

Communication

A Novel Myxosporean (Cnidaria: Myxobolidae) from Largescale Stoneroller, *Campostoma oligolepis* (Cypriniformes: Leuciscidae) from Northeastern Arkansas, USA

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Received: 2 June 2026; Revised: 9 July 2026; Accepted: 30 September 2026; Available online: 21 October 2026

ABSTRACT: During March 2024, 2025, and 2026, 27 largescale stonerollers, *Campostoma oligolepis*, were collected from the Black and White River drainages in Lawrence County, Arkansas, USA, and examined for myxosporean parasites. All fish had their gills, gallbladder, fins, integument, musculature, and other major organs examined. The gill of 1 of 27 (3.7%) *C. oligolepis* was infected with a new myxosporean, *Myxobolus campostoma* n. sp. Qualitative and quantitative morphological data were obtained from fresh myxospores. The plasmodia were orbicular to very broadly elliptoid. The myxospores were orbicular to broadly elliptoid and measured (L × W), $8.0 \pm 0.4 \times 7.0 \pm 0.4 \mu\text{m}$ in valvular view. Thick myxospores were $5.1 \pm 0.2 \mu\text{m}$ in sutural view, with a distinct sutural ridge. Two polar capsules were broadly pyriform, equal to subequal in size. The longer polar capsule was $3.7 \pm 0.3 \times 2.1 \pm 0.2 \mu\text{m}$, and 46% of the myxospore length, while the shorter polar capsule was $3.4 \pm 0.3 \times 2.1 \pm 0.2 \mu\text{m}$, and 42% of the myxospore length. A coiled polar tubule was not discernable, and myxospores lacked a mucous envelope and sutural markings. The new species is most similar morphologically to *Myxobolus stanlii* Iwanowicz, Iwanowicz, Howerth, Schill, Blazer, and Johnson, 2013, found in connective tissue and muscle of *C. oligolepis* from Alabama, USA, by possessing orbicular to broadly elliptoid myxospores, but differs in the size of myxospores and polar capsules. Molecular data consisted of a 1994 base pair sequence (GenBank Accession: PQ859550) of the partial small subunit (SSU) ribosomal RNA (rRNA) gene. Phylogenetic analysis grouped *M. campostoma* n. sp. with catostomid-infecting myxobolids from North America. This is the second time a myxosporean has been described from *C. oligolepis*, as well as being the first time it has been collected from an individual of the species from west of the Mississippi River, USA.

Keywords: Arkansas; Cnidaria; Myxobolidae; Largescale stoneroller; *Campostoma oligolepis*; *Myxobolus campostoma*; SSU rRNA; Phylogeny

1. Introduction

The largescale stoneroller, *Campostoma oligolepis* Hubbs and Greene, 1935 (Cypriniformes: Leuciscidae) is a heavily-bodied minnow that occurs in the Mississippi River and Lake Michigan drainages of Wisconsin and eastern Minnesota, eastern Iowa, and northern Illinois, USA; it also occurs in Ozark streams of Missouri, Arkansas, and northeastern Oklahoma, USA; as well as the Green, Cumberland, and Tennessee drainages from Kentucky to Alabama and east to Virginia and North Carolina, USA; and Mobile Bay drainages in Georgia, Alabama and Mississippi, USA [1,2]. In Arkansas, *C. oligolepis* occurs throughout the Ozark Mountains in the Black, Illinois, and White River systems [3]. Previously, populations representing the current taxon were variously assigned to the stoneroller, *Campostoma anomalum* (Rafinesque, 1820) (e.g., [3]), central stoneroller, *Campostoma anomalum pullum* (Agassiz, 1854) [2], or the plains stoneroller, *Campostoma plumbeum* (Girard, 1858) [4], contingent on the taxonomy of *Campostoma* used at the time.

There are a few previous reports of parasites specifically from *C. oligolepis* [5]. Cloutman [6] reported two species of monogeneans, *Dactylogyrus katherineae* Price, 1967, and *Gyrodactylus campostomae* Wellborn, 1967, and two species of digeneans, *Bucephalopsis* sp., and *Crassiphiala bulboglossa* Van Haitsma, 1925, from White River, Arkansas, specimens. Iwanowicz et al. [7] reported a new myxosporean of the genus *Myxobolus* from 510 *C. oligolepis* from the Mobile River Basin, Alabama.

Based on morphological, meristic, and molecular data, we provide a description of a novel species of *Myxobolus* from the gills of *C. oligolepis* from the Black River drainage of Northeastern Arkansas. To our knowledge, this is only the second species of myxosporean reported from members of the unwieldy genus *Campostoma*, both from *C. oligolepis*.

