Lake Manitoba & Lake St. Martin Outlet Channels Project

Aquatic Environment Monitoring 2021
Lake St. Martin Index Gillnetting Survey

REPORT

Prepared for Manitoba Transportation and Infrastructure
By North/South Consultants Inc. • 83 Scurfield Blvd. • Winnipeg, MB

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A Report Prepared for

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By:

North/South Consultants Inc.

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EXECUTIVE SUMMARY

North/South Consultants Inc. (NSC) was retained by Manitoba Transportation and Infrastructure (MTI) to collect supplemental data with respect to the aquatic environment in support of the Lake Manitoba and Lake St. Martin Outlet Channel Project (the Project). A draft Aquatic Effects Monitoring Program (AEMP) was developed in 2020 to provide a plan for monitoring the effects of the Project on the aquatic environment, focusing on key issues identified in the Environmental Impact Statement (EIS). The draft AEMP identified the need for the collection of data to supplement existing information that had been presented in the EIS.

Contemporary fish population and community data from La St. Martin will be required to assess potential effects related to the Project. A standardized index gillnetting program was conducted in 2018 (NSC 2019) to provide data to monitor the Lake St. Martin resident fish community and fish populations through time. Monitoring identified in the draft AEMP included collection of additional index gillnetting data to provide a more robust pre-Project baseline.

This report provides results from index gillnetting conducted on Lake St Martin from August 31 to September 7, 2021. Water level was low during the 2021 study period and ranged between the 10th to 20th historic percentile level conditions. In contrast, water level in 2018 corresponded to the 45th percentile for historic water level conditions on Lake St. Martin. Eleven sites comparable to those fished during the index netting conducted in 2018 (NSC 2019) were sampled during 2021. Nets were left in place overnight at each site. Index netting was conducted with standard index and small mesh index gillnet gangs the same as those used in 2018.

A total of 2,025 fish comprising 16 species were captured in standard index nets (n = 748) and small mesh nets (n = 1,277) set in lake St. Martin during 2021. Yellow Perch (*Perca flavescens*) (30.5%) and Walleye (*Sander vitreus*) (26.2%) were the most commonly captured species in the standard index nets. White Sucker (*Catastomus commersonii*) (11.9%), Shorthead Redhorse (*Moxostoma macrolepidotum*) (9.8%) and Northern Pike (*Esox lucius*) (9.1%) were also frequently captured. The majority of the small mesh index net catch (95.7%) was comprised of juvenile Yellow Perch (62.0%), Spottail Shiner (*Notropis hudsonius*) (22.9%) and Emerald Shiner (*Notropis atherinoides*) (10.8%).

The 2021 index netting results were comparable to the standard index and small mesh index gillnet catches reported in 2018. Although slight differences were observed between years, the primary species captured in standard index nets included Walleye, Yellow Perch, White Sucker, Shorthead Redhorse, Lake Whitefish, Cisco and Northern Pike. Notably, more perch were captured in 2021 compared to 2018. Primary fish captured in small mesh index nets included juvenile Yellow Perch, Spottail Shiner and Emerald Shiner. Again, more perch were captured in small mesh index nets during 2021 relative to 2018.

Data collected in 2018, this study and during future monitoring studies as set out in the AEMP will provide baseline information to assist in examining potential effects related to operation of the Project.

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ACRONYMS

AEMP	Aquatic Effects Monitoring Program
CAMP	Coordinated Aquatic Monitoring Program
CPUE	Catch-Per-Unit-Effort
DNRND	Department of Natural Resources and Northern Development
EIS	Environmental Impact Statement
K	Condition Factor
LMOC	Lake Manitoba Outlet Channel
LSMOC	Lake St. Martin Outlet Channel
MTI	Manitoba Transportation and Infrastructure
MSD	Manitoba Sustainable Development
NSC	North/South Consultants Inc.

1.0 INTRODUCTION

North/South Consultants Inc. (NSC) was retained by Manitoba Transportation and Infrastructure (MTI) to collect supplemental data with respect to the aquatic environment in support of the Lake Manitoba and Lake St. Martin Outlet Channel Project (the Project). The proposed Project is designed to manage flood waters on Lake Manitoba and Lake St. Martin by providing a channel by which flood waters can be conveyed, in addition to the natural outflow via the Fairford and Dauphin rivers (Figure 1). The Project consists of two outlet channels that are intended to work together:

- The 24 km Lake Manitoba Outlet Channel (LMOC) will work in tandem with the existing water control structure on the Fairford River (the Fairford Water Control Structure or FRWCS) to help regulate water levels and mitigate flooding on Lake Manitoba; and
- The 24 km Lake St. Martin Outlet Channel (LSMOC) will restore a more natural water regime to Lake St. Martin and will also provide flood protection by mitigating increased inflows from operation of the FRWCS, as well as additional inflows from the planned outlet from Lake Manitoba.

A draft Aquatic Effects Monitoring Program (AEMP) was developed in 2020 to provide a plan for monitoring the effects of the Project on the aquatic environment, focusing on key issues identified in the Environmental Impact Statement (EIS). The specific objectives of the AEMP were to:

- Verify the predicted effects presented in the surface water quality and fish and fish habitat sections of the EIS;
- Determine the effectiveness of mitigation measures;
- Assess the need for additional mitigation measures if initial measures are not adequate;
- Determine the effectiveness of any additional/adapted measure(s); and
- Confirm compliance with regulatory requirements relevant to surface water quality and fish and fish habitat set out in the Project approvals (e.g., Manitoba Environment Act License; Fisheries Act Authorization).

Contemporary fish population and community data from Lake St. Martin is required to assess potential effects related to the Project. To address this data gap, an index gillnetting program was conducted in 2018 (NSC 2019) to provide appropriate data to monitor the Lake St. Martin resident fish community and fish populations through time. Monitoring identified in the draft AEMP included collection of additional standard index gillnetting data to provide a more robust pre-Project baseline. This report provides results from index gillnetting conducted in Lake St Martin during 2021. Results of 2018 monitoring are presented in Appendix 1 of this report to allow for comparison between years.

2.0 METHODS

2.1 STUDY DESIGN

The Province of Manitoba and Manitoba Hydro conduct an ongoing annual fisheries monitoring program (the Coordinated Aquatic Monitoring program; CAMP 2022) in Sturgeon Bay in close proximity to the Dauphin River and outlet of the LSMOC. The CAMP sampling protocol was developed through a series of intensive workshops with Manitoba provincial fisheries biologists, researchers from Fisheries and Oceans Canada, and other specialists, and was intended to provide a format for a robust, cost-effective long-term sampling program that could be implemented in a wide range of waterbodies. CAMP monitoring in Sturgeon Bay is expected to continue into the foreseeable future and, as such, the program will provide a long-term monitoring tool to help assess potential effects of LSMOC operation. Consequently, study design, sampling methods, and level of fishing effort used in the Lake St. Martin monitoring program closely follow those used for CAMP to facilitate comparison with data from Sturgeon Bay, as well as other Manitoba waterbodies.

In addition, the Province of Ontario has developed a standardized protocol for designing programs for broad-scale fish community monitoring (Sandstrom et al. 2013). This protocol is very similar to the CAMP protocol, but also provides a means to determine the distribution of fishing sites within a lake on the basis of water depth distribution. This protocol was used to assist in site selection for Lake St. Martin fish community monitoring and resulted in effort at depth that is comparable to CAMP fish community monitoring in Sturgeon Bay.

2.1.1 Study Timing

Fish community composition can change in waterbodies where large numbers of fish make seasonal movements to support life history functions, such as movements to spawning locations. In Lake St. Martin, it is expected that fish community composition changes seasonally as fish move into and out of the lake for feeding and spawning. Most notably, large numbers of Lake Whitefish (*Coregonus clupeaformis*) move from Lake Winnipeg up the Dauphin River during fall to spawn in Lake St. Martin (Stone 1965; Cook and MacKenzie 1979; Kristofferson and Clayton 1990). As the intent of the Lake St. Martin program is to monitor changes to the general fish population residing in the lake, it was timed to occur subsequent to spring spawning when Walleye abundance may change and prior to Lake Whitefish migrating into Lake St. Martin in mid-to late September. The Ontario protocol for broad-scale fish community monitoring specifies that sampling should occur when surface water temperature exceeds 18^{o}C (Sandstrom et al. 2013), a condition that generally occurs from the third week of June to the second week of September in Lake St. Martin. Consequently, the monitoring program in Lake St. Martin was conducted in early September to avoid community composition changes related to spawning fish movements and to account for water temperature requirements suggested by the Ontario protocol.

2.1.2 Sampling Effort

The Ontario protocol for broad-scale fish community monitoring recommends that sampling effort be based on lake area and depth (number of depth strata). Lake St. Martin is approximately 35,000 ha in

area, 95% of which is comprised of two 3 m depth strata (1–3 m and 3–6 m; NSC 2017). If using the Ontario protocol, approximately 1240 m of net effort would be required. Nets used as part of CAMP are longer than those used in Ontario and considerably fewer nets sets would be required to provide a comparable effort. Standard CAMP gangs are composed of 5 panels of varying mesh size totaling 111.6 m in length and, to meet the level of sampling effort recommended by the Ontario protocol, 11 CAMP index gangs providing 1127 m of net effort would need to be set. Under the CAMP protocol, 12 gangs would be set in a waterbody the size of Lake St. Martin, providing 1340 m of net effort. The level of effort recommended under CAMP (i.e., 12 gangs) was retained when the Lake St. Martin monitoring program was designed in 2018 (NSC 2019).

Standard index gangs used as part of CAMP include mesh sizes of 51 mm (2”), 76 mm (3”), 95 mm (3.75”), 108 mm (4.25”), and 127 mm (5”). A 22.9 m long panel of 38 mm (1.5“) mesh was added to the CAMP standard index gang for the Lake St. Martin program to provide additional information on younger year classes, particularly for Lake Whitefish. This increased the sampling effort to 1648 m of net.

2.1.3 Site Selection

The distribution of nets within Lake St. Martin was determined by following methods described in the Ontario protocol for broad-scale fish community sampling (Sandstrom et al. 2013). According to the protocol, the number of nets and set locations are determined by the spatial extent/surface area of pre-defined bins of water depth (1–3 m deep, 3–6 m deep, 6–12 m deep, and so forth). At Lake St. Martin, water depths greater than 6 m comprise only a very small portion (<5%; NSC 2017) of the surface area of the lake and, consequently, net sets were distributed in water depth bins of 1–3 m deep and 3–6 m deep.

Spatial distribution and lake morphometry was also considered when selecting sampling sites. Lake St. Martin is comprised of a large southern basin connected to a smaller northern basin by a narrow constriction that is characterized by shallow water and higher currents relative to the rest of the lake. Net set locations were distributed in relation to the size of the basins. Sampling locations used in 2021 are identified in Figure 3, and closely replicate the sites used during the previous index netting program in 2018 (NSC 2019; also see Appendix 1).

2.2 DATA COLLECTION

2.2.1 Water Temperature

A water temperature logger manufactured by the Onset Corporation (HOBO Water Temperature Pro v2; Model U22-001) was installed in the south basin of Lake St. Martin (Birch Bay) during May 2021 and was operated continuously until November 2021. The logger was programmed to record water temperature at one-hour intervals. Water temperature was also measured daily using a hand-held thermometer during the index gillnetting program.

