# A Report on the Collection of Lake Trout Eggs and Milt from Lake of Bays for the Purpose of Rehabilitation Stocking in Mary Lake

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October 2009

A collection of lake trout eggs and milt was performed on Lake of Bays on October 20, 2009. At the time of collection, a goal of 1000 ml of water hardened eggs was sought. The purpose of the collection was to obtain a local strain of lake trout for an attempt to rehabilitate a self-sustaining population in nearby Mary Lake. The eggs were taken to the Haliburton Highlands Outdoor Association for rearing in their hatchery facilities.

## Background

### Lake Trout Spawning

Lake trout (*salvelinus namaycush*) are an important sport fish within the Parry Sound District, and across Ontario. Lake trout spawn on boulder and cobble lake bottoms, generally in the mid October range. Scott and Crossman (1973), report that lake temperatures of 8.9°C to 13.9° mark the time period in which lake trout typically spawn, however seasonal light levels may also play a part. Spawning takes place at night.

### Mary Lake

Mary Lake is a large waterbody located in Brunel and Stephenson Townships in the District of Muskoka. It covers an area of 10.7km². It maximum depth is 65 m, while its mean depth is 25 m. It is located in the watershed of the North Muskoka River.

Lake trout have been stocked many times in Mary Lake, starting in 1917, and most recently in 2008. Unfortunately, these stocked fish exhibit very little spawning tendency and yield virtually no natural recruitment. A 2008 spawning assessment observed 11 fish over 5 nights, on one shoal (Ivany, 2008). Additionally, annual Summer Profundal Index Netting performed by the Muskoka Lakes Fisheries Assessment Unit indicates a low presence of natural lake trout.

A review of fisheries management practices on Mary, Fairy, Peninsula and Vernon Lake recommended that stocking of different strains and life stages be done to determine if self-sustaining lake trout populations could be re-established in these lakes. Mary was chosen as the prime candidate largely based on its habitat, water quality and accessibility (OMNR 2009).

### Lake of Bays

Lake of Bays is a very large water body with several basins spread throughout the Townships of Sherbourne, Ridout, McLean, Franklin, and Brunel, in the District of Muskoka. It has a surface area of 67.8 km². The maximum depth is 70.1 m, while the mean depth is 22.3 m. It is located in the watershed of the South Muskoka River, directly adjacent to the watershed in which Mary Lake is located.

The lake trout population of Lake of Bays is native and self-sustaining. Supplemental stocking was discontinued after 1993 and few stocked fish remain in the population. It is suspected that the population is dominated by genes from the native population, although no genetic testing has been done to support this.

Extensive assessment work has been done on the lake, including mapping on observation of spawning shoals. There are approximately 60 mapped shoals.

The lake was chosen as the donor for Mary Lake based on the status of its lake trout population, the availability of information on spawning locations and its' proximity to Mary Lake.

## Methods

The Lake of Bays file was reviewed for existing records of lake trout spawning observations. One spawning shoal was targeted for collection. Shoal number 27a was chosen as it had produced many historical observations of spawning lake trout. Shoal 27a is located just offshore from Elizabeth Point, near the red navigation buoy.


Figure 1 Egg collection location on Lake of Bays, 2009.

A 6 foot trap net was set Monday October 19, approximately 50 meters from shoal 27a, along the shore of Elizabeth Point, with the intention of capturing mature lake trout overnight for the harvest. The shoal itself, is not well suited to the setting of a trap net.

Along with the trap net, Spring Littoral Index Nets (SLIN) were used, although the SLIN protocol was not followed. Each net consisted of two panels of 15.2m x 2.4m sections. Since the intent of these nets was simply to catch fish, no specific guidelines were followed. Each net was set for approximately 30 minutes before pulling and resetting. There were about 20 sets performed on 20 October 2009.

Captured fish were either released or retained based on the following criteria;

- Sex (male or female) – Once the minimum number of fish needed had been captured, extras were immediately released
- Spawning condition – Condition was checked of every fish captured. Only ripe fish were retained for processing. Green or spent fish were discarded

After sorting, ripe fish were held temporarily in a large cooler until they were divided by sex and placed in floating pens.

