REPORT ON PLAINS SUCKER (*PANTOSTEUS JORDANI*), ROCKY MOUNTAIN SCULPIN (*COTTUS* SP.), WESTERN SILVERY MINNOW (*HYBOGNATHUS ARGYRITIS*), AND STONECAT (*NOTURUS FLAVUS*) SAMPLING CONDUCTED IN 2020 IN THE MILK RIVER DRAINAGE, ALBERTA

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2021

Canadian Data Report of Fisheries and Aquatic Sciences 1330

Canadian Data Report of Fisheries and Aquatic Sciences

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ABSTRACT

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In 2020, the failure of a diversion structure in Montana resulted in natural summer flows in the Milk River system in Canada. This has provided a rare opportunity to sample four federally or provincially listed species at risk during natural flow conditions in the North Milk and Milk rivers in southern Alberta. These species include: Plains Sucker (*Pantosteus jordani*), Rocky Mountain Sculpin (*Cottus* sp.), Western Silvery Minnow (*Hybognathus argyritis*), and Stonecat (*Noturus flavus*). Sampling conducted in August and October 2020 utilized recently developed standardized sampling methods developed by Fisheries and Oceans Canada with Alberta Environment and Parks to monitor the relative abundance and distribution of the four species. The sampling revealed that natural summer flows in the North Milk and Milk rivers of Alberta have not greatly impacted the distribution of Plains Sucker, Rocky Mountain Sculpin, and Stonecat. Western Silvery Minnow were not caught at any access points sampled in August and were only caught during a subsequent sampling trip in October near the United States border. Follow-up sampling is required to further assess the distribution of Western Silvery Minnow in Canada.

RÉSUMÉ

Teillet, M., Watkinson, D.A., Petry, S.F., and Enders, E.C. 2021. Report on Plains Sucker (*Pantosteus jordani*), Rocky Mountain Sculpin (*Cottus* sp.), Western Silvery Minnow (*Hybognathus argyritis*), and Stonecat (*Noturus flavus*) sampling conducted in 2020 in the Milk River drainage, Alberta. Can. Data Rep. Fish. Aquat. Sci. 1330: vi + 13 p.

En 2020, la défaillance d’une structure de dérivation au Montana a entraîné des écoulements estivaux naturels dans le réseau de la rivière Milk au Canada. Cela a fourni une occasion rare d’échantillonner quatre espèces en péril inscrites au niveau fédéral et/ou provincial dans des conditions d’écoulement naturel dans les rivières North Milk et Milk dans le sud de l’Alberta. Ces espèces comprennent: le meunier des plaines (*Pantosteus jordani*), le chabot des montagnes Rocheuses (*Cottus* sp.), le méné d’argent de l’ouest (*Hybognathus argyritis*) et la barbotte des rivières (*Noturus flavus*). L’échantillonnage effectué en août et octobre 2020 a utilisé des méthodes d’échantillonnage standardisée récemment mises au point par Pêches et Océans Canada en collaboration avec Alberta Environment and Parks afin de surveiller l’abondance relative et la répartition des quatre espèces. L’échantillonnage a révélé que les débits estivaux naturels dans les rivières North Milk et Milk n’ont pas eu une grande incidence sur la répartition du meunier des plaines, du chabot des montagnes Rocheuses et de la barbotte des rivières. Le méné d’argent de l’ouest n’a pas été capturé à aucun point d’accès échantillonné en août et n’a été capturé que lors d’une sortie d’échantillonnage ultérieure en octobre près de la frontière des États-Unis. Un échantillonnage de suivi est nécessaire pour évaluer davantage la répartition du méné d’argent de l’ouest au Canada.

ACKNOWLEDGEMENTS

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1. INTRODUCTION

The Milk River drainage in Alberta, Canada has a diverse fish fauna that includes three SARA (*Species at Risk Act*) listed species: Plains Sucker (*Pantosteus jordani*), Rocky Mountain Sculpin (*Cottus* sp.), and Western Silvery Minnow (*Hybognathus argyritis*), as well as a provincially listed species, Stonecat (*Noturus flavus*).

Canada and the United States (U.S.) share the waters of the Milk and St. Mary river drainages. Both drainages originate in Montana and flow into Canada. The sharing agreement provides for the diversion of water from the St. Mary River into the North Milk and Milk rivers for conveyance through Canada and use in eastern Montana. This diversion of water has significantly increased seasonal flows in the Milk River drainage in Canada since the early twentieth century. In May 2020, a drop structure failed, suspending diversion flows and resulting in natural summer flows for the first time in over 100 years in the Milk River system (Appendix 1).

In response, Fisheries and Oceans Canada (DFO) and Alberta Environment and Parks (AEP) conducted standardized fish sampling to assess the relative abundance and distribution of fish in the Milk River drainage during its natural flow regime.