2.2.2 Water Level

Hourly water level data for Lake St. Martin (LAKE ST. MARTIN NEAR HILBRE [05LM005]) during 2021 were provided by the Water Survey of Canada (WSC 2022a). Historic data (1966-2020) were also downloaded and to calculate percentile water level conditions for the lake (WSC 2022b).

2.2.3 Fish Collection and Biological Sampling

Field methods used during 2021 replicated those used in 2018 (NSC 2019). Standard index gangs were set at each sampling location. Standard gangs were 137.2 m long and consisted of six 22.9 m long by 1.8 m deep panels of 38 mm (1.5”), 51 mm (2.0”), 76 mm (3.0”), 95 mm (3.75”), 108 mm (4.25”) and 127 mm (5”) twisted nylon mesh. A # 30 lead line and a 1.0 cm (3/8”) float line were seamed to each gillnet panel. Gillnet gangs were assembled by joining the panels of mesh from float line to float line and from lead line to lead line in, organized in sequentially increasing mesh size.

At every third set location, the large mesh end of a small mesh index gillnet gang was attached to the small mesh end of the standard index gang. Small mesh index gillnet gangs were comprised of three mesh sizes (16 mm, 20 mm and 25 mm), each constructed as a separate panel. Each panel was 10 m long, 1.8 m deep and constructed of clear monofilament.

Gillnet gangs were set for between 16 and 22 hours with a target duration of 18 hours. At each sampling site, the following information was collected:

- date and time set/retrieved;
- type of net set (standard index gang only or both standard index and small mesh index gangs);
- location (GPS coordinates at each end of the net);
- water temperature (°C);
- water depth (m);
- aquatic vegetation present (low, medium, high);
- substrate conditions; and,
- quantity and type of debris present.

All captured fish were enumerated by species and type of gillnet gang (i.e., standard index vs small mesh index). Fish captured in standard index gangs were also enumerated by mesh size. Walleye, Northern Pike, Lake Whitefish and White Sucker were measured for fork length (± 1 mm), round weight (± 10 g for fish <4 kg and ± 25 g for fish > 4 kg) and examined internally to determine sex and state of gonad maturity. Other fish species were bulk weighed to the nearest 10 g. Ageing structures were collected from fish species important to the commercial or domestic fisheries, including Walleye, Lake Whitefish and Northern Pike (*Esox lucius*). Based on the CAMP program protocols, otoliths were collected from Walleye and Lake Whitefish, and cleithra from Northern Pike.

In some instances, when large numbers of small fish were captured in the standard index nets, the catch was counted and bulk weighed to the nearest 25 g by species and mesh size. Forage fish captured in the

small mesh index gill nets were enumerated by species and bulk weighed to the nearest 10 g. Walleye, Northern Pike, Lake Whitefish and White Sucker captured in the small mesh index nets were measured for fork length (± 1 mm), round weight (± 10 g for fish <4 kg and ± 25 g for fish > 4 kg) and, for larger individuals, examined internally to determine sex and state of gonad maturity.

2.3 DATA ANALYSIS

2.3.1 Water Temperature

Daily mean water temperature was calculated and plotted to illustrate daily changes throughout the monitoring period.

2.3.2 Water Level

Lake St. Martin mean daily water level was calculated from the real-time 2021 data and plotted. The mean daily 5th, 25th, 50th, 75th and 95th percentile water level conditions were calculated based on 1977–2017 data and plotted to provide historical context for the 2021 data.

2.3.3 Fish

Data analyses focused on providing general species and site-specific information. More detailed analyses which may be required to examine trends in fish species or community changes through time will be conducted as set out in the AEMP once additional years of data have been collected.

2.3.3.1 Species Composition and Catch-Per-Unit-Effort

Standard index and small mesh index gillnet catches were tabulated by net type, species and sampling location. The frequency of occurrence of each species was calculated as a percentage of the standard index and small mesh index catches.

Catch-per-unit-effort (CPUE) was calculated on a total catch basis (mean of all sites and species combined) as well as on a species- and site-specific basis for each standard index and small mesh index gang. CPUE for standard index nets was calculated as the number of fish per 100 m of net per 24 hours (#fish/100m/24hrs) as follows:

$$CPUE = ((Cx/E)/1.371)*24$$

Where:

Cx is the total number of fish caught of species x, E is the duration of the net set in hours, 1.371 is a coefficient to standardize a 137.1 m net to 100 m, and 24 is to standardize the CPUE value to 24 hours.

For small mesh index gill nets, CPUE was standardized to the number of fish per 30 m of net per 24 hours (#fish/30m/24hrs) as follows:

$$CPUE = (Cx/E)*24$$

Where:

Cx is the total number of fish caught of species x, E is the duration of the net set in hours, and 24 is to standardize the CPUE value to 24 hours.

Data were tabulated and compared to 2018 results.

2.3.3.2 Size and Condition Factor

Mean length, weight and condition factor (K) were calculated for all fish species for which size measurements were available. Condition factor was calculated (after Fulton 1911 in Ricker 1975) per fish as follows:

$$K = \text{weight (g)} \times 10^5 / \text{fork length (mm)}^3$$

Size and condition calculations were conducted separately for fish captured in standard index gangs and for fish captured in small mesh index gangs. Results were tabulated and compared to 2018 results.

In instances where fish were bulk weighed rather than weighed individually, the total number of fish weighed and their combined weight were tabulated by species.

Fork length-frequency (%) distributions were calculated and presented graphically for all species captured in the standard index gangs and for which sufficient length data were available. Twenty-five mm length intervals were used for all species except Northern Pike. For pike, a 50 mm length interval was used to maintain consistency with analyses from the 2018 Lake St. Martin index netting program (NSC 2019) and from the CAMP. Species-specific length-frequency distributions for 2021 were compared to those reported in 2018 (NSC 2019).

2.3.3.3 Age

Ageing structures were collected from Lake Whitefish, Walleye, and Northern Pike captured during the 2021 field program. All ageing structures have been dried and archived at NSC. The need to age fish will be determined following the collection of additional years of monitoring data.

3.0 RESULTS

The index gillnetting program was conducted from August 31 to September 6 during 2021.

3.1 WATER TEMPERATURE

Mean daily water temperature ranged from 17.1-18.2°C during the 2021 gillnetting program (Figure 2). Water temperature was approximately 15°C during the 2018 program (Appendix 1; Table A1-1).

3.2 WATER LEVEL

In general, water level on Lake St. Martin has declined since flood conditions in 2014 and levels observed during 2021 were the lowest recorded since 2014 (Figure 3). Water level on Lake St. Martin ranged between 242.8-242.4 mASL during the 2021 sampling program (Figure 4), lower than median water level conditions recorded on the same dates during 1966-2017 (243.5-243.7 mASL; Figure 4). Water level observed during the 2021 sampling period ranged between the 10-20th percentile levels during 1966–2017. Average level during the 2021 study period was equal to the historic 15th percentile level.

In contrast, water level observed on Lake St. Martin during the 2018 gillnetting program was near median level conditions. Levels observed during the 2018 study ranged between 243.4-243.5 mASL, equal to the 42-49th percentile flow condition observed historically (1966-2017) on those dates (Figure 4). Average level during the 2018 study period was equal to the historic 45th percentile level.

3.3 FISH

3.3.1 Fishing Effort

Eleven sites were fished with standard index gangs during 2021, four of which also included small mesh index gangs (Table 1). An additional site fished in 2018 (GN-10; see Figure A1-1 in Appendix 1) could not be accessed in 2021 due to low water level. Seven sampling sites were located in the south basin and four were located in the north basin (Figure 5). Small mesh index gangs were included at 3 sites in the south basin and one site in the north basin (Table 1; Figure 5).

Mean net set duration was 21.5 hours during sampling in 2021 (range: 16.7-27.4 hours; Table 1). Similarly, mean net set duration was 21.2 hours in 2018 (range of 18.9-23.4 hours; Table A1-1 in Appendix 1).

3.3.2 Species Composition and Catch-Per-Unit-Effort

Sixteen species of fish were captured in standard and small mesh index nets during 2021 (Table 2), all of which had previously been reported the Lake St. Martin.

A total of 748 fish representing 11 species were captured in the standard index nets (Tables 2 and 3). The most common species captured were Yellow Perch and Walleye, comprising 30.5% and 26.2% of the catch, respectively (Table 3). White Sucker (11.9%), Shorthead Redhorse (9.8%), and Northern Pike (9.1%) were also frequently captured (Table 3). Lake Whitefish and Cisco comprised a smaller portion of the catch

(5.8% and 4.0%, respectively) while Goldeye, Carp, Black Bullhead, and Freshwater Drum were infrequently captured, collectively comprising 2.7% of the catch (Table 3).

The mean CPUE for the standard index catch was 55.1 ± 34.5 fish/100m/24hrs (Table 4). Yellow Perch (17.2 ± 20.1) and Walleye (14.1 ± 11.9) had the highest mean CPUEs (Table 4). Mean CPUE for White Sucker (6.6 ± 3.5), Shorthead Redhorse (5.3 ± 3.7), and Northern Pike (4.8 ± 3.0) were less than Walleye and Yellow Perch (Table 4). The remaining species had mean CPUEs which were less than 0.8 fish/100m/24hrs.

The catch composition and number of fish captured in standard index nets were similar between 2018 and 2021. Primary species captured included Walleye, Yellow Perch, White Sucker, Shorthead Redhorse, Lake Whitefish, Cisco and Northern Pike (Table 5). Walleye comprised a substantial portion of the catch in both years (28.5% in 2018; 26.2% in 2021; Table 5), whereas Yellow Perch comprised a larger portion of the catch in 2021 (30.5%) relative to 2018 (7.8%; Table 5). Conversely, Lake Whitefish comprised a smaller portion of the catch in 2021 (5.72%) compared to 2018 (14.2%; Table 5). Remaining species comprised similar portions of the catch in both years (Table 5).

Fewer species but a larger number of fish were captured in the small mesh index nets relative to the standard index nets. A total of 1,277 fish, representing nine species were captured (Tables 2 and 6). Yellow Perch comprised the majority of the catch (62.0%), followed by Spottail Shiner (22.9%) and Emerald Shiner (10.8%; Table 6). The remainder of the catch included Trout-perch (1.7%), Golden Shiner (0.9%), Northern Pike (0.8%), White Sucker (0.2%), Logperch (0.4%) and Walleye (0.2%; Table 6).

The mean CPUE for the small mesh index catch was 335.0 ± 172.2 fish/30m/24hrs (Table 7). Reflecting their relative abundance in the catch, Yellow Perch, Spottail Shiners, and Emerald Shiners had the highest species-specific mean CPUEs (206.2 ± 135.8, 79.9 ± 56.2, and 33.8 ± 25.5 fish/30m/24hrs, respectively; Table 7).

The catch composition and number of fish captured in small mesh index nets was also comparable between 2018 and 2021 (Appendix 1). The main species captured included juvenile Yellow Perch, Spottail Shiner and Emerald Shiner (Table 8). Only incidental numbers of other species were captured in both sampling years (Table 8).

3.3.3 Size and Condition

Mean size and condition factor for selected species of fish captured in the standard index gangs are provided in Table 9 and the total weight of bulk weighed fish is provided in Table 10. Length-frequency distributions are provided in Figures 6-9.

Walleye captured in standard index gillnets in 2021 ranged in length from 197-615 mm and had a mean length of had a mean length of 414 mm (Table 9). Walleye captured in 2018 were of comparable size, having a mean length of 415 mm and ranging in length from 156-640 mm (Table 9). In both years, approximately 83% of the Walleye catch was comprised of fish greater than 300 mm in length, but modal

length interval was 450-474 mm, slightly larger than the 400-424 mm length interval observed in 2018 (Figure 6).