Permission was obtained to use a private dock adjacent to the shoal as a work platform.

Harvest of the ripe fish was performed using the guidelines set out in the Ontario Ministry of Natural Resources Fish Culture Course 2000 Manual. After the ripe fish were separated, we collected milt and eggs in the following manner:

- dip net female fish from appropriate pen,
- measure fork length,
- wipe excess water from vent,
- hold female fish in elevated position (head up, firm grasp of tail to prevent it from slipping and moving),
- apply abdominal strokes to pelvic girdle, extruding eggs through vent into measuring cup to determine volume, then poured into plastic bowl for fertilizing,
- apply tag to dorsal fin,
- record all relevant information,
- place fish in recovery cooler,
- repeat process with male fish,
- eggs and milt were mixed using a ruffed grouse feather to prevent damage to eggs,
- excess milt was washed from eggs after 2 minutes by adding fresh water and draining it off, until no more milt was visible,
- eggs were placed in clean pan with plenty of fresh water for hardening

Fish which were spawned were tagged, and a fin punch was collected for genetic analysis. Tags were placed at the front of the dorsal fin. Tags were orange tied-on discs. The punch was taken from the caudal fin using a standard paper whole punch and stored in 95% alcohol; each pair of fish being kept in a separate container.

The fertilized eggs were mixed together and stored overnight in a cooler, kept in a refrigerator. The following day, they were taken to the Haliburton Highlands Outdoor Association hatchery in Haliburton.

Upon arrival at the hatchery, the Von Bayer method of estimating numbers of fish eggs was used. The method is as follows;

- gently spoon eggs into 12 inch Von Bayer trough,
- count eggs 3 times to acquire an average,
- relate average to accompanying table.

Once the number of eggs was determined, the eggs were disinfected using an organic iodine compound. The desired number of disinfected eggs was taken from the total number of eggs using a one litre graduated cylinder. The eggs were then placed in a covered pan in the hatchery raceway, and left to develop.

## Results

At the time of collection, a lake temperature of 10.3°C was observed at the shoal. For future reference, water temperatures measured at the MNR dam in Baysville are included in the appendix. Although the temperature at the dam is not necessarily the same as in the main lake (temperature in the river appears to vary more quickly with air temperature than the main lake) it appears to be a good surrogate to predict when spawning would occur in the main lake and can be readily obtained from the Environment Canada hydrometric data web site in real time.

The trap net was checked after approximately 24 hours time. Two female and five male lake trout were captured, along with various other fish species which were released immediately.

Using the SLIN gill nets, four additional ripe female lake trout were captured over the remainder of the day. A large quantity of ripe males were captured (estimate = 50-60). Of note is that ripe females did not appear to be on the shoals during daylight hours.

Collection time began at 1530 hours, and concluded at approximately 2130 hours. Eggs were collected from 6 females; the eggs of two were split into two lots and the eggs of one was split into three lots, for a total of nine lots. Fertilization was done on a 1:1 basis; only one male was used to fertilize each lot of eggs. Accordingly, milt was collected from 9 males.

In total, 950 ml of green eggs were collected. Table 1 illustrates the statistics of each fish, along with the collected biological samples.

Fish # 1580 produced very little egg volume. Subsequently, the amount she produced was discarded.

Fish # 1590 exhibited a curvature of its spine. The acquired eggs (125 ml) were fertilized but not mixed with the eggs collected from the other females.

A total of 825 ml of eggs were collected from the other five females and fertilized.