2. Materials and Methods

2.1. Fish Collection and Necropsy

During March 2024, 2025, and 2026, 27 juvenile and adult *C. oligolepis* (mean $\pm$ SD total length [TL] = 95.2 ± 30.0 , 46–180 mm) were collected with a modified minnow trap (L $\times$ W $\times$ H [61 $\times$ 61 $\times$ 28 cm]) from Coffee Creek, Black River drainage, Lawrence County ($n = 1$; 36°06'15.87" N, 91°05'44.39" W), or with a backpack electrofisher from Spring Mill Creek, White River drainage, Independence County ($n = 5$; 35°52'41" N, 91°18'41" W), and Big Creek, White River drainage, Fulton County ($n = 21$; 36°26'02" N, 91°30'56" W). Specimens were placed in aerated habitat water, taken to the laboratory, and necropsied within 24 h following guidelines for the use of fish in research by the American Fisheries Society [8]. Morphological and molecular analysis follows McAllister et al. [9].

2.2. Morphological Characterization

With the use of a stereomicroscope, samples of fresh first and second gill arches were placed in Petri dishes containing 0.9% (v/v) saline (no other examined anatomical site possessed visible plasmodia) and picked directly with fine forceps for myxosporean plasmodia. Ruptured plasmodia with released myxospores were examined and photographed in unstained temporary wet smears at magnification of $\times 40$ –1000 and archived as digital images taken with a Swift model M10 (Microscope World, Carlsbad, CA, USA) or an Accuscope 300-LED Series phase-contrast microscope (Accu-Scope Inc., Commack, NY, USA) and camera. Measurements of myxosporeans (to the nearest 0.1 μ m) were made from digital images

according to Lom and Arthur [10] and Hoffman [5], and terminology for shapes of myxospores and polar capsules follows Clopton [11]. Dimensions of myxospores are presented in micrometers (μm) as mean length $\pm$ SD $\times$ mean width $\pm$ SD with the ranges in parentheses where appropriate. Myxospores were transferred to 80% ethanol for molecular analysis.

Syntype and voucher specimens of parasites were deposited in the Harold W. Manter Laboratory of Parasitology (HWML), University of Nebraska, Lincoln, Nebraska. Host voucher specimens were deposited in the Northeast Texas Community College Vertebrate Collection (NTCCVC), Mt. Pleasant, Texas. Prevalence and mean intensity are in accordance with the terminology given in Bush et al. [12]. Fish common and scientific names follow Robison and Buchanan [13] and Page et al. [14].

2.3. Molecular Characterization and Phylogenetic Analysis

The plasmodia preserved in ethanol underwent a Genomic DNA extraction using a Qiagen DNeasy Blood and Tissue Kit following the manufacturer's instructions. The *SSU* rRNA gene was amplified using the primer pairs (*i.e.*, ERIB1/ACT1R, Myxo1F/MyxGen3R, GenMyxo3/H2, H9/H2, and H9/ERIB10) listed in Leis et al. [15] and the following thermocycler conditions: 95 C for 10 min; 40 cycles of 95 C for 1 min, 53–55 C for 1 min, 72 C for 2 min, and 72 C for 10 min. Successful reactions were sequenced, using the same primers, by Eurofins Genomics (Louisville, KY, USA), and the resulting sequences were *de novo* assembled into contigs in Geneious (www.geneious.com; accessed on 10 March 2026). The assembled *SSU* rRNA gene for the new species was evaluated for sequence similarity in GenBank through a BLAST search. Similar sequences were downloaded for phylogenetic analysis in MEGA X [16]. *Henneguya laseae* Leis, Rosser, Baumgartner, and Griffin, 2017 (KX354352; host: *Pylodictis olivaris* (Rafinesque, 1818); Wisconsin, USA) was chosen as the outgroup. Maximum Likelihood analysis (MLA) was completed using a General Time Reversible (GTR) model with a gamma distribution (G) parameters [17]. The final dataset was 2209 bp for 31 taxa used for phylogenetic reconstruction.

3. Results

The gill of one of 27 (3.7%) *C. oligolepis* was infected with a new myxosporean which is described as follows:

3.1. Description

3.1.1. *Myxobolus campostoma* n. sp.

