

DISTRIBUTION OF SPONGILLAFLIES (NEUROPTERA: SISYRIDAE) IN MANITOBA

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ABSTRACT

Although the presence of the family Sisyridae in Manitoba has been acknowledged in the literature, it has only briefly and indirectly mentioned, with no detailed locality data. We provide the first verified distribution records for *Climacia areolaris* (Hagen), *Sisyr nigra* (Retzius), and *Sisyr vicaria* (Walker), in Manitoba. Due to limitations in the larval taxonomy, we were unable to distinguish between *S. nigra* and *S. vicaria* larvae; these specimens were therefore identified as *S. nigra/S. vicaria*. Potential diagnostic differences between the larval stages of these two species are discussed.

Keywords: *Climacia areolaris*, *Sisyr nigra*, *Sisyr vicaria*

INTRODUCTION

Sisyridae (spongillaflies), members of the order Neuroptera, typically deposit their eggs on vegetation that overhangs still or slow-flowing freshwater bodies such as lakes and rivers. The larvae are aquatic, undergo three instars, and develop within freshwater sponges and bryozoans, which they also consume. Their elongated mouthparts allow them to penetrate sponge tissue and extract nutrients. Pupae are encased in a distinctive, net-like, usually double-layered cocoon. Adults are generally observed near larval habitats and are frequently attracted to artificial light sources (Oswald & Machado 2018).

Sisyrids have a cosmopolitan distribution and include 71 species in four genera (Oswald & Machado 2018). In the Nearctic region (excluding Mexico), six species in two genera are recognized (Tauber 1991; Penny et al. 1997; Cover & Resh 2008; Flint 2015). The six Nearctic species include *Sisyr apicalis* Banks, *Sisyr nigra* (Retzius) (historically referred to as *Sisyr fuscata* in older literature), *Sisyr vicaria* (Walker), *Climacia areolaris* (Hagen), *Climacia californica* Chandler, and *Climacia chapini* Parfin and Gurney (Parfin & Gurney 1956; Poirrier & Arceneaux 1972). Of these, only three species are currently known from Canada: *S. nigra*, *S. vicaria*, and *C. areolaris* (Parfin & Gurney 1956; Penny et al. 1997; Bowles 2006).

The distribution of Sisyridae in the United States is relatively well documented, with publications covering the entire country (Carpenter 1940; Chandler 1956; Parfin & Gurney 1956; Brown 1974; Bowles 2006), as well as regional studies in the southern U.S. (Poirrier & Arceneaux 1972), California (Grigarick 1975), Idaho (Clark 1985), Iowa (Bowles & Courtney 2020), Kentucky (Resh 1976), Michigan (Old 1933; Skelton & Strand 2013), Minnesota (Parfin 1952), Mississippi (Poirrier & Holzenthal 1980), North Dakota (Stoaks et al. 1983), Utah (Fisher et al. 2019), Virginia (Flint 2015), Ohio (Brown 1952), Wisconsin (Matteson & Jacobi 1980), Washington (Whaley et al. 2003), Florida (Rasmussen & Pescador 2002), and Texas/Oklahoma (White 1976).

In contrast, distribution records of Sisyridae in Canada are scarce. Parfin & Gurney (1956) noted that Sisyridae appear to be limited to the southern part of the country. *Climacia areolaris* has an eastern Canadian distribution, occurring in Ontario and Quebec (Carpenter 1940; Brown 1974; Parfin & Gurney 1956; Penny et al. 1997; Bowles 2006). *Sisyrna nigra* is known from British Columbia, Ontario, Quebec (Parfin & Gurney 1956; Penny et al. 1997), Alberta (Retallack & Walsh 1974), and Newfoundland (Bowles 2006). This species is Holarctic in distribution, with a broad range encompassing Canada, Europe, and northern parts of the United States (Bowles 2006). *Sisyrna vicaria* has been recorded from British Columbia, Nova Scotia, Ontario, and Quebec (Parfin & Gurney 1956; Penny et al. 1997; Bowles 2006). Carpenter (1940) suggested that *S. vicaria* may occur across southern Canada.

