Helminth Parasites of Select Cyprinid Fishes from the Red River Drainage of Southeastern Oklahoma

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Abstract: Between June and September 2014, 76 cyprinid fishes (seven taxa) collected from four sites in the Red River drainage of McCurtain County, Oklahoma, were examined for helminth parasites. Five endoparasites (four trematodes, one cestode) were found in 10 of 76 (13%) fish including: *Allocreadium lobatum* in Striped Shiners (*Luxilus chrysocephalus isolepis*), *Rhipidocotyle* sp. in Blacktail Shiners (*Cyprinella venusta*), *Postdiplostomum minimum* in a Highland Stoneroller (*Campostoma spadiceum*), *Clinostomum marginatum* in *L. c. isolepis*, and *Proteocephalus* sp. in Steelcolor Shiners (*Cyprinella whipplei*) and *L. c. isolepis*. In addition, the following were negative for helminths: Redfin Shiners (*Lythrurus umbratilus cyanocephalus*), Bigeye Shiners (*Notropis boops*) and Creek Chubs (*Semotilus atromaculatus*). Four new host and two new geographic distributional records are documented. There is a continued need to survey additional non-game fishes of the state for helminths as new host and distributional records are predicted as well as the possibility of discovery of new species. *©2014 Oklahoma Academy of Science*

Introduction

There are 176 species of fishes in Oklahoma (Miller and Robison 2004), yet little is known regarding helminth parasites of non-game species. The following papers report fragmentary information on various helminths of non-game fishes of Oklahoma: Self (1954) on Goldeyes; Self and Timmons (1955) on River Carpsuckers; Self and Campbell (1956) on buffalo fishes; Roberts (1957) on Carp; Calentine and Mackiewicz (1966), Mackiewicz (1964, 1968, 1969, 1970) and Williams and Ulmer (1971) on caryophyllaeid tapeworms of various catostomid fishes; Spall (1969) on parasites of fishes of Lake Carl Blackwell; Scalet (1971) on Orangebelly Darters; Oetinger and Buckner (1976) on Sunburst Darters; and McAllister and Bursey (2013) on Pirate Perches. Therefore, as recently noted by Scholz and Choudhury (2014), studies on freshwater fish parasites are mostly lacking with an obvious paucity of reports on helminth parasites of non-game fishes of Oklahoma. Here, we continue to augment that information by documenting new distributional and host records for select cyprinid fishes from four sites in the Red River drainage of McCurtain County, Oklahoma.

Methods

Between June and September 2014, 76 individual fishes (seven taxa) including 10 Highland Stonerollers (*Campostoma spadiceum*), 13 Blacktail Shiners (*Cyprinella venusta*), 20 Steelcolor Shiners (*Cyprinella whipplei*), 12 Striped Shiners (*Luxilus chrysocephalus isolepis*), seven Redfin Shiners (*Lythrurus umbratilus cyanocephalus*), 10 Bigeye Shiners (*Notropis boops*) and four Creek Chubs (*Semotilus atromaculatus*) were collected by dipnet or 3.7 m (1.6 mm mesh) seine from Yashau Creek at the US 70 bridge (33.98705°N, 94.74329°W), Yashau Creek at Memorial Street (34.011421ºN, 94.749924ºW), Beaver Creek, a tributary of the Mountain Fork River at Beavers Bend State Park (34.132033°N, 94.679418°W) and Yanubbee Creek N of Broken Bow off US 259 (34.062097ºN, 94.73965ºW). Fish were placed in aerated creek water, taken to the laboratory for necropsy within 24 hr and killed by prolonged immersion in a concentrated chloretone® (chlorobutanol) solution. The gills and gill filaments were not examined for monogenean trematodes. A mid-ventral incision was made to expose the viscera and the entire gastrointestinal tract and other organs were examined for helminths. Trematodes and cestodes were fixed in hot tap water without coverslip pressure, stained with acetocarmine, dehydrated in a graded ethanol series, and mounted in Canada balsam. Voucher specimens were deposited in the Harold W. Manter Laboratory of Parasitology (MWML), Lincoln, Nebraska. Host voucher specimens were deposited in the Henderson State University Herpetological Collection (HSU), Arkadelphia, Arkansas as HSU lots 3591-3593, 3595-3600.

Results and Discussion

Ten of 76 (13%) fish, including one (10%) *C. spadiceum*, two (15%) *C. venusta*, three (15%) *C. whipplei*, and four (33%) *L. chrysocephalus* harbored helminths; all infected fish came from Yashau Creek. The helminths found are presented below in annotated format.

Trematoda: Digenea: Allocreadiidae

***Allocreadium lobatum* Wallin, 1909 (Figs. 1-2)**

Figure 1. *Allocreadium lobatum* from *Luxilus chrysocephalus*. Note tandem testes (T) and ovary (O). Scale bar = 500 µm.

