence and mean intensity of infection: 6 fish (mean TL 61 mm) infected of 10 examined (60%); mean intensity 3.3 worms, range 2–5 worms per infected fish.

Site of infection: Gill lamellae.

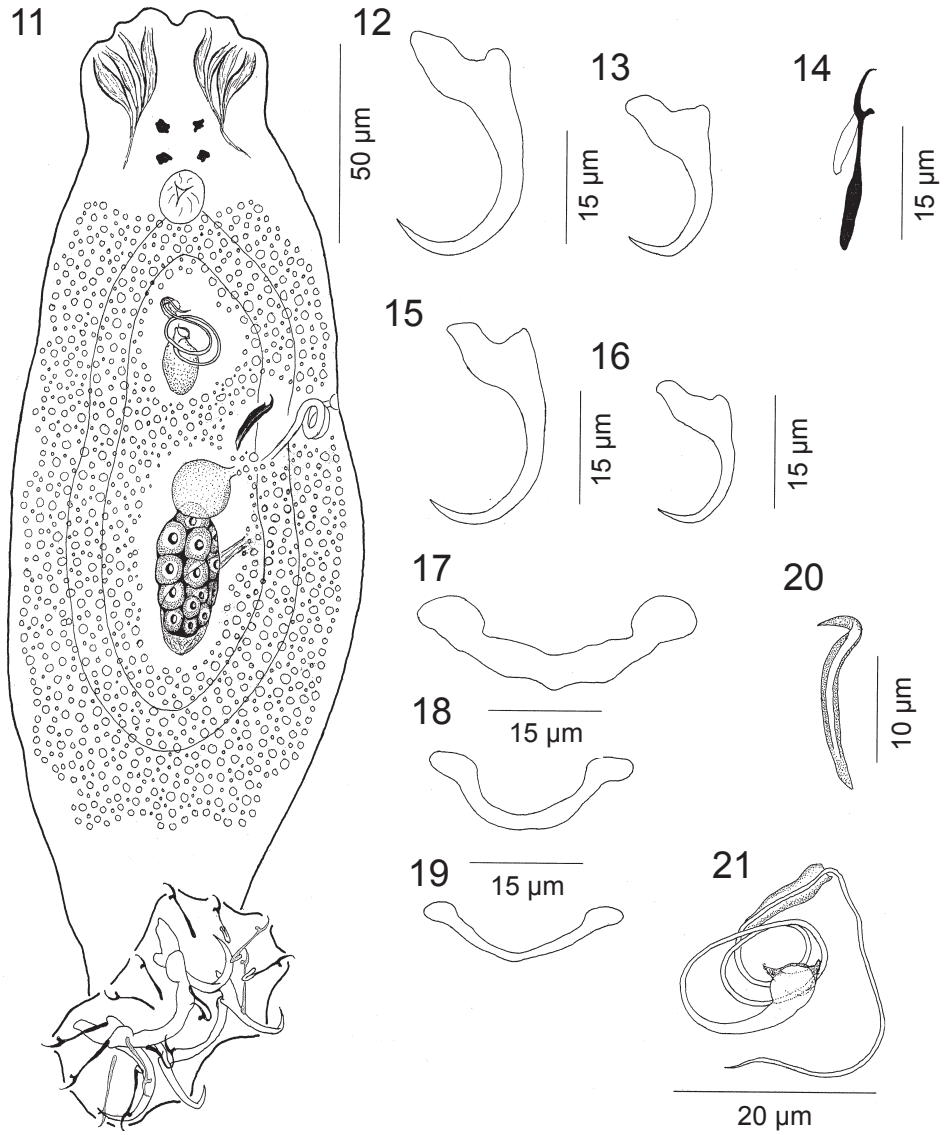
Other records: Arroyo Jose (16°06'50"N; 90°56'03"W; 200 m), 2/3 (mean TL 51 mm) (67%), 2 (not measured), June 2012. *Poeciliopsis retropinna* (Regan) from Río Chiriquicito (08°41'14"N; 82°17'27"W; 1 m) on the western coast of Panama, 2/2 (not measured) (100%), 9, January 2013 (see Table 2).

