



2008 Twelve-Mile Bay End of Spring Trap Netting (ESTN) Survey Report

February, 2009

Eric McIntyre, Coordinator
Eastern Georgian Bay Stewardship Council



Parry Sound High School Co-op student – Shawn Morrissey,
With lunker 12-Mile Bay muskellunge

Executive Summary:

We captured 16 different species comprising a total of 880 fish and weighing 383.2 kilograms. In terms of weight, our catch was dominated by muskellunge (27.9%), smallmouth bass (24.1%), northern pike (15.5%), rock bass (10.8%), brown bullhead (7.8%) and black crappie (4.8%). The remaining 10 species comprised the other 9.1%.

Our assessment of the 12-Mile Bay fish community is largely based on netting results (specifically CPUE) observed in this survey relative to our reference data set of similar ESTN surveys conducted on eastern Georgian Bay waters. In that context, fish abundance (as measured by species CPUE) in 12-Mile Bay is higher for rock bass; approximately equal for smallmouth, black crappie and musky; and lower to varying degrees for the remaining 12 species captured.

Although abundance indices (CUPE) are generally lower in 12-Mile Bay than our reference data set, this applies predominantly to coarse fish species (brown bullhead, bowfin, gar pike and white bass). With the exception of walleye – which is essentially absent from 12-Mile Bay, the abundance of muskie, pike, smallmouth bass, black crappie and largemouth bass are approximately equivalent or only slightly lower than our reference data set.

Size sampling data for game fish captured in this survey displays good size dispersion, suggesting that recruitment and mortality are balanced and game-fish populations are stable.

We conclude that game fish species in 12-Mile Bay have approximately average abundance for Eastern Georgian Bay and are healthy and stable. The near total absence of walleye (only one caught) in these waters is both surprising and perplexing.

Table of Contents

	Page
1.0 Introduction	4
2.0 Methods	
2.1 Field Methods	4
2.2 Data Analysis and Interpretation	6
3.1 Results	
3.2 Over-all Fish Productivity	7
3.2 Catch Composition	8
3.3 Catch-Per-Unit-Effort (CPUE)	9
3.4 Probability of Capture (Catch Frequency)	10
3.5 Number of Fish Species Caught	10
3.6 Species Analysis	
3.6.1 Muskellunge	10
3.6.2 Smallmouth Bass	11
3.6.3 Northern Pike	12
3.6.4 Largemouth Bass	13
3.6.5 Black Crappie	14
3.6.6 Walleye	14
3.6.7 "Other Species"	14
4.0 Literature Cited	15
5.0 Acknowledgements	15
Appendix A. 12-Mile Bay, 2008 ESTN Survey Catch Summary	16
Appendix B-1 Eastern Georgian Bay ESTN Reference Data Set of Species Catch-Per-Unit-Effort (CUPE)	17
Appendix B-2 Severn Sound ESTN surveys in the Eastern Georgian Bay Reference Data Set	17
Appendix C. Esocid (Northern Pike and Muskellunge) Size-Sampling Data	18
Appendix D. Smallmouth Bass Size-Sampling Data	19
Appendix E. Largemouth Bass Size-Sampling Data	20
Appendix F. Black Crappie Size-Sampling Data	20
Appendix G. Rock bass and Pumpkinseed Size-Sampling Data	21
Appendix H. "Other Species" Size-Sampling Data	22
Appendix I. UTM coordinates for trapnet sets	23

1.0 Introduction

The Eastern Georgian Bay Stewardship Council has received several requests for fish assessment surveys to be conducted throughout eastern Georgian Bay and inland lakes. In an effort to assist the Upper Great Lakes Management Unit (UGLMU) of the Ministry of Natural Resources in their daunting task of monitoring the status of fish communities along Georgian Bay, the EGBSC has endeavoured to conduct at least one fish assessment survey annually.

In 2008, the area of 12-Mile Bay was chosen primarily at the behest of the UGLMU who identified a paucity of data on the fishery in this area of Georgian Bay.

2.0 Methods

At the urging of the UGLMU, the OMNR standard *End-of-Spring Trap Netting* (ESTN) survey protocol was chosen. The ESTN survey is designed to evaluate relative abundance and other attributes of fish species and in particular walleye, which inhabit the littoral or near-shore zone of Ontario waters.

The purpose of our survey was to conduct a broad-spectrum assessment of the status of fish populations in the near-shore areas of 12-Mile Bay. Notwithstanding our intention of fish community assessment, we did have a particular interest in game fish – namely walleye, pike, muskellunge, crappie, smallmouth and largemouth bass.

2.1 Field Methods

Survey procedures were as specified in the Ministry's Manual of Instructions for End-of-Spring Trap Netting (ESTN) (Skinner and Ball; 2004), with the exception of set location. The protocol for ESTN surveys calls for the use of live-capture, 6' trap-nets that are set over-night (approximate 24-hour duration). Surveys are conducted during the spring with water temperatures ranging from 12 – 18° Celsius. All fish captured were enumerated (Appendix A). Species captured were size sampled, either complete or random (Appendix C-H). All fish were live released at the site of capture. Incidental mortality was negligible.

Field operations commenced May 26 and terminated June 5, 2008. Thirty net sets were made.

The study area extended from the eastern extremity of 12-Mile Bay westerly to Manitou Dock; and from Moose-Deer Point southerly to O'Donnell Point and the Bass Group of islands (Figures 1a and 1b).

Figures 1a and 1b. Study area showing locations of trap-net sets.

(Note: These figures are intended to provide an over-view of net set locations. See Appendix I for UTM net specific UTM coordinates.)