There are no well-documented publications specifically detailing Sisyridae from Manitoba. One reference comes from a 1962 report by the Canadian Department of Forestry on potential predators of the larch sawfly (Ives 1962). In this report, three Sisyridae species (*C. areolaris*, *S. nigra*, and *S. vicaria*) were recorded from light trap collections in a tamarack bog in Manitoba in 1961. However, no specific location details were provided for these captures.

Lehmkuhl (1975), a Saskatchewan researcher, published a field guide to aquatic insect families that includes distribution tables for the Canadian Prairie Provinces. In this guide, he lists Sisyridae as occurring in Alberta, Saskatchewan, and Manitoba.

Due to their small size (adults are 4–8 mm in length; Bowles & Contreras-Ramos (2019)) and lack of economic importance, Sisyridae have received limited taxonomic attention in recent decades in North America, particularly in the United States and Canada. This includes a lack of work aimed at resolving longstanding gaps in distribution records and ambiguities in species-level identification. The most recent key that covered this area is in Bowles (2006). The interpretation of early accounts of Sisyridae has presented challenges (Parfin & Gurney 1956; Brown 1952). Brown noted issues with redrawing and misinterpreting earlier figures. Tauber (1991) incorrectly stated that all Sisyridae larvae exhibit the same gill segmentation, citing the figure of *S. vicaria* from Parfin & Gurney (1956).

For the three species present in Manitoba (*C. areolaris*, *S. nigra*, and *S. vicaria*), keys for adults describe clear differences at both the generic and species levels, including forewing venation, the shape of the labial palps, and colouration (Parfin & Gurney 1956; Bowles 2006; Bowles & Contreras-Ramos 2019). However, no published keys are available to distinguish the larvae of *S. nigra* and *S. vicaria*. Bowles (2006) concluded that the two species cannot be distinguished reliably in the larval stage, and Poirrier & Arceneaux (1972) recorded *S. nigra* from New

England through the Great Lakes but omitted it from his key to larvae. Pupedis (1980) attempted to describe larval differences between these two species, but the characters he proposed are ambiguous. For example, he noted that the middle tubercle on the sixth abdominal segment is positioned more medially in *S. vicaria* than in *S. nigra*, and he compared ratios between tubercle placements on the pronotum. However, these ratios overlapped between the two species, reducing their diagnostic value.

Characters proposed elsewhere all involve comparison with species outside of Manitoba. Differences between European *S. nigra* and *Sisyr terminalis* Curtis larvae are given in Weissmair & Waringer (1994) and Elliott (2009), while distinctions between southern U.S. *S. vicaria* and *S. apicalis* larvae are provided by Rasmussen & Pescador (2002).

METHODS

The specimens used in this study were obtained from several sources. The majority are housed at the J.B. Wallis/R.E. Roughley Museum of Entomology (WRME) in Winnipeg, Manitoba, which includes both previously catalogued material and newly deposited specimens collected from the Winnipeg River and Burntwood River. These additional specimens were formally added to the WRME during the present study.

Specimens from the Winnipeg River were donated by Manitoba Hydro and originally collected by North/South Consultants Inc. (NSC) as part of an environmental monitoring project at the Pointe du Bois Generating Station. These were collected in 2018; earlier collections from 2016 were not available for use. All specimens were initially identified to the family level, with species-level identifications completed during the current study. Additional materials came from Manitoba Hydro on behalf of the Wuskwatim Power Limited Partnership (WPLP), collected from the Burntwood River by NSC in 2008 and 2016. These were also originally identified to family and were re-identified to species level for this work. Several Manitoba specimens were loaned by the Northern Forestry Centre Insect Collection (NFRC), Canadian Forest Service, Natural Resources Canada, Edmonton, Alberta.

Research-grade observations were obtained from iNaturalist.org. Only photographic records with unambiguous species-level identifications were included; no physical specimens were examined. The Global Biodiversity Information Facility (GBIF) occurrence numbers are provided for each of these records.