Specimens deposited: Holotype and 10 paratypes in the CNHE (9857 and 9858, respectively), 9 paratypes in IPCAS (M-616); 22 vouchers in the CNHE (9859 and 9860).

Etymology: The specific name indicates the similarity of this species to *Urocleidoides vaginoclaustrum* Jogunoori, Kritsky et Venkatanarasaiah, 2004.

Differential diagnosis. The morphometric comparison of anchors of *U. vaginoclaustroides* sp. n. with those of *U. vaginoclaustrum* from Jogunoori et al. (2004), 3 paratypes (BMNH 2003.9.14.13-20) and on specimens of this latter monogenoidean species found in this study (see *U. vaginoclaustrum* below) indicated that both species are different.

Urocleidoides vaginoclaustroides can be differentiated from *U. simonae* and *U. vaginoclaustrum* by its anchors, which have an evenly curved shaft and short point (curved elongated shaft and short point in *U. simonae* and "curved shaft and elongate point extending just past the tip of the superficial anchor root" in *U. vaginoclaustrum*) (see Figs. 12–13, 15–16 in the present study and figs. 24–25 in Jogunoori et al. 2004). Additionally, *U. vaginoclaustroides* slightly differs from *U. vaginoclaustrum* in the length of its anchors (ventral anchor 25–29 µm *vs* 21–25 µm; dor-



Figs. 11–21. *Urocleidoides vaginoclaustroides* sp. n. from *Pseudoxiphophorus bimaculata* (Heckel) from Río Danta, Chiapas, Mexico. **Fig. 11.** Composite (ventral view). **Fig. 12**, **15.** Ventral anchor. **Figs. 13**, **16.** Dorsal anchor. **Fig. 14.** Hook (pair 2). **Fig. 17.** Ventral bar. **Figs. 18**, **19.** Dorsal bars. **Fig. 20.** Vaginal sclerite. **Fig. 21.** Copulatory complex (dorsal).

sal anchor 18–22 µm *vs* 16–19 µm) and the length of the vaginal sclerite (13–16 µm *vs* 16–22 µm). *Urocleidoides vaginoclaustroides* also exhibits other dissimilarities with *U. vaginoclaustrum*, notably its distally coiled vaginal tube (vaginal canal is distally funnel-shaped in *U. vaginoclaustrum*).

In other features, *U. vaginoclaustroides* shows a slight resemblance to *Urocledoides flegomai* Mendoza-Franco, Aguirre-Macedo et Vidal-Martínez, 2007 (6 paratypes examined – IPCAS M-433) from *Piabucina panamensis* Gill from Panama in the general morphology of the vagina, which possesses a coiled tube. *Urocleidoides vaginoclaustroides* differs from the latter species in the number of rings of the MCO (3–4 rings *vs* 4–5) and length of the vaginal sclerite (13–16 µm *vs* 20–25 µm) and hooks (hook pairs 2, 3, 4 and 7 – 14–17 µm *vs* 21–25 µm).

The morphometrics of specimens of *U. vaginoclaustroides* from *P. retropinna* collected in Panama did not differ significantly from that of specimens found on *P. bimaculata* in Mexico. Although the body length of *U. vaginoclaustroides* from *P. bimaculata* varied considerably (i.e. from 157–278), the size of the sclerites is relatively constant among specimens (see Table 2). This variability in body length might be attributable to different degrees of maturity in the worms (see Mendoza-Franco and Vidal-Martínez 2011). *Urocleidoides vaginoclaustroides*, *U. simonae* as well as *U. vaginoclaustrum* are the only known species of *Urocleidoides* (*sensu stricto*) infecting native freshwater host species in Mexico.

Urocleidoides vaginoclaustrum Jogunoori, Kritsky et Venkatanarasaiah, 2004

Measurements of specimens from *X. hellerii* and *Profundulus labialis* are in Table 2.