Table 1 Egg collection summary, Lake of Bays, Oct 20, 2009.

| Pair | Male | | | Female | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Fork Length (mm) | Tag # | Fin Punch | Fork Length (mm) | Tag # | Fin Punch | Green Egg Volume | Est. Hard Volume | Est. Egg Number | Fate |
| 1 | - | - | - | 470 | 1580 | Yes | 0 | | | |
| 2 | 540 | 1572 | Yes | 470 | 1590 | Yes | 125 | 178 | 1427 | stocked Mary Lake |
| 3 | 595 | 1555 | Yes | 490 | 1506 | Yes | 125 | 178 | 1427 | 7000 to HHOA hatchery<br><br>2419 stocked in Mary Lake |
| 4 | 505 | 1535 | Yes | 460 | 1595 | Yes | 62 | 88 | 708 | |
| 5 | 470 | 1517 | Yes | " | " | " | 62 | 88 | 708 | |
| 6 | 595 | 1522 | Yes | 510 | 1576 | Yes | 62 | 88 | 708 | |
| 7 | 470 | 1501 | Yes | " | " | " | 62 | 89 | 708 | |
| 8 | 600 | 1579 | Yes | 680 | 1542 | Yes | 83 | 118 | 948 | |
| 9 | 650 | 1549 | Yes | " | " | " | 83 | 118 | 948 | |
| 10 | 470 | 1562 | Yes | " | " | " | 83 | 118 | 948 | |
| 11 | 440 | 1540 | Yes | 540 | 1598 | Yes | 200 | 284 | 2283 | |
| | | | | | | Sub-total (pair 3-10): | 825 | 1172 | 9419 | |
| | | | | | | Total: | 950 | 1350 | 10846 | |

After water hardening the volume increased to 1172ml of eggs; an expansion factor of 1.42. Similarly the 125 ml of eggs from fish #1590 expanded to 178 ml, giving us a total of 1350ml of fertilized eggs.

At the HHOA, we acquired a count of 58 eggs using the Von Bayer trough. This figure results in an estimate of 8046 eggs/litre (which we rounded to 8040); with an average egg size of 5.25 mm. The HHOA was able to accept 7000 fertilized eggs for rearing. At a factor of 8040 eggs/litre, this works out to 870ml of required fertilized eggs.

$$\frac{7000}{x} \times \frac{8040}{1000\text{ml}}$$

$$= 8040x = 7,000,000$$
$$x = 870\text{ ml}$$

The remaining 480 ml (3846 eggs) of eggs were taken and immediately stocked on Mary Lake at the Rocky Island shoal. Of those, 178 ml (1427 eggs) were the eggs from segregated fish #1590 and 302 ml (2419 eggs) were a composite of the eggs collected from the other five females.

## Discussion

In the future, the use of a trap net may not be necessary. The trap net use added two field days (one set and one retrieval day) to the operation, for very little benefit in terms of captured fish. The use of more gill nets may be advantageous for faster acquisition of spawning fish. A set time of 30 minutes produced favourable results in terms of survivability of captured lake trout. Only one lake trout did not survive the capture process. All fish that were spawned, clipped, and tagged, survived to the point of release.

As noted in the results, female lake trout were not present in required numbers on the shoal during daylight hours. This in conjunction with the overnight trap net catch indicates that the netting operation does not need to begin until later in the day, but may have to continue further into the night.

The day chosen for spawn collection was based on the temperature and experience of staff in the Minden area, where an annual egg collection also takes place. Several female lake trout were captured which appeared to be spent, or not quite ready to spawn. This would indicate that we were performing our operation at an appropriate time. The weather leading up to the collection data was somewhat cooler than normal in 2009 suggesting that spawning may have occurred earlier than normal and the peak may have passed; however, without additional data this is speculative.

Fish tag # 1590 which exhibited a curvature of the spine, which appeared to be scoliosis, was kept separate from the other collected eggs. None of these eggs were brought in to the hatchery, but they were stocked directly onto Mary Lake. Upon further research, the cause of scoliosis in fish is not entirely understood, but some evidence does exist that genetics may play a part. It is commonly believed that nutritional or environmental factors in the developmental stage of the fish are the main factors. Gjerde et al. (2005) recommend that although the removal of these fish from stock won't significantly reduce the likelihood of deformation, it will remove any possible genetic susceptibilities.

Now that an expansion factor for green vs. water hardened eggs has been calculated, a more accurate goal for egg collection can be achieved, to avoid over-harvesting.

