Electrofishing Program Summary 2015

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Introduction

The Miramichi Salmon Association (MSA) continued its electrofishing program in 2015 to assess juvenile Atlantic salmon populations in the smaller tributaries of the Miramichi River watershed. The MSA also worked co-operatively with the Department of Fisheries and Oceans (DFO) Science Branch on another survey using historic baseline sites that are monitored on an annual basis to assess Atlantic salmon juvenile abundance on the Miramichi River system. Both electrofishing surveys target Atlantic salmon and brook trout juveniles, but other fish species are often collected as by-catch. In this report, Atlantic salmon juveniles are listed as fry and parr, with the parr consisting of 1+ and 2+ age classes. Wild salmon fry (0+) are typically less than 60mm in length in late summer. Wild parr vary in size by site, but are grouped together in length by year class and generally do not exceed 120mm. There is typically a higher abundance of fry than parr, as fewer salmon are present in successive age classes due to mortality and predation. If this trend is not observed, it could be viewed as an indication that fry survival is low and should be investigated.

Electrofishing sites in both surveys are generally 3rd or 4th order streams and are tributaries to major rivers where salmon historically spawn; however sites may also include some main river locations. The tributary streams are the major focus of the MSA electrofishing program as they are considered feeder streams to the major rivers and can be under-seeded with juvenile salmon in the event adults were unable to access these areas to spawn (i.e.: barriers, low water levels). Generally, swift moving water less than 60cm deep with gravel or rocky substrate is characterized as juvenile salmon habitat. Adult salmon migrate as far upstream as possible to spawn, but juveniles in their first, second, or third year can move around quite extensively in search of food, to avoid predation, or to seek out over-wintering habitat. During the warm water periods in the summer months, juveniles (parr more often than fry) also move throughout the river seeking cold water refuge.

The main objectives for the 2015 annual electrofishing program were to:

1. ***Evaluate previous year's beaver dam removal success:***

   The Miramichi beaver dam management program resulted in 167 dams breached in 2014 over the entire Miramichi watershed. Upstream locations from where some of these dams were removed were a large focus for electrofishing crews in 2015 to determine if adult salmon were able to access these areas for spawning.

2. ***Evaluate spring stocking success:***

   Electrofishing surveys were conducted on stream stretches stocked with first-feeding fry in late June and early July of 2014 to assess fry survival rates. Stocked location densities that are higher than unstocked locations are considered to reflect successful survival of hatchery fry following stocking.

3. ***Determine future stocking sites of spring first-feeding fry:***

   Broodstock are collected annually from major rivers/streams in the Miramichi watershed and spawned at the Miramichi Salmon Conservation Centre (MSCC). The fry produced are returned to their native river system. In order to achieve effective stocking results in 2016, electrofishing surveys were carried out during the summer of 2015 to identify high quality juvenile habitat (gravel, or rocky substrate) with low fry and parr densities. Determining wild densities allows for avoidance of overstocking areas with healthy juvenile densities and for the targeting of tributaries that are naturally under-seeded or devoid of juvenile salmon. Any site containing more than 50 fry/100m^2 is not considered for stocking as it appears to reflect a healthy natural population, where sites with densities below this value are considered for stocking.

4. ***Estimate juvenile abundance using baseline locations:***

   Juvenile Atlantic salmon abundance surveys were conducted in partnership with DFO. These surveys monitor baseline sites, some of which have been electrofished for over 40 years, and allow for the estimation of absolute juvenile abundance in these areas.

Methods

Electrofishing is the use of electricity for the active capture of fish; electricity is generated by a battery located on the backpack of the electrofisher. An anode wand (positive) and cathode tail (negative) are placed in the water. The electric current moving between the wand and tail produce an electric field which can render fish immobile (galvanonarcosis) or cause them to move towards the electrofisher (galvanotaxis). A crew of three people wearing water tight chest waders and rubber gloves enter the site facing upstream. While the electrofisher stuns the fish, the other crew members collect the fish with dip nets and a small seine net as the fish are drawn up to the water surface by the electrical current. The fish are placed in a bucket of water and held until the site in completed.