Two each *A. lobatum* were found in the small intestine of two adult (105, 140 mm TL) *L. chrysocephalus*. These digeneans measured (mean L × W µm): body, 4,147 × 1,113, oral sucker, 349 × 359, pharynx, 170 × 201, cirrus sac, 490 × 218, ventral sucker, 407 × 399, ovary, 289 × 209, seminal receptacle, 213 × 205, anterior testis, 612 × 601, posterior testis, 640 × 510, ova, 65 × 44. These measurements fall within ranges previously reported for *A. lobatum* (Willis 2002). This is the second time *A. lobatum* has been reported from *L. chrysocephalus* (Kentucky, Aliff 1977); however, we report this digenean from Oklahoma for the first time. In addition, *A. lobatum* has been reported from various fishes from Kentucky, Idaho, Indiana, llinois, Maine, Michigan, Nebraska, Ohio, North Dakota, West Virginia, Wisconsin and Wyoming (Hoffman 1999; Willis 2001, 2002; Barger 2006). In the life cycle of *A. lobatum*, the first intermediate host is a sphaeriid clam (*Pisidium* spp.) and the second, amphipods (*Cragionyx gracilis*, *Gammarus pseudolimnaeus*) and isopods (*Caecidotea communis*, *C. intermedius*) (DeGiusti 1962; Schell 1985; Camp 1989). In addition to documenting a new state record, we report the southernmost distribution for *A. lobatum* in North America (Fig. 2).

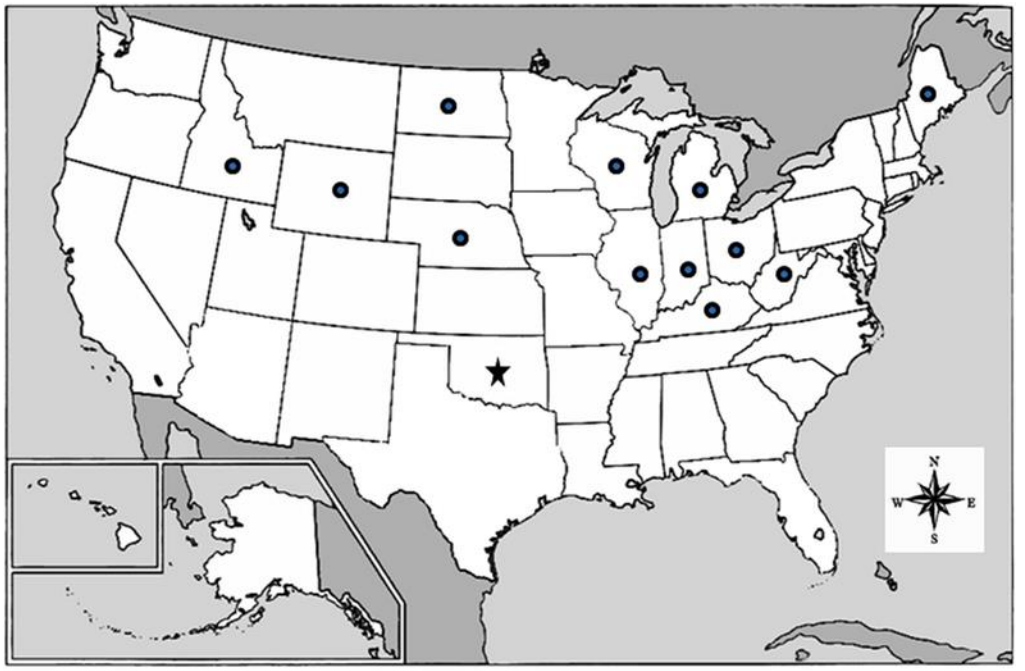

Figure 2. Records of *Allocreadium lobatum* in the United States. Dots = previous records; star = new record. There are also records from Canada (not shown).

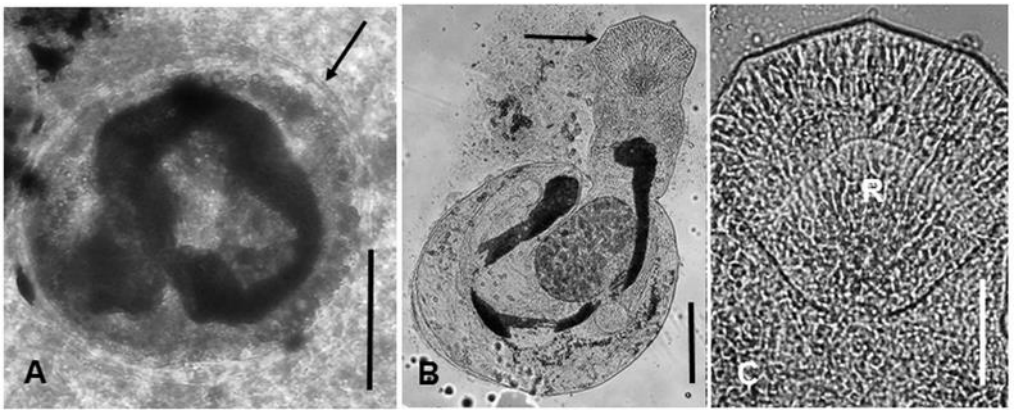

Figure 3. *Rhipidocotyle* sp. from *Cyprinella venusta*. A. Cyst (arrow) in liver containing metacercaria. Scale bar = 50 µm. B. Metacercaria removed from cyst; note rhynchus (arrow). Scale bar = 100 µm. C. Close-up of rhynchus (R). Scale bar = 50 µm.