The mean length of captured Northern Pike was slightly higher in 2021 (545 mm) than 2018 (522 mm; Table 9). The modal length same between 2018 and 2021 (551-600 mm; Figure 7), but a slight shift towards larger fish in was observed in 2021 (Figure 7). Similar to 2018, smaller pike were again poorly represented in the 2021 catch; only two fish smaller than 400 mm in length were captured (Figure 7).

The Lake Whitefish catch in 2018 and 2021 was comprised almost exclusively of large adult fish ranging in size from 350-499 mm in length (Figure 8). Only two whitefish, both captured in 2021, had a fork length less than 350 mm (Figure 8). The mean fork length of captured whitefish was slightly larger in 2021 (mean = 433 mm; range = 270–494 mm) than observed in 2018 (mean = 350 mm; range = 350-490 mm; Table 9). Most whitefish captured in 2018 and 2021 were sexually mature fish (88% and 95%, respectively) that would have spawned later during the respective falls.

The White Sucker catch in 2021 and 2018 was comprised of a small group (15.5% and 10.2% of the catch, respectively) of young fish ranging in length from 150-249 mm and a much larger group of adult fish (84.5% and 89.8% of the catch, respectively) ranging from 275-524 mm in length (Figure 9). The mean length of captured suckers was comparable between 2021 (393 mm) and 2018 (392 mm in 2018; Table 9). Fish in the 400-449 mm length range were most frequently captured in both years (Figure 9).

The biomass of bulk weighed species captured in standard index gill nets is provided in Table 10.

Mean size and condition factor for a small number of fish captured in the small mesh index gangs are provided in Table 11. Fish for which individual measurements were taken included key fish such as Northern Pike or Walleye which captured incidentally in the small mesh index gangs. Table 12 presents the biomass for fish that were bulk weighed by species. A total of 1,259 fish comprised of Emerald Shiner, Golden Shiner, Log Perch, Spottail Shiner, Trout-perch, and juvenile Yellow Perch weighed 10,725 g (Table 12).

4.0 SUMMARY

This report provides results from index gillnetting conducted on Lake St Martin from August 31 to September 7 during 2021. Water level was low during the 2021 study period and ranged between the 10th to 20th historic percentile level conditions. Eleven sites comparable to those fished during a previous index netting conducted in 2018 (NSC 2019) were sampled during 2021. Index netting was conducted with standard index and small mesh index gillnet gangs comparable to those used in 2018.

A total of 2,025 fish comprising 16 species were captured in standard nets (n = 748) and small mesh nets (n = 1,277) set in Lake St. Martin during 2021. Yellow Perch (30.5%) and Walleye (26.2%) were the most commonly captured species in the standard index nets. White Sucker (11.9%), Shorthead Redhorse (9.8%) and Northern Pike (9.1%) were also frequently captured. The majority of the small mesh index net catch (95.7%) was comprised of juvenile Yellow Perch (62.0%), Spottail Shiner (22.9%) and Emerald Shiner (10.8%).

The 2021 index netting results were comparable to the standard index and small mesh index gillnet catches reported in 2018. Although slight differences were observed between years, the primary species captured in standard index nets included Walleye, Yellow Perch, White Sucker, Shorthead Redhorse, Lake Whitefish, Cisco and Northern Pike. Notably, more perch were captured in 2021 compared to 2018. Primary fish captured in small mesh index nets included juvenile Yellow Perch, Spottail Shiner and Emerald Shiner. Again, more perch were captured in small mesh index nets during 2021 relative to 2018.

Data collected in 2018, this study and during future monitoring studies will provide baseline information to assist in examining potential effects related to operation of the Project.

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Table 1. Location and set information for standard index and small mesh index gillnet gangs set in Lake St. Martin, late summer 2021.

Site [1,2]	Location [3]		Set Date	Set Time	Duration (hrs)	Depth (m)		Water Temperature (°C)
	Easting	Northing				Start	End	
GN-01	547522	5739667	04-Sep-21	14:16	17.7	1.2	1.1	18.0
GN-02	554834	5737595	05-Sep-21	8:30	23.5	1.0	1.0	17.5
GN-03 (SM)	549478	5735906	04-Sep-21	14:43	18.8	1.2	0.9	18.0
GN-04	545431	5734295	03-Sep-21	15:29	18.0	1.6	1.5	17.0
GN-05	541066	5732282	03-Sep-21	15:05	19.4	1.5	1.7	17.0
GN-06 (SM)	540044	5726294	31-Aug-21	16:16	18.7	3.7	3.3	15.0
GN-07 (SM)	531810	5727247	01-Sep-21	7:38	27.4	0.8	1.2	16.5
GN-08	535286	5724837	01-Sep-21	8:06	25.4	3.5	1.5	16.5
GN-09	537876	5719746	31-Aug-21	16:43	16.7	4.3	4.3	15.0
GN-11 (SM)	533613	5716385	02-Sep-21	8:20	24.2	2.8	3.1	17.0
GN-12	534815	5717096	02-Sep-21	8:00	26.5	3.5	3.4	17.0

1 - sites labelled with (SM) are those at which small mesh gillnets gangs were also fished

2 - one site fished in 2018 (GN-10) could not be accessed in 2021 due to low water level on Lake St. Martin

3 - UTM coordinates; NAD83, Zone 14U; site locations illustrated in Figure 6

Table 2. Fish species captured in standard index and small mesh index gillnet gangs set in Lake St. Martin, late summer 2018 and 2021.

Family *Scientific Name* [1]	Common Name	2018		2021	
		Standard Index Gangs	Small Mesh Index Gangs	Standard Index Gangs	Small Mesh Index Gangs
Hiodontidae					
Hiodon alosoides	Goldeye	x		x	
Cyprinidae					
Cyprinus carpio	Carp	x		x	
Notemigonus chrysoleucas	Golden Shiner		x		X
Notropis atherinoides	Emerald Shiner		x		X
Notropis hudsonius	Spottail Shiner		x		X
Catostomidae					
Moxostoma macrolepidotum	Shorthead Redhorse	x		x	
Catostomus commersonii	White Sucker	x	x	x	X
Ictaluridae					
Ameiurus melas	Black Bullhead	x	x	x	
Esocidae					
Esox lucius	Northern Pike	x	x	x	X
Salmonidae					
Coregonus artedi	Cisco	x		x	
Coregonus clupeaformis	Lake Whitefish	x	x	x	
Percopsidae					
Percopsis omiscomaycus	Trout-perch		x		X
Percidae					
Perca flavescens	Yellow Perch	x	x	x	X
Percina caprodes	Logperch				X
Sander vitreus	Walleye	x	x	x	X
Sciaenidae					
Aplodinotus grunniens	Freshwater Drum	x	x	x	

1 - taxonomy after Stewart and Watkinson (2004)

Table 3. Site- and species-specific summary of fish catches from standard index gillnet gangs set in Lake St. Martin, late summer 2021.

Species	Site-Specific Catch [2]											Total Catch	RA (%) [1]
	GN-1	GN-2	GN-3	GN-4	GN-5	GN-6	GN-7	GN-8	GN-9	GN-11	GN-12		
Goldeye	-	-	-	-	1	-	-	-	-	-	-	1	0.1
Carp	1	-	-	-	1	-	-	-	-	1	2	5	0.7
Shorthead Redhorse	2	8	1	12	5	5	12	3	2	16	7	73	9.8
White Sucker	8	4	4	9	11	8	20	12	4	8	1	89	11.9
Black Bullhead	1	-	-	-	-	-	-	2	-	-	-	3	0.4
Northern Pike	6	4	7	-	6	2	17	5	3	7	11	68	9.1
Cisco	-	-	-	-	-	2	-	9	13	4	2	30	4.0
Lake Whitefish	5	1	3	5	12	-	2	8	3	4	-	43	5.8
Yellow Perch	4	-	1	14	8	10	3	53	63	39	33	228	30.5
Walleye	8	-	3	9	7	10	10	45	31	32	41	196	26.2
Freshwater Drum	-	-	-	-	-	-	2	3	-	7	-	12	1.6
Total:	35	17	19	49	51	37	66	140	119	118	97	748	100.0

1 - relative fish species abundance calculated as a percentage of the total catch

2 - one site fished in 2018 (GN-10) could not be accessed in 2021 due to low water level on Lake St. Martin

Table 4. Site- and species-specific catch-per-unit-effort (CPUE) calculated for fish captured in standard index gillnet gangs set in Lake St. Martin, late summer 2021.

Species	Site-Specific Catch											Mean ± SD [1]
	GN-1	GN-2	GN-3	GN-4	GN-5	GN-6	GN-7	GN-8	GN-9	GN-11	GN-12	
Goldeye	-	-	-	-	0.9	-	-	-	-	-	-	0.1 ± 0.3
Carp	1.0	-	-	-	0.9	-	-	-	-	0.7	1.3	0.4 ± 0.5
Shorthead Redhorse	2.0	6.0	0.9	11.7	4.5	4.7	7.7	2.1	2.1	11.6	4.6	5.3 ± 3.7
White Sucker	7.9	3.0	3.7	8.7	9.9	7.5	12.8	8.3	4.2	5.8	0.7	6.6 ± 3.5
Black Bullhead	1.0	-	-	-	-	-	-	1.4	-	-	-	0.2 ± 0.5
Northern Pike	5.9	3.0	6.5	0.0	5.4	1.9	10.9	3.4	3.1	5.1	7.3	4.8 ± 3.0
Cisco	-	-	-	-	-	1.9	-	6.2	13.6	2.9	1.3	2.4 ± 4.2
Lake Whitefish	4.9	0.7	2.8	4.9	10.8	0.0	1.3	5.5	3.1	2.9	-	3.4 ± 3.2
Yellow Perch	3.9	-	0.9	13.6	7.2	9.3	1.9	36.5	66.0	28.2	21.8	17.2 ± 20.1
Walleye	7.9	-	2.8	8.7	6.3	9.3	6.4	31.0	32.5	23.2	27.1	14.1 ± 11.9
Freshwater Drum	-	-	-	-	-	-	1.3	2.1	-	5.1	-	0.8 ± 1.6
Total:	34.6	12.7	17.7	47.6	46.0	34.6	42.2	96.5	124.7	85.5	64.1	55.1 ± 34.5

1 - standard deviation

Table 5. Comparison of species-specific fish catches from standard index gangs set in Lake St. Martin, late summer 2018 and 2021.

Species	2018			2021		
	n	RA [1]	CPUE [2]	n	RA [1]	CPUE [2]
Goldeye	1	0.2	0.1 ± 0.3	1	0.1	0.1 ± 0.3
Carp	1	0.2	0.1 ± 0.3	5	0.7	0.4 ± 0.5
Shorthead Redhorse	39	6.5	2.6 ± 2.3	73	9.8	5.3 ± 3.7
White Sucker	103	17.1	7.0 ± 4.8	89	11.9	6.6 ± 3.5
Black Bullhead	3	0.5	0.2 ± 0.4	3	0.4	0.2 ± 0.5
Northern Pike	97	16.1	6.7 ± 3.0	68	9.1	4.8 ± 3.0
Cisco	37	6.1	2.6 ± 3.2	30	4.0	2.4 ± 4.2
Lake Whitefish	86	14.2	5.8 ± 5.5	43	5.7	3.4 ± 3.2
Yellow Perch	47	7.8	3.3 ± 2.7	228	30.5	17.2 ± 20.1
Walleye	172	28.5	12.2 ± 11.8	196	26.2	14.1 ± 11.9
Freshwater Drum	18	3.0	1.2 ± 2.1	12	1.6	0.8 ± 1.6
Total:	604	100	41.7 ± 12.2	748	100	55.1 ± 34.5

1 - relative fish species abundance calculated as a percentage of the total catch

2 - mean CPUE ± standard deviation expressed as #fish/30m of net/24hrs

Table 6. Site- and species-specific summary of fish catches from small mesh index gangs set in Lake St. Martin, late summer 2021.