2. METHODS

2.1 HABITAT AND SITE DESCRIPTIONS

Six access points were selected for sampling to capture the range of the distribution of the four target fish species in the Milk River drainage (Figure 1). Two were located in the North Milk River and four in the Milk River (Figure 1, Table 1). Sampling at these access points was conducted in August 2020. One additional access point was surveyed in October 2020 in order to confirm the presence of Western Silvery Minnow in Canada (Figure 1). The following habitat characteristics were measured once at each access point: water temperature (°C), conductivity (µS/cm), turbidity (Nephelometric Turbidity Unit, NTU), Secchi depth (cm; when suitable water depth was present), and wetted and rooted width (m) of the channel. Depth (m) and water velocity (m/s) were measured at individual sample sites throughout an access point (Macnaughton et al. 2019a, 2019b, 2019c, 2020). Percent substrate composition based on the Wentworth scale and macrophyte cover were estimated visually at individual sample sites throughout an access point.

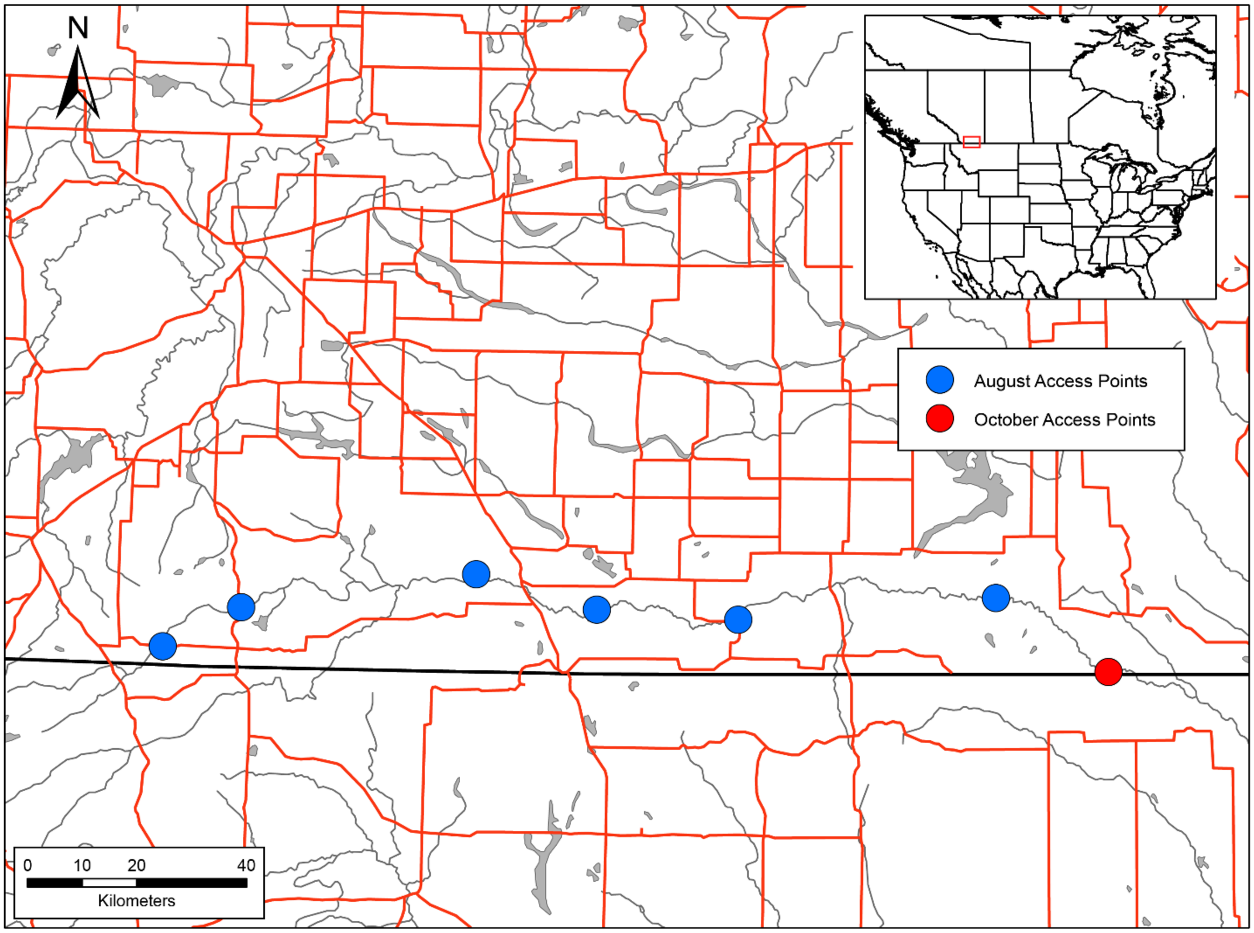

Figure 1. Map of access points in the Milk River drainage sampled in 2020.

Table 1. Access points on the North Milk and Milk rivers sampled in 2020. Sites are listed in upstream to downstream order.

