Revista Mexicana de Biodiversidad 79: 33S- 40S, 2008
http://dx.doi.org/10.22201/ib.20078706e.2008.001.509

Saccocoelioides lamothei n. sp. from *Dormitator latifrons* (Pisces: Eleotridae) from coastal lagoons of Guerrero, Mexico

Saccocoelioides lamothei n. sp. de *Dormitator latifrons* (Pisces: Eleotridae) de lagunas costeras de Guerrero, México

M. Leopoldina Aguirre-Macedo[1*] and Juan Violante-González[2]

[1]*Laboratorio de Parasitología, Centro de Investigación y Estudios Avanzados-Instituto Politécnico Nacional (CINVESTAV-IPN), Unidad Mérida, Carretera Antigua a Progreso Km 6. Apartado postal 73 Cordemex, 97310 Mérida, Yucatán, México.*
[2] *Laboratorio de Ecología, Unidad Académica de Ecología Marina, Universidad Autónoma de Guerrero, Gran Vía Tropical No. 20, Fracc. Las Playas, 39390 Acapulco, Guerrero, México.*
**Correspondent: leo@mda.cinvestav.mx*

Abstract. A new haploporid trematode, *Saccocoelioides lamothei* n. sp., is described from the intestine of the Pacific fat sleeper, *Dormitator latifrons* (Richardson, 1844) from 2 coastal lagoons of Guerrero, Mexico. The new species is characterized by the presence of diffuse eye-spot pigmentation in the forebody, 2 sac-like caeca ending pretesticularly, ventral sucker pre-equatorial and miracidium with pigmented eye-spots in eggs. It differs from all other congeneric species by having a small, pyriform to slightly elongated body, a short but conspicuous prepharynx and sac-like caeca terminating pretesticularly, an extreme posterior position of the testis, a small spherical to elongated ovary, vitelline follicles irregular in shape and size and reaching the ovary level, the uterus extending from the testicular zone to the acetabular region, with numerous relatively large eggs.

Key words: Digenea, Haploporidae, estuarine fishes, Tres Palos, Coyuca, Pacific Ocean, Mexico.

Resumen. En este trabajo se describe una especie nueva de tremátodo de la familia Haploporidae, *Saccocoelioides lamothei* n. sp. recolectado del intestino del popoyote *Dormitator latifrons* (Richardson, 1844) en 2 lagunas costeras del estado de Guerrero, México. La especie nueva se caracteriza por la presencia de remanentes de las manchas oculares dispersas en la parte anterior del cuerpo; 2 ciegos intestinales saculares que terminan pretesticularmente o apenas tocando el borde anterior del testículo, acetábulo preecuatorial y huevos conteniendo miracidios con manchas oculares. Esta especie nueva se diferencia de otras del mismo género por tener un cuerpo pequeño, piriforme a ligeramente alargado, una prefaringe muy pequeña pero conspicua y ciegos intestinales que terminan pretesticularmente, un testículo en el extremo posterior del cuerpo, un ovario pequeño, esférico a cilíndrico, difícil de distinguir, con folículos vitelinos de forma y tamaño irregulares, y un útero dispuesto entre el acetábulo y la region testicular con huevos relativamente grandes y numerosos.

Palabras clave: Digenea, Haploporidae, peces estuarinos, Tres Palos, Coyuca, océano Pacífico, México.

Introduction

Trematodes of the genus *Saccocoelioides* Szidat, 1954 are small worms that frequently are difficult to identify because there are many morphological similarities between members of the family (Overstreet and Curran, 2005). In addition, they have a delicate tegument that rapidly disintegrates and, if not fixed when fresh enough, they do no stain well, making observation of internal structures more difficult.

Recibido: 13 septiembre 2007; aceptado: 07 marzo 2008

During a study of fish parasites of coastal lagoons of Guerrero, Mexico, Garrido-Olvera et al. (2004) and 1 of us (JVG) found trematodes of *Saccocoelioides* Szidat, 1954 in the Pacific fat sleeper *Dormitator latifrons* (Richardson, 1844) in Tres Palos and Coyuca coastal lagoons and reported them as *Saccocoelioides* sp. (Violante-Gonzalez, 2006; Violante-González and Aguirre-Macedo, 2007; Violante-González et al., 2007). In this paper, we describe these specimens and compare them with other haploporids reported from Mexico and those morphologically similar species that have been reported in Central and South America.