Figure 1a – Easterly portion of study area

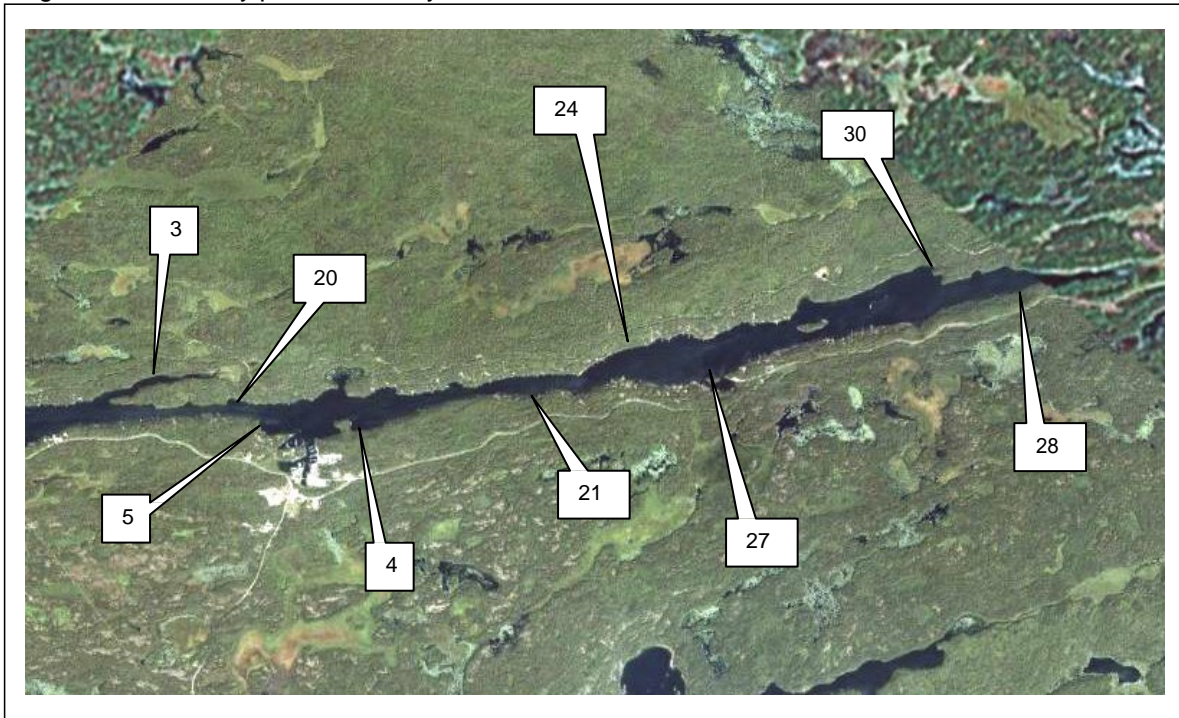
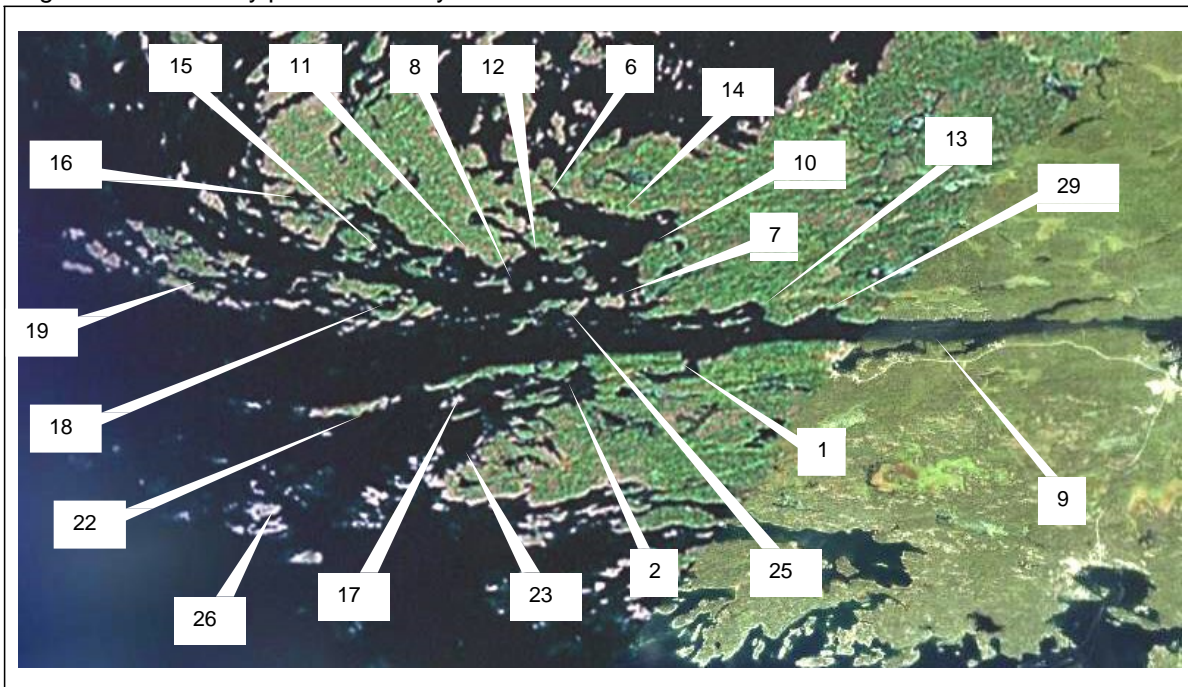


Figure 1b – Westerly portion of study area



Due to the known difficulties in pre-selecting netting sites according to the ESTN manual, net locations were selected in accordance with the following guidelines:

- Nets were to be approximately evenly dispersed throughout the study in an effort to fish various fish habitats in the proportion to which they occurred. The intention here was that the catch would reflect the 'whole study area' as accurately as possible.
- The site had to be suitable for the net to fish effectively. (Consequently – factors such as: contour of the lake bottom, absence of obstructions, depth, sufficient lead length, etc. were considered.)
- Nets were to be set far enough apart (> 500 m) such that they were not competing with each other.
- Avoid areas of potential conflict where there is human habitation.
- Avoid areas where nets could act as a navigational hazard.

2.2 Data Analysis and Interpretation

Surveys such as the ESTN methodology we employed do not generate estimates of fish density or finite population for individual species. They do generate indices of species abundance. These indices include:

- Catch-Per-Unit-Effort (CPUE): The mean number of a particular species caught per net set. CPUE can be expressed either as the number or weight of fish caught per net set. We calculated both, but use only number for comparative purposes as CPUE-weight was not available in our reference data set.
- Probability of Capture (POC), also called frequency of capture: A statistic indicating the probability of at least one fish of a particular species being captured in any net set. (A POC of 1.0 indicates a particular species was captured in 100% of net sets; a POC of 0.5 indicates it was captured in 50% of the net sets; a POC of 0.1 indicates it was captured in 10% of net sets; etc.).

In and of themselves, these indices are of limited value. Their increased value and utility comes from comparing them to other ESTN surveys conducted in a similar manner and on ecologically similar water bodies. It is their ranking in this comparative process that indicates a high, medium or low abundance of a particular species. For this reason, they are referred to as indices of **relative abundance** (i.e. abundance relative to other similar surveys).

We are fortunate that a number of ESTN surveys have been previously conducted at various locations along the Eastern Georgian Bay shoreline. We refer to these surveys as our **reference data set** (Appendix B1). These surveys form a benchmark against which indices of abundance for various species generated in our survey can be compared.

Unfortunately however, there are biases within this reference data set. The data set consists of 15 ESTN surveys, including this one, conducted on Georgian Bay waters from 1998 to 2008. Of these 15 surveys, 8 were conducted on the relatively nutrient rich and highly productive waters of Severn Sound (Appendix B-2). The over-representation of Severn Sound has the biasing effect of elevating the mean CPUE for various species in the data set. To mitigate this bias, we combined all eight Severn Sound surveys and

used the mean CPUE values generated to represent a single survey in the reference data set (Appendix B-1).

Similarly, there are three surveys from the Moon River area in the reference data set. Because the water chemistry and aquatic ecosystem of the Moon River area is more typical or representative of Eastern Georgian Bay, these surveys were not combined. Also, we didn't want to reduce of reference data set sample size any further as it now contains only eight surveys (Appendix B-1).

Perhaps the most effective reference data set is one comprised of similar surveys conducted over time in the same vicinity. Indeed, Severn Sound is well on their way to having an excellent and ideal reference data set. Such a data set does not exist for 12-Mile Bay. Indeed, this is the first Provincially standardized netting survey to be conducted in this area of Eastern Georgian Bay.

3.0 Results

3.1 Over-all Fish Productivity

From 30 over-night trap-net sets, we captured 16 fish species comprising a grand total of 880 fish weighing 383.2 kilograms (Appendix A).

Over-all Catch-Per-Unit-Effort in terms of number (CPUE-no) was 29.2 fish per net set. Over-all CPUE in terms of weight (CPUE-wt) was 12.8 kg per net set (Appendix A).

From our reference dataset of ESTN surveys (including this one) conducted on eastern Georgian Bay from 1998 to 2008, the average CPUE-no is 71.1 fish per net set (Appendix B-1). Our CPUE-no (29.2) was well below this average. Over-all abundance of fish in the 12-Mile Bay area is well below the average of our eastern Georgian Bay reference dataset. As is discussed later in the report, this over-all lower abundance of fish in 12-Mile Bay is largely attributable to the relative scarcity of coarse fish species – and in particular brown bullhead.