River	Access Point	Coordinates
North Milk River	Highway 501 Bridge	49.02641, -112.96956
North Milk River	Highway 62 Bridge	49.09380, -112.77712
Milk River	Township Rd 24A	49.15694, -112.19241
Milk River	Coffin Bridge	49.10267, -111.89050
Milk River	Deer Creek Bridge	49.08851, -111.53676
Milk River	Pinhorn Ranch	49.12597, -110.89433
Milk River	U.S. Border	49.00427, -110.61483

2.2 FISH SAMPLING PROTOCOL

Sampling of fish followed standardized protocols developed by Fisheries and Oceans Canada (Macnaughton et al. 2019a, 2019b, 2019c, 2020) and are outlined in more detail below. Previous knowledge of fish presence (summarized in Table 2) at various access points along the Milk River informed fish sampling and use of appropriate protocols. The number of fish sampling sites at an access point was based on the standardized protocols and the locations of sample sites were randomly selected (Macnaughton et al. 2019a, 2019b, 2019c, 2020). Samplers always fished sample sites in a downstream to upstream direction. Once sampling was completed at a given sample site, fork or total length (to the nearest mm) of target species were measured depending on the morphology of the species and, unless retained as vouchers (Appendix 2), all fish were released immediately after identification and enumeration.

Plains Sucker and Stonecat

Two sample sites were randomly selected at the six access points with known populations of Plains Sucker and Stonecat (Table 2; Macnaughton et al. 2019a, 2020). Fish were collected using a Smith Root LR-24 Backpack Electrofishing unit (settings are displayed in Appendix 3) while electro-fishing upstream in a zigzag fashion. Two netters used 38.1 by 33.0 cm dip nets with 6.4 mm mesh. Each site was fished for approximately 600 s or 300 m^2 (Macnaughton et al. 2019a, 2020).

Rocky Mountain Sculpin

Four stream cross-sections were established 20 m apart at the four access points with known populations of Rocky Mountain Sculpin (Table 2; Macnaughton et al. 2019c). Five 1 m^2 quadrat sample sites were selected along each cross section at varying depths. Fish were collected using a Smith Root LR-24 Backpack Electrofishing unit by shocking for 20 s while the operator moved the anode throughout the quadrat. While shocking, the substrate was agitated with a kicking motion and netters held two 20.0 by 60.0 cm nets with 6.4 mm mesh directly downstream of each quadrat (Macnaughton et al. 2019b).

Western Silvery Minnow

Five sample sites were randomly selected at the four access points with known populations of Western Silvery Minnow (Table 2; Macnaughton et al. 2019b). One additional access point was sampled near the U.S. border in October to increase sampling effort for Western Silvery Minnow. Given the directed nature of sampling at the U.S. border location, sites were not randomly selected and only Western Silvery Minnow were enumerated. Fish were collected at each sample site using a 9.14 m long by 1.8 m high seine net with a 1.8 by 1.8 m bag and 4.76 mm mesh. The net was anchored at a shoreline pivot point while the other end was deployed upstream and then pulled in an upstream to downstream radius sampling a semi-circle area (~130 m^2; Macnaughton et al. 2019c).

Table 2. Expected presence (x) based on previous distributions of the four species at seven access points throughout Alberta's Milk River drainage (Macnaughton et al. 2019a, 2019b, 2019c, 2020). This information informed protocol selection at each access point.

Access Point	Plains Sucker	Rocky Mountain Sculpin	Western Silvery Minnow	Stonecat
Highway 501 Bridge	x	x		
Highway 62 Bridge	x	x		x
Township Rd 24A	x	x	x	x
Coffin Bridge	x	x	x	x
Deer Creek Bridge	x		x	x
Pinhorn Ranch	x		x	x
U.S. Border			x	x

3. RESULTS

3.1 HABITAT

Water temperatures ranged from 17.2–23.9 °C among access points (Table 3). Conductivity was higher at downstream access points, ranging from 383–448 µS/cm in the three most upstream points and 946–1242 µS/cm in the three most downstream points (Table 3). Turbidity in the system was low, ranging from 2.3–8.6 NTU (Table 3). Water velocities varied, ranging from 0–0.49 m/s (Table 4). Substrate ranged from silt to boulder, but the majority of sample sites were either sand or gravel (Table 4).

Table 3. Summary of water quality variables at each of the six access points sampled in August 2020.

Access Point	Date Sampled (d/m/y)	Water Temperature (°C)	Conductivity (µS/cm)	Turbidity (NTU)
Highway 501 Bridge	26/8/2020	20.6	383	2.3
Highway 62 Bridge	26/8/2020	17.6	401	3.8
Township Rd 24A	25/8/2020	19.3	448	8.6
Coffin Bridge	25/8/2020	23.9	946	7.3
Deer Creek Bridge	27/8/2020	23.6	1138	2.4
Pinhorn Ranch	27/8/2020	17.2	1262	not recorded

Table 4. Summary of mean habitat variables at each access point by method. Minimum and maximum ranges are displayed in brackets and percent substrate composition are reported as means. Access points where a method was not used are shown by blank rows.