Materials and methods

Adult trematodes from *D. latifrons* were collected in Tres Palos (99º47´ W; 16º48´ N) and Coyuca (100º02´ W; 16º57´ N) lagoons, Guerrero, Mexico. Trematodes come from several fish samplings performed between April, 2000 and November 2003 (see Violante-González and Aguirre-Macedo, 2007; Violante-González et al., 2007 for details of sampling dates). Trematodes were fixed with hot 4% formaldehyde solution, stained with Mayer's carmine and mounted in Canada balsam as permanent preparations. A few specimens were flattened and fixed with GAP (glycerin: ammonium picrate) according to the method used for monogeneans (Vidal-Martínez et al., 2001). Observations and drawings were made using an Olympus microscope with Nomarski interference contrast. Only gravid worms fixed with hot formalin were measured. Measurements are given in micrometers.

Description

Saccocoelioides lamothei n. sp. (Figs. 1-4)

Description (based on 12 unflattened specimens; measurements are the range for all paratypes, and holotype measurements in parentheses). Body pyriform to slightly elongated in specimens with numerous eggs (Fig. 1), with maximum width at second third of body, 420-850 (670) long and 240-510 (330) wide. Tegument entirely spined; tegumental spines narrow and small. Remnants of eye spots scattered in lateral fields from oral opening to anterior half of hermaphroditic sac, more conspicuous in young specimens.

Oral sucker subterminal, spherical, 62-155 (72) long and 77-127 (87) wide. Acetabulum spherical, pre-equatorial, 71-137 (97) long and 82-125 (95) wide, slightly larger or of same size as oral sucker; sucker ratio 1: 0.84-1.23. Prepharynx present, 7-12 (10) long; pharynx oval, strongly muscular, large, situated obliquely in lateral view, slightly shorter than oral sucker length, 52-112 (77) long and 47-97 (77) wide; esophagus long, extending to posterior half of acetabulum, caecal bifurcation 157-270 from anterior end of body. Caeca saccate, thick-walled, terminating anterior to testis or slightly overlapping its anterior border (in young non-gravid specimens Fig. 3).

Testis oval to spherical, situated at posterior end of body, 90-112 (93) long and 67-117 (67) wide. External seminal vesicle spherical, entering dorsally hermaphroditic sac. Hermaphroditic sac oval to club-shaped, obliquely arched dorsally around ventral sucker (Figs. 2 and 3) or anterior to it in specimens with uterus full of eggs (Fig. 1), 100-212 (117) long and 60-130 (77) wide. Internal seminal vesicle oval to club-shaped, reaching to 3 quarters of hermaphroditic sac length, 100-212 (117) long and 60-130 (77) wide; ejaculatory duct short, entering long hermaphroditic duct; prostatic cells in peripheral region of hermaphroditic sac. Genital pore preacetabular.