There are two methods for measuring density in a given area: catch-per-unit-effort (CPUE) and closed-site depletion (or removal). The MSA survey for assessing headwater areas for stocking uses the CPUE method exclusively. CPUE sweeps are continued back and forth along the stream from bank to bank until a predetermined amount of time has elapsed on the electrofisher, approximately 200-500 seconds depending on the site. CPUE calculations are standardized so all densities reflect a 500 second sampling time and $100m^2$ area to allow for comparisons. The crew then samples the captured fish on shore for length and abundance counts for each species. The fish are then released back into the stream. The depletion method, only performed during the MSA/DFO juvenile assessment, is done by capturing all fish from a measured section of stream rather than the timed CPUE method. A $200m^2$ section of stream is measured and barricaded with fine nets at the upper and lower ends of the site. This “closed site” is then swept three to four times, removing all fish or until an acceptable reduction in fish occurs (usually four sweeps). This method produces an actual density for a known area and is used to calibrate the formula for the timed CPUE method.

All fish are identified to species and lengths and weights are recorded. Substrate type (rocky, gravel, etc.), stream type (riffle, run, etc.), water and air temperature, site dimensions, and GPS locations are recorded.

Results

A total of 87 electrofishing sites were assessed by MSA and DFO field crews between August 7th and October 21st, 2015 on the Miramichi River system. MSA alone surveyed 29 sites, while MSA and DFO worked together on 58 sites.

Beaver dam removal success from previous year

In total, 76% (22/29) of the sites electrofished in 2015 focused on areas upstream of beaver dams removed in 2014 (18 on the Southwest and 4 on the Northwest). Nine of these sites had fry present, with fry densities ranging from 0 to 74.2 fry/100m^2 (Table 1). Sites with fry present were in lower to midstream reaches of the tributaries, suggesting adult salmon did make it past dams that were breached in the lower sections, but were not able to access the more upstream habitat. Beavers can repair active dams within a 24 hour time frame, so the timing of notching/removing dams is crucial in helping the fish access ideal spawning habitat. Field crews can only access and remove so many dams per day and the efficiency of the beavers in repairing them can still pose problems for adult salmon migrating upstream to spawn.

Evaluating spring stocking success

Only seven sites (of 29) were surveyed to assess the previous year's stocking success because of the large focus put on surveying areas upstream of beaver dams removed in 2014. Of these seven sites, five of them contained parr and four of those had greater than 5 parr/100m^2 (Table 2). The high survival of first-feeding fry at stocked sites can help to increase the overall juvenile salmon production in the river, therefore the MSA will continue to stock first-feeding fry in the future.

Determine future stocking sites of spring first-feeding fry:

Many of the sites surveyed to assess beaver dam removal success from 2014 were good quality habitat for juvenile Atlantic salmon. Only nine of the 22 sites surveyed contained fry in 2015, which leaves 13 sites available for potential stocking locations in 2016 (Table 1).

Table 1. Salmon fry abundance assessments calculated using the CPUE method for 22 sites electrofished in 2015 by the MSA upstream of beaver dams removed in 2014.

