Lake Simcoe Bass (*Micropterus* spp.) Tagging Study, 2006 - 2010

June 2016

Report prepared by

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for

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in cooperation with

Aurora Bassmasters

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Cover Photo – Wil Wegman and Gerry Heels with a Lake Simcoe smallmouth bass (Jason Borwick photo).

Executive Summary

This report summarizes the results of a five year (2006 – 2010) cooperative project involving the Ontario Ministry of Natural Resources and Forestry (MNRF) and Bassmasters to determine characteristics of bass (M*icropterus* spp.) angled during eighteen different competitive fishing events on Lake Simcoe. This multi-year project won the Canadian Sport Fishing League (CSFL) Conservation Award as well as the international Berkley Conservation Award.

During a five year period, a total of 327 largemouth bass (*Micropterus salmoides*) and 1,468 smallmouth bass (*M. dolomieu*) were tagged and released. A total of 1,450 bass were measured and 1,244 bass were weighed over the five year study period. The mean total length of largemouth bass was 41.1 cm. The mean total length of smallmouth bass was 45.8 cm. The mean total weight for largemouth and smallmouth bass was 1.36 kg and 1.92 kg, respectively.

Angled smallmouth bass varied from 2-15 years of age (mean 7.4 years, N = 365). The age composition of smallmouth bass was older than largemouth bass. Largemouth bass ranged from 2-13 years of age (mean 6.9 years, N = 62). Both species first recruited to the competitive fishery at two years of age.

Lake Simcoe bass grow very quickly and to large sizes. There were 280 smallmouth bass and 5 largemouth bass which exceeded 50 cm in length. The biggest largemouth bass was a fish measuring 54.0 cm in length and weighing 2.9 kg. Two hundred and thirty-five smallmouth bass exceeded 2.5 kg in weight. The largest smallmouth bass (two different fish) encountered weighed 3.6 kg (7.9 pounds) and measured 59.6 cm (23.5 inches) in length.

Over the five year period, a total of ninety-four bass were reportedly recaptured. This represents a recapture rate of 4.9% for largemouth bass and 6.8% for smallmouth bass. Five bass were recaptured twice. The mean time for recapture after release was 260.9 days for largemouth bass and 383.6 days for smallmouth bass. The longest elapsed time until recapture exceeded five years. The longest post-release movement was estimated to be approximately 78 km downstream (from Lake Couchiching to Burrows Bay in Gloucester Pool).

Many bass angled from deeper water in the fall appeared to suffer from barotrauma and attempts were made to relieve pressure from the air bladder (a process known as “fizzing”). A total of 684 bass were “fizzed” during this study. Fifty-two of the ninety-four recaptured bass (55.3%) had been fizzed.

Conducting biological sampling at competitive fishing events is believed to represent an efficient and cost-effective means of monitoring the status of local bass populations. Recommendations are offered for similar projects in the future.

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Introduction

Description of Study Area

Lake Simcoe is Ontario's sixth largest inland lake. Being only a short distance from Canada's most populated region, it is the most heavily fished inland waterbody in the Province of Ontario (Wegman 2006).

Lake Simcoe contains a mix of oligotrophic, mesotrophic and eutrophic conditions. It has a shoreline of only 232 km (including islands) most of which is exposed and lacking bays and other sheltered areas (Table 1). There are two long bays: Kempenfelt Bay on the west side of the lake and Cook's Bay in the southwestern part of the lake (Figure 1). The lake is part of the Trent-Severn waterway which joins eastern Lake Ontario with Georgian Bay. The natural outlet of the lake flows north into Lake Couchiching and the Severn River.

Table 1. Characteristics of Lake Simcoe, Ontario.

Latitude	44° 26' 12"
Longitude	79° 20' 21''
Surface Area (km^2)	745
Catchment Area (km^2)	2,840
Surface Elevation (m)	219
Volume of Water (km^3)	11.6
Maximum Length (km)	30
Maximum Width (km)	25
Maximum Depth (m)	41
Mean Depth (m)	17
Length of Shoreline (km)	232
Number of Tributaries	8
Number of Islands	6
Number of Resident Fish Species	56

Lake Simcoe supports a diverse fish community comprised of at least 56 different species. Several non-native aquatic species have become established in Lake Simcoe (MOECC 2015). Perhaps the most important, from the perspective of bass, was the introduction, colonization and proliferation of round goby (*Neogobius melanosomus*). Since zebra mussels *(Dreissena polymorpha*) and, subsequently, Quagga mussels (*Dreissena bugenisis*) invaded Lake Simcoe in the mid 1990s, water clarity has increased substantially. Improved water clarity is generally believed to enhance feeding by visual predators such as bass (Carter et al. 2010).