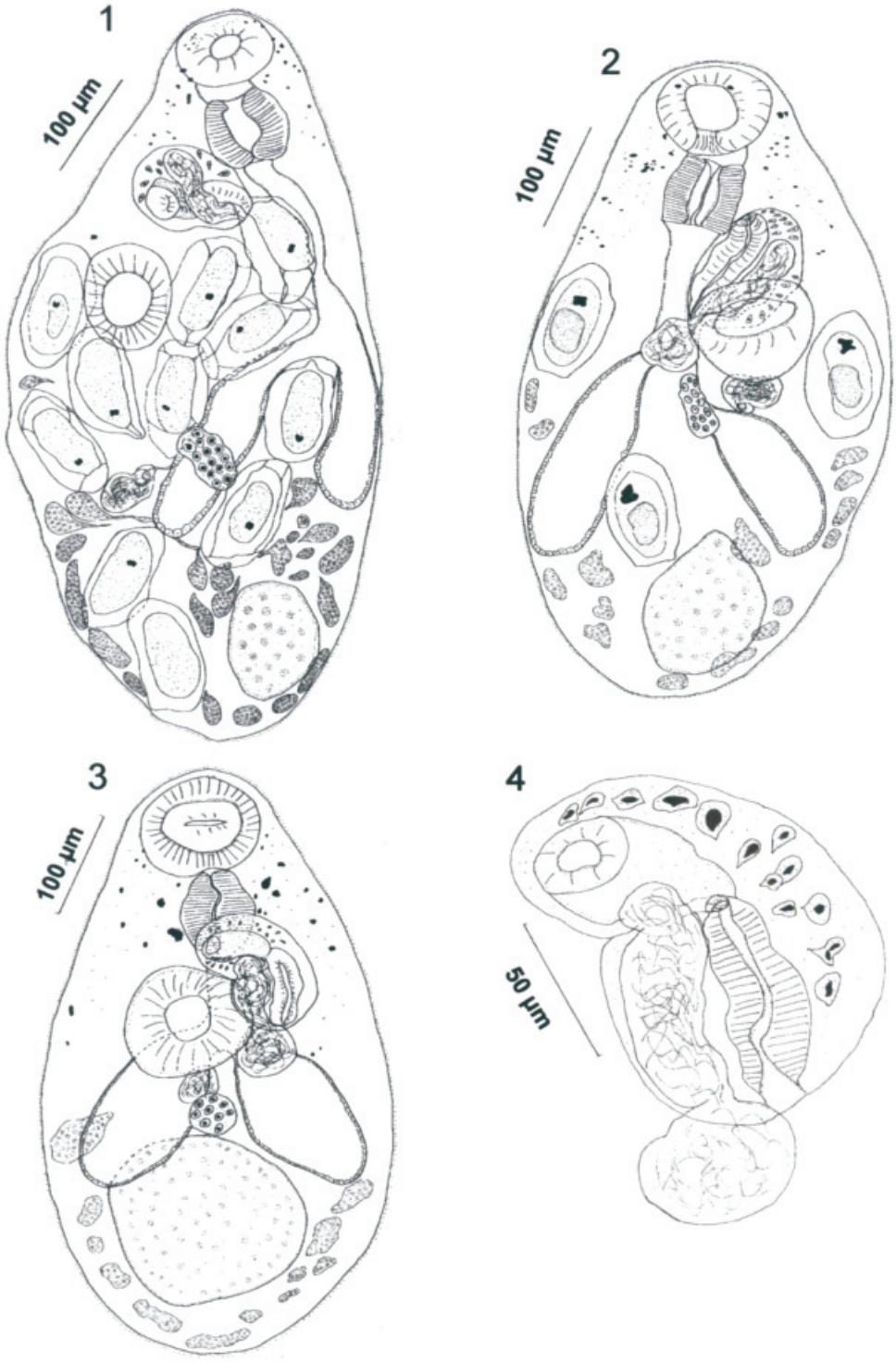
Ovary oval to cylindrical, smooth, slightly submedian, postequatorial, half way between acetabulum and testis, 42-62 (50) long and 25-42 (42) wide. Seminal receptacle subspherical, 30-45 long and 37-52 wide; Laurer's canal not observed. Uterus occupying all space from acetabulum to posterior end of body, surrounding testis, entering in its distal part to hermaphroditic sac; metraterm thick-walled, opening to hermaphroditic duct. Vitelline follicles usually irregular in shape and size, distributed in lateral fields from ovarian level to posterior extremity, confluent in post-testicular region. Eggs operculate, with eye-spotted miracidia, 87-137 (110) long and 50-78 (65) wide, (1 to ≈ 40 eggs in uterus). Excretory vesicle Y-shaped, bifurcating at anterior level of testis, without excretory concretions; excretory pore terminal.

Taxonomic summary

Type host: Pacific fat sleeper, *Dormitator latifrons* (Richardson, 1844) (Perciformes: Eleotridae).
Site: intestine.
Type locality: Tres Palos, Guerrero, Mexico (prevalence (P) = 18.8; intensity range (IR) = 1-267).
Other locality: Coyuca, Guerrero, Mexico (P= 24.8, IR = 1-75).
Deposition of types: holotype and 2 paratypes in the Colección Nacional de Helmintos, Instituto de Biología, Universidad Nacional Autónoma de México, México City, Mexico (CNHE: 5920 and 5921); 2 paratypes in the U.S. National Parasite Collection, Beltsville, Maryland, USA (USNPC: 100579); 2 paratypes at the Institute of Parasitology, AS CR, České Budějovice, Czech Republic (IPCAS: D-623); and 2 paratypes at the Laboratory of Parasitology, CINVESTAV-IPN Unidad Mérida, Yucatán, Mexico (CHCM: 503).
Etymology: the species is named in honor of Professor Rafael Lamothe-Argumedo for his significant contribution to Mexican helminthology.