Description of plasmodia and mature myxospores based on fresh specimens (n = 18 unless otherwise stated): Plasmodia orbicular to very broadly elliptoid (191–239) $\times$ (235–260) (*n* = 2). Myxospores are morphologically consistent with those of the genus *Myxobolus* Bütschli, 1882 [18,19]. Myxospores orbicular to broadly elliptoid, 8.0 ± 0.4 (6.9–8.5) long $\times$ 7.0 ± 0.4 (6.5–8.1) wide in valvular view. Myxospores 5.1 ± 0.2 (4.8–5.3) (*n* = 4) thick in sutural view, with a distinct sutural ridge (Figures 1C and 2B). Polar capsules two, broadly pyriform, equal to subequal in size; longer polar capsule 3.7 ± 0.3 (3.2–4.0) $\times$ 2.1 ± 0.2 (1.8–2.8), 46 (40–51)% of myxospore length; shorter polar capsule 3.4 ± 0.3 (2.7–3.7) $\times$ 2.1 ± 0.2 (1.6–2.4), 42 (36–49)% of myxospore length. Coiled polar tubule not discernable. Myxospores lack a mucous envelope and sutural markings. Intercapsular process present.



Figure 1. Photomicrographs of *Myxobolus campostoma* n. sp. from gill lamellae of *Campostoma oligolepis*. (A) Plasmodium (P) near tip of gill filament. (B) Myxospores, ventral view. (C) Myxospore, sutural view.

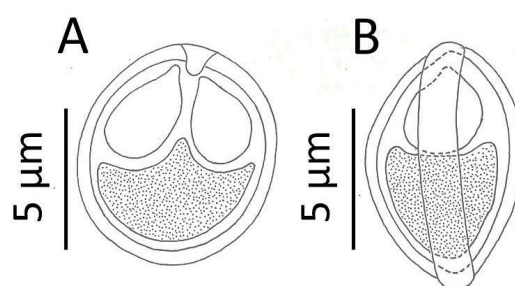


Figure 2. Composite line drawing of the myxospore of *Myxobolus campostoma* n. sp. (A) Ventral view. (B) Sutural view.

3.1.2. Taxonomic Summary

Type host: *Campostoma oligolepis* Hubbs and Greene, 1935 (Actinopterygii: Cypriniformes: Leuciscidae), 115 mm TL male, collected 13 March 2024.

Type locality: USA: Arkansas: Lawrence County, Coffee Creek at Black Rock (36°06'15.87" N, 91°05'44.39" W).

Geographic distribution: Black River drainage, Lawrence County, Arkansas, USA.

Prevalence: Overall, one of 27 (3.7%); 1/1 Lawrence County; 0/21 (0%) Fulton County; 0/5 (0%) Independence County.

Intensity: Numerous plasmodia; myxospores too numerous to count.

Site of infection: Gill lamellae.

Materials deposited: Syntypes, proxy photographs of myxospores according to ICZN Declaration 45 [19], HWML 218488.

Representative DNA sequences: Partial SSU rRNA genes, GenBank accession numbers (PQ859550).

ZooBank registration: To comply with the regulations set out in article 8.5 of the amended 2012 version of the International Code of Zoological Nomenclature [19], details of the new species have been submitted to ZooBank. The Life Science Identifier (LSID) for *Myxobolus campostoma* n. sp. is urn:lsid:zoobank.org:pub:0C5EA02D-908B-47F1-8C13-C27BBF6C046A.

Etymology: The new species is named after the genus of the host. *Campostoma* comes from the Greek words *kampe* (meaning “curved”) and *stoma* (meaning “mouth”).

3.2. Remarks

For comparative purposes, Iwanowicz et al. [7] provided a table of myxosporeans from leuciscids (reported then as cyprinids). *Myxobolus campostoma* n. sp. is morphologically most similar to *Myxobolus stanlii* Iwanowicz, Iwanowicz, Howerth, Schill, Blazer, and Johnson, 2013 found in connective tissue and muscle of *C. oligolepis* from Alabama by possessing orbicular to broadly ellipsoid myxospores, but differs in size of myxospores, 8.0 (6.9–8.5) × 7.0 (6.5–8.1) × 5.1 (4.8–5.3) in *M. campostoma* n. sp. versus 10.0

$(7.5\text{--}11.0) \times 8.8 (6.3\text{--}11.3) \times 6.3 (6.2\text{--}8.6)$ in *M. stanlii*. Polar capsules are smaller, $3.7 (3.2\text{--}4.0) \times 2.1 \pm 0.2 (1.8\text{--}2.8)$ and $3.4 (2.7\text{--}3.7) \times 2.1 (1.6\text{--}2.4)$ in the new species versus those of *M. stanlii*, $4.6 (4.5\text{--}6.9) \times 2.5 (2.1\text{--}4.3)$ [7].