Method	Access Point	Mean Water Velocity (m/s)	Mean Water Depth (m)	Clay (%)	Silt (%)	Sand (%)	Gravel (%)	Cobble (%)	Boulder (%)
Electrofishing Transect	Highway 501 Bridge	0.10 (0.09-0.10)	0.22 (0.19-0.24)			10	20	65	5
	Highway 62 Bridge	0.19 (0.17-0.21)	0.28 (0.27-0.28)			37	5	50	8
	Township Rd 24A	0.05 (0.02-0.07)	0.38 (0.34-0.42)		8	68	7	5	12
	Coffin Bridge	0.29 (0.24-0.33)	0.13 (0.12-0.13)			10	50	25	15
	Deer Creek Bridge	0.11 (0.08-0.14)	0.25 (0.13-0.37)		2	65	8	5	20
	Pinhorn Ranch	0.12 (0.09-0.14)	0.10 (0.09-0.10)			100			
Electrofishing Quadrat	Highway 501 Bridge	0.16 (0.01-0.49)	0.29 (0.10-0.69)		8	7	57	27	1
	Highway 62 Bridge	0.22 (0.02-0.46)	0.27 (0.14-0.48)		4	16	55	20	5
	Township Rd 24A	0.04 (0-0.10)	0.26 (0.05-0.46)			60	35	2	3
	Coffin Bridge	0.15 (0.01-0.43)	0.22 (0.08-0.66)		5	18	51	20	6
	Deer Creek Bridge								
	Pinhorn Ranch								
Bag Seine	Highway 501 Bridge								
	Highway 62 Bridge								
	Township Rd 24A	0.07 (0.02-0.12)	0.28 (0.13-0.42)		5	55	29	6	5
	Coffin Bridge	0.05 (0.02-0.08)	0.22 (0.10-0.47)	18	39	27	14	2	
	Deer Creek Bridge	0.14 (0.01-0.31)	0.13 (0.06-0.23)			98	2		
	Pinhorn Ranch	0.08 (0.03-0.13)	0.11 (0.06-0.16)			97	3		

3.2 FISH

Plains Sucker

Plains Sucker were caught at five access points (Table 5). In total, 24 Plains Sucker were caught with a fork length ranging from 27–178 mm, and mean of 102 mm (Figure 2). Plains Sucker were most commonly caught using the protocol specifically designed for them (Macnaughton et al. 2019a), however, some were also caught using the quadrat protocol (Macnaughton et al. 2019c) and the seine net sampling protocol (Table 5; Macnaughton et al. 2019b). Plains Sucker were caught along with a number of other species (Table 6).