Occurrence data from Manitoba Hydro and the Manitoba government's Coordinated Aquatic Monitoring Program (CAMP) were used under limited permission for the inclusion of two general presence locations (Cross Lake and Rat River) on the distribution map. No specimen or field data are provided.

Taxonomic keys and descriptions used to identify both larvae and adult Sisyridae were drawn from Longinos (1935), Killington (1936), Chandler (1956), Parfin & Gurney (1956), Poirrier &

Table 1. Manitoba Sisyridae *Climacia* records.

Species	N	Stage	Location	Lat. (N)	Long. (W)	Date	Collection Method	Collector ¹	Depository ²	Voucher #
<i>C. areolaris</i>										
1	adult	Burntwood River	55.92	-97.46	24.vii.1967			CFS	NFRC	
1	adult	Rennie	49.85	-95.55	16.viii.1961	Light Trap		CFS	NFRC	
5	adult	Rennie	49.85	-95.55	6.viii.1961	Light Trap		CFS	NFRC	
1	adult	Star Lake, Whiteshell Provincial Park	49.7527	-95.2569	21.viii.2015	Light Trap		<i>C. Mills</i>	UM-WRME	JBWM0359851
1	adult	Star Lake, Whiteshell Provincial Park	49.7527	-95.2569	21.viii.2015	Light Trap		<i>E. Barstead</i>	UM-WRME	JBWM0359852
1	larva	Winnipeg River	50.2965	-95.5409	20.vi.2018	Drift Net		NSC	UM-WRME	WRME0519828
1	larva	Winnipeg River	50.2963	-95.5424	20.vi.2018	Drift Net		NSC	UM-WRME	WRME0519838
2	larva	Winnipeg River	50.2959	-95.5429	20.vi.2018	Drift Net		NSC	UM-WRME	WRME0519829
2	larva	Winnipeg River	50.2964	-95.5416	20.vi.2018	Drift Net		NSC	UM-WRME	WRME0519839
2	larva	Winnipeg River	50.2965	-95.5409	21.vi.2018	Drift Net		NSC	UM-WRME	WRME0519823
3	larva	Winnipeg River	50.2961	-95.5425	21.vi.2018	Drift Net		NSC	UM-WRME	WRME0519826
3	larva	Winnipeg River	50.2963	-95.5424	21.vi.2018	Drift Net		NSC	UM-WRME	WRME0519831
1	larva	Winnipeg River	50.2968	-95.5400	21.vi.2018	Drift Net		NSC	UM-WRME	WRME0519835
1	larva	Winnipeg River	50.2959	-95.5430	21.vi.2018	Drift Net		NSC	UM-WRME	WRME0519837
1	larva	Winnipeg River	50.2964	-95.5413	22.vi.2018	Drift Net		NSC	UM-WRME	WRME0519824
1	larva	Winnipeg River	50.2963	-95.5424	22.vi.2018	Drift Net		NSC	UM-WRME	WRME0519832
2	larva	Winnipeg River	50.2959	-95.5429	22.vi.2018	Drift Net		NSC	UM-WRME	WRME0519834
1	larva	Winnipeg River	50.2969	-95.5401	22.vi.2018	Drift Net		NSC	UM-WRME	WRME0519841
2	larva	Winnipeg River	50.3183	-95.5282	23.vi.2018	Drift Net		NSC	UM-WRME	WRME0519827
7	larva	Winnipeg River	50.3042	-95.5477	24.vi.2018	Drift Net		NSC	UM-WRME	WRME0519836
1	larva	Winnipeg River	50.3172	-95.5301	24.vi.2018	Drift Net		NSC	UM-WRME	WRME0519840
1	larva	Winnipeg River	50.3042	-95.5477	25.vi.2018	Drift Net		NSC	UM-WRME	WRME0519830
2	larva	Winnipeg River	50.3180	-95.5290	25.vi.2018	Drift Net		NSC	UM-WRME	WRME0519833

¹ Canadian Forest Service (CFS), North/South Consultants Inc. (NSC).² Northern Forestry Centre Insect Collection (NFC) in Edmonton, Alberta. J.B. Wallis/R.E. Roughley Museum of Entomology (WRME) in Winnipeg, Manitoba.