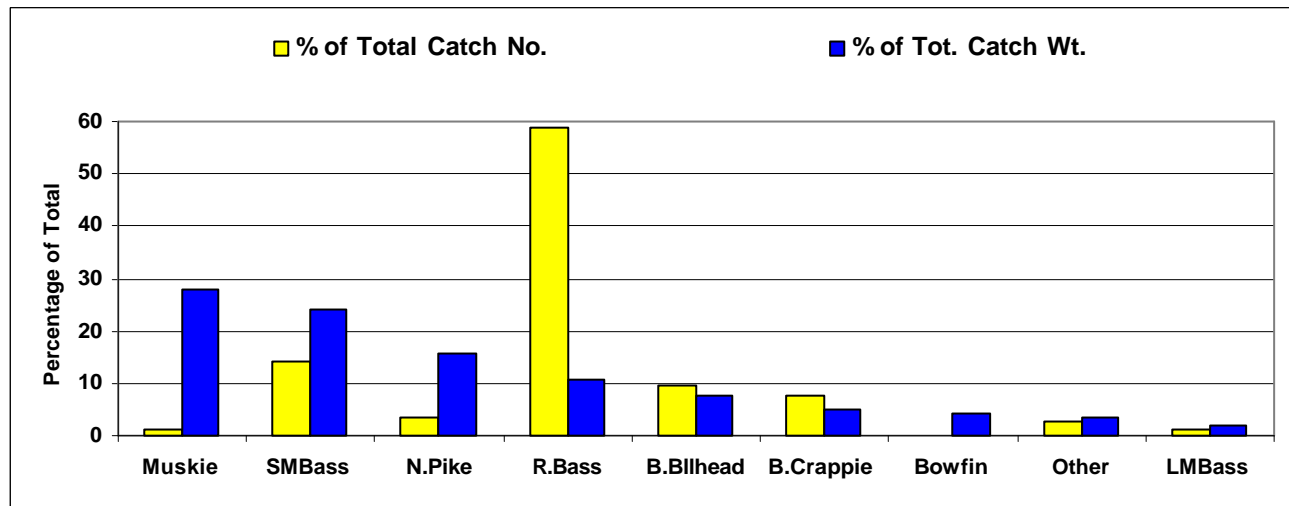
One observation that was readily apparent to our netting crew throughout the duration of the survey was the extreme variability in the types of habitat being fished. Variation in water clarity, shoreline substrate and exposure were extreme throughout the study area. The eastern (inner) extremity of 12-Mile Bay is largely characterized by soft substrates with more frequent aquatic vegetation and high dissolved organic content in the water. This gives the water a distinct yellow-brown colour that restricts light transparency. Secchi depth readings were as low as 2.0 meters. At the western extremity of our study area in the open waters of Georgian Bay, water clarity was an amazing 18+ meters. Substrates were generally hard (bedrock, boulder, cobble, gravel) and aquatic vegetation sparse or absent. Fish productivity as measured by catch weight per net set was highest in the easterly portion of the study area and diminished progressively as nets were moved westerly towards open Georgian Bay waters.

3.2 Catch Composition

In terms of number of fish caught (total 880), the catch was dominated by rock bass (59%), smallmouth bass (14%), brown bullhead (10%) and black crappie (8%) (Figure 2). The remaining 12 species in the catch cumulatively comprised the remaining 10% of the total catch number.

In terms of weight (total 383 kg), the catch was dominated by muskellunge (28%), smallmouth bass (24%), northern pike (16%), rock bass (11%), brown bullhead (8%), black crappie (5%) (Figure 2). The remaining 10 species cumulatively comprised the remaining 8% of the total catch weight (Figure 2).

Figure 2. Species Catch Composition by Percent of Total Catch Number and Weight.
(Total Number Caught: 880; Total Weight Caught: 383.2 kg.; data from Appendix A)



We caution our readers that the foregoing results may give the impression that our catch is representative of fish community composition. Such is not necessarily the case. Although 6' trap-nets are a broad-spectrum capture gear for near-shore fish, not all species are equally vulnerable to the gear. Also, there is size selectivity associated with the gear. Consequently, very small and abundant fish species such as minnows are absent from the catch as are the early life stage of larger fish species. Consequently, our catch composition should not be considered a direct reflection of fish community composition.

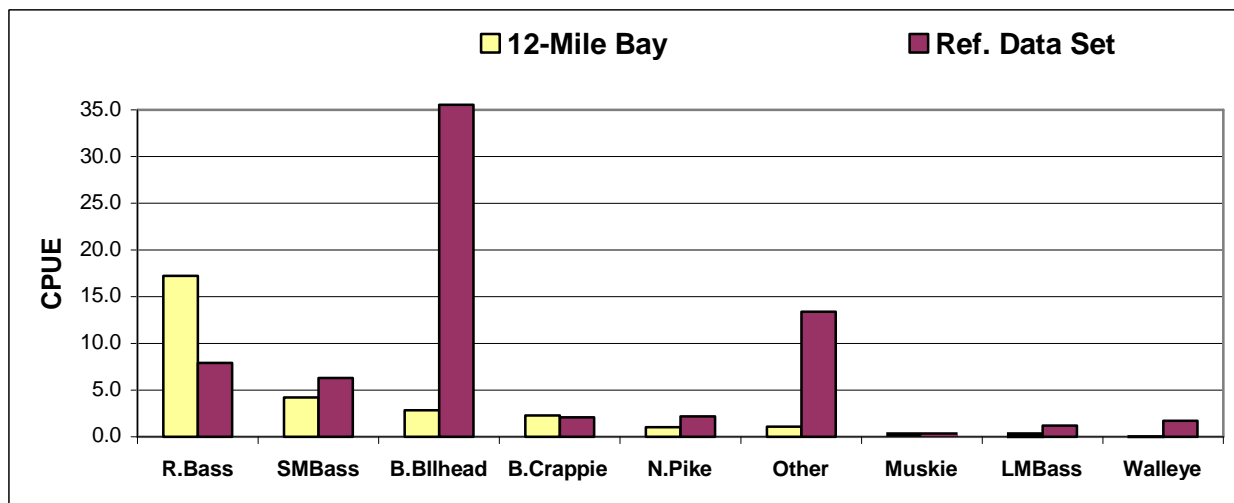
We further caution our readers of another bias associated with this and other ESTN surveys. Our survey was conducted from May 28th to June 5th. Muskellunge are late spring spawners and it appears evident from the size, number and location of capture, they were spawning along portions of the 12-Mile Bay shoreline. Indeed, 9 of the 10 musky captured were in nets near or east of Moose Deer Point marina and in the vicinity of vegetated segments of shoreline that are likely providing spawning habitat. Hence, the muskie catch in this survey as well as other ESTN surveys probably over-represent

this species because of its concentration in specific areas for spawning purposes. A large portion of muskie captured in this survey probably exit 12-Mile Bay after spawning activities are completed.

3.3 Catch-Per-Unit-Effort (CPUE) – Index of Abundance

Rock bass was the most abundance species in our survey with a catch rate (CPUE) of 17.2 fish per net set (Appendix A). This was followed by smallmouth bass (4.2), brown bullhead (2.8), black crappie (2.1), northern pike (1.0) and the remaining 10 species at less than 1.0 fish per net set (Figure 3) (See Appendix A for species specific CPUE and confidence limits).

Figure 3. Species CPUE (no. fish / net set) for 12-Mile Bay and Reference ESTN Data Set.



Relative to our reference data set, rock bass were more abundant in 12-Mile Bay, while smallmouth bass, black crappie, largemouth bass and muskellunge were approximately equal. The abundance of “other species” combined (gar pike, bowfin, white bass, white sucker, pumpkinseed, yellow perch) and especially brown bullhead, was lower in 12-Mile Bay than the reference data set.

Over-all, fish abundance as measured by CPUE was lower in 12-Mile Bay than our reference data set. This is not a statistic of great concern however. This lower over-all fish abundance is largely attributable to the relative scarcity of coarse fish in our survey; and that scarcity is directly related to the limited availability of suitable habitat for these species in the study area. Where suitable habitat was present for rock bass, smallmouth bass, crappie, northern pike and muskie – the abundance of these species is equivalent to the reference data set.