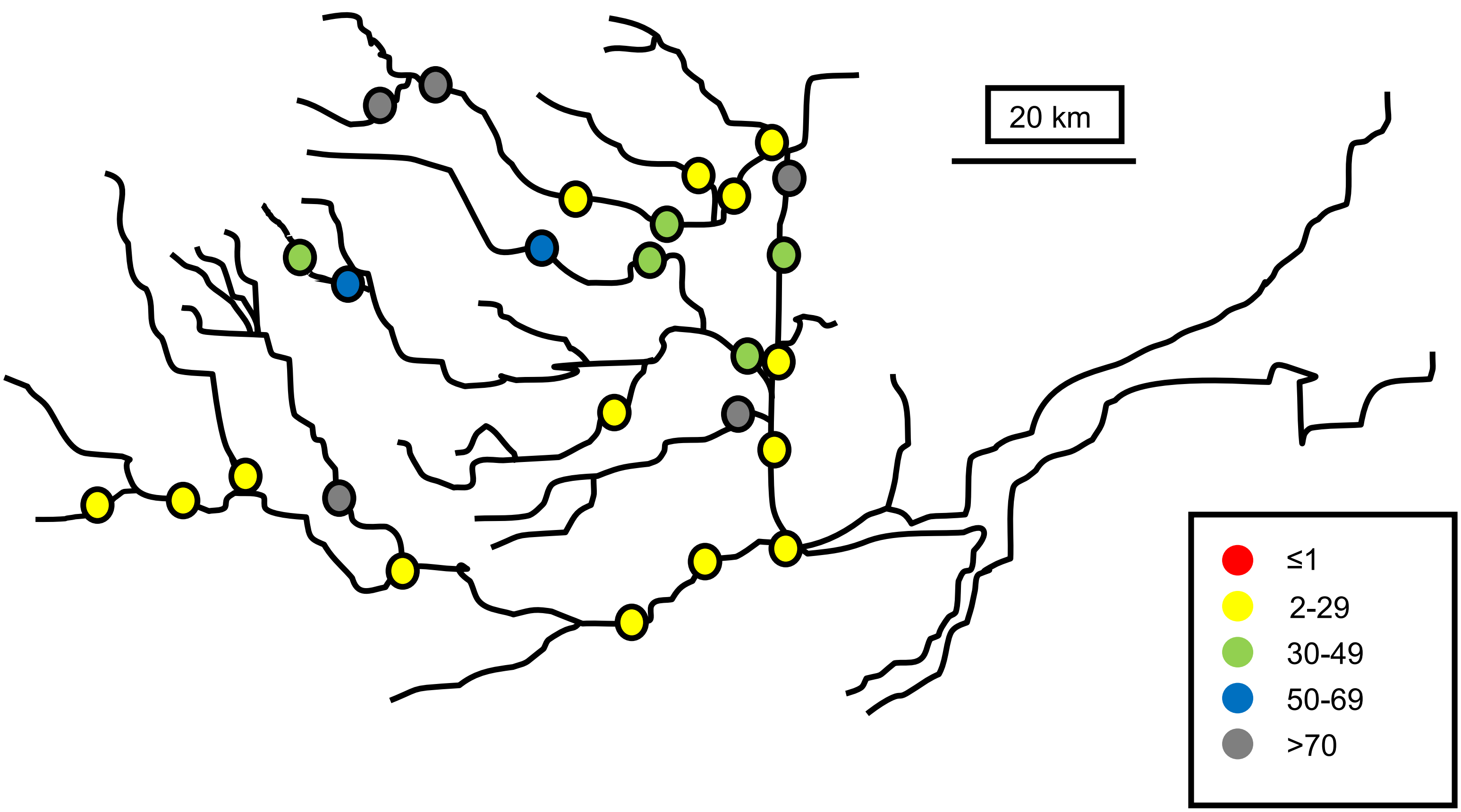
River	Site	Fry/100m^2
MSW	Betts Mills Brook (upper)	0.0
MSW	Betts Mills Brook (middle)	0.0
MSW	Betts Mills Brook (lower)	3.6
MSW	Big Hole Brook (upper)	28.1
MSW	Big Hole Brook (middle)	0.0
MSW	Big Hole Brook (lower)	0.0
MSW	Crooked Bridge Brook	0.0
MSW	Porter Brook (upper)	0.0
MSW	Porter Brook (lower)	28.8
MSW	Burntland Brook	0.0
MSW	Mckinley Brook	0.0
NW	Below bridge on CI road	5.5
NW	Bellefond	0.0
NW	Little River (upper)	7.0
NW	Little River (lower)	13.9
Cains	Muzzeroll Bk (bridge on GL road)	6.6
Cains	Otter Brook (below bridge)	0.0
MSW	South branch in Juniper above Foreston bridge 1	19.6
MSW	South branch in Juniper above Foreston bridge 2	74.2
MSW	Elliott Brook (upper)	0.0
MSW	Elliott Brook (lower)	0.0
MSW	Big Teague	0.0

Table 2. Juvenile abundance assessments calculated using the CPUE method for 7 sites electrofished by the MSA to identify stocking success from 2014.