Remarks

The specimens from *D. latifrons* were placed in *Saccocoeliodes* rather than to *Culuwiya* Overstreet and Curran, 2005 (where some species of *Saccocoelioides* reported from cichlid fishes from Mexico and Central America were accommodated by Aguirre-Macedo and Scholz, 2005) on the basis of the following characteristics:



Figures 1-4. 1, *Saccocoelioides lamothei* n. sp. from *Dormitator latifrons*, Holotype CNHE: 5920 (total view). 2, young gravid specimen, paratype CNHE: 5921a (ventral view). 3, dorsal view of juvenile specimen (paratype CNHE: 5921b). 4, hermaphroditic sac (dorsal view).

body pyriform to elongated with remnants eye-spots in the anterior part of the body, a very short prepharynx (larger in members of *Culuwiya*); esophagus long; caeca saccate to cylindrical but thick-walled, terminating pretesticular (instead of at the level of mid-testis as in *Culuwiya*); testis reaching to the posterior margin of the body; ovary small and cylindrical (proportionally larger in *Culuwiya*); vitelline follicles irregular in size and shape (large, elongated along the longitudinal axis in *Culuwiya*), surrounding testis; uterus preacetabular and post-testicular (confined to the postacetabular and pretesticular zone in *Culuwiya*); eggs containing miracidia with eye-spots (eye-spots absent in miracidia of *Culuwiya*).

Several species of *Saccocoelioides* have been described in the Americas, most from characid, poeciilid, mugilid and cichlid fishes (Szidat, 1954; Travasos, 1978; Kohn 1985, Díaz and González, 1990; Dyer et al., 1999; Lunaschi, 2002; Aguirre-Macedo and Scholz, 2005). Some of these species have been transferred recently to other genera of the same family (Overstreet and Curran, 2005). *Saccocoelioides lamothei* n. sp. is the first record of the genus from eleotrid fishes.

Saccocoelioides lamothei n. sp. differs from the 2 other species of *Saccocoelioides* reported from Mexico, *S. chauhani* Lamothe-Argumedo, 1974 from *Astyanax fasciatus* Cuvier, 1819 in Veracruz (Lamothe-Argumedo, 1974) and *S. sogandaresi* Lumsden, 1963 recorded from *Poecilia sphenops* Valenciennes, 1846 collected in the same localities as *S. lamothei* (Violante-González and Aguirre-Macedo, 2007; Violante-González et al., 2007) and in other hosts and localities in Mexico (see Salgado Maldonado, 2006 and Pérez-Ponce de León et al., 2007 and literature therein). *Saccocoelioides lamothei* differs in the position of the testis (subterminal in *S. chauhani* and *S. sogandaresi* vs. terminal in *S. lamothei*) and the distribution of vitelline follicles (occupying the acetabular to post-testicular zone in *S. chauhani* and *S. sogandaresi* vs. situated from the ovarian level to the post-testicular zone in *S. lamothei*) (Lumsden, 1963; Lamothe-Argumedo, 1974; Scholz et al., 1995). Although *S. lamothei* is very similar in body shape and size to *S. chauhani* (Table 1), it also differs in distribution of the uterus, the uterus of *S. chauhani* is confined to the zone between the acetabulum and the testis, whereas it extends posterior to the testis in *S. lamothei*, the miracidium lack eye spots and terminal genitalia do not end in a hermaphroditic duct in *S. chauhani* (Lamothe-Argumedo, 1974).

Saccocoelioides lamothei n. sp. also differs from all other small (< or ≈ 1 mm) South American *Saccocoelioides* species with saccated caeca ending pretesticularly and large eggs with oculate miracidia. These small species include *S. octavus* Szidat, 1954 (= *S. basiliformis* (Szidat, 1954) Overstreet and Curran, 2005), *S. elongatus* Szidat, 1954, *S. magniovatus* Szidat, 1954, *S. nani* Szidat, 1954 and *S. tarpazensis* Díaz and González, 1990. *Saccocoelioides lamothei* differs from them in the position of the testis (subterminal to the beginning of the posterior third of the body in the species previously mentioned vs. terminal in *S. lamothei* n. sp.) and the distribution of the vitelline follicles (2 lateral fields running from the postacetabular or ovarian level to the posterior border of the testis in South American species vs. vitelline follicles running lateral from the ovary to the posterior end of the body surrounding the testis, including the small postesticular space in *S. lamothei*) (Table 1) (Szidat, 1954, 1970; Kohn, 1985; Díaz and González, 1990; Lunaschi, 1996, 2002).

Saccocoelioides carole Lunaschi, 1984, found in *Cichlasoma facetum* (Jenyns, 1842) in Provincia de Buenos Aires, is probably the morphologically most similar species to *S. lamothei* as they share several characteristics: body slightly elongated (in gravid specimens that are full of eggs, Fig. 3), the saccate caeca ending pretesticular, testis at the posterior border of the body, the uterus occupying the total hindbody from the hermaphroditic sac to the posterior end of the body including the testicular zone, and large eggs with occulate miracidium inside (Lunaschi, 1984; Martorelli, 1986).