Myxobolus campostoma n. sp. is found on a leuciscid species, but is phylogenetically grouped with catostomid-infecting species of *Myxobolus* from North America. Considerable host and site specificity is exhibited among the 41 nominal species of *Myxobolus* known from catostomids [9,20,21]. It is becoming increasingly difficult to distinguish many of these species morphologically due to overlap in the shape and size of myxospores. A combined suite of several host, site, morphological, and genetic characters is often needed to differentiate species. *Myxobolus campostoma* n. sp. can be differentiated from these other species by its unique combination of characters (see description herein) compared to characteristics of all other known catostomids (see Table 1 [20,21]). Of these 41 nominal species, nine are morphometrically similar enough to warrant further comparison with *M. campostoma* n. sp. (Table 1). With the exception of *M. globosus* for which there are no data for polar capsules, *M. campostoma* n. sp. has consistently smaller polar capsules than the other species (Table 1). *Myxobolus globosus* ($7.0\text{--}8.0 \times 6.0$) has smaller myxospores than *M. campostoma* n. sp. ($8.0 [6.9\text{--}8.5] \times 7.0 [6.5\text{--}8.1]$) (Table 1). In addition, *M. globosus* has a very narrowly elliptoid plasmodium, whereas that of *M. campostoma* n. sp. is orbicular to broadly elliptoid (Table 1). *Myxobolus campostoma* n. sp. is most genetically similar to *Moxostoma bibullatus* (Kudo, 1934) found on the gills of white sucker, *Catostomus commersonii* (Lacépède, 1803) (Figure 3), but is only 93.97% similar. In addition, *M. campostoma* n. sp. is easily distinguished morphologically from *M. bibullatus* by its much smaller myxospores ($8.0 [6.9\text{--}8.5] \times 7.0 [6.5\text{--}8.1]$ versus $14.0 [10.5\text{--}16.0] \times 11.0 [8.0\text{--}13.0]$) and polar capsules ($3.7 [3.2\text{--}4.0] \times 2.1 [1.5\text{--}2.8]$ versus $5.5 [5.0\text{--}6.5] \times 3.0 [2.5\text{--}4.0]$), respectively.

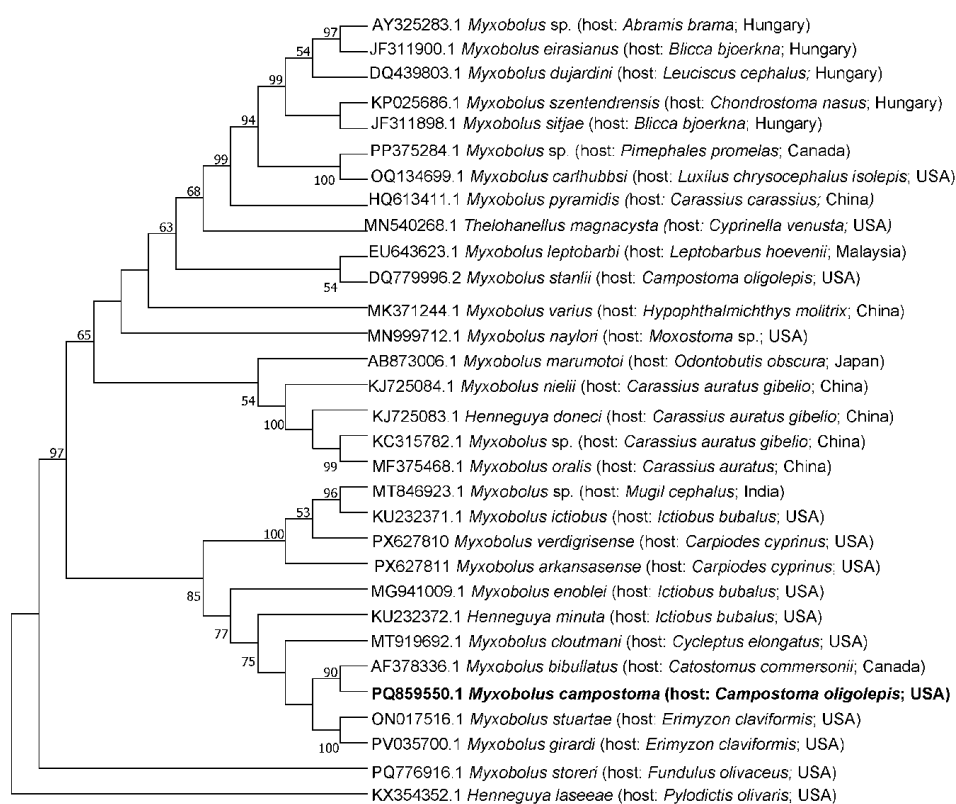


Figure 3. Phylogenetic tree produced through Maximum Likelihood analysis involving the SSU rRNA gene for *Myxobolus campostoma* n. sp., genetically similar species downloaded from GenBank as well as *Myxobolus stanlii*, the only other myxosporean described from *C. oligolepis*. Bootstrap values >50 are shown and based on 1000 replicates.