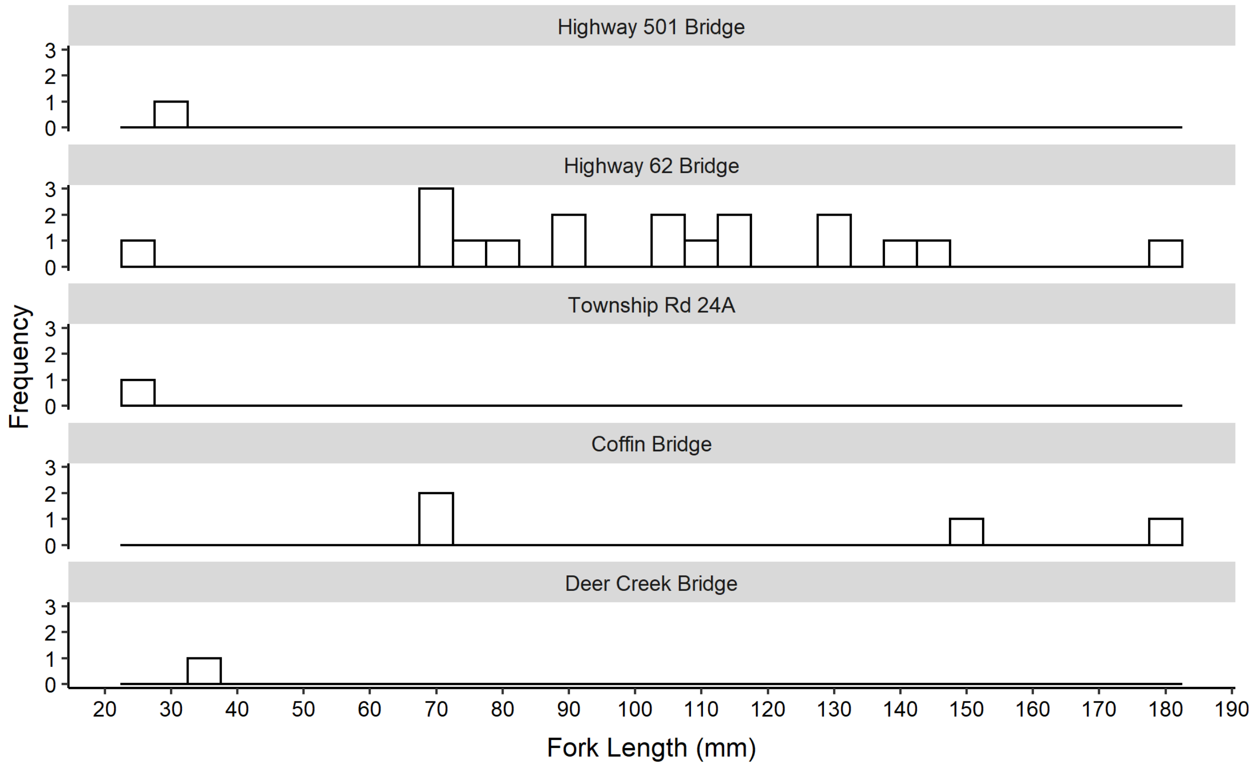

Figure 2. Frequency distribution of the fork length (mm) of Plains Sucker at the five access points where they were sampled.

Rocky Mountain Sculpin

Rocky Mountain Sculpin were caught at four access points (Table 6). In total, 504 Rocky Mountain Sculpin were caught, with total lengths ranging from 24–99 mm and a mean of 43 mm (Figure 3). Rocky Mountain Sculpin were caught using all three methods, with the largest number of fish collected with the electrofishing transect method (Macnaughton et al. 2019a) and the highest catch-per-unit-effort (fish·min^{-1}) with the electrofishing quadrat method (Table 5; Macnaughton et al. 2019c).

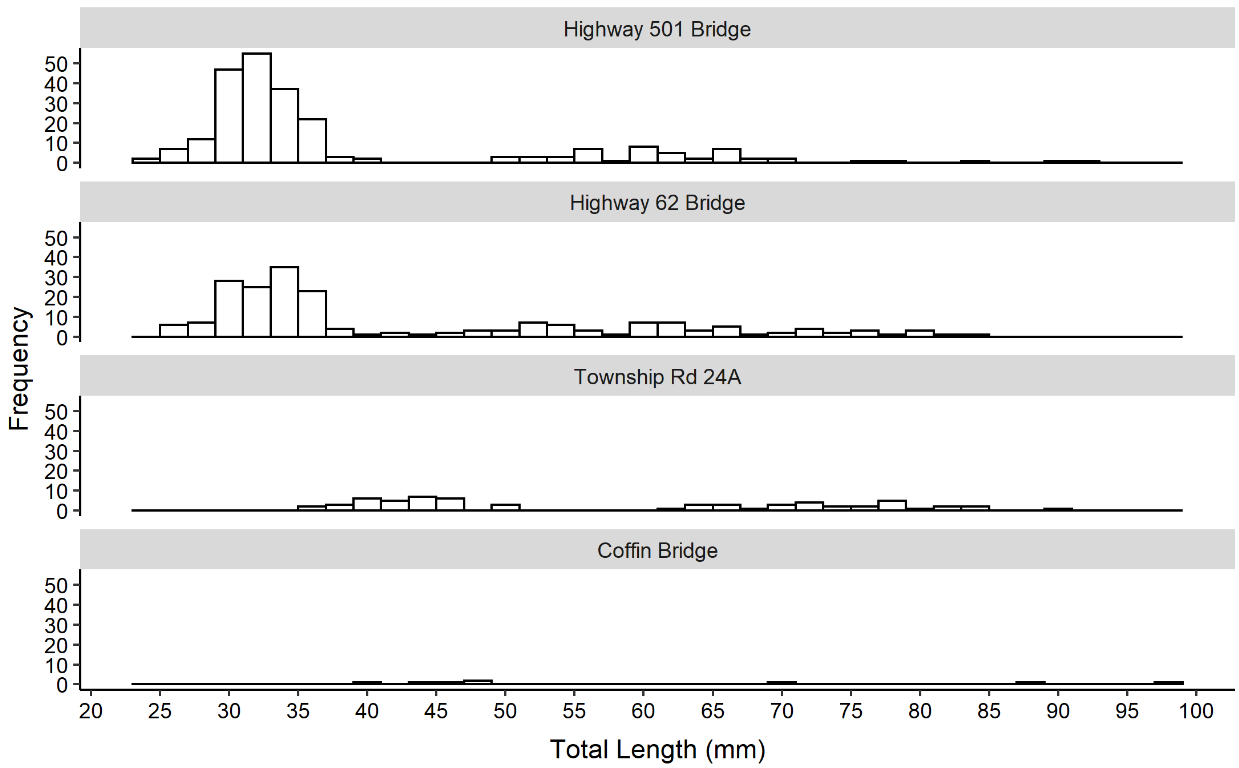

Figure 3. Frequency distribution of total length (mm) of Rocky Mountain Sculpin across the four access points where they were sampled.

Western Silvery Minnow

Western Silvery Minnow were not caught at any of the first six access points during the August sampling surveys. Subsequently, additional sampling was conducted in October at an extra access point closer to the U.S. border (Table 6). At this additional access point sample sites were not randomly selected but were chosen to specifically target Western Silvery Minnow habitat. In total, eight seines were conducted using the same method outlined in Macnaughton et al. (2019b) and 11 Western Silvery Minnow were caught. Western Silvery Minnow were identified and enumerated while additional species collected were only identified. Bycatch at the U.S. border access point included Flathead Chub, Sauger, and sucker species. Logistical issues at the U.S. border limited the data that could be collected so habitat, bycatch, and stream morphology variables were not collected.