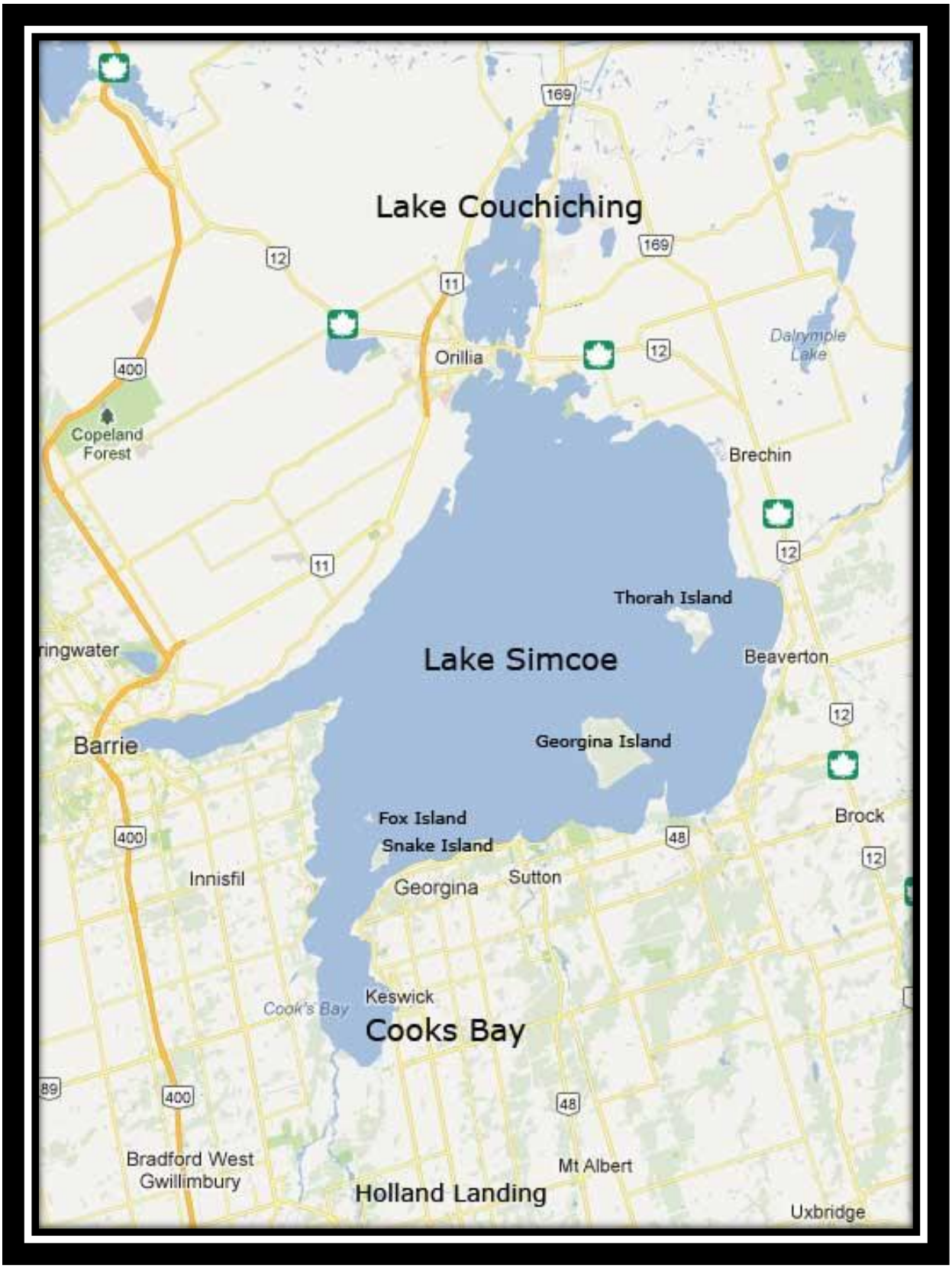

Figure 1. Lake Simcoe, Ontario (Google map).

