

A New Species of *Lissorchis* (Trematoda: Lissorchiidae) from Creek Chubsuckers (*Erimyzon oblongus*) in the Big Thicket National Preserve, Texas, U.S.A.

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ABSTRACT: *Lissorchis amniculensis* n. sp. is described from the small intestine of creek chubsuckers collected from a small tributary stream of Big Sandy Creek in the Big Sandy Creek Unit of the Big Thicket National Preserve, Polk County, Texas, U.S.A. Members of the new species possess a distinct trilobed ovary, a feature found in individuals of 9 other species of *Lissorchis*. The new species is distinguished from these species by possessing a bipartite seminal vesicle with the distal portion larger than the proximal portion, vitelline follicles that extend beyond the posterior extent of the testes, a small posttesticular space, and a single dextral uterine loop that originates from the posttesticular space.

KEY WORDS: *Lissorchis amniculensis*, *Erimyzon oblongus*, creek chubsucker, Big Thicket National Preserve, Texas.

Fifteen species of trematodes have been assigned (Choudhury and Nelson, 1998; Hoffman, 1999) to the genus *Lissorchis* Magath, 1917, the adults of which all occur in the gastrointestinal tract of catostomid fishes (suckers), and occasionally other cypriniform fishes, in the Nearctic: *Lissorchis attenuatum* (Mueller and Van Cleave, 1932); *Lissorchis calentinei* Christensen, Wellner, and Gleason, 1982; *Lissorchis crassicurum* (Haderlie, 1954); *Lissorchis fairporti* Magath, 1917; *Lissorchis garricki* (Simer, 1929); *Lissorchis gullaris* Self and Campbell, 1956; *Lissorchis heterorchi* (Krygier and Macy, 1969); *Lissorchis hypentelii* (Fischthal, 1942); *Lissorchis kritskyi* Barnhart and Powell, 1979; *Lissorchis macropharynx* Choudhury and Nelson, 1998; *Lissorchis minytremiti* Christensen, Wellner, and Gleason, 1982; *Lissorchis mutabile* (Cort, 1918); *Lissorchis polylobatum* (Haderlie, 1950); *Lissorchis simeri* (Mueller and Van Cleave, 1932); and *Lissorchis translucens* (Simer, 1929). Haderlie (1950) provided a summary of the taxonomic history of the genus up to that point, and Bray (2008) provided the most recent diagnosis of the genus and a discussion of the relationships of its members to other groups. During a survey of the parasites of fishes as part of an All Taxon Biodiversity Inventory in the Big Thicket National Preserve of southeastern Texas, U.S.A., specimens of a previously undescribed species of *Lissorchis* were recovered from creek chubsuckers, *Erimyzon oblongus*; the species is described herein.

MATERIALS AND METHODS

Creek chubsuckers were collected by seine from a small, unnamed tributary of Big Sandy Creek in the Big Sandy