Species	Site-Specific Catch				Total Catch	RA (%) [1]
	GN-3	GN-6	GN-7	GN-11		
Golden Shiner	4	3	5	-	12	0.9
Emerald Shiner	15	12	81	30	138	10.8
Spottail Shiner	28	86	34	145	293	22.9
White Sucker	-	2	1	-	3	0.2
Northern Pike	1	1	4	4	10	0.8
Trout-perch	-	12	6	4	22	1.7
Yellow Perch	20	251	341	180	792	62.0
Logperch	-	2	-		2	0.2
Walleye	-	4	-	1	5	0.4
Total:	68	373	472	364	1277	100.0

1 - relative species abundance calculated as a percentage of the total catch

Table 7. Site- and species-specific catch-per-unit-effort (CPUE) calculated for fish captured in small mesh index gillnet gangs set in Lake St. Martin, late summer 2021.

Species	Site-Specific Catch				Mean ± SD [1]
	GN-3	GN-6	GN-7	GN-11	
Golden Shiner	5.1	3.8	4.4	-	3.3 ± 2.3
Emerald Shiner	19.2	15.4	71.0	29.8	33.8 ± 25.5
Spottail Shiner	35.8	110.2	29.8	144.0	79.9 ± 56.2
White Sucker	-	2.6	0.9	-	0.9 ± 1.2
Northern Pike	1.3	1.3	3.5	4.0	2.5 ± 1.4
Trout-perch	-	15.4	5.3	4.0	6.2 ± 6.5
Yellow Perch	25.6	321.6	299.0	178.7	206.2 ± 135.8
Logperch	-	2.6	-	-	0.6 ± 1.3
Walleye	-	5.1	-	1.0	1.5 ± 2.4
Total:	86.9	477.9	413.9	361.4	335.0 ± 172.2

1 - standard deviation

Table 8. Comparison of species-specific fish catches from small mesh gangs set in Lake St. Martin, late summer 2018 and 2021.

Species	2018			2021		
	n	RA [1]	CPUE [2]	n	RA [1]	CPUE [2]
Golden Shiner	1	0.1	0.3 ± 0.5	12	0.9	3.3 ± 2.3
Emerald Shiner	226	19.2	61.5 ± 42.9	138	10.8	33.8 ± 25.5
Spottail Shiner	439	37.2	125.0 ± 57.7	293	22.9	79.9 ± 56.2
White Sucker	18	1.5	16.7 ± 19.8	3	0.2	0.9 ± 1.2
Black Bullhead	5	0.4	1.4 ± 2.7	-	-	-
Northern Pike	7	0.6	1.9 ± 1.8	10	0.8	2.5 ± 1.4
Cisco	3	0.3	0.9 ± 1.8	-	-	-
Lake Whitefish	1	0.1	0.3 ± 0.5	-	-	-
Trout-perch	-	-	-	22	1.7	6.2 ± 6.5
Yellow Perch	464	39.4	130.6 ± 95.0	792	62.0	206.2 ± 135.8
Logperch	-	-	-	2	0.2	0.6 ± 1.3
Walleye	5	0.4	1.5 ± 3.1	5	0.4	1.5 ± 2.4
Trout-perch	7	0.6	2.1 ± 2.5	-	-	-
Freshwater Drum	3	0.3	0.8 ± 1.0	-	-	-
Total:	1179	100.0	331.3 ± 149.7	1277	100.0	335.0 ± 172.2

1 - relative fish species abundance calculated as a percentage of the total catch

2 - mean CPUE ± standard deviation expressed as #fish/30m of net/24hrs

Table 9. Comparison of the mean size and condition factor (K) for fish species captured in standard index gillnet gangs set in Lake St. Martin, late summer 2018 and 2021. Species captured in 2018 but not in 2021 are not included. 2018 size data for those species are provided in Appendix 1.

Species	n	Fork Length (mm)			Weight (g)			K	
		Mean	SD [1]	Range	Mean	SD [1]	Range	Mean	Range
White Sucker									
2018	103	392	87	160-500	1064	506	70-1920	1.55	1.24-2.12
2021	88	393	90	150-502	1022	485	30-2000	1.45	0.80-2.40
Northern Pike									
2018	97	522	119	272-891	1091	747	150-4550	0.68	0.41-1.12
2021	68	545	78	294-772	1184	479	100-3100	0.69	0.39-0.88
Lake Whitefish									
2018	86	420	25	350-490	1108	247	550-1820	1.47	1.18-1.90
2021	43	433	41	270-494	1193	311	210-1900	1.43	1.03-1.89
Walleye									
2018	172	415	97	156-640	913	529	36-3030	1.10	0.83-1.49
2021	196	414	100	197-615	941	565	55-2700	1.11	0.50-1.85

1 - standard deviation

Table 10. Biomass of fish species captured in standard index gillnet gangs set in Lake St. Martin, late summer 2021.

Species	2018		2021	
	n	Combined Weight of Catch (g)	n	Combined Weight of Catch (g)
Goldeye	-	-	1	500
Carp	-	-	5	50950
Shorthead Redhorse	2	200	72	47890
Black Bullhead	-	-	3	2950
Cisco	30	2400	30	5400
Yellow Perch	37	1780	228	9295
Freshwater Drum	-	-	7	18350
Total:	69	4380	346	135335

Table 11. Comparison of the mean size and condition factor (K) for fish captured in small mesh gillnet gangs set in Lake St. Martin, late summer 2018 and 2021. Species captured in 2018 but not in 2021 are not included. 2018 size data for those species are provided in Appendix 1.

Species	n	Fork Length (mm)			Round Weight (g)			K	
		Mean	SD [1]	Range	Mean	SD	Range	Mean	Range
White Sucker									
2018	9	76	3	73-81	5	1	4-6	1.19	1.03-1.48
2021	3	44	15.3	35-62	-	-	-	-	-
Northern Pike									
2018	7	520	120	303-628	1074	583	150-1750	0.67	0.54-0.73
2021	10	547	64.6	445-633	1156	387.9	600-1700	0.69	0.58-0.79
Walleye									
2018	15	145	68	115-388	68	161	13-650	1.26	0.77-1.70
2021	5	244	147.8	130-491	284	461.5	10-1100	0.84	0.46-1.32

1 - standard deviation

Table 12. Biomass of fish species captured in small mesh index gillnet gangs set in Lake St. Martin, late summer 2021.

Species	2018		2021	
	n	Combined Weight of Catch (g)	N	Combined Weight of Catch (g)
White Sucker	17	80	-	-
Emerald Shiner	226	1110	138	625
Golden Shiner	-	-	12	40
Log Perch	-	-	2	5
Spottail Shiner	439	2260	293	1940
Trout-perch	7	47	22	105
Yellow Perch	430	2880	792	8010
Total:	1119	6377	1259	10725

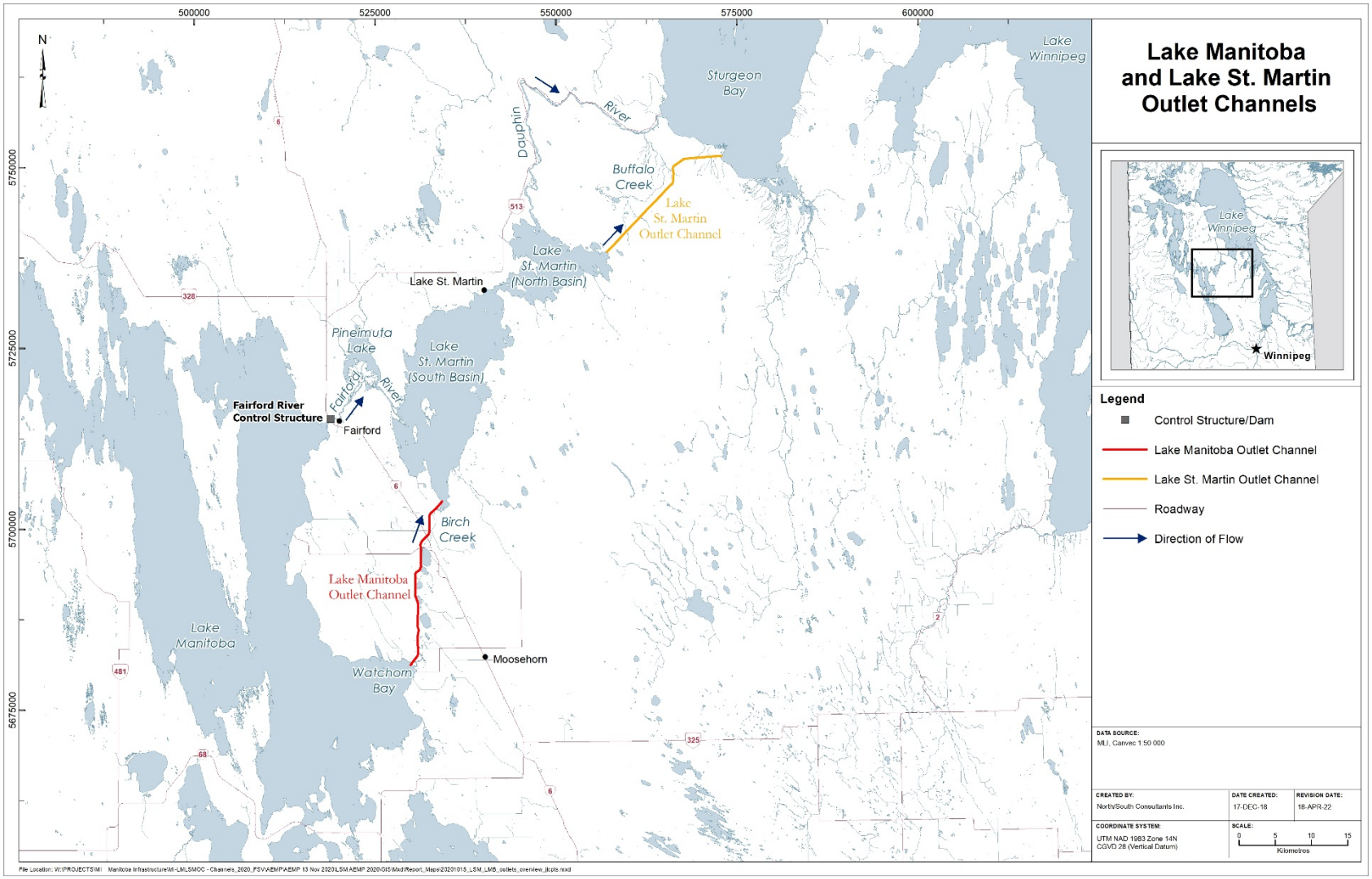

Figure 1. Location of the proposed Lake Manitoba and Lake St. Martin Outlet Channels in central Manitoba.