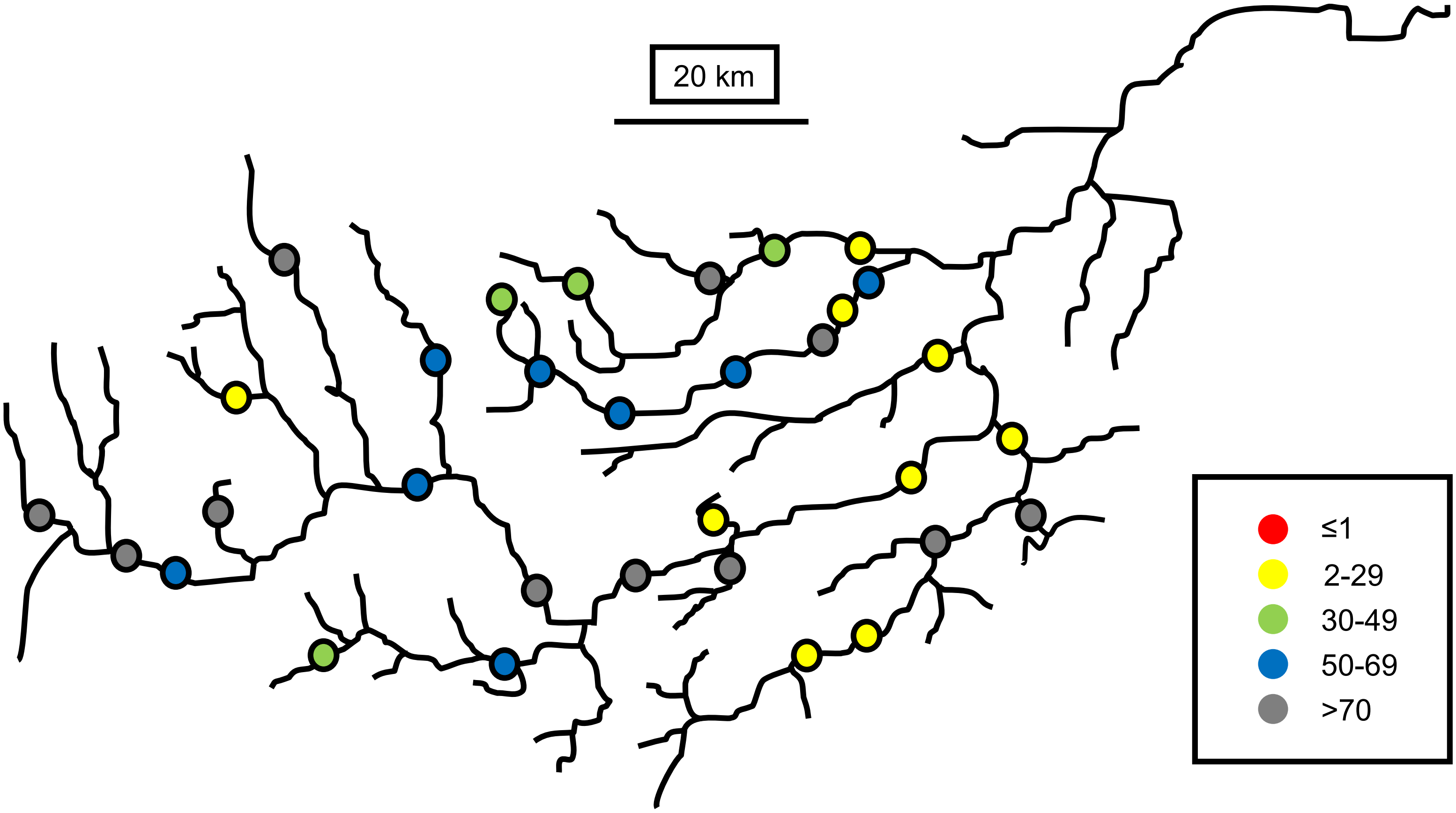
River	Site	Parr/100m^2
Cains	Sling Dung Brook	17.0
Cains	McKinley Brook	9.7
NW	Pats Brook	1.1
MSW	Moores Donnelly Brook	6.8
MSW	Burntland Brook 1 (main)	8.7
MSW	Burntland Brook 2 (west branch)	0.0
MSW	Burntland Brook 3 (east branch)	0.0

Juvenile population assessment survey (MSA/DFO)