Table 1. Host, site, and morphometrics of species of *Myxobolus* parasitizing catostomids similar to *Myxobolus camptostoma* n. sp. (bold type).

Species	Host	PLS	PLL	PLW	MXS	MXL	MXW	MXT	PCS	LPCL	LPCW	SPCL	SPCW	PTC	ME	SM	IP	Site	Locality	Reference
<i>M. arkansense</i> McAllister et al., 2026	<i>Carpionodes cyprinus</i>	1,2	200 (90–380)	150 (60–290)	1,2,3	10.5 (8.9–11.6)	8.7 (7.7–9.4)	6.2 (5.6–6.5)	5	4.9 (4.4–5.6)	2.8 (2.6–3.2)	4.8 (4.2–5.6)	2.7 (2.4–3.2)	(4–6)	P	A	P	2	OK	[21]
<i>M. camptostoma</i> n. sp.	<i>Camptostoma oligolepis</i>	1,2,3	(235–260)	(191–239)	1,2,3	8.0 (6.9–8.5)	7.0 (6.5–8.1)	5.1 (4.8–5.3)	6	3.7 (3.2–4.0)	2.1 (1.8–2.8)	3.4 (2.7–3.7)	2.1 (1.6–2.4)	–	A	A	P	1	AR	[Present study]
<i>M. cloutmani</i> McAllister et al., 2021	<i>Cycleptus elongatus</i>	2	407 (300–850)	270 (200–250)	1,2,3	8.7 (8.1–9.6)	7.8 (6.6–8.8)	3.7 (3.3–4.1)	5	5.5 (4.8–5.9)	3.1 (2.6–3.7)	5.1 (4.4–5.6)	2.9 (2.6–3.3)	(5–6)	A	A	A	1	AR	[22]
<i>M. endovasus</i> (Davis, 1947) Grinham and Cone, 1990	<i>Ictiobus bubalus</i>	8	-	-	1	9	8	-	5	5	3.5	-	-	-	-	-	-	1	IA	[23–26]
<i>M. girardi</i> McAllister et al., 2025	<i>Erimyzon claviformis</i>	1	(230–250)	(230–250)	1,2,3	10.3 (9.6–10.9)	8.9 (8.4–9.4)	6.2	7	5.5 (4.4–6.1)	2.9 (2.6–3.4)	5.2 (4.4–6.1)	2.8 (2.4–3.3)	(5–7)	A	A	A	2	AR	[20]
<i>M. globosus</i> Gurley, 1893	<i>Erimyzon oblongus</i>	4	500	-	1,3	(7.0–8.0)	6	5	-	-	-	-	-	-	-	A	A	1	NC, SC	[27,28]
<i>M. lamellus</i> Grinham and Cone, 1990	<i>Catostomus commersonii</i>	7	(500–1,000)	(80–150)	3	12.0 (9.5–13.5)	10.5 (9.0–12.0)	7.0 (5.0–8.0)	6	6.0 (5.0–7.0)	3.5 (3.0–4.5)	-	-	(5–6)	A	A	P	1	NS	[26]
<i>M. meglitschi</i> (Meglitsch, 1937) Grinham and Cone, 1990	<i>Carpionodes cyprinus</i>	1	500	-	1,3	(12.0–14.0)	(11.0–13.0)	(7.0–8.5)	6,7	(6.0–7.0)	(3.0–4.0)	-	-	6	-	A	A	1	IL	[24,29]
<i>M. stuartae</i> McAllister et al., 2022	<i>Erimyzon claviformis</i>	2,3,4	665 (440–890)	205 (190–220)	1,2,3	11.8 (10.4–12.9)	10.5 (9.6–11.4)	-	7	5.2 (3.9–5.7)	3.1 (2.9–3.6)	4.7 (3.8–5.0)	3.1 (2.7–3.6)	(6–7)	A	A	A,P	3	AR	[9]
<i>M. verdigrisense</i> McAllister et al., 2026	<i>Carpionodes cyprinus</i>	1,2	230 (180–260)	180 (140–250)	1,2,3	8.7 (7.3–9.7)	8.3 (7.3–9.4)	6.3 (5.6–6.8)	5	5.0 (4.4–5.6)	3.1 (2.7–3.4)	4.6 (4.2–5.0)	3.0 (2.4–3.4)	(3–6)	P	A	P	1	OK	[21]

Mean measurements (µm) followed by range in parentheses. Shape of plasmodia, myxospore, and polar capsules [11]: 1, orbicular; 2, ellipsoid; 3, broadly ellipsoid; 4, very narrowly ellipsoid; 5, pyriform; 6, broadly pyriform; 7, ovoid; 8, crescentic. Site: 1, Gill lamellae; 2, Gill arch/rakers; 3, Fins. PLS plasmodium shape, PLL plasmodium length, PLW plasmodium width, MXS myxospore shape, MXL myxospore length, MXW myxospore width, MXT myxospore thickness, PCS polar capsule shape, LPCL length of longer polar capsule, LPCW width of longer polar capsule, SPCL length of shorter polar capsule, SPCW width of shorter polar capsule, PTC number of polar tubule coils, ME mucous envelope (A = absent, P = present), SM sutural markings, IP intercapsular process.