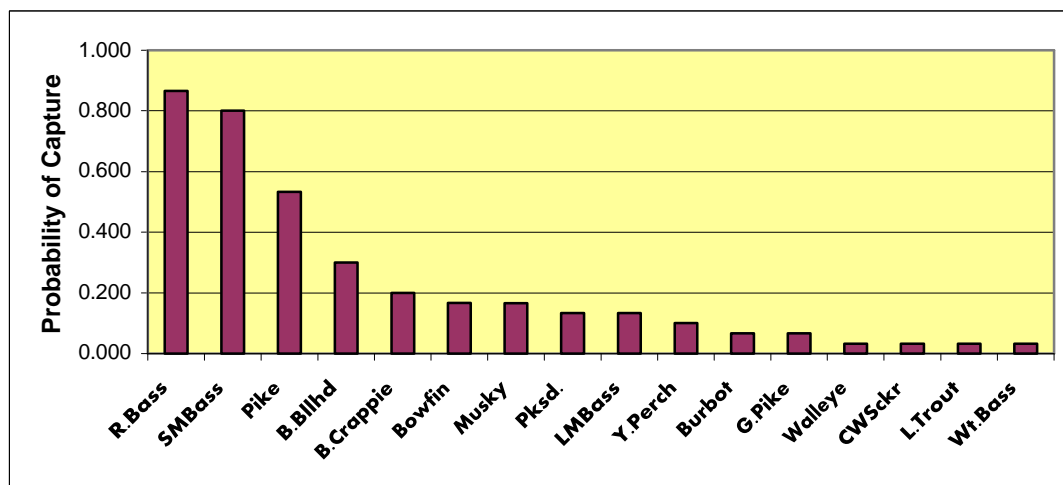
3.4 Probability of Capture (Catch Frequency):

“Probability of Capture” (POC) is a statistic that indicates the frequency with which a particular species is caught. If net sets are randomly distributed, it can provide an indication of how widely distributed a particular species is throughout the study area.

A Probability of Capture (POC) of 1.000 indicates at least one fish of a particular species was captured in all or 100% of the nets set. A POC of 0.500 indicates 50% of the nets captured at least one of a particular species; 0.100 indicates it's capture in 10% of the nets; etc.

Rock bass, smallmouth bass, northern pike and brown bullhead were most frequently caught with a POC of 0.866, 0.800, 0.533 and 0.300 respectively (Figure 4). The 12 remaining species had a POC of 0.200 or less.

Figure 4. Catch frequency of species as measured by Probability of Capture.
(Species specific POC values in Appendix A)



3.5 Number of Fish Species Caught

We captured 16 different fish species, the same as the average in our reference data set.

3.6 Species Analysis

3.6.1 Muskellunge

Muskellunge was the dominant fish in our catch in terms of weight. We captured 10 musky – all large adult fish, weighing an estimated total of 106.8 kilograms, or 24.1% of the total catch weight (Appendix A). We were unable to conclusively determine a total or

mean weight as five of the muskie captured exceeded the 12-kg (25+lb) capacity of our weight scale. Weights for these fish were conservatively estimated (Appendix C).

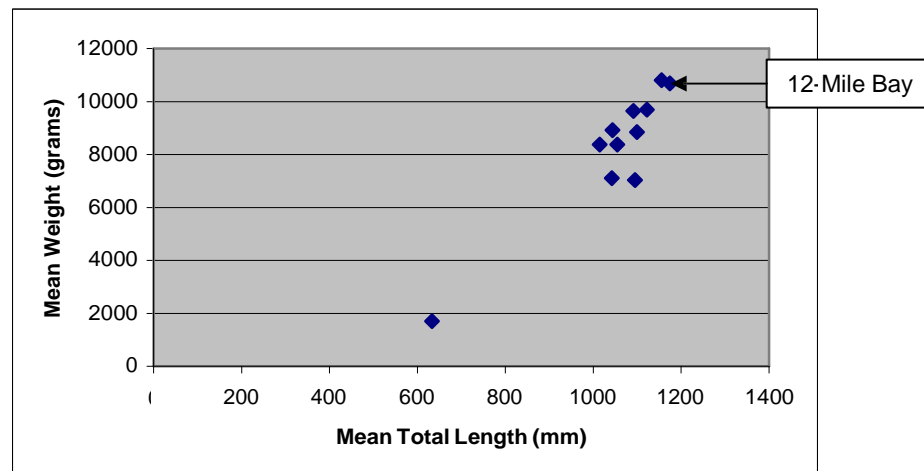
Our muskie CPUE was 0.3 fish per net set \pm 0.103 ($p < 0.05$) (Appendix A). This is very similar to our reference dataset in which the mean muskie CPUE is 0.2 per net set (Appendix B-1).

Our muskellunge Probability-of-Capture (POC) was 0.166; five of the 30 sets caught at least one muskie (Appendix A). All muskie, with the exception of one, were captured in sets close to Moose-Deer Point marina. We strongly suspect muskie spawning activities are taking place in this portion of 12-Mile Bay.

All muskie captured exceeded 100 cm in total length. Estimated mean weight was 1068 grams (23.6 lbs) (Figure 5). The mean size of muskellunge captured in this survey is amongst the highest in our reference dataset.

Figure 5. Mean muskellunge size distribution (total length and round weight) for 15 surveys in our reference dataset.

(Mean total length for all surveys: 1048 mm; mean weight: 8286 grams)



As previously mentioned (Section 3.2), we attribute the high abundance of adult muskellunge in the inner portion of 12-Mile Bay to be due to spawning activity.

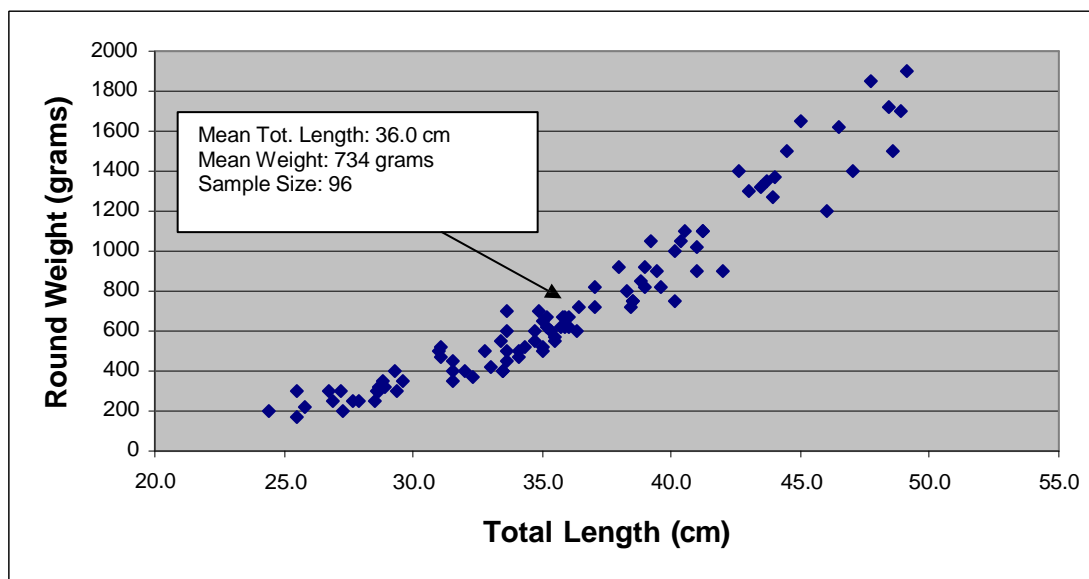
3.6.2 Smallmouth Bass

Smallmouth bass was the second highest caught species (126) with a CPUE-no of 4.2 per net set \pm 1.4 ($p < 0.05$) (Appendix A). The mean for our reference data set is approximately similar at 6.3 bass per net set (Appendix B-1). This suggests smallmouth bass abundance in 12-Mile Bay is average or moderate.