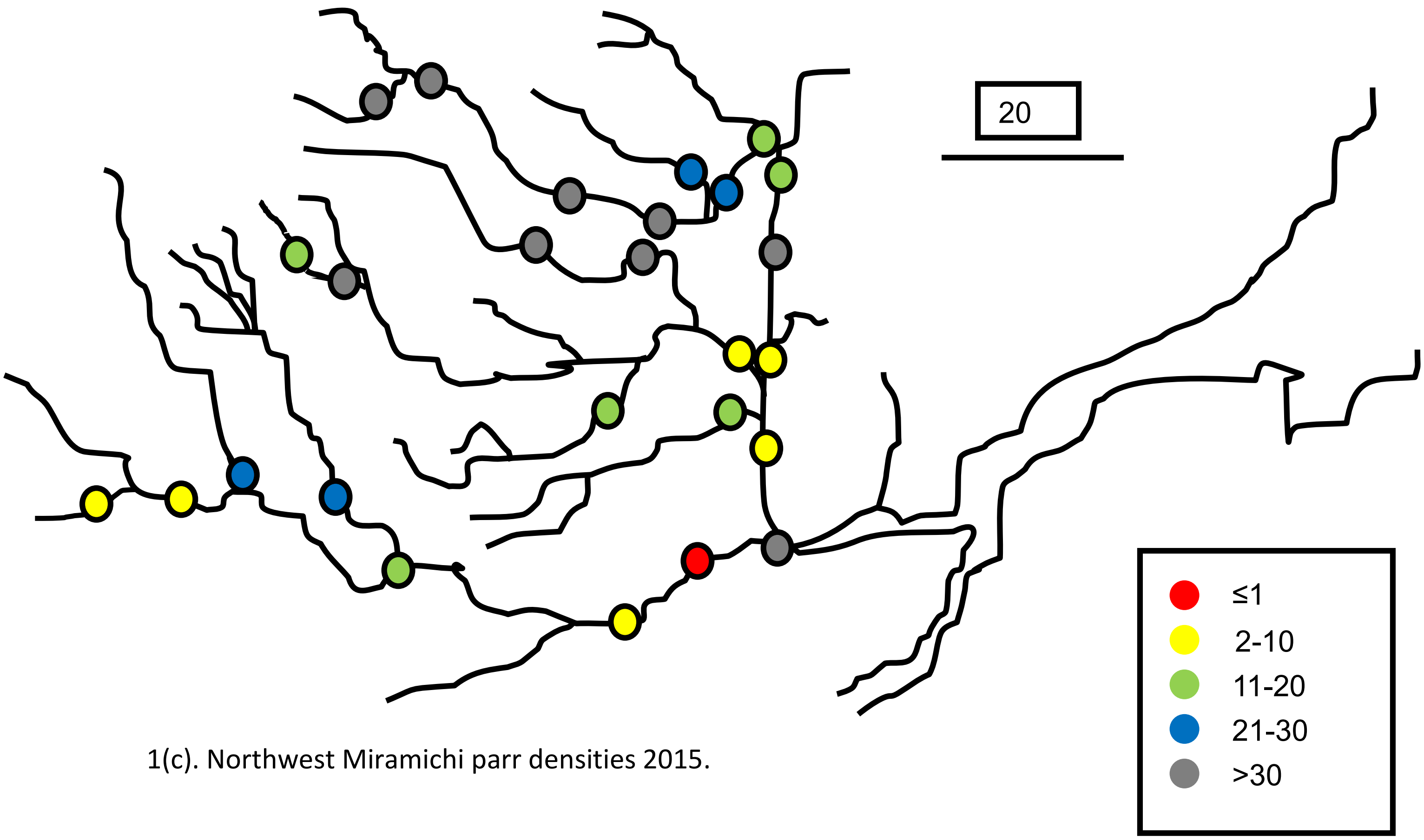
From August 24th to September 24th 2015, a total of 58 baseline sites were electrofished in several tributaries as part of the MSA/DFO cooperative program. Preliminary results from the assessment revealed high fry densities at many sites in both the Northwest and Southwest Miramichi Rivers, as 60% (35/58) of all sites contained greater than 30 fry/100m^2 (Fig 1a&b). No site contained zero fry and 40% (23/56) of sites had between 30 and 50 fry/100m^2. Parr densities were high (>20 parr/100m^2) at 48% (28/58) of sites, and only 5% (3/58) of sites contained zero parr (Fig 1c&d).