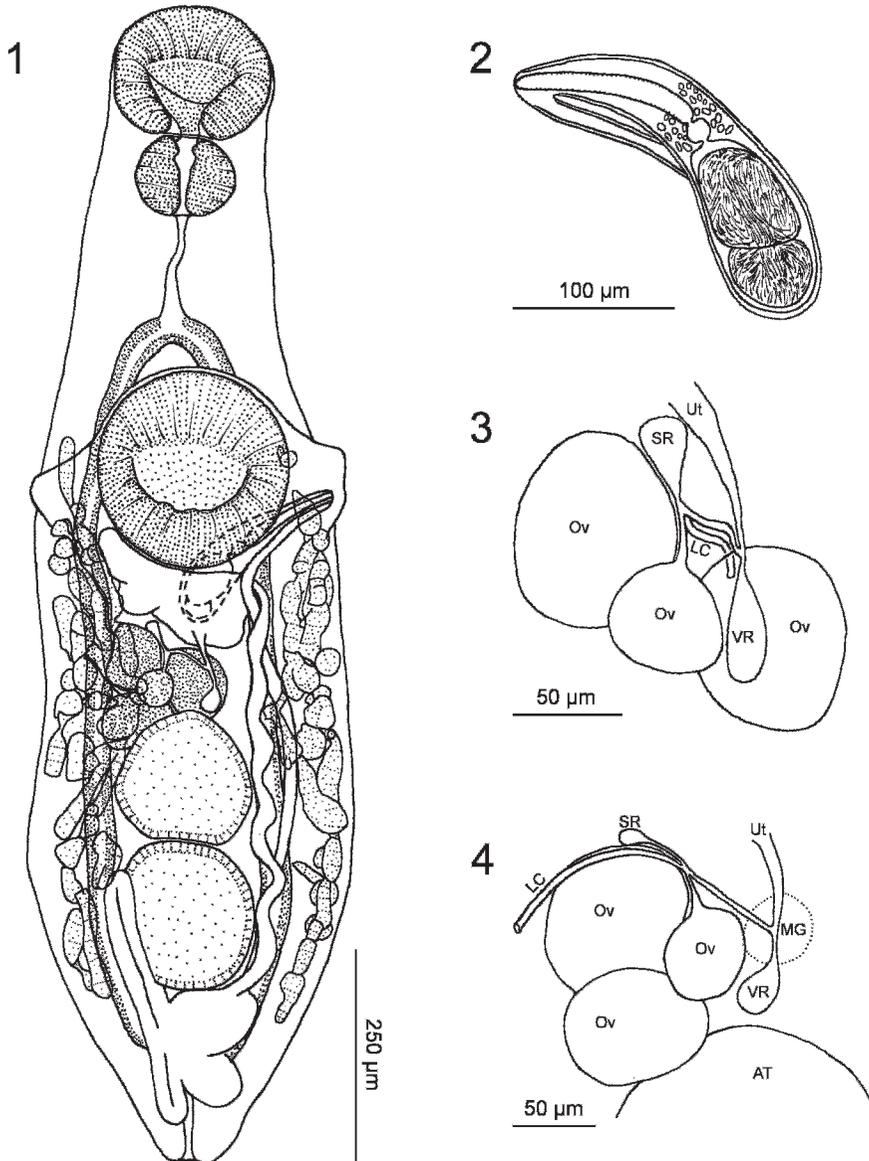
Creek Unit of the Big Thicket National Preserve, Polk County, Texas, U.S.A., in March 2007. Twenty-three specimens of *Lissorchis* were recovered from the small intestines of 3 creek chubsuckers collected, of which 13 were mature, as evidenced by the presence of eggs in the uterus. Worms were killed in near-boiling water, fixed and stored in 70% ethanol, stained in carmalum, dehydrated in an ethanol series, cleared in xylene, and mounted on glass slides in damar balsam. Mounted worms were examined with bright-field and differential interference contrast microscopy, and photographs were taken with an Olympus DP-70 camera mounted on an Olympus B-Max 50 compound microscope. Line drawings of individual structures were made from high-resolution photographs taken in series at adjacent focal planes, and drawings were then assembled in Adobe Photoshop 7.0 software (Adobe Systems Inc., San Jose, California, U.S.A.) to produce composite line drawings. Measurements are presented in μm as the range followed by the mean parenthetically. Specimens from the following lots in the U.S. National Parasite Collection were examined for comparison: 008683 (*Triganodistomum simeri*); 008684 (*Triganodistomum attenuatum*); 051376 (*Alloplagiiorchis garricki*); 051687 (*L. fairporti*); 037193 (*Triganodistomum crassicurum*); 037217 (*Triganodistomum polylobatum*); 038102, 074754 (*L. gullaris*); 044974 (*Triganodistomum mutabile*); 051860 (*Triganodistomum translucens*); 051861, 074871 (*L. kritskyi*); 071345 (*L. heterorchi*); 072602 (*L. fischthali*); 076742 (*L. calentinei*); 076744 (*L. minytremiti*); 087834 (*L. macropharynx*).

RESULTS

Lissorchis amniculensis n. sp. (Figs. 1–9)

Description

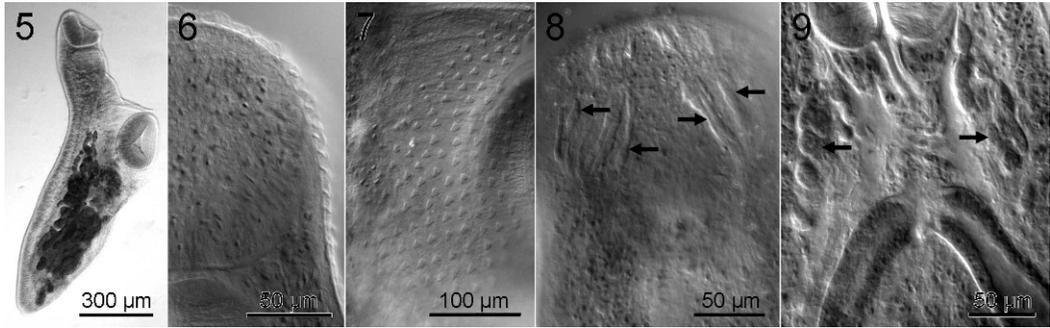
Based on observations of 13 specimens and measurements of 9. Adult worms elongate, forebody stretching when alive; hindbody inactive. When killed in near-boiling water, worms arch dorsally,