Table 2. Manitoba Sisyridae *Sisyra* records.

Species	N	Stage	Location	Lat. (N)	Long. (W)	Date	Collection Method	Collector ¹	Depository ²	Voucher # ³
<i>S. nigra</i>	1	adult	Winnipeg	49.8602	-97.0726	5.vii.2022	Photo	B. Guinn	iNaturalist	4162280354
	1	adult	Winnipeg	49.8306	-97.0991	30.vii.2023	Photo	B. Guinn	iNaturalist	4519302878
	1	adult	Winnipeg	49.8534	-97.0448	12.vii.2024	Photo	B. Guinn	iNaturalist	5006904025
	4	adult	Rennie	55.58	-98.36	18.vii.1961	Light Trap	CFS	NFRC	
<i>S. vicaria</i>	1	adult	Rennie	55.58	-98.36	6.viii.1961	Light Trap	CFS	NFRC	
	1	adult	Glenlea Research Station	49.65	-97.12	15.viii.1984	C0 ₂ Trap	L. Reichert	UM-WRME	JBWM0093571
	1	adult	Glenlea Research Station	49.65	-97.12	23.vii.1987		L. Manaiagre	UM-WRME	JBWM0093339
	1	adult	Glenlea Research Station	49.65	-97.12	24.vii.1985		D.M. Currey	UM-WRME	JBWM0093379
	1	Adult	Oak Hammock ⁴	50.1881	-97.1249	3.vii.1986		E. Fortney	UM-WRME	JBWM0093572
	9	adult	Rennie	55.58	-98.36	10.vii.1961	Light Trap	CFS	NFRC	
	2	adult	Rennie	55.58	-98.36	18.vii.1961	Light Trap	CFS	NFRC	
	1	adult	Rennie	55.58	-98.36	17.vii.1961	Light Trap	CFS	NFRC	
	1	adult	Rennie	55.58	-98.36	21.vii.1961	Light Trap	CFS	NFRC	
<i>S. vicaria/nigra</i>	1	adult	Winnipeg	49.868	-97.163	1.vii.1978	UV Light Trap	W.B. Preston	UM-WRME	WRME0519809
	1	adult	Winnipeg	49.868	-97.163	1.vii.1978	UV Light Trap	W.B. Preston	UM-WRME	WRME0519810
	1	larva	Burntwood River	55.5755	-98.3641	26.viii.2008	Kicknet	NSC	UM-WRME	WRME0519812
	1	larva	Burntwood River	55.5412	-98.4559	10.ix.2016	Ponar	NSC	UM-WRME	WRME0519813
	1	larva	Crooked Creek/ (Hwy 20) near Dauphin	51.135	-99.821	19.viii.1982		B. Heise	UM-WRME	WRME0519811
			Cross Lake ⁵						CAMP	
			Rat Lake ⁵						CAMP	

¹ Canadian Forest Service (CFS), North/South Consultants Inc. (NSC).

² Northern Forestry Centre Insect Collection (NIFC) in Edmonton, AB. J.B. Wallis/R.E. Roughley Museum of Entomology (WRME) in Winnipeg, MB.

³ Voucher #s from iNaturalist are GBIF Occurrence Numbers.

⁴ This adult specimen was damaged, see Results for details.

⁵ No data given about these specimens as per data agreement.

Arceneaux (1972), Aspöck *et al.* (1980), Weissmair & Waringer (1994), Rasmussen & Pescador (2002), Bowles (2006), Elliott (2009), Heckman (2017), and Bowles & Contreras-Ramos (2019). Additionally, reference material (larvae and adults of *S. nigra* from Alberta) was borrowed from the University of Alberta Freshwater Invertebrate Collection (UAFIC) for comparative purposes.

RESULTS

Remarks on Examined Material

The following four specimens in WRME were originally misidentified as Hemerobiidae (brown lacewings) and were identified as *S. vicaria* in this study; WRME0519809, WRME0519810, JBWM0093379, and JBWM0093339.