3.3. Molecular Characterization and Phylogenetic Analysis

A 1994 bp sequence (GenBank Accession PQ859550) was produced for *M. campostoma* n. sp. A BLAST search (accessed December 2024) resulted in the highest max scores belonging to the following catostomid (sucker) species: *Myxobolus bibullatus* (Kudo, 1934) Grinham and Cone, 1990 (93.97%; AF378336.1; host: white sucker, *Catostomus commersonii* (Lacépède, 1803); Nova Scotia, Canada), *Myxobolus cloutmani* McAllister, Woodward, Stilwell, Rosser, Fayton, Camus, Griffin, and Robison, 2021 (93.15%; MT919692.1; host: blue sucker, *Cycleptus elongatus* (Lesueur, 1817); Black River, AR, USA), *Myxobolus* sp. (92.19%; ON017516; host: western creek chubsucker, (Girard, 1856); Wilson Creek, AR, USA), *Henneguya minuta* (Cohn, 1895) Labbé, 1899 (92.2%; KU232372.1; host: smallmouth buffalo, *Ictiobus bubalus* (Rafinesque, 1818); USA). All others were <92% similar. Maximum Likelihood analysis (Figure 3) revealed *M. campostoma* n. sp. was in a well-supported clade that included these species as well as other myxosporeans known to infect catostomids, with the lone outlier being an unnamed *Myxobolus* sp. that infects a marine species, flathead gray mullet, *Mugil cephalus* (L., 1758) in India. A direct BLAST comparison between the morphologically similar *M. campostoma* n. sp. and *M. stanlii* showed that the two species were only 86.84% similar.

4. Discussion

Phylogenetic analysis placed *M. campostoma* n. sp. among myxosporeans that infect various North American fish species, mostly catostomids, as well as a seemingly random myxosporean reported to infect *M. cephalus* (Figure 3). This clade, similar to the catostomid-specific clade shown in McAllister et al. [9,21], appears to be primarily confined to North American species; however, there is potential for a connection to India if the sequence for the *Myxobolus* sp. that infects *M. cephalus* (MT846923) can be verified through the species being formally described. Interestingly, the sequence for *M. stanlii*, the only other myxosporean described from *C. oligolepis*, does not belong to the clade previously mentioned but is in its own lineage and sister to *Myxobolus leptobarbi* Székely, Shaharom-Harrison, Cech, Mohamed, and Molnár, 2009 (host: mad barb, *Leptobarbus hoevenii* [Bleeker, 1851]) from a fish farm in Machang, Kelantan Province, Malaysia, indicating multiple *Myxobolus* lineages infect *C. oligolepis*.

The fact that *M. campostoma* n. sp. parasitizes a leuciscid but is genetically grouped with species that infect catostomids indicates that its phylogenetic history is influenced more by ecological association with, and host switching from, catostomids than by host phylogeny. Interestingly, the two hosts, *C. oligolepis* and the white sucker, *Catostomus commersonii* (Lacépède), that are hosts to the genetically similar *M. campostoma* n. sp. and *M. bibullatus* (see Figure 3), are sympatric in much of their respective ranges [2].

5. Conclusion Remarks

Herein, we report the second known myxosporean species, *M. campostoma* n. sp., to be described from *C. oligolepis* with the novel species description being supported by morphological, mensural, and molecular data. We suggest that additional species of *Campostoma* [2,3] in Arkansas and elsewhere in the USA be surveyed for myxosporeans and predict that new host and new geographic records will be found for their myxosporeans as well as the distinct possibility of discovering new species.

Acknowledgments

We thank commercial fisherman Dwight Ferguson, Black Rock, Arkansas, USA, for collecting the type host and providing his fish hut for host processing. Usage of trade names does not imply endorsement by the U.S. Government. The findings and conclusions in this article are those of the authors and do not necessarily represent the views of the U.S. Fish and Wildlife Service.