Stonecat

Stonecat were caught at four access points (Table 6). In total, 30 Stonecat were caught with total lengths ranging from 37–178 mm and a mean of 95 mm (Figure 4). Stonecat were exclusively caught using the protocol designed for their capture (Table 5; Macnaughton et al. 2020).

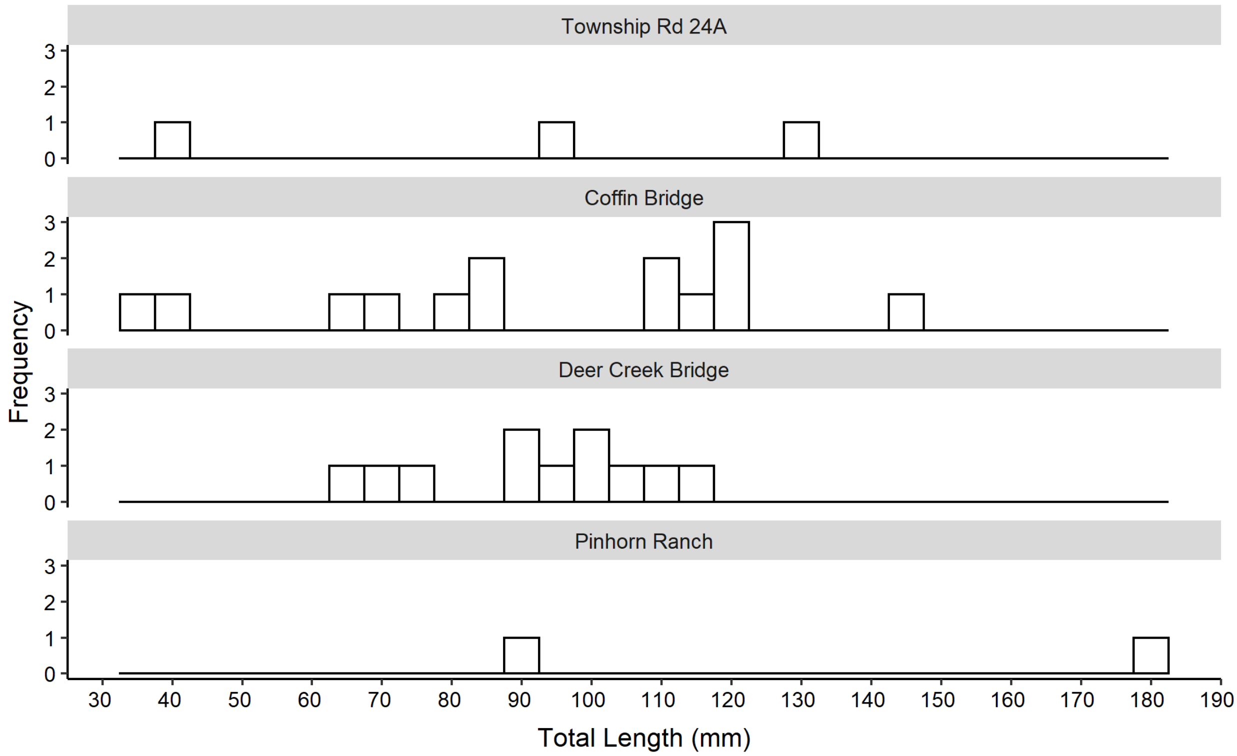

Figure 4. Frequency distribution of total length (mm) of Stonecat across the four access points where they were sampled.

Table 5. Total effort, catch-per-unit-effort (CPUE), and total number of fish caught (in brackets) broken down by method, access point, and species. Access points where a method was not used are shown by blank rows.

Method	Access Point	Total Effort (s or m^2)	Plains Sucker	Rocky Mountain Sculpin	Western Silvery Minnow	Stonecat
Electrofishing Transect (fish·min^{-1})	Highway 501 Bridge	1224	0	8.24 (168)	0	0
	Highway 62 Bridge	1370	0.70 (16)	4.64 (106)	0	0
	Township Rd 24A	1439	0	2.50 (60)	0	0.13 (3)
	Coffin Bridge	1313	0.23 (5)	0.27 (6)	0	0.64 (14)
	Deer Creek Bridge	1272	0	0	0	0.52 (11)
	Pinhorn Ranch	1240	0	0	0	0.10 (2)
Electrofishing Quadrat (fish·min^{-1})	Highway 501 Bridge	400	0.15 (1)	10.05 (67)	0	0
	Highway 62 Bridge	400	0.90 (6)	13.65 (91)	0	0
	Township Rd 24A	400	0	0.45 (3)	0	0
	Coffin Bridge	400	0	0.30 (2)	0	0
	Deer Creek Bridge					
	Pinhorn Ranch					
Bag Seine (fish·m^{-2})	Highway 501 Bridge					
	Highway 62 Bridge					
	Township Rd 24A	656	0.002 (1)	0.002 (1)	0	0
	Coffin Bridge	656	0	0	0	0
	Deer Creek Bridge	656	0.002 (1)	0	0	0
	Pinhorn Ranch	656	0	0	0	0
	U.S. Border	1049	0	0	0.01 (11)	0
		Mean CPUE (fish·min^{-1})	**0.20**	**4.01**	**0**	**0.14**
		Mean CPUE (fish·m^{-2})	**0.0006**	**0.0003**	**0.002**	**0**