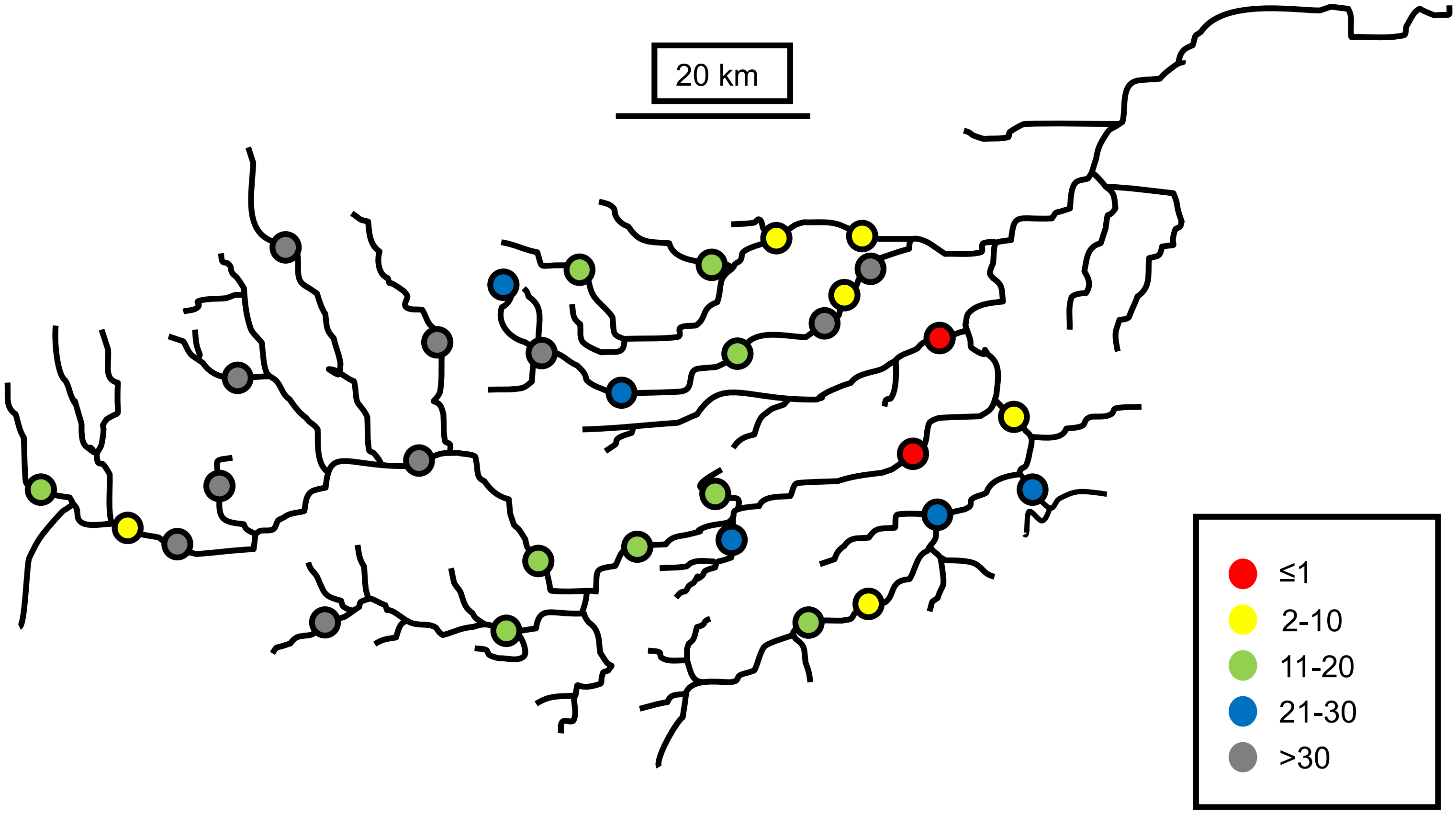
1(a). Northwest Miramichi fry densities 2015.



1(b). Southwest Miramichi fry densities 2015.



1(c). Northwest Miramichi parr densities 2015.



1(d). Southwest Miramichi parr densities 2015.

Figure 2: Preliminary juvenile density results from the 2015 DFO/MSA annual electrofishing program – (a) fry densities at sites on the Northwest Miramichi River system, (b) fry densities at sites on the Southwest Miramichi River system, (c) parr densities on the Northwest Miramichi River system, (d) parr densities on the Southwest Miramichi River system. Fry densities range from ≤1, 2-29, 30-49, 50-69, and >70 per $100m^2$. Parr densities range from ≤1, 2-10, 11-20, 21-30, and >30 per $100m^2$.