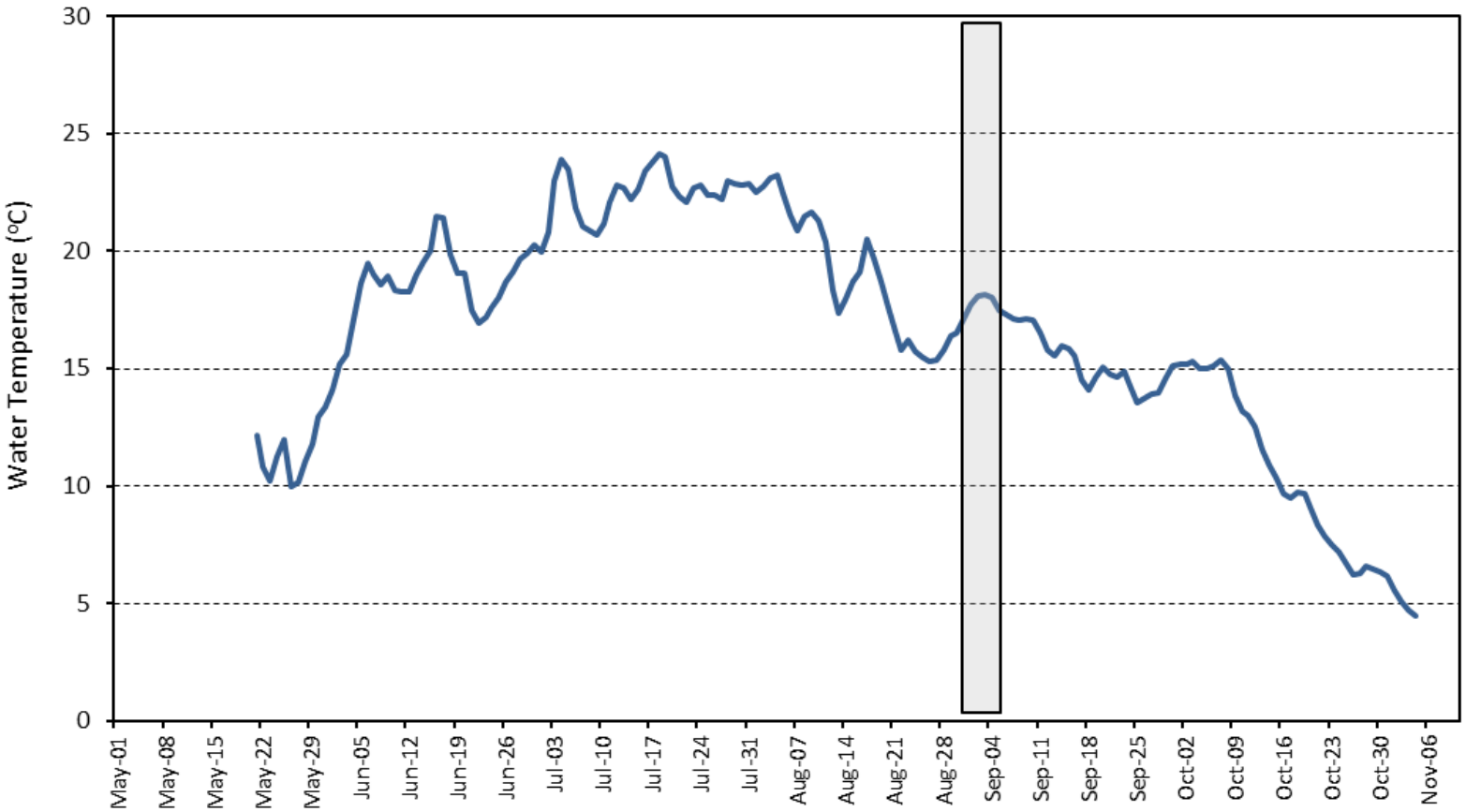

Figure 2. Daily mean water temperature in Lake St Martin, May to November 2021. Shaded box indicates 2021 study period.

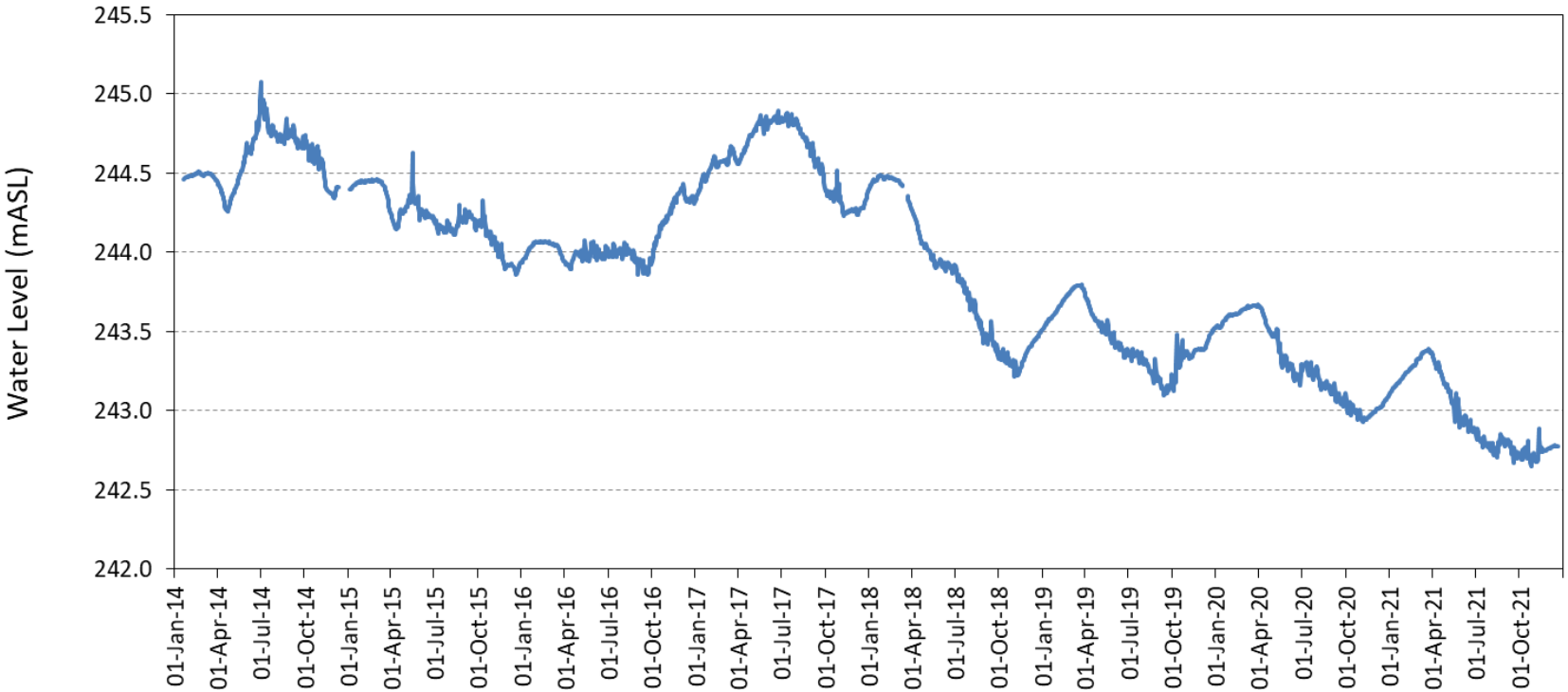

Figure 3. Daily mean water level in Lake St. Martin, 2014-2021. Water level data from Water Survey of Canada (2022) for LAKE ST. MARTIN NEAR HILBRE [STN 05LM005]). Note that 2021 data are provisional.

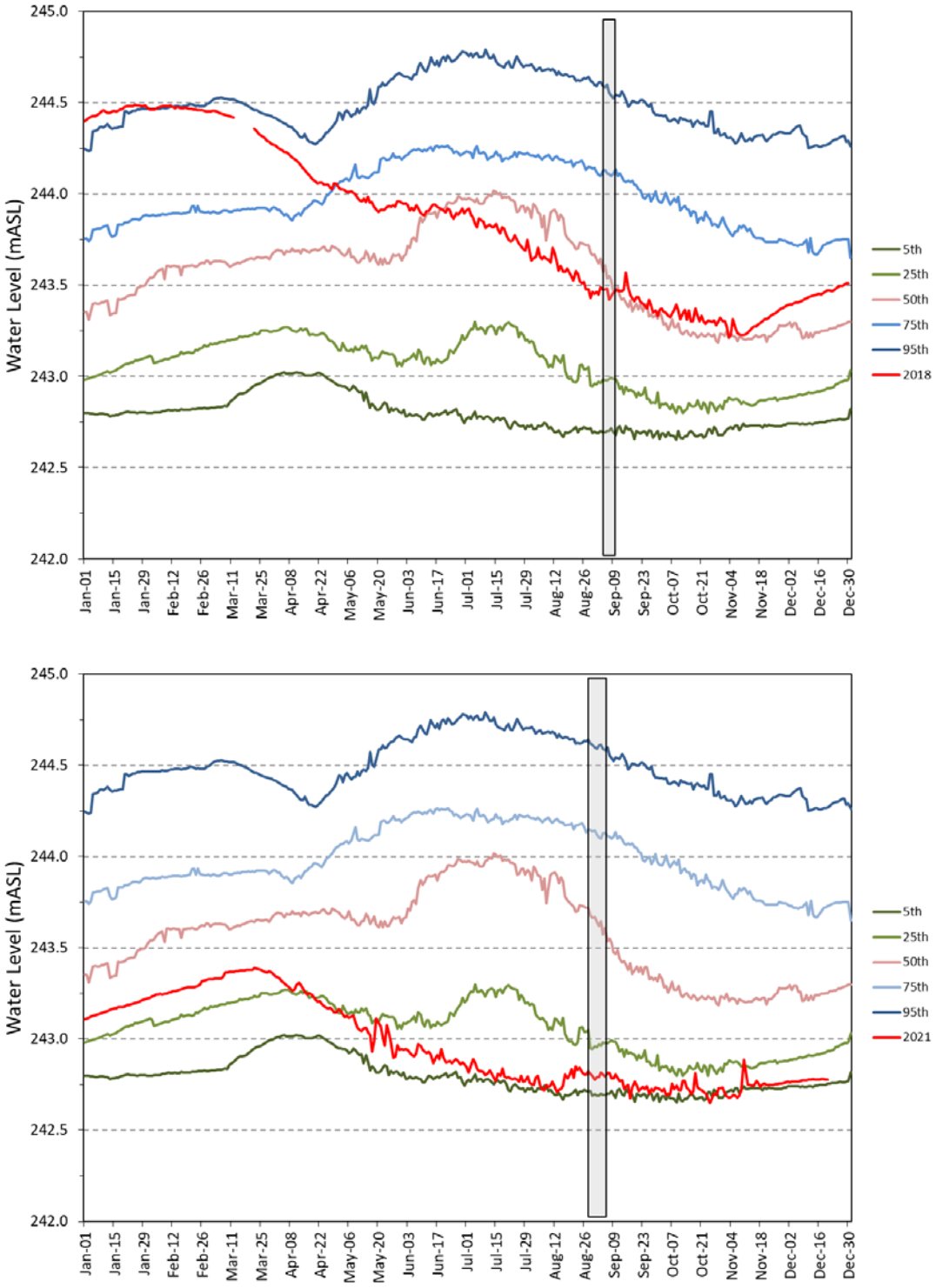

Figure 4. Percentile water level conditions (1966-2017) and mean daily water level in Lake St Martin during 2018 (top) and 2021 (bottom). Data provided by Water Survey of Canada (Station 05LM001). Water level data from Water Survey of Canada (2022) for "LAKE ST. MARTIN NEAR HILBRE [STN 05LM005)". Note that 2021 data are provisional. Shaded box indicates study periods.