One specimen of *S. vicaria* in WRME was represented only by a detached forewing and a pin bearing a locality label. No body parts remained on the pin, and no other *Sisyra* specimens were present in the collection drawer. Based on wing venation, the detached wing was confidently identified as *S. vicaria*. Given the absence of any other potential source, we consider it highly likely that the wing originated from the missing specimen on the pin. This record (JBWM0093572) is included here with this caveat.

New Manitoba Records

A total of 74 sisyrinid specimens were identified or verified during this study (Tables 1 & 2). These include 44 *C. areolaris* specimens (34 larvae, 10 adults) (Table 1), 8 adult *S. nigra*, and 19 *S. vicaria* specimens (Table 2). Three additional larval specimens could only be identified as *S. vicaria/nigra*. Additional *S. vicaria/nigra* larvae (CAMP) were included on the distribution map.

Climacia areolaris was primarily observed and collected in the south-east, with a single northern locality (Figure 1). *Sisyra* specimens were found in the northern, south-western, and south-eastern regions of Manitoba (Figure 2). The larvae identified as *S. vicaria/nigra* represent the northernmost records of *Sisyra* in the province. Adults of both *S. vicaria* and *S. nigra* were recorded in the south-eastern and south-western areas.

DISCUSSION

This study provides first clear documentation of the distribution of the three Sisyridae species in Manitoba: *Climacia areolaris*, *Sisyra nigra*, and *Sisyra vicaria*. It is likely that their ranges extend beyond the localities mapped here. Many areas of Manitoba remain under-sampled due to remoteness, limited accessibility, or location on private property. Notably, none of the specimens examined in this study were collected as part of targeted efforts for Sisyridae. To our knowledge, no prior studies in Manitoba have specifically focused on collecting sisyrinids or investigating their larval habitats.

There appears to be a geographic overlap in the distribution of *C. areolaris*, *S. vicaria* and *S. nigra*. *Sisyra nigra* is known to occur in other northern regions, including Finland, Norway, Sweden, and Alaska (Aspöck *et al.* 1980). Previous to this study, the northernmost