Bass in Lake Simcoe

Bass are considered to be a valuable and highly sought species in Ontario's recreational fishery (Funnell 2012). Both largemouth bass (*Micropterus salmoides*) and smallmouth bass (*M. dolomieu)* inhabit Lake Simcoe (Moles 2010). Anecdotal records of the smallmouth bass fishery date back to 1838 (Wegman 2006).

Early season angling for smallmouth bass is usually concentrated in shallower waters around several islands (Thorah, Georgina, Stawberry) but then shifts to deeper water in the late summer and autumn. Most smallmouth bass anglers fish over subtle structure in relatively deep water. Largemouth bass are found throughout the lake but most commonly in Cook's Bay at the south end of Lake Simcoe.

Bass are the target species in many competitive fishing events in Ontario (Kerr 1999, 2004, 2009, 2012). With the popularity of Lake Simcoe's bass fishery, the lake is the target for many competitive fishing events (see definition in Glossary) each year (Table 2).

Table 2. Competitive fishing events on Lake Simcoe (from Kerr 1999, 2004, 2008 and 2012).

Year	No. of Events	No. Bass Events
1999	35	-
2004	29	22 (75.9%)
2008	50	27 (54.0%)
2012	26	15 (57.7%)

Project Objectives

Competitive fishing events are increasingly being recognized as an efficient and cost-effective source of fisheries management information (Corbett et al. 2007, Ridgway and Roberge 2007, Zhu 2015). This project was initiated with a number of objectives:

- Obtain biological information from which to monitor adult bass stocks in Lake Simcoe.
- Demonstrate that competitive fishing events represent an efficient and cost-effective means of obtaining information on adult bass.
- Provide an opportunity for organized stakeholders to get involved in fisheries management activities.
- Initiate efforts to determine the effectiveness of "fizzing" (see Glossary).

This five year project involved staff from the Ontario Ministry of Natural Resources (MNR) as well as tournament organizers and numerous volunteers from the Bassmasters organization. The project was initially funded under the Community Fisheries and Wildlife Involvement Program (CFWIP). Bass aging costs were covered by the Aurora chapter of Bassmasters.

Materials and Methods

Method of Fish Capture

All bass involved in this study were captured by means of angling by specialized anglers who were entered in a competitive fishing event on Lake Simcoe between 2006 and 2010 (Appendix 1). All events were governed by rules which included size and entry limits (Table 3). Angling was restricted to the use of artificial lures only. Since most, if not all, events have a minimum size (usually 30.5 cm), samples derived from competitive fishing events are selected for older, larger individual fish.

Table 3. Rules of Lake Simcoe Bass Events, 2006-2010.

Event	Minimum Size Limit	Entry Limit (# fish) per Team
Aurora Bassmasters Club Tournament	30.5 cm	5
Barrie Bassmasters Club Tournament	30.5 cm	5
Rick White Memorial (Bassmania)	33.0 cm	5
Bass Pro Shops Lake Simcoe Open	30.5 cm	5
Crackle Cup	30.5 cm	5
BASS Federation National Championship	30.5 cm	5

At the conclusion of each event, fish were brought into a central weigh-in site where they were subsequently weighed, sampled and tagged. Bass were then loaded onto a release boat and returned to the lake.

Tagging Technique

Bass were marked by means of individually numbered Floy tags which were inserted behind the dorsal spine with a tagging gun. In an effort to investigate tag loss, each fish had two

numbered tags inserted. In addition to an individual number, these plastic tags also contained a telephone number for anglers to call and report the capture of a tagged fish to MNR officials.

Anglers were encouraged to report captures of tagged fish to MNR. Signs "Catch and Call – You can Help us All" were posted around Lake Simcoe for promotional purposes.

"Fizzing" Technique

If any angled bass displayed symptoms of barotrauma (see Glossary) the fish was "fizzed". Fizzing is a procedure whereby an 18 gauge needle is inserted into a specific spot on the side of the fish to reduce air pressure which has accumulated in the air bladder of the fish (see Kerr 2001, www.bassmaster.com/slideshow/fizzing-fish-step-step-how). Typically, only bass caught from deep water during late fall events on Lake Simcoe required this procedure.

Information sheets and instructions were disseminated during the pre-tournament meeting. Demonstrations were also provided to anglers and the public at the weigh-in.