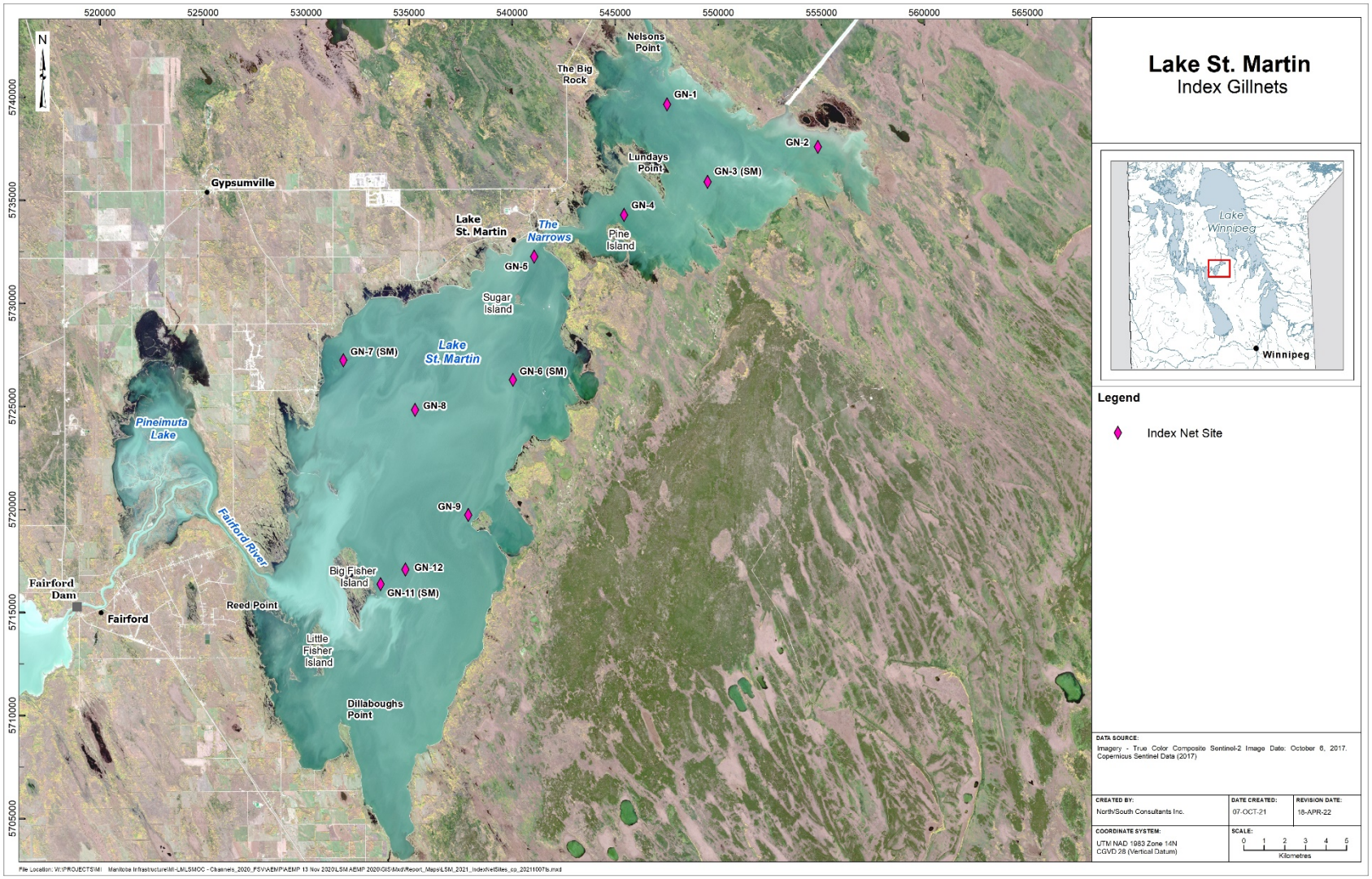

Figure 5. The location of standard index and small mesh index gillnet sites sampled in Lake St. Martin, late summer 2021.

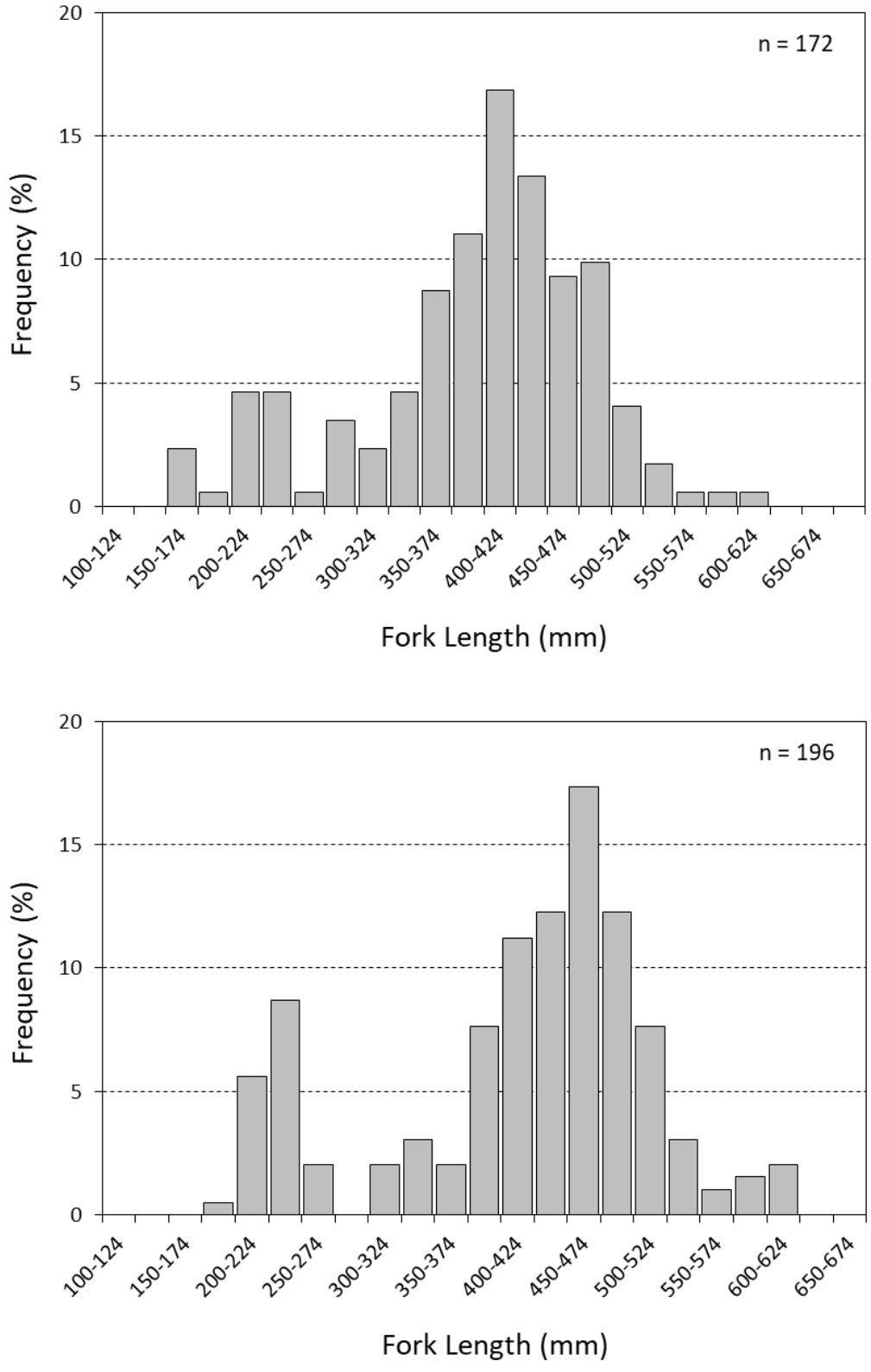

Figure 6. Length-frequency distribution for Walleye captured in standard index gillnet gangs set in Lake St. Martin, late summer 2018 (top) and 2021 (bottom).

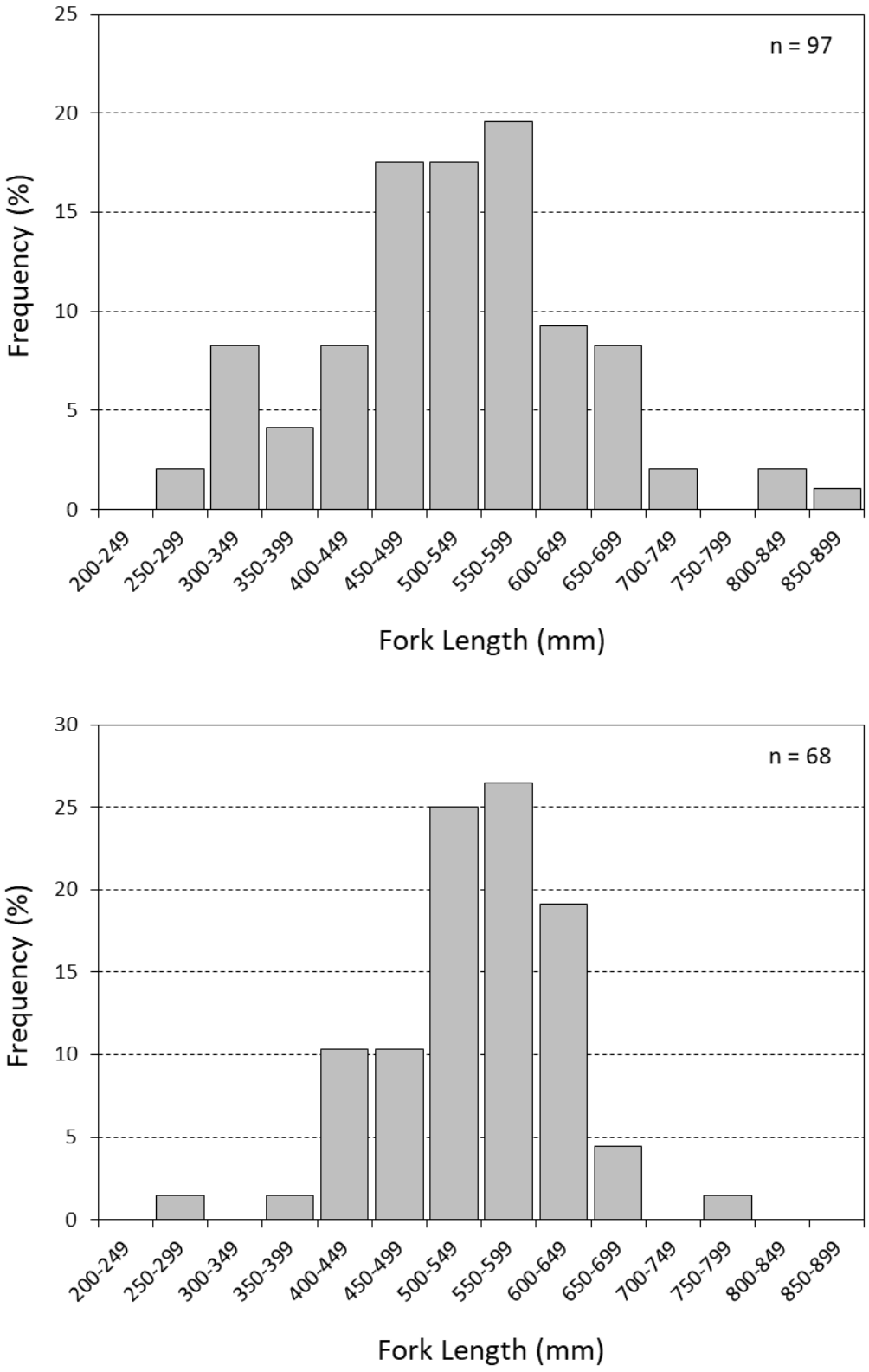

Figure 7. Length-frequency distribution for Northern Pike captured in standard index gillnet gangs set in Lake St. Martin, late summer 2018 (top) and 2021 (bottom).