Figures 1–4. Line drawings of *Lissorchis amniculensis*. **1.** Holotype, ventral view. Eggs omitted; outline of space occupied by uterus shown only. Vitelline follicles rendered as translucent to allow structures lying dorsal to be seen. Worm is tilted slightly to its left. **2.** Detail of cirrus sac, dorsal view, showing union with uterus. **3.** Detail of female reproductive structures, ventral view. Mehlis' gland omitted for clarity; postero-lateral ovarian lobe not shown. **4.** Detail of female reproductive structures, dextral view. Extent of Mehlis' gland shown in stippled area. AT, anterior testis; LC, Laurer's canal; MG, Mehlis' gland; Ov, ovary; SR, seminal receptacle; Ut, uterus; VR, vitelline reservoir.

1,200–1,510 (1,364) long, 350–450 (405) wide at widest point. Spines cover ventral and lateral surfaces from anterior end of oral sucker to posterior end, largest and most dense around oral and ventral suckers; dorsal surface without spines except the region immediately adjacent to the oral sucker.

Mouth subterminal, surrounded by large oral sucker, 148–170 (162) long, 185–223 (209) wide. Short prepharynx, 0–8 (4) long, indiscernible in some specimens. Pharynx large, 88–98 (93) long, 113–130 (124) wide. Esophagus 85–133 (113) long, with 1 shallow curve prior to joining intestinal ceca;



Figures 5–9. Photographs of *Lissorchis amniculensis*. **5.** Dextral view of whole specimen, showing arched body and peduncle of ventral sucker. **6.** Spines on sinistral surface of oral sucker. **7.** Spines on dextral surface of peduncle at edge of ventral sucker. **8.** Ducts leading from anterior end to cervical gland cells lateral to esophagus. **9.** Cervical gland cells lateral to esophagus. All photographs differential interference contrast.

bifurcation 320–380 (357) from anterior end, just anterior to ventral sucker. Large cervical gland cells grouped in clusters on each side of esophagus, leading to ducts that terminate at anterior end. Ceca lateral, in dorsal third of worm, extending to midway between the posterior extent of the posterior testis and the posterior end of the worm, 110–148 (131) from posterior end, with thick gastrodermis. Ventral sucker 215–260 (241) long, 225–260 (247) wide, on short, broad peduncle, contained within anterior half of body; anterior edge posterior to bifurcation of intestinal ceca; posterior edge 600–730 (671) from anterior end, 640–840 (721) from posterior end. Vitelline follicles mostly extra-cecal, midway between ventral and dorsal surfaces, broadly interconnected, arranged in anterior and posterior groups on each side, each group usually consisting of 4 sets of interconnected follicles, each set uniting into a single duct; each duct uniting with the other on its side and then with the duct from the other side to form a small, distinct vitelline reservoir ventral to the median lobe of the ovary. Vitelline follicles extend from roughly midpoint of ventral sucker past posterior testis to just anterior to termini of the intestinal ceca. Ovary midway between ventral and dorsal surfaces, 640–820 (730) from anterior end, consisting of 3 irregularly shaped and distinct lobes, arranged in triangular pattern, with 2 lateral lobes abutting dextral ceca and 1 medial lobe. Ovarian lobes unite ventrally to form roughly spherical structure that leads to oviduct. Ovary dorsal to testes and overlapping anterior testis slightly; total space occupied by ovary, 125–170 (156) long, 150–228 (176) wide. Oviduct short, leading anteriorly to common union with duct from seminal receptacle and Laurer's canal, then medially to union with duct from vitelline reservoir at

the ootype. Ootype surrounded by large, diffuse Mehlis' gland. Uterus confined to ventral half of worm, extending from ootype to form several loops anterior to ovary and slightly overlapping posterior extent of ventral sucker before descending on sinistral side, roughly ventral to left intestinal cecum, to posttesticular region, forming approximately 6 loops, including 1 loop that ascends on dextral side to between midpoint of posterior testis and posterior third of anterior testis. Ascending uterus on sinistral side of worm, ending at common genital pore on sinistral side dorsal to, and at midpoint of, ventral sucker. Eggs small and numerous, 17.5 long, 8.1 wide, as measured through body wall (eggs somewhat deformed in permanent mounts). Laurer's canal extends dorsally and medially from origin, terminating at small pore on dorsal surface at level of ovary. Seminal receptacle along median edge of most anterior and dextral lobe of ovary; sperm not observed in seminal receptacle. Testes tandem, near ventral surface, both irregular in shape, edges not scalloped or lobed. Anterior testis 720–940 (826) from anterior end, 143–168 (157) long, 153–235 (183) wide; posterior testis larger, 160–218 (181) long, 150–210 (183) wide. Vasa eferentia extend anteriorly and contact cirrus pouch without uniting; no vas deferens detected. Cirrus sac claviform, 213–250 (241) long, extending from common sinistral genital pore located posterior and dorsal of ventral sucker to approximately midway between ventral sucker and ovary. Seminal vesicle internal, bipartite; distal portion (closer to genital pore) two to three times larger than proximal portion (closer to base of cirrus sac), leading to prominent bulb surrounded by prostrate gland cells. Cirrus long and spined. Excretory bladder tubular, extending dorsal to testes

to approximately the anterior edge of the anterior testis; 2 thin tubules branching off and extending laterally and anteriorly, looping frequently, to level of pharynx.