## Conclusions

The collection of lake trout eggs on Lake of Bays for the purpose of stocking on Mary Lake can be considered a success at this time. Minimal time and staff effort was involved, and the goal of 1000 ml of eggs was exceeded. This project provided MNR staff with valuable learning opportunities, which can be used in the future for more egg collections.

## References


Gjerde B., Pante Ma.J.R., Baeverfjord G. 2005. Genetic variation for a vertebral deformity in Atlantic salmon (Salmo salar). [Online]. www.sciencedirect.com

Ivany, A. 2008. Results of a Lake trout Spawning Shoal Assessment on Mary Lake in 2008. File Report. Ontario Ministry of Natural Resources, Bracebridge.

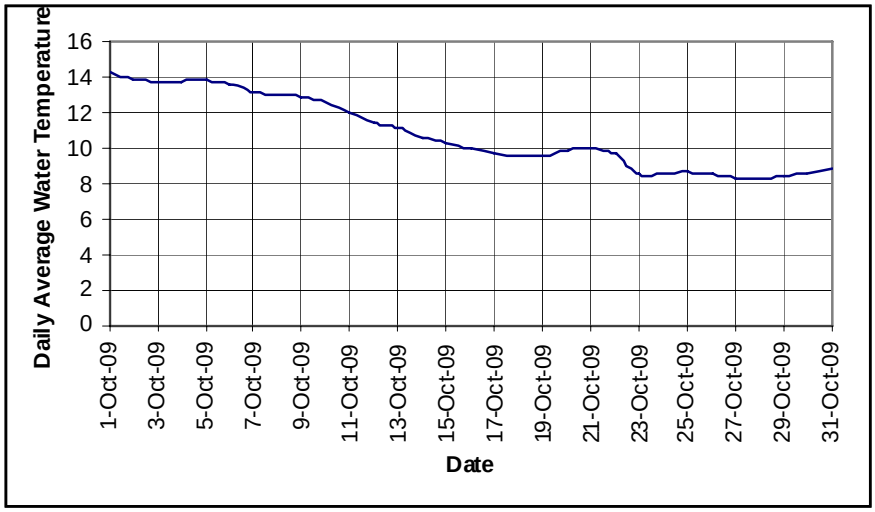
OMNR, 2009. A fisheries management review for Fairy, Mary, Peninsula and Vernon Lakes. File Report. Ontario Ministry of Natural Resources, Bracebridge. 24 p.

Scott, W. B., Crossman, E.J. 1973. Freshwater Fishes of Canada. Fisheries Research Board of Canada.

## Appendix

Daily average temperature recorded at Baysville dam, October, 2009. Spawn collection occurred on Oct 20 at a surface temperature of 10C.

| Date | Temperature |
|---|---|
| 1-Oct-09 | 14.3 |
| 2-Oct-09 | 13.9 |
| 3-Oct-09 | 13.8 |
| 4-Oct-09 | 13.8 |
| 5-Oct-09 | 13.9 |
| 6-Oct-09 | 13.7 |
| 7-Oct-09 | 13.2 |
| 8-Oct-09 | 13.0 |
| 9-Oct-09 | 12.9 |
| 10-Oct-09 | 12.6 |
| 11-Oct-09 | 12.0 |
| 12-Oct-09 | 11.4 |
| 13-Oct-09 | 11.2 |
| 14-Oct-09 | 10.7 |
| 15-Oct-09 | 10.3 |
| 16-Oct-09 | 10.0 |
| 17-Oct-09 | 9.7 |
| 18-Oct-09 | 9.5 |
| 19-Oct-09 | 9.6 |
| 20-Oct-09 | 9.9 |
| 21-Oct-09 | 10.0 |
| 22-Oct-09 | 9.7 |
| 23-Oct-09 | 8.5 |
| 24-Oct-09 | 8.6 |
| 25-Oct-09 | 8.6 |
| 26-Oct-09 | 8.5 |
| 27-Oct-09 | 8.3 |
| 28-Oct-09 | 8.2 |
| 29-Oct-09 | 8.5 |
| 30-Oct-09 | 8.6 |
| 31-Oct-09 | 8.8 |



**Appendix** Photographs