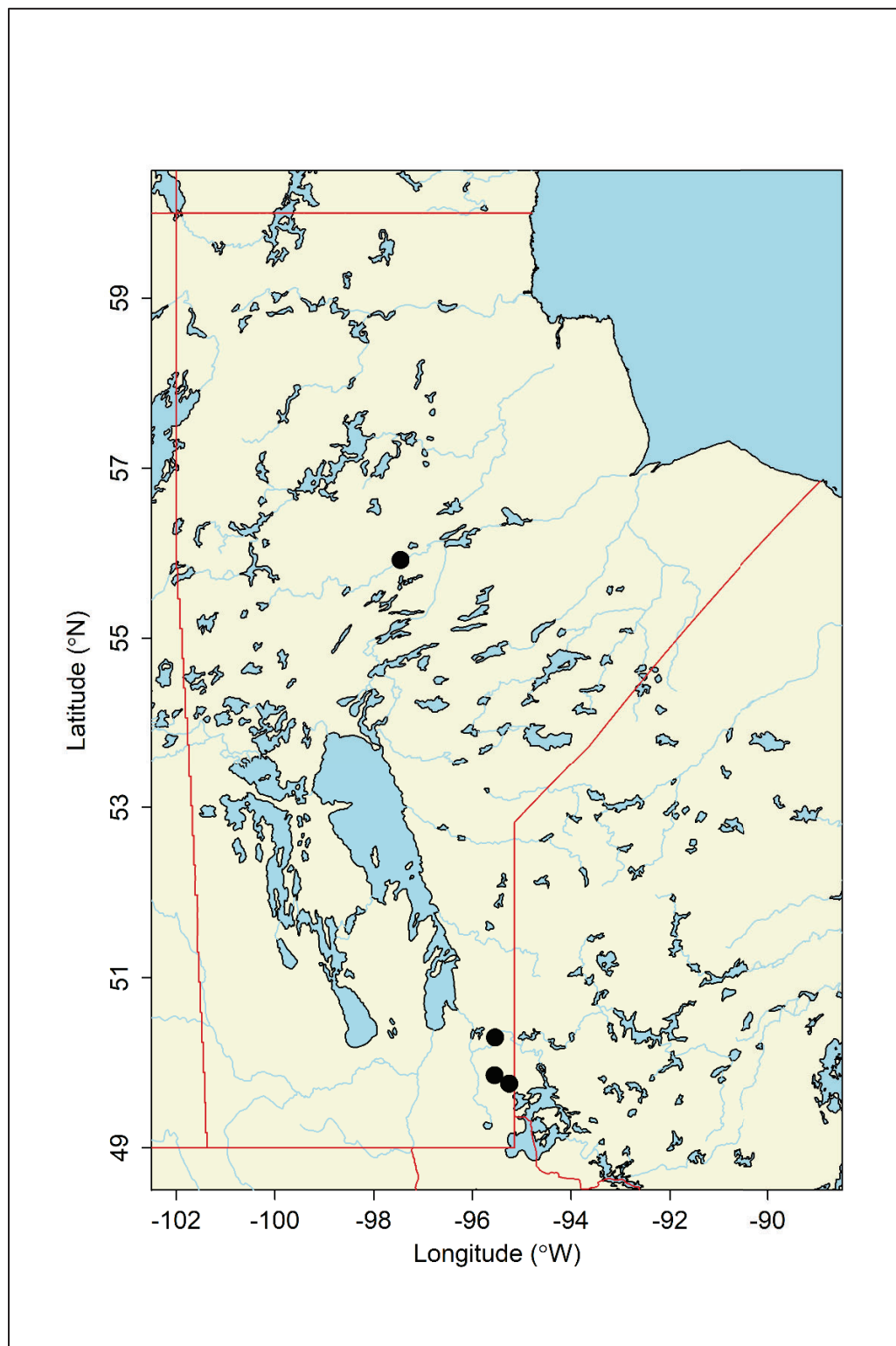


Figure 1. Distribution of *Climacia areolaris* in Manitoba.