Next to rock bass, smallmouth bass was the second most frequently caught species in this survey with a probability of capture of 0.8 (Appendix A); indicating its wide distribution throughout the study area.

Mean size of smallmouth bass captured in this survey was 360 mm total length and 734 grams in weight (Appendix D). This is slightly smaller than our reference dataset mean size of 386 mm total length and 941 grams in weight. Our sample of 96 smallmouth bass from which size sampling data was collected indicated good representation in all size ranges (Figure 6). This suggests mortality and recruitment are well balanced and population numbers are probably stable.

Figure 6. Size Distribution of Smallmouth Bass from the 2008 12-Mile Bay ESTN Survey
(Note: See Appendix D for raw data)



3.6.3 Northern Pike

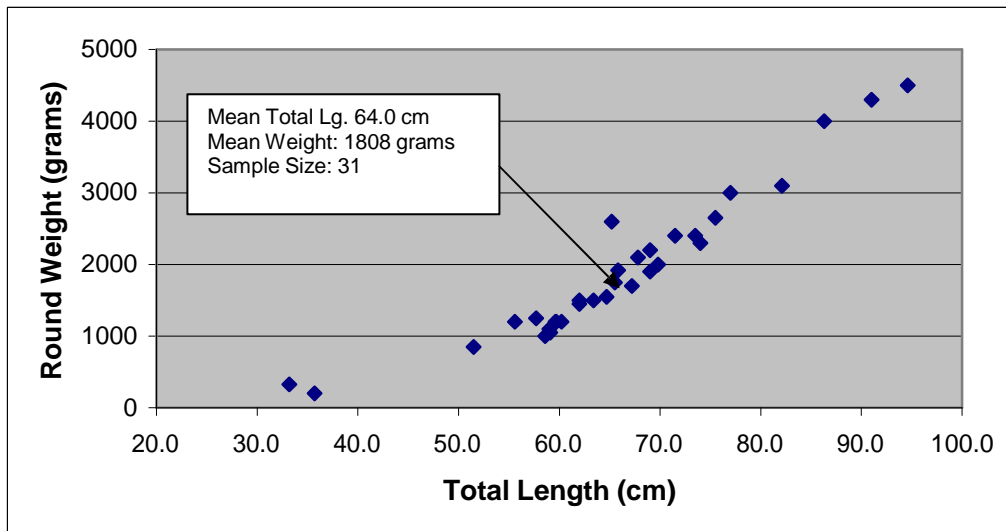
Northern pike are a major component of the 12-Mile Bay nearshore fish community. They comprised a substantial 15.5% of the total catch weight, just behind muskie (27.9%) and smallmouth bass (24.1%) (Appendix A). They comprised 3.5% of the total catch by number.

They were also among the most frequently caught and widely distributed species with a probability-of-capture (POC) of 0.533, behind rock bass (0.866) and smallmouth bass (0.800) (Figure 4).

Our northern pike CPUE was 1.0 fish per net set \pm 0.44 ($p < 0.05$) (Appendix A); somewhat below our reference data set mean value of 2.2 (Appendix B-1). (Note: As CPUE numbers become smaller, it becomes more tenuous to establish relative differences between them.)

Mean size of northern pike captured in this survey was 64.0 cm total length and 1808 grams in weight (Figure 7 and Appendix C). Size distribution indicated a scarcity of pike less than 50 cm in length, raising the possibility of poor recruitment in recent years. Otherwise the population looked healthy with good representation of size classes over 50 cm.

Figure 7. Size Distribution of Northern Pike captured in the 2008 12-Mile Bay ESTN Survey. (See Appendix for raw data)



3.6.4 Largemouth Bass

Largemouth bass are a minor component of the 12-Mile Bay fish community. They comprised only 1.1% of the total catch by number and 7.2% of the total catch weight (Appendix A). Their low abundance and limited distribution is directly related to the scarcity of suitable habitat for this species within the study area. Almost all largemouth bass were caught at the eastern extremity of 12-Mile Bay.

Largemouth bass CPUE was 0.3 fish per net set \pm 0.38 ($p < .05$) (Appendix A); below the mean of 1.2 in our reference data set (Appendix B-1). (*Again note: As CUPE numbers become smaller, it becomes more tenuous to establish relative differences between them.*)

Largemouth bass were only caught in four sets for a low Probability-of-Capture (POC) of 0.133 (Figure 4).

Mean size of largemouth bass captured in our survey was 36.0 cm total length and 722 grams in weight (Appendix E). Based on our small sample size of 10 fish we are unable to comment on indicators of recruitment and mortality.

3.6.5 Black Crappie

Black crappie is a minor species in the 12-Mile Bay fish community, but in specific locations appeared quite abundant. We captured a total of 69 crappie comprising 7.8% of the total catch number and 4.8% of the total catch weight (Appendix A).

Probability of capture (POC) was 0.2, indicating crappie were not widely distributed throughout the study area. In fact, two sets - #28 and 30 at the eastern extremity of 12-Mile Bay, accounted for 83% of the crappie caught.

Black crappie CPUE was 2.3 fish per net set ± 2.9 ($p < 0.05$) (Appendix A). This is very similar to our reference data set (2.1; Appendix B-1), suggesting crappie abundance is moderate or average.

From 17 crappie sampled for size, we determined a mean total length of 23.9 cm and mean weight of 267 grams (Appendix F).

3.6.6 Walleye

Along the eastern shore of Georgian Bay, walleye is arguably the most sought after sport-fish species and consequently of prime interest to fish managers. Although this was a broad-scale survey intended to assess the status of the nearshore fish community, we had a particular interest in assessing the walleye component.

We captured only one walleye for a CPUE of 0.03 walleye per set. As CPUE is rounded to the nearest decimal – our walleye CPUE is considered zero (Appendix A). The mean walleye CPUE for our reference data set is 1.7 walleye per set (Appendix B-1). The capture of only one walleye is a clear indication of this species being almost absent from the waters in and around 12-Mile Bay.

There are no known or historical walleye spawning sites in 12-Mile Bay.

The lone walleye we did capture was 57.8 cm in total length and weighed 1900 grams.

3.6.7 “Other Species”

“Other species” are primarily comprised of comprised of non-game fish species (brown bullhead, bowfin, rock bass, pumpkinseed, burbot, gar pike, common white sucker and white bass). Also, due to the low and inconsequential catch, we include yellow perch and lake trout in this grouping.

Most notable amongst “other species” in this survey was rock bass. We captured a total of 517 rock bass that comprised 59% of our total catch number and 10.8% of our total catch weight (Appendix A). Rock bass has the highest CPUE in our survey at 17.2 fish per net set ± 9.7 ($p < 0.05$) (Figure 3 and Appendix A). This was the only species in our survey whose CPUE greatly exceed that in our reference data set (Figure 3) indicating a relatively high abundance. Rock bass also had the highest POC in our survey – 0.866 (Figure 4), indicating it was the most widely distributed species throughout the study

area. Rock bass had a mean total length of 16.4 cm and mean weight of 80 grams (Appendix G).

We captured 85 brown bullhead that comprised 9.7% of our total catch and 7.6% of the total catch weight (Appendix A). Brown bullhead CPUE was 2.8 fish per net set \pm 3.6 ($p < 0.05$) (Appendix A); well below our reference data set mean of 36.0 (Appendix B-1). Probability of capture was 0.3 (Figure 4). The low abundance of brown bullhead in this survey was largely attributable to suitable habitat for this species being limited to the eastern extremity of the study area. This was similarly true for bowfin and gar pike.