Taxonomic summary

Type host: Creek chubsucker *Erimyzon oblongus*.

Type locality: Unnamed tributary of Big Sandy Creek, Big Sandy Creek Unit, Big Thicket National Preserve, Polk County, Texas, U.S.A., 30.61378°N; 94.67595°W.

Date of collection: 20 March 2007.

Site of infection: Small intestine.

Specimens deposited: Holotype and paratypes on 2 slides, each with multiple specimens. Slide bearing holotype marked with "holotype" scratched on surface; holotype identified by circle scratched on underside of slide. Both slides deposited in Harold W. Manter Laboratory of Parasitology, Nebraska State Museum, Lincoln, Nebraska, HWML 49130 (holotype and paratypes) and 49131 (paratypes).

Etymology: The specific epithet translates from the Latin as "from the little river or brook" (*amiculus*: little river or brook) and is intended to mark the very small stream from which the hosts were collected.

Remarks

Lissorchis amniculensis is one of 10 species in the genus (*L. attenuatum*, *L. garricki*, *L. heterorchis*, *L. hypentelii*, *L. kritskyi*, *L. macropharynx*, *L. mutabile*, *L. simeri*, and *L. translucens* being the others) in which individuals possess an ovary that is principally trilobed (Simer, 1929; Mueller and Van Cleave, 1932; Wallace, 1941; Fischthal, 1942; Krygier and Macy, 1969; Barnhart and Powell, 1979; Choudhury and Nelson, 1998). In the new species, the smaller lobe lying at the conjunction of the 3 main ovarian lobes gives rise to the oviduct and is characterized by an internal structure different from that of the main lobes, observations consistent with examinations of the type material of the species listed above. All other species of *Lissorchis* are characterized by an ovary composed of more than 3 lobes (Magath, 1917; Haderlie, 1950, 1954; Self and Campbell, 1956; Christensen et al., 1982). Among the species with a trilobed ovary, the new species can be distinguished from *L. macropharynx* and *L. garricki* by possessing a bipartite, rather than unipartite, seminal vesicle. In *L. translucens*, *L. kritskyi*, *L. mutabile*, and *L. simeri*,

the distal portion of the bipartite seminal vesicle is smaller than the proximal portion, whereas in the new species, *L. heterorchis*, *L. hypentelii*, and *L. attenuatum*, the distal portion is larger than the proximal portion. Among the last 4 species, only the new species possesses a single loop of the uterus that extends part way up the right side of the body before descending. The uteri in specimens of *L. heterorchis*, *L. hypentelii*, and *L. attenuatum* coil the full length of the hindbody on both sides of the worm. *Lissorchis mutabile* is the only other species with a dextral coil of the uterus similar to that in the new species, but it is much shorter than in the new species.

Overall, the new species most closely resembles *L. attenuatum*, *L. hypentelii*, *L. mutabile*, and *L. simeri*. In all 4 of these species, however, the vitelline follicles are larger, and their posterior extent is substantially anterior of the posterior extent of the testes, whereas in the new species, the vitelline follicles always extend past the posterior testis. *Lissorchis attenuatum* and *L. simeri* both have very large post-testicular spaces, making up a quarter or more of the length of the worms, whereas in the new species, the post-testicular space is about 15% of the worm length. The ventral suckers of *L. hypentelii* and *L. attenuatum* are well within the anterior third of the body, whereas in the new species, the ventral sucker lies at, or just anterior to, the midline. Finally, the esophagus of the new species is similar in absolute length to that of *L. hypentelii*, although in the latter species, the esophagus is straight; in *L. attenuatum*, *L. mutabile*, and *L. simeri*, the esophagi are much shorter.

The clusters of cervical gland cells, and the tubules that unite them, observed in specimens of the new species have not been reported for other species of *Lissorchis*. Examination of the type material of other species has revealed their presence in *L. attenuatum*, *L. macropharynx*, and *L. simeri*. In other species, glandular cells could not be observed, but this might be because of the poor quality of the specimens of some of these species.

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