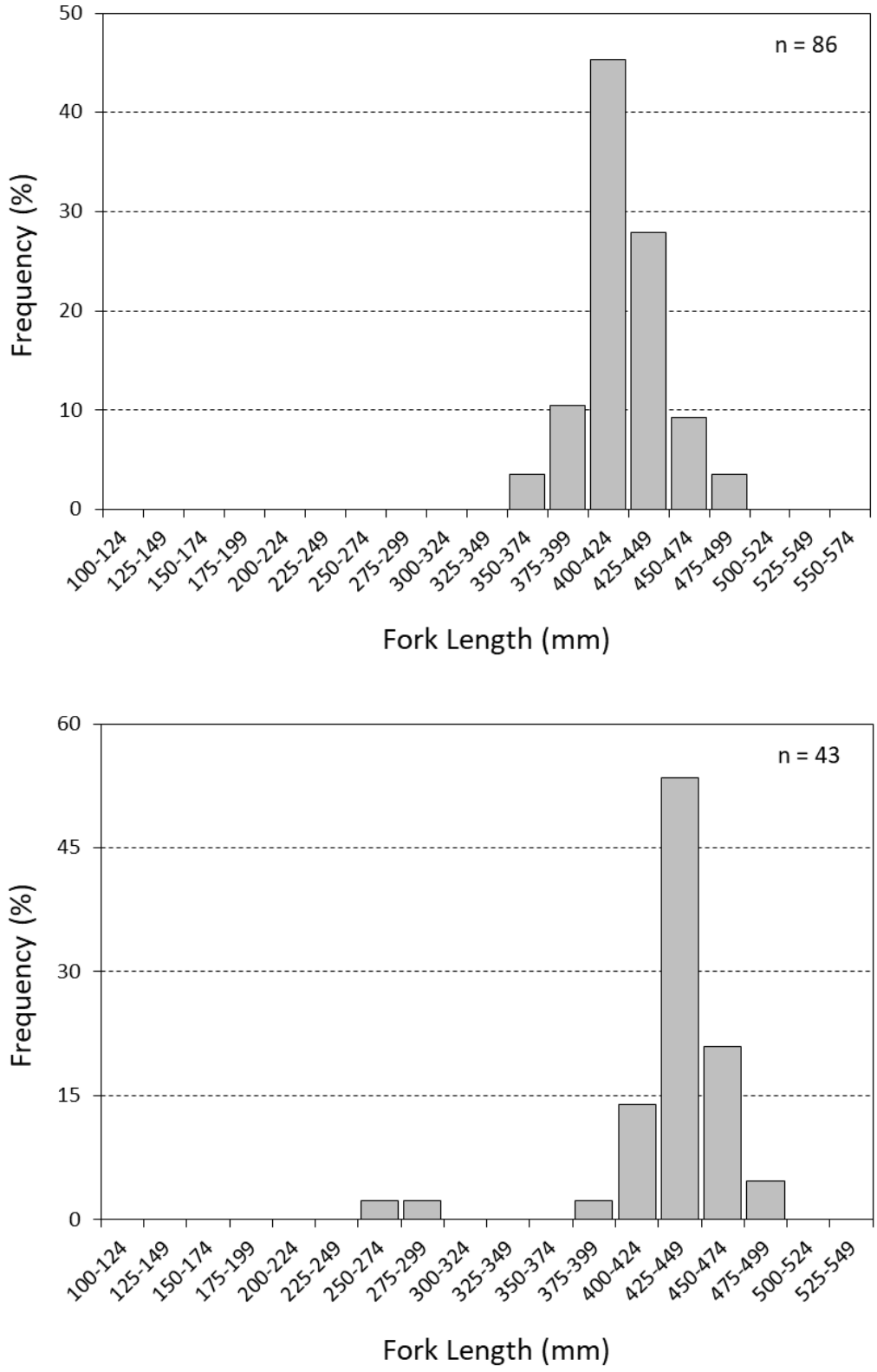

Figure 8. Length-frequency distribution for Lake Whitefish captured in standard index gillnet gangs set in Lake St. Martin, late summer 2018 (top) and 2021 (bottom).

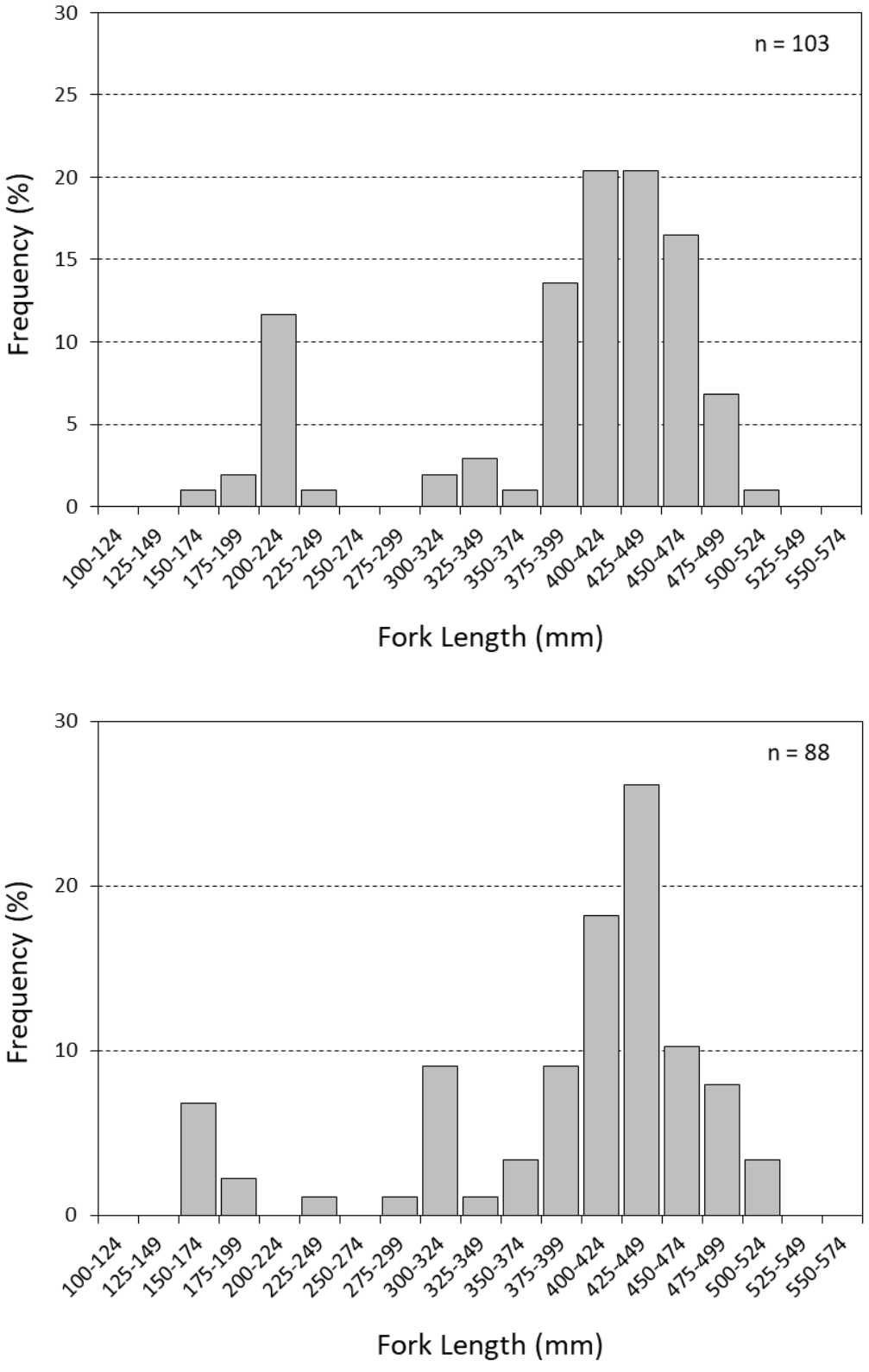

Figure 9. Length-frequency distribution for White Sucker captured in standard index gillnet gangs set in Lake St. Martin, late summer 2018 (top) and 2021 (bottom).

APPENDIX 1. LAKE ST. MARTIN INDEX GILLNETTING DATA - 2018

Table A1-1. Location and set information for standard index and small mesh index gillnet gangs set in Lake St. Martin, September 2018 [1].

Site [2]	Location [3]		Set Date	Set Time	Duration (hrs)	Depth (m)		Water Temperature (°C)
	Easting	Northing				Start	End	
GN-1	547509	5739669	05-Sep-18	14:31	19.3	1.8	1.8	15.0
GN-2	554851	5737558	05-Sep-18	15:05	19.8	1.8	1.9	15.0
GN-3 (SM)	549463	5735937	06-Sep-18	9:40	23.4	2.0	2.1	15.0
GN-4	545429	5734297	06-Sep-18	12:05	23.1	2.1	2.1	15.0
GN-5	541140	5732290	06-Sep-18	12:55	23.4	2.3	2.1	15.0
GN-6 (SM)	540016	5726239	07-Sep-18	13:56	19.7	4.1	4.2	14.5
GN-7 (SM)	531846	5727133	08-Sep-18	12:18	22.2	1.9	2.4	15.0
GN-8	535336	5724577	07-Sep-18	14:13	20.1	4.1	4.1	14.5
GN-9	537887	5719725	08-Sep-18	11:10	22.5	5.1	5.0	15.0
GN-10	528992	5716286	09-Sep-18	14:13	18.9	2.0	2.1	14.5
GN-11 (SM)	533625	5716365	09-Sep-18	13:50	20.3	2.6	3.5	15.0
GN-12	532717	5711955	09-Sep-18	13:30	21.3	3.8	4.1	15.0

1 - site locations illustrated on Figure 3

2 - sites identified with (SM) are those at which small mesh gillnets gangs were also fished

3 - UTM coordinates; NAD83, Zone 14U

Table A1-2. Site- and species-specific summary of fish catches from standard index gillnet gangs set in Lake St. Martin, September 2018.

Species	Site-Specific Catch												Total Catch	RA (%) [1]
	GN-1	GN-2	GN-3	GN-4	GN-5	GN-6	GN-7	GN-8	GN-9	GN-10	GN-11	GN-12		
Goldeye	-	1	-	-	-	-	-	-	-	-	-	-	1	0.2
Carp	1	-	-	-	-	-	-	-	-	-	-	-	1	0.2
Shorthead Redhorse	6	1	9	7	6		2	2	1		2	3	39	6.5
White Sucker	11	10	17	23	7	7	7	9	2	1	7	2	103	17.1
Black Bullhead	-	-	-	-	1	1	-	-	-	-	-	1	3	0.5
Northern Pike	13	8	7	9	8	6	15	2	4	8	7	10	97	16.1
Cisco	-	1	2	3	-	11	-	7	9	1	1	2	37	6.1
Lake Whitefish	9	7	5	27	14	1	5	3		4	8	3	86	14.2
Yellow Perch	1	8	5	5	1	4	3	2	5	1	11	1	47	7.8
Walleye	3	9	5	7	3	41	3	24	10	15	12	40	172	28.5
Freshwater Drum	-	-	1	-	1	1	9	-	1	1	4	-	18	3.0
Total:	44	45	51	81	41	72	44	49	32	31	52	62	604	100.0

1 - relative fish species abundance calculated as a percentage of the total catch

Table A1-3. Site- and species-specific catch-per-unit-effort (CPUE) calculated for fish captured in standard index gillnet gangs set in Lake St. Martin, September 2018.