Yellow perch, common white sucker, pumpkinseed, burbot and white bass were caught in such low number (3, 2, 10, 2 and 3 respectively; Appendix A) as to be considered incidental catch. Most surprising was the capture of a single lake trout, which was indeed a strange anomaly. Size sampling data for these species is provided in Appendix H.

5.0 Literature Cited

Skinner, A. and H. Ball; 2004. Manual of Instructions – End of Spring Trap Netting (ESTN). Queen's Printer for Ontario. 58 p.

6.0 Acknowledgements

The EGBSC would like to thank and acknowledge the tremendous assistance in terms of staff and equipment provided by the Parry Sound District of the Ministry of Natural Resources. Parry Sound District provided transportation to and from the study area as well as the boat and netting equipment to conduct the survey. We also enjoyed as part of the netting crew: Jim Palmer (6 days), Shawn Morrissey (Parry Sound co-op student) (4 days), Ken Molyneaux (1 day) and Leanne Leduc (1 day).

Special thanks to Donna and Dave LaRush of the 12-Mile Bay Cottage Association, as well as John Wilson of the Manitou Association. Your assistance with netting operations was much appreciated.

Also, thanks to Arunas Liskauskas of the Upper Great Lakes Management Unit – Lake Huron Office (OMNR), for technical guidance and provision of the reference data set.

The project was supervised by Eric McIntyre, Coordinator, Eastern Georgian Bay Stewardship Council.

Appendix A

12-Mile Bay, 2008 ESTN Survey Catch Summary

Net Set No.	Walleye	SM. Bass	LM. Bass	N. Pike	Muskie	Black Crappie	Yellow Perch	C.W. Sucker	Brown Bullhead	Pumpkin-seed	Rock Bass	Burbot	Bowfin	Gar Pike	Lake Trout	White Bass	All
1	0	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	
2	0	13	0	0	0	0	0	0	0	0	47	0	0	0	0	0	
3	0	2	0	3	0	0	0	0	0	0	1	0	1	0	0	0	
4	0	2	0	1	4	2	1	0	2	0	7	0	1	1	0	0	
5	0	9	0	0	1	1	1	2	4	0	29	0	0	0	0	0	
6	0	8	0	0	0	0	0	0	0	0	2	0	0	0	0	0	
7	0	9	0	0	1	0	0	0	0	0	37	1	0	0	0	0	
8	0	1	0	1	0	0	0	0	0	0	3	0	0	0	0	0	
9	0	5	0	1	0	0	0	0	0	0	28	0	0	0	0	0	
10	0	6	0	2	0	0	1	0	0	0	5	0	0	0	0	0	
11	0	7	0	0	0	0	0	0	0	0	18	0	0	0	0	0	
12	0	0	0	3	0	0	0	0	0	1	0	0	0	0	0	0	
13	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	
14	0	3	0	0	0	0	0	0	0	0	1	0	0	0	0	0	
15	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	
16	0	4	0	0	0	0	0	0	0	0	5	0	0	0	0	0	
17	0	0	0	0	0	0	0	0	0	0	40	1	0	0	0	0	
18	0	0	0	2	0	0	0	0	1	0	7	0	0	0	0	0	
19	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	
20	0	2	0	1	2	0	0	0	0	0	14	0	0	0	1	0	
21	1	13	0	3	2	1	0	0	18	1	9	0	3	0	0	0	
22	0	9	0	0	0	0	0	0	0	0	32	0	0	0	0	0	
23	0	1	0	1	0	0	0	0	0	0	5	0	0	0	0	0	
24	0	10	0	3	0	0	0	0	2	0	0	0	0	0	0	0	
25	0	3	0	0	0	0	0	0	0	0	47	0	0	0	0	0	
26	0	4	0	0	0	0	0	0	0	0	39	0	0	0	0	0	
27	0	6	4	3	0	8	0	0	50	7	0	0	1	1	0	3	
28	0	2	4	3	0	18	0	0	2	0	2	0	0	0	0	0	
29	0	4	0	0	0	0	0	0	5	1	127	0	0	0	0	0	
30	0	1	1	2	0	39	0	0	1	0	0	0	2	0	0	0	Grand Totals
Total Catch (no.)	1	126	10	31	10	69	3	2	85	10	517	2	8	2	1	3	880
% of Total Catch No.	0.1	14.3	1.1	3.5	1.1	7.8	0.3	0.2	9.7	1.1	58.8	0.2	0.1	0.2	0.1	0.3	
CPUE (no. / net-night)	0.0	4.2	0.3	1.0	0.3	2.3	0.1	0.1	2.8	0.3	17.2	0.1	0.3	0.1	0.0	0.1	
Standard Error	0.033	0.720	0.188	0.217	0.161	1.421	0.056	0.067	1.741	0.237	4.751	0.046	0.126	0.046	0.033	0.100	
Standard Deviation	0.183	3.943	1.028	1.189	0.884	7.782	0.305	0.365	9.538	1.295	26.021	0.254	0.691	0.254	0.183	0.548	
Confidence Level (95.0%)	0.068	1.472	0.384	0.444	0.330	2.906	0.114	0.136	3.562	0.484	9.716	0.095	0.258	0.095	0.068	0.205	
Sample Size	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	
Probability of Capture	0.033	0.800	0.133	0.533	0.166	0.200	0.100	0.033	0.300	0.133	0.866	0.067	0.167	0.067	0.033	0.033	
Mean Weight (grams)	1900	734	722	1918	10680	267	100	1850	342	27	80	925	1930	1350	1250	308	
Tot. Catch Wt.(kg)	1.900	92.484	7.225	59.475	106.800	18.432	0.300	3.700	29.070	0.270	41.360	1.850	15.440	2.700	1.250	0.925	383.181
% of Tot. Catch Wt.	0.50	24.14	1.88	15.52	27.87	4.81	0.08	0.96	7.59	0.07	10.79	0.48	4.03	0.70	0.33	0.24	99.99
CPUE (kg / net set)	0.063	3.082	0.241	1.983	3.56	0.614	0.01	0.123	0.969	0.009	1.379	0.062	0.515	0.09	0.042	0.031	12.773

Appendix B-1.

Eastern Georgian Bay ESTN Reference Data Set of Species Catch-Per-Unit-Effort (CPUE) (Note: Severn Sound surveys conducted from 1999-2007 have been combined to eliminate bias from 8 surveys all conducted in highly productive Severn Sound Area)