Author Contributions

This study was designed by C.T.M., D.G.C. and E.M.L. Field collections were performed by C.T.M., D.G.C., E.M.L., M.R.R. and G.B. Laboratory procedures for processing fish and necropsy were performed by C.T.M., D.G.C., E.M.L., M.R.R. and G.B. Laboratory procedures for measurements, photomicrographs (Figure 1), and isolation of plasmodia and myxospores were performed by C.T.M., D.G.C. and E.M.L. The line drawing (Figure 2) was prepared by D.G.C. E.M.L. performed molecular analyses and prepared Figure 3. The manuscript was written by all authors and all read, including M.R.R., G.B. and H.W.R., and they approved the final manuscript.

Ethics Statement

The Arkansas Game and Fish Commission issued Scientific Collecting Permit no. 051420214 on 1 March 2026 to CTM and approved all the procedures and field study of the fish in this study. All applicable institutional, national, and international guidelines for the care and use of animals were followed.

Informed Consent Statement

Not applicable.

Data Availability Statement

All data are available upon request.

Funding

This research received no external funding.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

1. Cashner RC, Matthews WJ, Marsh-Matthews E, Unmack PJ, Cashner FM. Recognition and redescription of a distinctive stoneroller from the Southern Interior Highlands. *Copeia* **2010**, 2010, 300–311. DOI:10.1643/CI-08-051
2. Page LM, Burr BM. *Peterson Field Guide to Freshwater Fishes of North America North of Mexico*, 2nd ed.; Houghton Mifflin Harcourt: New York, NY, USA, 2011.
3. Robison HW, Buchanan TM. *Fishes of Arkansas*; University of Arkansas Press: Fayetteville, AR, USA, 2004.
4. Blum MJ, Neely DA, Harris PM, Mayden RL. Molecular systematics of the cyprinid genus *Campostoma* (Actinopterygii: Cypriniformes): Disassociation between morphological and mitochondrial differentiation. *Copeia* **2008**, 2008, 360–369. DOI:10.1643/CI-06-093
5. Hoffman GL. *Parasites of North American Freshwater Fishes*, 2nd ed.; Comstock Publishing Associates: Ithaca, NY, USA, 1999.
6. Cloutman DG. Parasitism in relation to taxonomy of the sympatric sibling species of stonerollers, *Campostoma anomalum pullum* (Agassiz) and *C. oligolepis* Hubbs and Greene, in the White River, Arkansas. *Southwest. Nat.* **1976**, 21, 67–70. DOI:10.2307/3670325
7. Iwanowicz DD, Iwanowicz LR, Howerth EW, Schill WB, Blazer VS, Johnson RL. Characterization of a new myxozoan species (Myxozoa: Myxobolidae: Myxosporea) in Largescale Stonerollers (*Campostoma oligolepis*) from the Mobile River Basin (Alabama). *J. Parasitol.* **2013**, 99, 102–111. DOI:10.1645/GE-2890.1
8. Use of Fishes in Research Committee (Joint Committee of the American Fisheries Society, the American Institute of Fishery Research Biologists, and the American Society of Ichthyologists and Herpetologists). *Guidelines for the Use of Fishes in Research*; American Fisheries Society: Bethesda, MD, USA, 2014. Available online: <https://fisheries.org/policy-media/science-guidelines/guidelines-for-the-use-of-fishes-in-research/> (accessed on 3 May 2026).