The specimens collected from *Dormitator latifrons* are considered to be a new species based on the presence of a well developed seminal receptacle in *S. lamothei*, observed in fresh live specimens and seen best in specimens with few eggs. Further differences include the extension and distribution of vitelline follicles, from the posterior end of the acetabulum to the testis level but not confluent in the posterior zone in *S. carole* vs. vitelline follicles distributed from the ovarian level to the posterior end of the body and confluent postesticularly in *S. lamothei*.

Discussion

Recently, Overstreet and Curran (2005) reviewed the Haploporidae, proposing the new subfamily Chalcinotrematinae and transferred the *Saccocoelioides* from Haploporinae, where it was accommodated previously, into the new subfamily together with the genera *Unicoelium*, *Megacoelium*, *Paralecithobothrys* and *Chalcinotrema*. They also removed several species from *Saccocoelioides* to other genera of the new subfamily, or to other subfamilies of the Haploporidae, and retained in *Saccocoelioides* only those species with vitelline follicles surrounding the testes, an uterus extending throughout the hindbody and reaching to the forebody, having a short prepharynx, and eggs with or without occulate miracidia.

Table 1. Comparative measurements and morphological characteristics of some *Saccocoelioides* species similar to *S. lamothei* n. sp.

Species	*S. lamothei* n. sp.	*S. sogandaresi* Lumsden, 1963	*S. chauhani* Lamothe-Argumedo, 1974	*S. carolae* Lunaschi, 1984	*S. nanii** Szidat, 1954	*S. tarpazensis* Díaz and González, 1990	†*S. octavus* Szidat, 1970
Host	*Dormitator latifrons*	*Mollienisia latipinna*	*Astyanax fasciatus*	*Cichlasoma facetum*	*Prochilodus lineatus*	*Lebistes reticulatus*	*A. fasciatus*
Total body Length (l) Width (w)	 420-850 240-510	 341-512 165-307	 536-966 289-418	 580-825 208-349	 600-720 200-300	 385-572 407-528	 869-959 237-307
Oral sucker	62-155 77-127	55-103 60-87	108-112	92-132 80-132	90-99 80	87-130 92-225	101-115 92-112
Acetabulum	71-112 82-107 Pre-equatorial	62-105 75-103 ?	101-105 Pre-ecuatorial	92-138 96-140 Pre-equatorial	100-110 100 ?	85-125 80-130 Sligthly pre-equatorial	86-103 92-99 Pre-ecuatorial
Sucker ratio	1: 0.84-1.2	1:1.2	1:0.96	1: 1.0-1.2	1:1.25	-	1:0.82-1.02
Prepharynx	7.5-12	1-12	18-26	Short	Short	5-15	Present
Pharynx	52-112 55-97	45-73 37-70	48-60 45-52	43-73 42-43	40-55 60	47-80 50-80	46-55 57-67
Bifurcation from anterior body end	157-270 Bifurcating at posterior end of acetabulum	Long, Bifurcating half level of acetabulum	218-405 Posterior border of acetabulum	Bifurcating posterior to or at the end of acetabulum	Bifurcating about half level of acetabulum	126-280 Bifurcating at last quarter of acetabulum	Long, bifurcating at half length of acetabulum
Extent of caeca	Ending pretesticular	Ending in posterior third of body	Pretesticular	Posterior border of ovary	Anterior quarter of testis	Ending pretesticularly	Pretesticular, touching slightly anterior end
Genital pore position	In midway between pharynx and acetabulum	In midway between pharynx and acetabulum	Preacetabular	Preacetabular	Anterior border of acetabulum	Between pharynx and acetabulum	preacetabular
Hermaphroditic sac	100-215 60-130 Between pharynx and acetabulum, overlapping anterior end	45-98 50-84 Half level of acetabulum to pharynx	112-128 75-82 Half level of acetabulum to pharynx	116-170 63-97	80 70 Half level of acetabulum to pharynx	95-160 57-112 Medial	115-126 80-106 Between pharynx and acetabulum, overlapping anterior end