Species	Site-Specific CPUE (#fish/100m/24hrs)												Mean ± SD [1]
	GN-1	GN-2	GN-3	GN-4	GN-5	GN-6	GN-7	GN-8	GN-9	GN-10	GN-11	GN-12	
Goldeye	-	0.9	-	-	-	-	-	-	-	-	-	-	0.1 ± 0.25
Carp	0.9	0.0	-	-	-	-	-	-	-	-	-	-	0.1 ± 0.26
Shorthead Redhorse	5.4	0.9	6.7	5.3	4.5	-	1.6	1.7	0.8	-	1.7	2.5	2.6 ± 2.30
White Sucker	10.0	8.8	12.7	17.4	5.2	6.2	5.5	7.8	1.6	0.9	6.0	1.6	7.0 ± 4.83
Black Bullhead	-	-	-	-	0.7	0.9	-	-	-	-	-	0.8	0.2 ± 0.37
Northern Pike	11.8	7.1	5.2	6.8	6.0	5.3	11.8	1.7	3.1	7.4	6.0	8.2	6.7 ± 2.98
Cisco	-	0.9	1.5	2.3	-	9.8	-	6.1	7.0	0.9	0.9	1.6	2.6 ± 3.23
Lake Whitefish	8.2	6.2	3.7	20.5	10.5	0.9	3.9	2.6	-	3.7	6.9	2.5	5.8 ± 5.52
Yellow Perch	0.9	7.1	3.7	3.8	0.7	3.6	2.4	1.7	3.9	0.9	9.5	0.8	3.3 ± 2.70
Walleye	2.7	7.9	3.7	5.3	2.2	36.5	2.4	20.9	7.8	13.9	10.3	32.9	12.2 ± 11.83
Freshwater Drum	-	-	0.7	-	0.7	0.9	7.1	-	0.8	0.9	3.4	-	1.2 ± 2.08
Total:	39.8	39.7	38.1	61.4	30.7	64.0	34.7	42.6	24.9	28.6	44.8	51.0	41.7 ± 12.17

1 - standard deviation

Table A1-4. Site- and species-specific summary of fish catches from small mesh index gangs set in Lake St. Martin, September 2018.

Species	Site-Specific Catch				Total Catch	RA (%) [1]
	GN-3	GN-6	GN-7	GN-11		
Golden Shiner	-	-	1	-	1	0.1
Emerald Shiner	108	54	59	5	226	19.2
Spottail Shiner	126	137	39	137	439	37.2
White Sucker	1	5	12	-	18	1.5
Black Bullhead	-	-	5	-	5	0.4
Northern Pike	2	-	4	1	7	0.6
Cisco	-	3	-	-	3	0.3
Lake Whitefish	-	-	1	-	1	0.1
Trout-perch	-	3	-	4	7	0.6
Yellow Perch	175	197	56	36	464	39.4
Walleye	-	5	-	-	5	0.4
Freshwater Drum	2	-	1	-	3	0.3
Total:	414	404	178	183	1179	100.0

1 - relative fish species abundance calculated as a percentage of the total catch

Table A1-5. Site- and species-specific catch-per-unit-effort (CPUE) calculated for fish captured in small mesh index gillnet gangs set in Lake St. Martin, September 2018.

Species	Site-Specific Catch				Mean ± SD [1]
	GN-3	GN-6	GN-7	GN-11	
Golden Shiner	0.0	0.0	1.1	0.0	0.3 ± 0.54
Emerald Shiner	110.6	65.9	63.8	5.9	61.5 ± 42.93
Spottail Shiner	129.1	167.1	42.2	161.7	125.0 ± 57.73
White Sucker	1.0	6.1	13.0	0.0	16.7 ± 19.77
Black Bullhead	0.0	0.0	5.4	0.0	1.4 ± 2.70
Northern Pike	2.0	0.0	4.3	1.2	1.9 ± 1.83
Cisco	0.0	3.7	0.0	0.0	0.9 ± 1.83
Lake Whitefish	0.0	0.0	1.1	0.0	0.3 ± 0.54
Trout-perch	0.0	3.7	0.0	4.7	2.1 ± 2.46
Yellow Perch	179.3	240.2	60.5	42.5	130.6 ± 94.97
Walleye	0.0	6.1	0.0	0.0	1.5 ± 3.05
Freshwater Drum	2.0	0.0	1.1	0.0	0.8 ± 0.99
	424.1	492.7	192.4	216.0	331.3 ± 149.69

1 - standard deviation

Table A1-6. Mean size and condition factor (K) for fish species captured in standard index gillnet gangs set in Lake St. Martin, September 2018.

Species	n	Fork Length (mm)			Weight (g)			K	
		Mean	SD [1]	Range	Mean	SD	Range	Mean	Range
Goldeye	1	295	-	-	340	-	-	0.32	-
Carp	1	642	-	-	4420	-	-	1.67	-
Shorthead Redhorse	38	340	85	153-449	688	377	55-1380	1.50	0.91-2.23
White Sucker	103	392	87	160-500	1064	506	70-1920	1.55	1.24-2.12
Black Bullhead	3	336	19	320-357	603	111	500-720	1.57	1.53-1.61
Northern Pike	97	522	119	272-891	1091	747	150-4550	0.68	0.41-1.12
Cisco	7	178	37	136-226	85	56	28-170	1.28	1.05-1.54
Lake Whitefish	86	420	25	350-490	1108	247	550-1820	1.47	1.18-1.90
Yellow Perch	10	147	17	119-176	56	21	30-100	1.70	1.32-2.13
Walleye	172	415	97	156-640	913	529	36-3030	1.10	0.83-1.49
Freshwater Drum	18	439	28	388-520	1381	311	950-2240	1.61	1.32-1.94

1 - standard deviation

Table A1-7. Mean size and condition factor (K) for fish species captured in small mesh index gillnet gangs set in Lake St. Martin, September 2018.

Species	n	Fork Length (mm)			Round Weight (g)			K	
		Mean	SD [1]	Range	Mean	SD	Range	Mean	Range
Goldeye	7	108	2	106-111	17	2	15-20	1.37	1.22-1.51
White Sucker	9	76	3	73-81	5	1	4-6	1.19	1.03-1.48
Black Bullhead	5	325	72	200-384	620	312	110-920	1.58	1.38-1.72
Northern Pike	7	520	120	303-628	1074	583	150-1750	0.67	0.54-0.73
Cisco	3	156	38	134-200	43	40	20-90	0.92	0.81-1.13
Lake Whitefish	1	475	-	-	1320	-	-	1.23	
Walleye	15	145	68	115-388	68	161	13-650	1.26	0.77-1.70
Yellow Perch	10	103	16	88-145	18	10	7-41	1.50	1.03-1.90
Freshwater Drum	3	443	41	396-467	1467	446	960-1800	1.64	1.55-1.78

1 - standard deviation

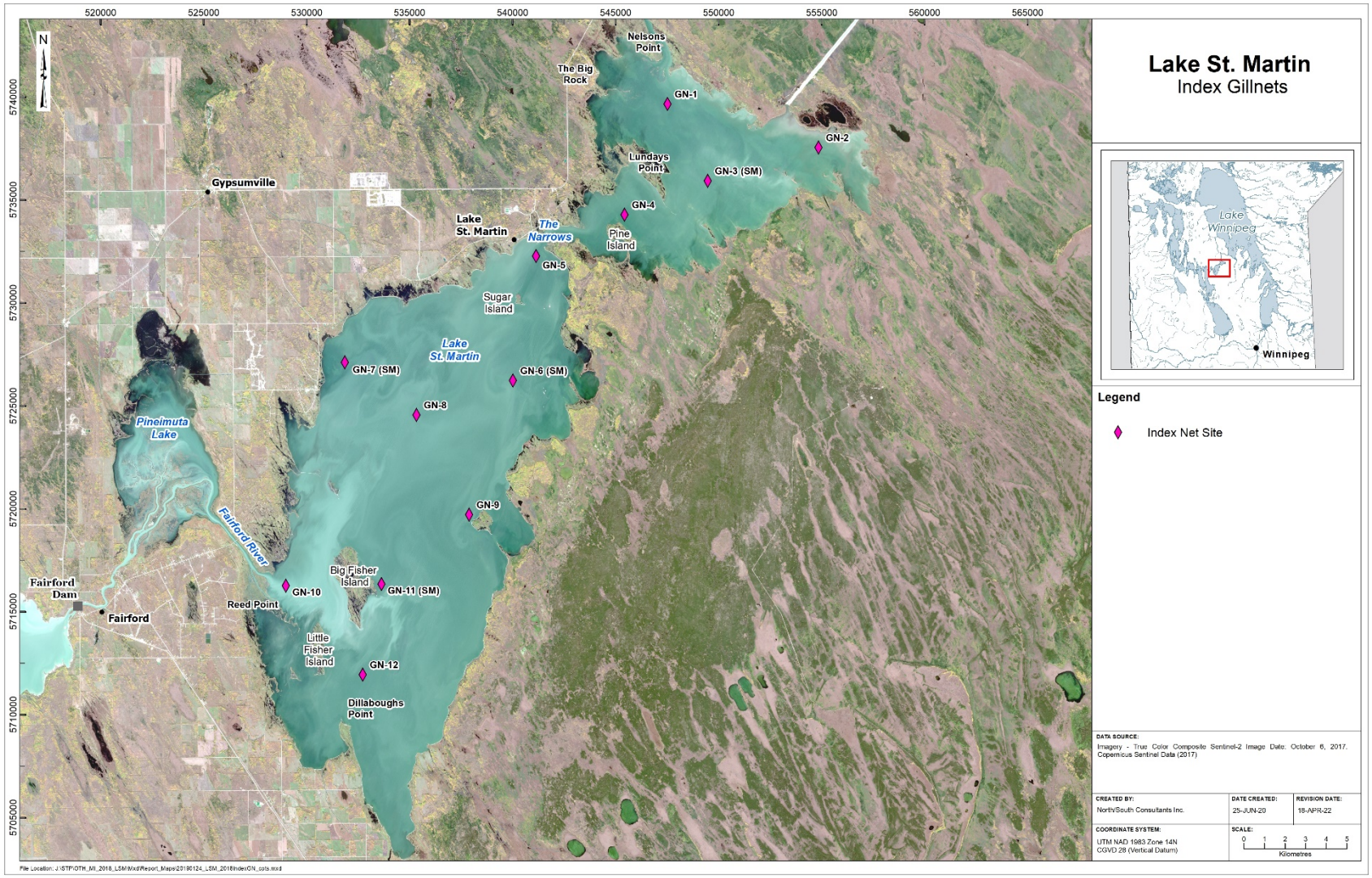

Figure A1-1. The location of standard index and small mesh index gillnet sites sampled in Lake St. Martin, September 2018.