Some bass were "fizzed" by anglers in the boat while they were fishing. Typically bass that were caught from water over 10 metres (sometimes less) needed to be "fizzed" if they were retained in the livewell. Early in the project, "fizzing" was not a common practice but as the years progressed more and more anglers were "fizzing" their bass (in the boat, shortly after capture).

At the weigh-in station (after the bass were weighed, measured and tagged) bass would be put into large aerated tanks. Those that were holding near the surface were the first candidates for "fizzing". Then the fish would be checked for other symptoms such as extended stomachs and, lastly, eyes that appeared to be bulging (this symptom was very rarely seen).

In October 2010, a separate "fizzing" experiment was conducted by Dr. Bruce Tufts, Queens University, assisted by volunteers from Bassmasters. He collected blood samples from a total of 20 bass (10 fizzed and 10 not fizzed) which were taken back to his laboratory in Kingston for analysis.

Information Collected

At each event 5-10 volunteers were utilized to collect and record information and then release the fish. Individual bass were measured (total and fork length in most instances) and a subsample of fish were weighed. Structures were also removed for aging purposes. This involved the removal of 3-6 scales as well as the 3rd dorsal spine. Both structures were examined by an experience ager to assign ages but more confidence was given to spine-derived ages. All information was recorded on individual fish scale sample envelopes.

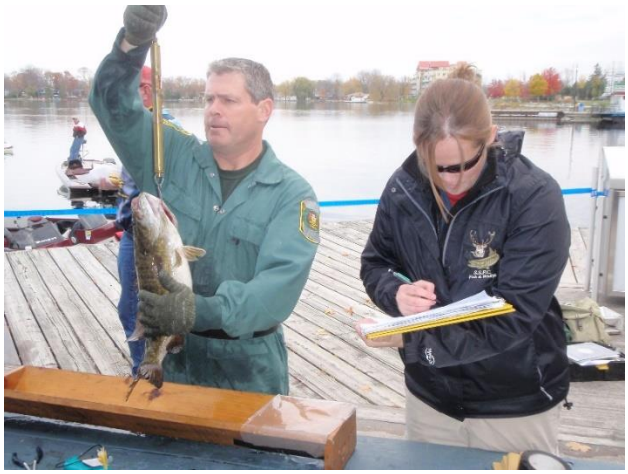

Figure 1. Obtaining biological information for tournament-caught bass from Lake Simcoe (MNRF photo).

Anglers were encouraged to report captures of tagged fish. With conventional bass tournaments it is almost impossible to acquire the exact location where each and every bass was originally captured. Recapture data was based on where the fish was released (typically near the tournament weigh-in site) and the general location reported by the angler who had recaptured the fish. Anglers were not asked to divulge the exact site of the catch but simply the waterbody and a general location on the lake.

Release Techniques

Methods of transport and selection of release sites varied according to event. At smaller events bass were released near the weigh-in site. In larger events which involved the use of live-release pontoon boats (Figure 3), bass were taken offshore and released at approximately one kilometer from the weigh-in site. For events held in Orillia, bass were released in either Lake Simcoe or Lake Couchiching.

Figure 3. Tournament-caught bass on release boat (MNRF photo).

Results

Bass Sampling and Tagging Activities

Over a five year (2006-2010) period a total of 1,468 bass were examined at eighteen different competitive fishing events on Lake Simcoe (Table 4 and Appendix 1). An additional seventeen fish were tagged at a non-competitive fishing event. During the study, a total of 684 fish (46.6% of total) were "fizzed".

Table 4. A summary of bass sampling and tagging activities during competitive fishing events on Lake Simcoe, 2006-2010. This table does not include results of fish tagged at a non-competitive fishing event.

		Number of Fish Tagged		
Year	**Number of Events**	**Largemouth Bass**	**Smallmouth Bass**	**Number of Fish "Fizzed"**
2006	3	31	95	64
2007	4	32	166	121
2008	3	34	127	117
2009	4	190	420	122
2010	4	40	333	260
Total	**18**	**327**	**1,141**	**684**

Size of Angled Bass

A total of 1,450 bass were measured and 1,244 were weighed over a five year period (Table 5).

The largest bass sampled (based on total length) was a smallmouth bass angled during the Bass Pro Shops Lake Simcoe Open in October, 2007. The fish measured 59.6 cm (23.5 inches) in length. In terms of round weight, the largest smallmouth bass weighed 3.6 kg (7.9 lb.) and measured 58.3 cm in length. That fish was angled on October 24, 2009 at the Bass Pro Shop Lake Simcoe Open.