Table 1. Continues

Species	*S. lamothei* n. sp.	*S. sogandaresi* Lumsden, 1963	*S. chauhani* Lamothe-Argumedo, 1974	*S. carolae* Lunaschi, 1984	*S. nanii** Szidat, 1954	*S. tarpazensis* Díaz and González, 1990	†*S. octavus* Szidat, 1970
Host	*Dormitator latifrons*	*Mollienisia latipinna*	*Astyanax fasciatus*	*Cichlasoma facetum*	*Prochilodus lineatus*	*Lebistes reticulatus*	*A. fasciatus*
External seminal vesicle	40-70 40-55 Spherical lateral to acetabulum	Saccular, from posterior edge of acetabulum to insert into posterior end H.S.	48 33-37	Spherical reaching posterior end of acetabulum	Big, club-shaped	Saccular, dorsal to acetabulum	Saccular
Testis	90-152 67-137 At posterior end of body	--112 In third quarter of boty	112-120 75-180	32-189 54-135 Posterior end of body	140 90 -	125-235 50-123 Last quarter of body	193-230 143-207 Far from body end
Ovary	42-62 25-42 Cylindrical, midway between acetabulum and testis	41 62 Immediately postacetabular sligthy overlaping testis	45-82 52-75 Postacetabular, pretesticular	41-120 43-128 Post-equatorial	60 40 Spherical, medial, pretesticular	112-175 28-52 Elongated, submedial, pretesticular	76-103 57-75 Intercecal-immediately pretesticular
Uterus	Occupying acetabular to testicular zone	Mostly in hindbody	Between testis and acetabulum	Between anterior border of acetabulum to testis	Pretesticular between acetabulum and testis	Postacetabular to post-testicular	Between acetabulum and post-testicular region
Eggs	80-135 50-78 With miracidium	78-87 37-55 Embrionated	101-105 56-63	72-123 41-68 Embryonated	78-87 38-42	117-130 52-125 With miracidium	92-108 46-57 Without miracidium
Vitellaria	Irregular in size and shape ovarian to post-testicular level	From middle level of acetabulum to post-testicular zone	Big follicles in lateral fields of postacetabular level to posterior end of body	2 lateral cords, small folicles overlapping or not testis	2 lateral cords, postacetabular to testis posterior end	From posterior end of ceca to testis level in lateral fields of body	2 groups 1pre- and 1 post- testicular
Excretory vesicle	Y-shaped	Y-shaped	Y-shaped	Y-shaped	Y-shaped	-	

*A combination of measurements and morphological characteristics provided by Szidat (1954) and Kohn (1985). † Lunaschi (2002).

In Mexico, several species of *Saccocoelioides* have been reported from the same species of fish hosts and from the same localities under different species names (i.e., *S. nani*, *S. beauforti*, *S. sogandaresi* and *Saccocoelioides* sp.) sometimes by the same authors (see references in Pérez-Ponce de León et al., 1996, 2007; Vidal-Martínez et al., 2001; Aguirre-Macedo and Scholz, 2005; Salgado-Maldonado, 2006). This emphasizes the difficulty of assigning specimens to known species of these trematodes, especially in view of the lack of well-fixed material.

Salgado-Maldonado (2006) mentioned only 2 species of *Saccocoelioides* that occur in freshwater fishes in Mexico, *S. chauhani* (from *Astyanax fasciatus*) and *Saccocoelioides* sp. (from *D. latifrons*), and assigned all other species reported previously as *S.* cf. *sogandaresi* by Scholz et al. (1995), Salgado-Maldonado et al. (2001; 2004 a,b; 2005 a,b) and Pineda-López et al. (2005) from different families of fish to *Culuwiya* sp. Pérez-Ponce de León et al. (2007) retained *S. sogandaresi* for most of the records in poeciliid fishes and also for those recorded in some other families, including Goodeidae, Characidae, Cichlidae and Eleotridae. It is evident that a review of all of the material designated as *S. sogandaresi* from freshwater fish of Mexico needs to be made in order to clarify whether specimens should be assigned to *Saccocoelioides* or to *Culuwiya*. A morphological characterization of specimens collected from fishes of each host family together with molecular analysis would be of great help as it appears that a certain degree of host family specificity exists in some members of the Haploporidae (Overstreet and Curran, 2005; Aguirre-Macedo and Scholz, 2005). Thus, it seems reasonable to suggest that, since several fish host families are involved, it is possible that several species of helminth are present.

In addition to *Saccocoelioides* sp. (now *S. lamothei* n. sp.) from *D. latifrons*, Violante-González and Aguirre-Macedo (2007) and Violante-González et al. (2007) recently recorded *S. sogandaresi* from *Poecilia sphenops* from Coyuca and Tres Palos lagoons. Although many other fish species were examined, including members of the Ariidae, Characidae, Cichlidae, Eleotridae, Gobiidae, Mugilidae and Poeciliidae, neither *Saccocoelioides* nor *Culuwiya* were found. This supports the hypothesis that a certain degree of host specificity exists at the level of host family.