Table 6. Total number of fish caught at the six access points sampled in August and one access point sampled in October in the Milk River drainage.

Access Point	Date Sampled (d/m/y)	Plains Sucker	Rocky Mountain Sculpin	Western Silvery Minnow	Stonecat	Lake Chub	Fathead Minnow	Flathead Chub	Longnose Dace	Longnose Sucker	White Sucker	Trout -perch	Burbot	Sauger	Total
Highway 501 Bridge	26/8/2020	1	235			2			42	2	15				**297**
Highway 62 Bridge	26/8/2020	22	198			1			62	17	62	1			**363**
Township Rd 24A	25/8/2020	1	63		3	12	1		139		123				**342**
Coffin Bridge	25/8/2020	5	8		14	1	1	2	134	58	22		3	1	**249**
Deer Creek Bridge	27/8/2020	1			11		3	216	63	60	651	16	2	2	**1025**
Pinhorn Ranch	27/8/2020				2			480	18	10	55			4	**569**
U.S. Border*	1/10/2020			11											**11**
Total		**30**	**504**	**11**	**30**	**15**	**5**	**698**	**458**	**147**	**928**	**17**	**5**	**7**	**2856**

*Directed sampling for Western Silvery Minnow; other species not enumerated.

4. DISCUSSION

The failure of a diversion structure in Montana prevented summer augmentation of the Milk River in Canada for the first time in over a century. This resulted in natural summer flows in Canada's portion of the Milk River drainage and, with the exception of a large rain event in July, summer discharge was lower than average (Appendix 1), raising interest in the relative abundance and distribution of fish species as it relates to the natural flow. This was a first attempt at using standardized sampling methods (Macnaughton et al. 2019a, 2019b, 2019c, 2020) developed to assess relative abundance and distribution of Plains Sucker, Rocky Mountain Sculpin, Western Silvery Minnow, and Stonecat and build a baseline for future comparison to detect population trends. We found populations of Plains Sucker, Rocky Mountain Sculpin, and Stonecat with varying lengths (Figure 2-4) at a number of access points (Table 6) suggesting that natural flow up to August 2020 did not affect the presence of these species in the Milk River drainage.

The standardized sampling protocols (Macnaughton et al. 2019a, 2019b, 2020) yielded the highest catch-per-unit-effort for Plains Sucker, Rocky Mountain Sculpin, and Stonecat (Table 5). These methods proved to be well suited and should be used in future sampling. The transect electrofishing method (Macnaughton et al. 2019a, 2020) collected large numbers of Rocky Mountain Sculpin and may also be useful in future surveys for summarizing relative abundance and distribution trends. However, the protocol developed specifically for the species is still preferred as it allows for the collection of detailed depth, velocity, and substrate data that can be attributed to life stage.

Plains Sucker were present at five upstream access points sampled. They are considered cool water fish and their observed distribution may be related to the generally cooler water temperatures that would be expected at these access points. These locations also tended to have larger percentages of gravel and cobble substrate (Table 4), which is considered preferred habitat for Plains Sucker (Macnaughton et al. 2019a).

Rocky Mountain Sculpin relative abundance was highest in the four upstream access points in the drainage where water temperatures would be lowest. As well, more fish that were likely young-of-the-year were collected from an upstream to downstream direction (Figure 3) suggesting an underlying gradient of habitat quality for the species exists in the drainage. All the sampled Rocky Mountain Sculpin were collected within the designated Critical Habitat for the species (Fisheries and Oceans Canada 2012).

Western Silvery Minnow were absent at four access points where they have been observed in the past, but were caught during a subsequent sampling trip targeting the species at an access point near the U.S. border in October 2020. Historically, Western Silvery Minnow relative abundance has been variable in Canada (Macnaughton et al. 2019b). The observed reduction in relative abundance and distribution of Western Silvery Minnow could be explained by increased migratory and schooling behaviour of Western Silvery Minnow due to natural flows (COSEWIC 2017, Neufeld unpublished data). This would result in patchy distributions and sampling effort may have been insufficient to collect any individuals during the first sampling trip in August. When the standardized sampling was completed at the Deer Creek Bridge and Pinhorn Ranch access points without collecting Western Silvery Minnow, visual surveys were undertaken to locate habitat or a school of Western Silvery Minnow that could be targeted for sampling. Despite visually surveying ~1 km of river at each access point, no Western Silvery Minnow were identified. Follow-up sampling is recommended in 2021 to assess the age structure, relative abundance, and distribution of Western Silvery Minnow as the Milk River returns to flow conditions observed during directed sampling conducted from 2005–2007 and 2013 (Macnaughton et al. 2019b, Neufeld unpublished data, Watkinson unpublished data). If sampling in 2021 reveals a normal population of age 1 individuals (COSEWIC 2017, Neufeld unpublished data), then it is likely that Western Silvery Minnow can successfully reproduce under natural flow conditions in the Milk River. Furthermore, if relative abundance of Western Silvery Minnow was to increase in 2021 to levels observed in previous directed sampling efforts with a low proportion of age 1 individuals, it would suggest that augmented flows may be important in maintaining a broader distribution of the species in Canada.