ESTN Survey & Yr.	Walleye	Smooth Bass	Lmouth Bass	N. Pike	Musky	Blk. Crappie	Wt. Suckr	Other Suckr	Br. Blthead	Pump-kinseed	Rock Bass	Yellow Perch	Bowfin	L.nose gar	Other	All
Key R. 1998	3.1	1.8	0.1	1.4	0.0	9.8	9.0	11.8	91.2	7.3	8.4	0.5	1.9	0.7	0.2	147.2
Bay of Islands 2001	2.9	7.2	0.1	1.7	0.5	0.6	0.2	0.0	9.8	0.6	4.1	0.4	1.5	0.2	0.6	30.4
Moon River 2008	0.5	5.7	1.6	3.4	0.4	0.1	0.3	0.0	93.2	1.7	5.6	0.0	0.4	0.1	1.0	114.0
Moon River 2005	1.4	12.7	2.6	2.0	0.1	0.2	0.1	0.1	18.4	0.4	5.1	0.0	1.0	9.1	4.9	58.1
Moon River 2004	1.5	7.5	2.8	2.4	0.5	0.7	0.1	0.1	24.9	0.1	6.8	0.0	0.6	3.5	1.2	52.7
Serpent R. Hbr. 2002	1.5	1.4	0.0	2.0	0.0	0.0	11.4	0.0	5.5	0.0	5.0	1.1	0.3	0.0	0.3	28.5
Severn Sound 99-07	2.7	10.1	2.2	3.7	0.2	2.8	2.1	1.8	42.5	10.8	11.2	0.2	2.8	11.4	4.6	109.0
12-Mile Bay 2008	0.0	4.2	0.3	1.0	0.3	2.3	0.1	0.0	2.8	0.3	17.2	0.1	0.3	0.1	0.2	29.2
Mean	1.7	6.3	1.2	2.2	0.2	2.1	2.9	1.7	36.0	2.7	7.9	0.3	1.1	3.1	1.6	71.1
Confidence Level(95.0%)	0.937	3.261	1.014	0.790	0.175	2.755	3.840	3.443	30.820	3.431	3.670	0.317	0.745	3.818	1.638	38.440
Standard Error	0.396	1.379	0.429	0.334	0.074	1.165	1.624	1.456	13.034	1.451	1.552	0.134	0.315	1.615	0.693	16.256
Standard Deviation	1.121	3.900	1.213	0.945	0.209	3.296	4.593	4.118	36.865	4.104	4.390	0.379	0.891	4.567	1.959	45.979
Sample Size	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8

Appendix B-2

Severn Sound ESTN surveys in the Eastern Georgian Bay Reference Data Set (Mean CPUE data for these 8 surveys have been combined for insertion into Appendix B-1)

ESTN Survey & Yr.	Walleye	Smooth Bass	Lmouth Bass	N. Pike	Musky	Blk. Crappie	Wt. Suckr	Other Suckr	Br. Blthead	Pump-kinseed	Rock Bass	Yellow Perch	Bowfin	L.nose gar	Other	All
Severn Sound 2007	2.6	12.8	1.6	1.6	0.2	1.5	1.4	3.4	45.6	9.7	12.4	0.1	3.1	14.3	3.4	113.7
Severn Sound 2005	1.8	9.5	1.7	2.2	0.3	0.7	3.2	1.8	24.3	1.5	9.2	0.1	1.3	5.2	4.1	66.9
Severn Sound 2004	2.1	11.4	2.4	3.2	0.3	3.3	3.6	1.3	33.6	2.8	10.6	0.1	2.3	20.6	6.5	104.1
Severn Sound 2003	3.1	13.2	2.5	3.8	0.1	1.9	2.7	1.5	55.7	8.3	6.8	0.1	2.7	25.8	3.0	131.2
Severn Sound 2002	1.5	6.8	1.7	1.6	0.0	1.0	0.6	0.7	19.3	9.4	2.4	0.0	2.5	8.8	4.3	60.6
Severn Sound 2001	1.7	4.7	1.1	1.0	0.0	2.0	2.0	0.1	40.0	9.7	7.1	0.1	0.8	1.3	2.5	74.1
Severn Sound 2000	3.7	14.0	4.6	14.8	0.3	9.1	2.0	2.4	103.0	10.3	21.3	1.2	6.9	1.2	0.7	195.5
Severn Sound 1999	4.7	8.2	1.8	1.7	0.0	2.9	1.2	3.4	18.5	35.0	19.9	0.1	2.4	13.6	12.1	125.5
Mean	2.7	10.1	2.2	3.7	0.2	2.8	2.1	1.8	42.5	10.8	11.2	0.2	2.8	11.4	4.6	109.0
Standard Error	0.396	1.179	0.381	1.614	0.050	0.952	0.363	0.421	9.797	3.652	2.303	0.140	0.650	3.152	1.223	15.599
Confidence Level(95.0%)	0.935	2.787	0.900	3.816	0.118	2.251	0.859	0.995	23.166	8.636	5.447	0.331	1.536	7.454	2.893	36.886
Standard Deviation	1.119	3.334	1.077	4.564	0.141	2.692	1.027	1.190	27.710	10.330	6.515	0.396	1.838	8.916	3.460	44.121
Count	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8

Appendix C. Esocid (Northern Pike and Muskellunge) Biosampling Data from the 2008 12-Mile Bay ESTN Survey.

Northern Pike

Total Lg. (cm)	Fork Lg. (cm)	Weight (grams)
82.1	77.8	3100
69.0	64.0	1900
59.0	55.4	1100
67.2	63.1	1700
33.2	31.8	325
57.7	54.4	1250
67.8	63.5	2100
73.5	69.0	2400
62	58	1500
86.3	82.5	4000
75.5	71.0	2650
62.0	58.5	1450
63.4	59.3	1500
77.0	72.8	3000
71.5	67.2	2400
55.6	52.2	1200
51.5	48.3	850
74.0	69.3	2300
69.0	65.0	2200
94.6	89.6	4500
35.7	33.8	200
59.1	55.7	1050
58.6	55.4	1000
59.6	56.0	1200
59.7	56.3	1200
60.2	56.3	1200
91.0	86.5	4300
65.5	61.6	1750
65.2	61.3	2600
64.7	61.4	1550
69.8	65.2	2000

65.8	62.0	1918.5
13.166	12.515	1051.308
4.829	4.591	385.623
		59475
31	31	31

Muskellunge

Total Lg. (cm)	Fork Lg. (cm)	Weight (grams)
112.0	104.0	9900
109.0	104.0	9900
124.0	115.0	12000 *
112.0	104.0	9900
119.0	112.0	12000 *
119.0	113.0	12000 *
118.0	114.0	9500
124.0	121.0	12000 *
133.0	128.0	13500 *
104.0	96.0	6100

* denotes muskellunge whose weight exceeded wt. scale limit - 25 lb.
Weight estimated

Mean	117.4	111.1	10680
Standard Deviation	2.676	2.964	659.259
Confidence Level(95.0%)	6.053	6.706	1491.347
Total Weight (gr)			106800
Count	10	10	10

Appendix D. Smallmouth Bass Biosampling Data from the 2008 12-Mile Bay ESTN Survey

Total Lg. (cm)	Fork Lg. (cm)	Weight (grams)	Total Lg. (cm)	Fork Lg. (cm)	Weight (grams)	Total Lg. (cm)	Fork Lg. (cm)	Weight (grams)
39.4	36.6	900	43.5	41.3	1325	32.0	30.0	400
43.9	41.6	1275	45.0	42.5	1650	28.5	27.0	250
42.6	40.0	1400	34.7	32.9	600	34.9	33.1	700
49.1	46.8	1900	27.2	25.8	300	33.6	31.8	500
41.2	39.2	1100	43.0	40.5	1300	33.6	31.6	450
40.5	38.0	1100	31.1	29.2	475	35.9	34.0	625
36.0	34.2	675	36.4	34.6	725	27.3	25.9	200
37.0	34.8	825	41.0	38.7	1025	31.5	29.8	350
35.2	33.2	625	28.8	27.3	350	29.4	27.8	300
43.7	41.1	1350	25.5	23.7	300	37.0	35.8	725
34.1	32.0	475	38.8	36.2	850	35.9	34.0	675
39.6	37.3	825	33.4	31.2	550	35.5	33.5	575
34.3	32.2	525	29.6	27.8	350	27.9	26.4	250
31.5	30.1	400	46.5	43.3	1625	35.8	33.9	675
25.5	24.2	175	36.3	34.4	600	28.9	27.1	325
31.5	29.7	450	34.7	32.8	550	28.7	27.3	325
35.0	33.2	650	35.3	33.4	600	25.8	24.5	225
48.6	45.8	1500	38.3	36.6	800	28.7	27.0	300
40.1	37.9	750	35.0	33.0	525	24.4	23.1	200
29.3	28.1	400	44.5	42.0	1500	27.7	26.4	250
33.6	31.8	700	44.0	41.5	1375	28.6	27.2	300
33.6	31.8	600	48.4	45.0	1725	33.0	31.2	425
35.2	33.1	675	39.0	37.0	925	39.0	36.6	825
31.1	30.4	525	35.5	33.5	550	34.1	32.1	500
41.2	38.6	1100	36.0	34.5	625	32.3	30.5	375
31.0	29.5	500	38.5	36.0	750	47.0	44.3	1400
40.4	38.1	1050	38.5	36.0	750	48.9	46.4	1700
26.7	25.4	300	46.0	43.0	1200	42.0	39.6	900
39.2	37.0	1050	41.0	38.5	900	35.7	33.5	625
47.7	44.8	1850	35.0	33.0	500	38.4	36.5	725
40.1	38.3	1000	26.9	25.4	250	33.5	31.6	400
38.0	35.7	925	32.8	31.0	500	33.5	31.6	400
Mean			36.0	34.0	734.4			
Standard Error			0.621	0.581	43.019			
Standard Deviation			6.088	5.691	421.499			
Confidence Level(95.0%)			1.233	1.153	85.404			
Count			96	96	96			