Acknowledgments

The authors wish to thank the technical assistance of Raúl, Óscar, Jonathan, Armando, and Jaime, students of the Unidad Académica de Ecología Marina and, to Clara Vivas-Rodríguez and Gregory Arjona-Torres for their help in the laboratory. To Dr. Víctor Manuel Vidal-Martínez, Laboratory of Parasitology, CINVESTAV-IPN Unidad Mérida for the revision of an early version of this paper.

Literature cited

Aguirre-Macedo M. L. and T. Scholz. 2005. *Culuwiya cichlidorum* n. sp. (Digenea: Haploporidae) from the black-belt cichlid *Vieja maculicauda* (Pisces: Cichlidae) from Nicaragua. Journal of Parasitology 92:944-948.

Díaz, M. T. and T. G. González 1990. Ciclo de vida de *Saccocoelioides tarpazensis* n. sp. (Trematoda: Haploporidae). Acta Científica Venezolana 41:327-336.

Dyer, W. G., L. Bunkley-Williams and E. H. Williams, Jr. 1999. *Saccocoelioides agonostomus* sp. n. (Digenea: Haploporidae) from the mountain mullet and the serajo goby in Puerto Rico, with a summary of the genus. Caribbean Journal of Science 35:225-230.

Garrido-Olvera, L., L. García-Prieto and B. Mendoza-Garfias. 2004. Helminth parasites of the fat sleeper, *Dormitator latifrons* (Richardson, 1844) from Tres Palos Lagoon, Guerrero, Mexico. American Midland Naturalist 151:163-169.

Kohn, A. 1985. On the species described by Szidat in 1954 in the genus *Saccocoelioides* (Digenea: Haploporidae). Memorias do Instituto Oswaldo Cruz 80:387-393.

Kohn, A. 1986. *Saccocoelioides godoyi* n. sp. (Haploporidae) and other trematodes parasites of fishes from the Guaiba estuary, RS, Brazil. Memorias do Instituto Oswaldo Cruz 81:67-72.

Lamothe-Argumedo, R. 1974. Estudio helmintológico de los animales silvestres de la estación de biología tropical Los Tuxtlas, Veracruz. Trematoda I. Una especie nueva de *Saccocoelioides* Szidat, 1954, parásita de *Astyanax fasciatus* Günther. Anales del Instituto de Biología, Universidad Nacional Autónoma de México, Serie Zoología 45:39-44.

Lumsden, R. D. 1963. *Saccocoelioides sogandaresi* sp. n., a new haploporid trematode from the sailfin molly *Mollienisia latipinna* Le Sueur in Texas. Journal of Parasitology 49:281-284.

Lunaschi, L. I. 1984. Helmintos parásitos de peces de agua dulce de la Argentina I. Tres nuevas especies del género *Saccocoelioides* Szidat, 1954 (Trematoda Haploporidae). Neotrópica 30:31-42.

Lunaschi, L. I. 1996. Redescripción y sinonímia de *Saccocoelioides nanii* Szidat, 1954 (Digenea: Haploporidae). Neotrópica 42:81-84.

Lunaschi, L. I. 2002. Redescripción de *Saccocoelioides octavus* Szidat 1970 y *S. bacilliformis* Szidat, 1973 (Digenea, Haploporidae), parásitos de peces del género *Astyanax* Baird and Girard 1854 (Pisces: Characidae). Gayana 66:31-37.

Martorelli, S. 1986. Estudios parasitológicos en biotopos lénticos de la República Argentina III. El ciclo biológico de *Saccocoelioides carolae* Lunaschi (Digenea) parásito de *Cichlasoma facetum* (Jenyns, 1842) (Pisces: Cichlidae). Neotrópica 32:125-132.

Overstreet, R. M. and S. S. Curran. 2005. Family Haploporidae Nicoll, 1914. *In* Keys to the Trematoda, vol. 2, A. Jones, R. A. Bray and D. I. Gibson (eds.). CAB International and The Natural History Museum, London, p. 129-165.

Pérez-Ponce de León G., L. García-Prieto and B. Mendoza-Garfias. 2007. Trematode parasites (Platyhelminthes) of wildlife vertebrates in Mexico. Zootaxa 1534:1-247.

Pérez-Ponce de León G., L. García-Prieto, D. Osorio-Sarabia and V. León-Règagnon. 1996. Listados Faunísticos de México VI. Helmintos parásitos de aguas continentales de México. Instituto de Biología, Universidad Nacional Autónoma de México. México, D.F. 100 p.