Hosts, localities, parameters of infection and collection date: *Xiphophorus hellerii* Heckel (Cyp-

Table 2. Comparative measurements of *Urocleidoides vaginoclaustroides* sp. n. and *Urocleidoides vaginoclaustrum* Jogunoori, Kritsky et Venkatanarasaiah, 2004 (Monogenoidea).

	U. vaginoclaustroides sp. n. from Mexico and Panama		*U. vaginoclaustrum* from Mexico	
	*Pseudoxiphophorus bimaculata** (Heckel)	*Poeciliopsis retropinna* (Regan)	*Xiphophorus hellerii* Heckel	*Profundulus labialis* (Günther)
	Río Danta†	Río Chiriquicito	Río Danta	Río Chicoasen
Body length	203 (157–278; n = 7) [108 (88–135; n =7)]	182 (165–205; n = 9)	111 (95–127; n = 10)	211 (145–255; n = 8)
Greatest width	70 (42–90; n = 4) [29 (22–38; n = 6)]	60–96	43 (34–51; n = 7)	65
Pharynx	12 (10–15; n = 3) [8]	13	-	-
Haptor width	62 (48–72; n = 9) [46 (40–57; n = 5)]	64 (57–70; n = 12)	30–38	58 (55–60; n = 8)
Ventral anchor length	27 (25–29; n = 20) [25 (25–26; n = 8)]	27 (26–28; n = 25)	21 (20–23; n = 33)	23 (22–25; n = 20)
Base width	11 (10–12; n = 12) [(11–12)]	11 (10–12; n = 12)	11 (10–12; n = 12)	12 (11–13; n = 15)
Dorsal anchor length	19 (18–22; n = 12) [(17–18)]	20 (19–21; n = 13)	17 (16–17; n = 23)	19 (18–20; n = 21)
Base width	10 (9–10; n = 7)	10 (n = 6)	9 (7–10; n = 9)	10 (10–12; n = 15)
Ventral bar length	30 (26–34; n = 10) [27 (25–28; n = 3)]	29 (28–30; n = 9)	21 (18–24; n = 9)	23 (21–24; n = 3)
Dorsal bar length	25 (22–28; n = 6)	22–23	17 (15–20; n = 3)	21–22
Hook pair 1	11 (9–13; n = 4)	12–13	10 (10–11; n = 6)	12 (11–13; n = 6)
Hook pair 5	10 (n = 2)	-	15–17	11 (11–12; n = 3)
Hook pairs 2–4, 6 and 7	15 (14–17; n = 15)	17 (17–18; n = 6)	16 (15–17; n = 4)	17 (15–19; n = 5)
Ring diameter of MCO	13 (11–15; n = 3)	20 (17–23; n = 6)	-	14 (13–17; n = 9)
Germarial length	30 (29–32; n = 3)	-	-	-
Germarial width	16 (14–18; n = 3)	-	-	-
Testis width	9	-	-	-
Vaginal sclerite length	15 (13–16; n = 10)	15 (12–18; n = 5)	15 (14–18; n = 17)	16 (15–18; n = 10)

* type host; † type locality; small forms of *U. vaginoclaustroides* sp. n. are in brackets.

rinodontiformes: Poeciliidae) from Río Danta (16°09'08"N; 90°54'06"W; 200 m), a tributary of the Río Lacantún in the BRMA, Chiapas, Mexico; 4/9 (mean TL 62) (44%), 6.25, June 2012. *Profundulus labialis* from Río at rancho San Antonio, Chicoasén, Chiapas, México (16°58'31"N; 93°03'45"W; 375 m), 6/20 (mean TL 39 mm) (30%), 7.3, 2–18, May 2013. **Honduras**: *Profundulus portillorum* Matamoros et Shaefer from Creek at Ojojona, Fco. Morazán (Río Nacaome basin) (13°55'44"N; 87°17'40"W; 1 391 m), 18/30 (mean TL 49 mm) (60%), 9, May 2014. Lepaterique, Fco. Morazán (Río Nacaome basin) (14°03'43"N; 87°27'59"W; 1 462 m), 8/10 (mean TL 56 mm) (80%), 6.6, May 2014.