Appendix E. Largemouth Bass Biosampling Data from the 2008 12-Mile Bay ESTN Survey

	Total Lg. (cm)	Fork Lg. (cm)	Weight (grams)
	35.6	34.4	725
	38.1	37.8	500
	33.4	32.0	525
	43.5	42.0	1500
	30.2	29.0	350
	41.2	39.7	1075
	40.6	39.1	1025
	32.4	31.0	500
	30.5	29.4	400
	34.2	33.0	625
Mean	36.0	34.7	722.5
Standard Error	1.475	1.460	115.977
Standard Deviation	4.665	4.616	366.752
Confidence Level(95.0%)	3.337	3.302	262.358
Total Weight (gr.)			7225
Sample Size	10	10	10

Appendix F. Black Crappie Biosampling Data from the 2008 12-Mile Bay ESTN Survey

	Total Lg. (cm)	Fork Lg. (cm)	Weight (grams)
	21.6	20.9	175
	28.7	27.5	425
	18.8	17.8	175
	20.2	19.5	75
	15.3	14.6	25
	22.0	19.4	100
	21.0	20.1	175
	21.6	20.6	175
	23.0	22.3	200
	21.5	20.6	175
	31.0	29.9	450
	28.1	27.0	450
	24.5	23.5	375
	28.4	27.2	450
	28.6	27.5	475
	27.3	25.5	450
	24.6	23.6	200
Mean	23.9	22.8	267.647
Standard Error	1.030	1.006	37.791
Standard Deviation	4.248	4.150	155.816
Confidence Level (95.0%)	2.184	2.134	80.113
Total			4550
Sample Size	17	17	17

Appendix G. Rock Bass and Pumpkinseed Biosampling Data from the 2008 12-Mile Bay ESTN Survey

Rock Bass				Pumpkinseed			
Total Lg. (cm)	Fork Lg. (cm)	Weight (grams)		Total Lg. (cm)	Fork Lg. (cm)	Weight (grams)	
16.0	15.4	75		16.2	15.5	75	
16.5	16.0	75		15.3	14.4	25	
16.6	16.0	125		13.5	12.6	25	
15.1	14.5	75		13.0	12.4	25	
19.3	18.8	150		14.6	14.0	25	
17.0	16.2	125		14.4	14.0	25	
16.7	16.1	125		12.4	11.9	15	
16.0	15.5	100		12.4	11.9	15	
17.2	16.6	175		12.4	11.9	15	
17.1	16.7	175		12.1	11.5	25	
16.6	15.9	125					
15.1	14.5	125					
15.1	14.7	125					
15.1	14.5	75					
18.0	17.5	100					
15.5	15.0	75					
15.8	15.3	75					
16.4	15.8	80 *	Mean	13.6	13.0	27	
0.277	0.278	8.335	Standard Error	0.450	0.430	5.538	
1.143	1.148	34.367	Standard Deviation	1.423	1.358	17.512	
0.587	0.590	17.670	Confidence Level(95.0%)	1.018	0.972	12.527	
		1900	Total			270	
17	17	17	Sample Size	10	10	10	
* Rock Bass mean weight based on total weight of 27900 grams for 349 rock bass 'group weighed'							

Appendix H. "Other Species" Biosampling Data from the 2008 12-Mile Bay ESTN Survey

Brown Bullhead		
	Total Lg. (cm)	Weight (grams)
	31.5	450
	29.5	375
	28.5	450
	22.8	225
	25.8	350
	28.6	400
	24.0	200
	31.5	400
	33.5	500
	34.1	675
	32.5	550
	25.7	300
	34.5	725
Mean	29.4	342 *
Standard Error	1.087	43.130
Standard Deviation	3.918	155.508
Confidence Level(95.0%)	2.367	93.972
Sum		5600
Count	13	13
* mean weight based on total catch weight of 27700 gr for 81 bullheads weighed		

Species	Total Lg. (cm)	Fork Lg. (cm)	Weight (grams)
Bowfin	56.5		1700
Bowfin	66.1		2550
Bowfin	59.2		2000
Bowfin	61.0		1700
Bowfin	61.0		1700
Mean			1930
Gar	93.5		2300
Gar	59.0		400
Total			2700
Yellow Perch	17.7	16.9	50
Yellow Perch	18.4	17.3	125
Yellow Perch	26.5	25.5	125
total			300
Common Wt Sucker	50.1	47.1	1700
Common Wt Sucker	52.9	48.5	2000
total			3700
Burbot	60.4		1100
Burbot	45.9		750
Total			1850
Lake Trout	51.8	47.4	1250
Walleye	57.8	55.2	1900
white bass	27.7	26	300
white bass	26.8	25.2	300
white bass	28.0	26.3	325
Total			925

Appendix I. UTM Coordinates (NAD-83) for trapnet sets; 2008 12-Mile Bay ESTN Survey

Set No.	UTM Coordinate		Vicinity
1	573728.76	4993498.71	Off Nat'l Park Is.
2	572620.86	4993677.14	W. of Nat'l Park Is.
3	577550.38	4993266.35	E. of Isaac Bay
4	578874.05	4992672.98	E of Moose Deer Pt. Marina
5	578239.19	4992822.36	Near Moose-Deer Pt. Marina
6	572604.26	4995345.21	Hurontario Bay
7	573147.84	4994365.95	Hurontario Bay Is
8	572073.14	4994747.69	W. 12-Mile Bay
9	576193.52	4993179.21	E. of Isaac Bay
10	573737.06	4994747.69	Hurontario Bay
11	571280.60	4995312.01	W. Loon Is.
12	572637.46	4994847.28	W. 12-Mile Bay
13	574546.90	4993967.60	E. of Nat'l Park Is.
14	573317.97	4995112.84	Hurontario Bay
15	570537.85	4995415.75	Starvation Bay
16	570351.12	4995942.73	S. of Moose-Deer Pt.
17	571517.11	4993652.24	S. of Bowes Is.
18	570932.04	4994706.20	W. 12-Mile Bay
19	569234.93	4995204.13	N. Martin Is.
20	578056.61	4993058.88	West of Moose-Deer Pt. Marina
21	580197.72	4992631.48	East end
22	570537.85	4993718.63	S. Jacques Is.
23	571483.92	4993063.02	S. of Bowes Is.
24	580994.41	4992834.81	East end
25	572658.21	4994295.40	W. 12-Mile Bay
26	569355.26	4992909.50	Bass Group Is.
27	581525.53	4992498.70	East end
28	584118.93	4992668.83	East end
29	575280.64	4993693.74	NW of Isaac Bay
30	583247.55	4992967.59	East end