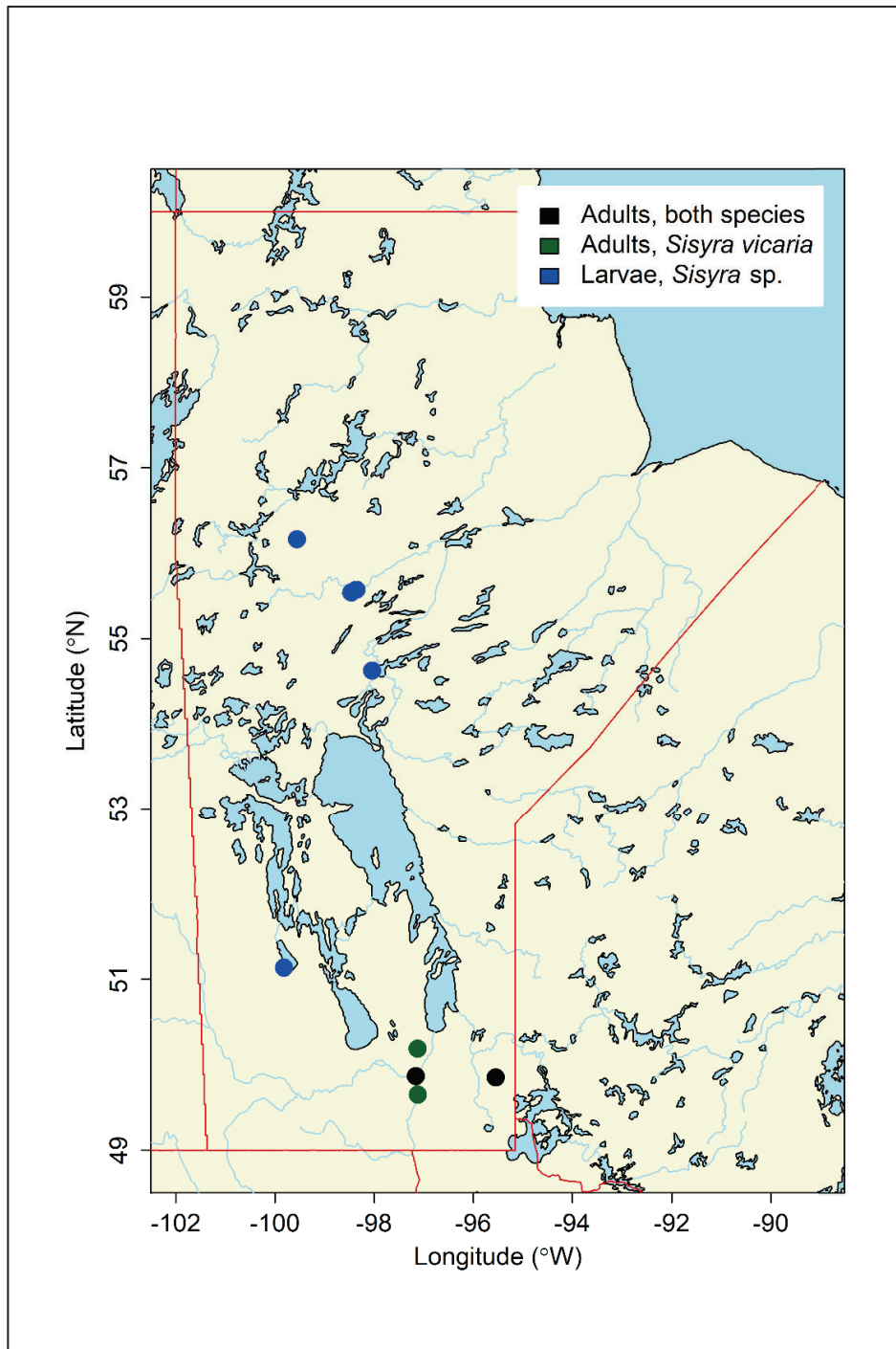


Figure 2. Distribution of *Sisyra* in Manitoba. Black symbols indicate sites where adults of both *S. nigra* and *S. vicaria* were recorded; green symbols indicate sites where only *S. vicaria* adults were recorded; blue symbols indicate sites where larvae identified as *S. vicaria* /*S. nigra* were recorded.

Verified occurrence of *S. vicaria* species in Canada was from Anglin Lake in Sask. (GBIF, 2025, occurrence 1416451201) suggesting that *S. vicaria* may also have a broad northern distribution.

Preliminary examination of larval specimens from Manitoba identified as *Sisyrta vicaria* or *S. nigra* suggests that these individuals may possess a greater number of gill segments on abdominal segments II–VII than the three segments typically reported for *S. nigra* (Lestage 1921; Weissmair & Waringer 1994; Elliott 1996, 2009; Ecosystema Ecological Center 2025). The number of gill segments in *S. vicaria* has not been explicitly described in the literature, except for indirect reference to Anthony (1902). In that work, Anthony illustrated gills II–VII with three segments from a specimen identified as *Sisyrta umbrata*. Parfin and Gurney (1956) later synonymized *S. umbrata* with *S. vicaria*, but they also noted that at least one adult male of *S. nigra* was present in the same material, suggesting that Anthony's illustration could likely depict gill segmentation of *S. nigra* rather than *S. vicaria*. This same illustration has been reproduced in subsequent works (Parfin & Gurney 1956; Tauber 1991; Rasmussen & Pescador 2002; Elliot 2009). Gill segmentation has been recognized as a diagnostic character among *Sisyrta* species elsewhere: Bowles (2006) distinguished *S. nigra* from *S. apicalis* in North America using this feature, and Weissmair and Waringer (1994) separated *S. nigra* from *S. terminalis* in Austria on the same basis. These comparisons suggest that gill segmentation may represent a useful morphological character for distinguishing *S. vicaria* from *S. nigra*, although additional material is needed to confirm whether the observed variation reflects interspecific differences or intraspecific variability.

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