Site of infection: Gill lamellae.

Specimens deposited: 25 vouchers in CNHE (9861).

Previous records: Gills of the introduced *X. hellerii* (type host) in India (Jogunoori et al. 2004) and Los Berros spring in the state of Durango, northern Mexico (Mendoza-Palmero and Aguilar-Aguilar 2008).

Remarks. Present specimens of *U. vaginoclaustrum* from *X. hellerii* and *Profundulus labialis* do not differ significantly from the type specimens examined (three paratypes – BMNH 2003.9.14.13-20). This species was originally described from introduced *X. hellerii* in India (Jogunoori et al. 2004). Although the specimens from Mexico are similar in shape, they are smaller (mainly in body length) than those used in the original description (i.e. 95–127 µm *vs* 168–244 µm long). Mendoza-Palmero and Aguilar-Aguilar (2008) also reported smaller specimens based on the size of anchors/bars of *U. vaginoclaustrum* collected from introduced *X. hellerii* in northern Mexico. This size difference might be due to intraspecific variation, probably attributed to different environmental factors in different locations (i.e. Mexico *vs* India).

DISCUSSION

This study not only provides morphological descriptions of two new species of *Urocleidoides*, but also shows the geographical distributions of these monogenoids on 9 species of *Profundulus* (*P. balsanus*, *P. guatemalensis*, *P. kreiseri*, *P. labialis*, *P. oaxacae*, *P. portillorum*, *P. punctatus*, *Profundulus* sp. 1, and *Profundulus* sp. 2) and 3 species of Poeciliidae (*P. bimaculata*, *P. retropinna* and *X. hellerii*). Only *Profundulus hildebrandi* Miller and *Profundulus candalarius* (Hubbs) from Chiapas, Mexico were negative for monogenoids. *Urocleidoides* is unique within the tropics by containing 20 species (plus two new ones described in this study) parasitising fishes of 10 families from 3 orders (Characiformes, Cyprinodontiformes and Gymnotiformes) (see Mizelle and Price 1964, Kritsky et al. 1986, Moreira et al. 2015). Despite the fact there are no phylogenetic analyses of species that parasitise fish, it is clearly composed by different taxonomic groups, suggesting complex origins.

As described in this study, *U. vaginoclaustroides* is phenotypicly similar *U. vaginoclaustrum*, both parasitising poeciliids (*P. bimaculata*, *P. retropinna* and *X. hellerii*) and a profundulid, *P. labialis* (Profundulidae). The ocurrence of *U. simonae*, *U. vaginoclaustroides* and *U. vaginoclaustrum* on profundulids and poeciliids documented here extends the known geographical distribution of species of *Urocleidoides* (*sensu stricto*) to southeastern Mexico. Additionally, *U. vaginoclaustrum* was collected on *X. hellerii* in their native habitat (i.e. the BRMA) in Mexico, which contrast with the previous records of this species on introduced populations of *X. helleri* in the north of Mexico, out of its natural range of distribution (Mendoza-Palmero and Aguilar-Aguilar 2008).

Among fish species reported as hosts of *Urocleidoides* are those of the order Characiformes (200 species in Africa and more than 1 200 species in the Neotropics in about 14–16 families) and Cyprinodontiformes (850 species in about 110 genera), which comprise the most speciose assemblages of fishes in the tropics and North America (Costa 1998). The mixing of fish (i.e. different taxonomic groups occurring in sympatry) with different origins and evolutionary trajectories have resulted in groups with different rates of diversification in the tropics (Morris et al. 2001, Chen and Borowsky 2004).

Given this scenario, interactions of potential host species for *Urocleidoides* may have been an important factor on distribution of these parasite species resulting in different host switching events and speciation. Additional morphological and molecular data are necessary to identify patterns of diversification among profundulid and poeciliid species and their respective monogenoids. This will allow us to explore whether host phylogeny and/or geographic distribution are important factors in driving diversification of these ectoparasites.

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