9. McAllister CT, Cloutman DG, Camus AC, Trauth SE, Ray JC, Robison HW, et al. A new species of *Myxobolus* (Cnidaria: Myxosporea: Myxobolidae) from the fins of the Western Creek Chubsucker, *Erimyzon claviformis* (Cypriniformes: Catostomidae), from Arkansas. *J. Parasitol.* **2022**, *108*, 545–552. DOI:10.1645/22-40
10. Lom J, Arthur JR. A guideline for the preparation of species descriptions in Myxosporea. *J. Fish Dis.* **1989**, *12*, 151–156. DOI:10.1111/j.1365-2761.1989.tb00287.x
11. Clopton RE. Standard nomenclature and metrics of plane shapes for use in gregarine taxonomy. *Comp. Parasitol.* **2004**, *71*, 130–140. DOI:10.1654/4151
12. Bush AO, Lafferty KD, Lotz JM, Shostak AW. Parasitology meets ecology on its own terms: Margolis et al. Revisited. *J. Parasitol.* **1997**, *83*, 575–583. DOI:10.2307/3284227
13. Buchanan TM, Robison HW. *Fishes of Arkansas*, 2nd ed.; University of Arkansas Press: Fayetteville, AR, USA, 2020.
14. Page LM, Bemis KE, Dowling TE, Espinosa-Pérez HS, Findley LT, Gilbert CR, et al. *Common and Scientific Names of Fishes from the United States, Canada, and Mexico*, 8th ed.; American Fisheries Society: Bethesda, MD, USA, 2023.
15. Leis EM, Rosser TG, Baumgartner WA, Griffin MJ. Two novel myxozoans from Pirate Perch *Aphredoderus sayanus* (Gilliams, 1824) in the Upper Mississippi River, including the first North American species of *Hennegoides* Lom, Tonguthai, & Dyková, 1991. *J. Parasitol.* **2019**, *105*, 918. DOI:10.1645/19-43
16. Kumar S, Stecher G, Li M, Knyaz C, Tamura K. MEGA X: Molecular evolutionary genetics analysis across computing platforms. *Mol. Biol. Evol.* **2018**, *35*, 1547–1549. DOI:10.1093/molbev/msy096
17. Tamura K, Nei M. Estimation of the number of nucleotide substitutions in the control region of mitochondrial DNA in humans and chimpanzees. *Mol. Biol. Evol.* **1993**, *10*, 512–526. DOI:10.1093/oxfordjournals.molbev.a040023
18. Fiala I, Bartošová-Sojčková P, Whipps CM. Classification and phylogenetics of Myxozoa. In *Myxozoan Evolution, Ecology and Development*; Okamura B, Gruhl A, Bartholomew JL, Eds.; Springer: Cham, Switzerland, 2015; pp. 85–110. DOI:10.1007/978-3-319-14753-6_5
19. ICZN (International Commission on Zoological Nomenclature). Declaration 45—Addition of Recommendations to Article 73 and of the term “specimen, preserved” to the Glossary. *Bull. Zool. Nomencl.* **2017**, *73*, 96–97. DOI:10.21805/bzn.v73i2.a2
20. McAllister CT, Cloutman DG, Leis EM, Camus AC, Robison HW. A new *Myxobolus* (Cnidaria: Myxosporea: Myxobolidae) from the gill arch of the Western Creek Chubsucker, *Erimyzon claviformis* (Cypriniformes: Catostomidae), in Arkansas, USA. *Acta Parasitol.* **2025**, *70*, 68. DOI:10.1007/s11686-025-01001-6
21. McAllister CT, Cloutman DG, Leis EM, Robison HW. Two new species of *Myxobolus* (Cnidaria: Myxosporea: Myxobolidae) from the gills of Quillback, *Carpionodes cyprinus* (Cypriniformes: Catostomidae), from the Arkansas River Drainage, Oklahoma, USA. *Fishes* **2026**, *11*, 180. DOI:10.3390/fishes11030180
22. McAllister CT, Woodyard ET, Stilwell JM, Rosser TG, Fayton TJ, Camus AJ, et al. A new species of *Myxobolus* (Cnidaria: Myxosporea: Myxobolidae) from the Blue Sucker, *Cycleptus elongatus* (Lesueur) (Cypriniformes: Catostomidae: Cycleptinae), from Arkansas. *J. Parasitol.* **2021**, *107*, 582–592. DOI:10.1645/20-125
23. Davis HS. Studies of the protozoan parasites of fresh-water fishes. *Fish Wildl. Serv. Fish. Bull.* **1947**, *51*, 1–29.
24. Grinham T, Cone DK. A review of species of *Myxobolus* (Myxosporea) parasitizing catostomid fishes, with a redescription of *Myxobolus bibullatus* (Kudo, 1934) n. comb. and description of *Myxobolus lamellus* n. sp. from *Catostomus commersoni* in Nova Scotia. *Can. J. Zool.* **1990**, *68*, 2290–2298. DOI:10.1139/z90-320
25. Landsberg JH, Lom J. Taxonomy of the genera of the *Myxobolus/Myxosoma* group (Myxobolidae: Myxosporea), current listing of species and revision of synonyms. *Syst. Parasitol.* **1991**, *18*, 165–186. DOI:10.1007/BF00009358
26. Cone DK, Raesly RL. Redescription of *Myxobolus rhinichthidis* (Myxosporea) parasitizing *Rhinichthys cataractae*, with a revised taxonomic list of species of *Myxobolus* known from North American freshwater fishes. *Can. J. Fish. Aquat. Sci.* **1995**, *52*, 7–12. DOI:10.1139/f95-502
27. Gurley RR. On the classification of the Myxosporidia, a group of protozoan parasites infesting fishes. *Bull. U. S. Fish Comm.*, **1893**, *11*, 407–420.
28. Kudo R. Studies on Myxosporidia: A synopsis of genera and species of Myxosporidia. *Ill. Biol. Monogr.* **1920**, *5*, 1–265. DOI:10.5962/bhl.title.16800
29. Meglitsch PA. On some new and known Myxosporidia of the fishes of Illinois. *J. Parasitol.* **1937**, *23*, 467. DOI:10.2307/3272393