Stonecat were present at four access points in the Milk River and absent in the North Milk River. Variation in total length (Figure 4) suggests a healthy breeding population, with the shorter total lengths potentially representing young-of-the-year (Macnaughton et al. 2020).

The sampling trips conducted in August and October 2020 revealed that natural summer flows in the North Milk and Milk rivers of Alberta have not greatly impacted the distribution of Plains Sucker, Rocky Mountain Sculpin, and Stonecat. Follow-up sampling is required to further assess the status of Western Silvery Minnow in Canada as well as relative abundance of all four species. Repairs to the diversion structure were completed throughout 2020 and water was diverted outside of the normal augmentation period in October 2020 (Appendix 1) to allow for municipal usage and reservoir storage. Normal augmentation is expected in the Milk River drainage in 2021. Continued use of the standardized sampling protocols (Macnaughton et al. 2019a, 2019b, 2019c, 2020) discussed in this report is recommended.

5. REFERENCES

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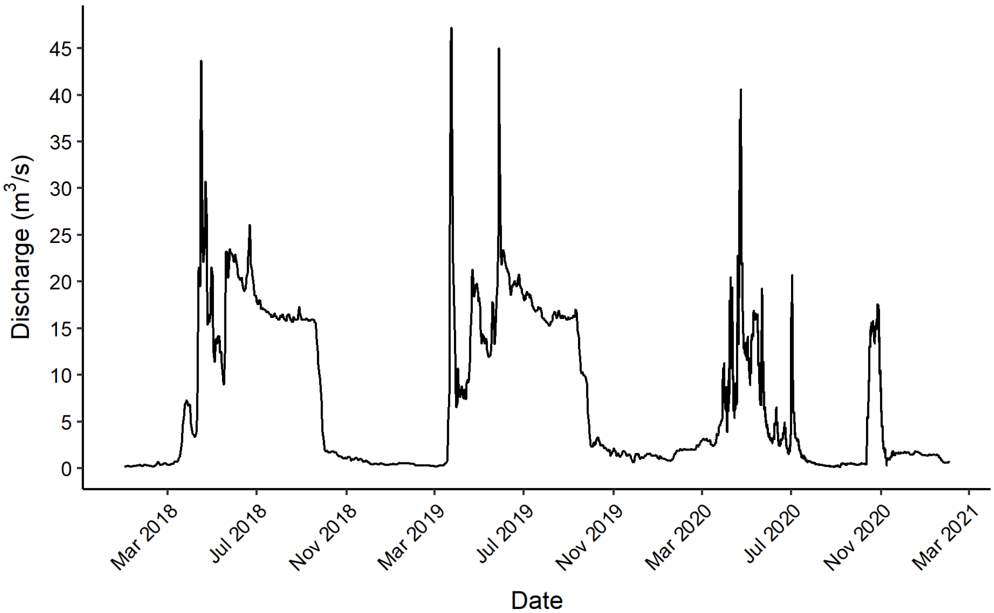
6. APPENDICES

Appendix 1. Hydrograph illustrating discharge over three years (2018–2020) in the Milk River at Water Survey of Canada station 11AA005.



Appendix 2. Number of individuals retained as vouchers.

Access Point	Plains Sucker	Rocky Mountain Sculpin	Western Silvery Minnow	Lake Chub	Fathead Minnow	Flathead Chub	Longnose Dace	Longnose Sucker	White Sucker	Trout-perch
Highway 501 Bridge										
Highway 62 Bridge										1
Township Rd 24A	1	1		3			1		3	
Coffin Bridge	4			1		1	5	5		
Deer Creek Bridge	5				3	2		3	1	3
Pinhorn Ranch										
U.S. Border			2							
Total	**10**	**1**	**2**	**4**	**3**	**3**	**6**	**8**	**4**	**4**

Appendix 3. LR-24 backpack electrofishing unit settings based on access point.

Access Point	Voltage (V)	Frequency (Hz)	Pulse width (%)
Highway 501 Bridge	300	30	15
Highway 62 Bridge	300	30	15
Township Rd 24A	300	30	15
Coffin Bridge	220	30	15
Deer Creek Bridge	250	30	15
Pinhorn Ranch	175	30	15