Bucephalidae

***Rhipidocotyle* sp. (metacercaria) (Fig. 3)**

Two *C. venusta* (62, 66 mm TL) harbored encysted metacercaria of *Rhipidocotyle* sp. in their mesenteries and liver (Fig 3A). These metacercaria possessed the characteristic rhynchus with a pentagonal cap or hoodlike expansion and ventroposterior suctorial pit (Figs. 3B-C) (see Hoffman 1999, fig. 223). Three species of *Rhipidocotyle* are known from North American freshwater fishes (gars, pikes, suckers, centrarchids, moronids), including *R. papillosa* (Woodhead, 1929), *R. septpapillata* Krull, 1934, and *R. tridecapapillata* Curren and Overstreet, 2009 (Hoffman 1999; Curren and Overstreet 2009).

There are previous reports of *R. papillosa* and *R. septpapillata* from Smallmouth Bass (*Micropterus dolomieu*) from adjacent Arkansas (Becker et al. 1966; Kilambi and Becker 1977; Becker 1978). The life cycle includes cercaria in clams and metacercaria in fishes with the adult worm in the intestine and caeca of predatory fishes (Hoffman 1999). This is the first time this digenean has been reported from *C. venusta* and Oklahoma.

Strigeatida: Diplostomidae

***Postdiplostomum minimum* (MacCallum, 1921) Dubois, 1936**

Metacercariae of *P. minimum* (white grub) were found encapsulated in the mesenteries of a single adult *C. spadiceum* (122 mm TL). Our specimens are presumed to be *P. minimum* because many metacercariae cannot be identified to species using only features of metacercarial morphology. However, if metacercaria are fed to a definitive host then adult worms can be identified to species based on morphology. This digenean has been reported previously from related Central Stoneroller, *C. anomalum* (Hoffman 1999) and from Oklahoma (Spall 1969). It has also been reported from a variety of other fishes of different families (including nine cyprinids) from Alabama and Florida (Williams and Dyer 1992). This is the first time, to our knowledge, that this parasite has been reported from *C. spadiceum*.

Clinostomidae

***Clinostomum marginatum* Rudolphi, 1819**

Two metacercariae of *C. marginatum* (yellow grub) were recovered from the dermal tissue of an adult (138 mm TL) *L. chrysocephalus*. Although this digenean is a very common trematode that is cosmopolitan in distribution (Lane and Morris 2000), this is the first time it has been reported from *L. chrysocephalus*. In Oklahoma, the yellow grub has been reported previously from other non-game fishes, including Pirate Perches, *A. sayanus* (Hopkins 1933; McAllister and Bursey 2013), and Carp, *Cyprinus carpio* (Spall 1969).

Cestoidea: Proteocephalidea: Proteocephalidae

***Proteocephalus* sp. (Fig. 4)**

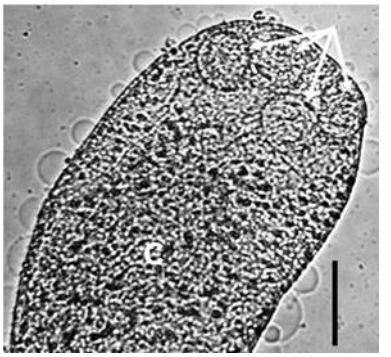

Figure 4. *Proteocephalus* sp. tapeworm from *Cyprinella whipplei* showing four unarmed suckers (arrows). Abbreviation: Calcareous corpuscles (C); Scale bar = 250 µm.

Two immature cestodes, *Proteocephalus* sp. were found in the small intestine of three (47, 49, 52 mm TL) *C. whipplei*. In addition, a single (8%) *L. chrysocephalus* (102 mm TL) harbored an extraintestinal immature *Proteocephalus* sp. tapeworm. Because these were immature (no mature or gravid proglottids present), specific identification was not possible. Interestingly, no cestodes have been previously reported from these hosts (Hoffman 1999). However, this genus of tapeworm has been commonly reported from various fishes, including several from Oklahoma (see Hoffman 1999).

In summary, examination of several cyprinid fishes revealed few helminth parasites. These results of low diversity of helminths are similar to those of Barger (2006) who examined over 600 *S. atromaculatus* from Nebraska and reported only four helminths (*A. lobatum*, *Proteocephalus* sp., a nematode (*Rhabdochona canadensis*) and an acanthocephalan (*Paulisentis missouriensis*) in this cyprinid host. Perhaps increasing the sample sizes and collecting at different sites that support suitable intermediate hosts

(aquatic molluscs) may increase our knowledge of the diversity and abundance of helminths in fishes of southeastern Oklahoma.

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