Pineda-López, R., G. Salgado-Maldonado, E. Soto-Galera, N. Hernández-Camacho, A. Orozco-Zamorano, S. Contreras-Robledo, G. Cabañas-Carranza and R. Aguilar-Aguilar. 2005. Helminth parasites of viviparous fishes in Mexico. *In* Viviparous fishes, H. Grier and M. C. Uribe (eds.). New Life Publications, Homestead, Florida. p. 437-456.

Salgado-Maldonado, G., G. Cabañas-Carranza, J. M. Caspeta-Mandujano, E. Soto-Galera, E. Mayén-Peña, D. Brailovsky and R. Báez-Valé. 2001. Helminth parasites of freshwater fishes of the Balsas River drainage basin, southwestern Mexico. Comparative Parasitology 68 *Poecilia sphenops*:196-203.

Salgado-Maldonado, G., R. Aguilar-Aguilar, G. Cabañas-Carranza, E. Soto-Galera and C. Mendoza-Palmero. 2005a. Helminth parasites in freshwater fish from the Papaloapan river basin, Mexico. Parasitology Research 96:69-89.

Salgado-Maldonado, G., G. Cabañas-Carranza, E. Soto-Galera, R. F. Pineda-López, J. M. Caspeta- Mandujano, E. Aguilar-Castellanos and N. Mercado-Silva. 2004a. Helminth parasites of freshwater fishes of the Pánuco river basin, east central Mexico. Comparative Parasitology 71:190-202.

Salgado-Maldonado, G., N. Mercado-Silva, G. Cabañas-Carranza, J. M. Caspeta-Mandujano, R. Aguilar-Aguilar and L. I. Íñiguez-Dávalos. 2004b. Helminth parasites of freshwater fishes of the Ayuquila river, Sierra de Manantlán Biosphere Reserve, west-central Mexico. Comparative Parasitology 71:67-72.

Salgado-Maldonado, G., R. Pineda-López, L. García-Magaña, S. López-Jiménez, V. M. Vidal-Martínez and M. L. Aguirre-Macedo. 2005b. Helmintos parásitos de peces dulceacuícolas. *In* Biodiversidad del estado de Tabasco, J. Bueno, F. Álvarez and S. Santiago (eds.). Instituto de Biología Universidad Nacional Autónoma de México, México, D.F., p. 145-166.

Scholz, T., J. Vargas-Vázquez, F. Moravec, C. Vivas-Rodríguez and E. Mendoza-Franco. 1995. Cenotes (sinkholes) of the Yucatán Peninsula, Mexico, as a habitat of adult trematodes of fish. Folia Parasitologica 42:37-47.

Szidat, L. 1954. Trematodos nuevos de peces de agua dulce de la República de Argentina y un intento por aclarar su carácter marino. Revista del Instituto Nacional de Investigación de las Ciencias Naturales y Museo de Argentino de Ciencias Naturales "Bernardino Rivadavia", Ciencias Zoológicas 3:1-85.

Szidat, L. 1970. "*Saccocoelioides octavus*" n. sp., una nueva especie del género "*Saccocoelioides*" Szidat, 1954 (Trematoda, Haploporinae Looss, 1902). Revista del Museo Argentino de Ciencias Naturales "Bernardino Rivadavia" e Instituto Nacional de Investigación de las Ciencias Naturales, Zoología 10:87-99.

Szidat, L. 1973. Sobre una nueva especie del género *Saccocoelioides* Szidat, 1954 de *Astyanax bipunctatus*, *Saccocoelioides bacilliformis* sp. nov., del río Reconquista, provincia de Buenos Aires. Conmemoraciones del Museo Argentino de Ciencias Naturales "Bernardino Rivadavia", Parasitología 1:97-100.

Vidal-Martínez, V. M., M. L. Aguirre-Macedo, T. Scholz, D. González-Solís and E. F. Mendoza-Franco. 2001. Atlas of the helminth parasites of cichlid fish of Mexico. Academia, Prague. 165 p.

Violante-Gonzalez, J. 2006. Comunidades de parásitos metazoarios de peces en dos lagunas costeras del estado de Guerrero, México. Tesis Doctorado, CINVESTAV-Instituto Politécnico Nacional- Unidad Mérida. 155 p.

Violante-González, J. and M. L. Aguirre-Macedo. 2007. Metazoan parasites of fishes from Coyuca Lagoon, Guerrero, Mexico. Zootaxa 1531:39-48.

Violante-González J., M. L. Aguirre-Macedo and E. F. Mendoza-Franco. 2007. A checklist of metazoan parasites of fish from Tres Palos lagoon, Guerrero, Mexico. Parasitology Research 102:151-161.