The biggest largemouth bass (in terms of both length and weight) was a fish measuring 54.0 cm in length and weighing 2.9 kg. It was angled at an Aurora Bassmasters event on September 12, 2010.

Table 5. Size characteristics of bass angled during competitive fishing events on Lake Simcoe, 2006-2010

Number of Events	18
Number of Bass Measured	1,123 smallmouth bass 327 largemouth bass 1,450 species combined
Mean Total Length (Range) of Angled Bass	45.8 cm (30.2 - 59.6) smallmouth bass 41.1 cm (30.5 – 54.0) largemouth bass 44.8 cm (30.2 – 59.6) species combined
Number of Bass ≥ 50 cm	280 smallmouth bass 5 largemouth bass 285 species combined
Number of Bass Weighed	956 smallmouth bass 288 largemouth bass 1,244 species combined
Mean Round Weight (Range) of Angled Bass	1.92 kg (0.2 – 3.6) smallmouth bass 1.36 kg (0.5 – 2.9) largemouth bass 1.80 kg (0.2 – 3.6) species combined
Number of Bass ≥ 2.5 kg	235 smallmouth bass 5 largemouth bass 240 species combined

Age of Angled Bass

Ages were determined for 365 smallmouth bass and 62 largemouth bass over a five year period. Aging was not completed for fish sampled at four events.

Assigned ages were ranged from 2 – 15 years for smallmouth bass and 2 – 13 years for largemouth bass (Table 6). The mean age of the catch was 7.4 years for smallmouth bass and 6.9 years for largemouth bass.

Table 6. Age characteristics of a subsample of bass angled during competitive fishing events on Lake Simcoe, 2006-2010.

	Smallmouth Bass	Largemouth Bass
Sample Size (# Fish)	365	62
Mean Age of Catch (years)	7.4	6.9
Range in Ages	2-15	2-13

The smallmouth bass catch was well represented by all year classes although age 5, 8 and 9 year old fish dominated (Table 7). Largemouth bass catches consisted of younger individuals dominated by fish aged 3-5 years.

Table 7. Age distribution of largemouth bass and smallmouth bass entered in various competitive fishing events on Lake Simcoe, 2006-2010.

	Smallmouth Bass		Largemouth Bass	
Age (years)	**Sample Size**	**% of Total**	**Sample Size**	**% of Total**
2	4	1.1	2	3.2
3	25	6.8	15	24.2
4	35	9.6	11	17.7
5	44	12.1	10	16.1
6	36	9.9	7	11.3
7	31	8.5	4	6.5
8	62	17.0	4	6.5
9	49	13.4	5	8.1
10	26	7.1	1	1.6
11	26	7.1	1	1.6
12	12	3.3	1	1.6
13	7	1.9	1	1.6
14	6	1.6	-	-
15	2	0.5	-	-

Recaptures of Tagged Bass

Recapture rates are based on the proportion of bass which were tagged, released and subsequently angled and reported.

Over a ten year (2006-2015) period, a total of 94 tagged fish were reportedly recaptured (Table 8). This represents a recapture rate of 4.9% for largemouth bass and 6.8% for smallmouth bass. Five smallmouth bass (tag numbers 78, 93, 95, 187 and 273) were recaptured on two occasions.

Table 8. Summary of recaptured bass tagged in Lake Simcoe, 2006-2010.

	Largemouth Bass	**Smallmouth Bass**	**Total**
Number of Fish Tagged	327	1,141	1,468
Number of Recaptures (% of Number Tagged)	16 (4.9%)	78 (6.8%)	94 (6.4%)
Mean (Range) Time from Tagging to Recapture	260.9 days (5 - 805, N=14)	383.6 days (3 - 1,883, N=69)	354.4 days (3 - 1,883, N=83)

The low number of recaptured fish was somewhat disappointing although perhaps not unexpected in a large lake with an abundant and healthy bass population. Similar observations of low recaptures have been reported for Lake of the Woods (B. Corbett, pers. comm.) and the Kawartha lakes (Roberge 2004).

The average length of time from release until recapture was 260.9 and 383.6 days for largemouth bass and smallmouth bass, respectively. The longest elapsed time until recapture was more than 5 years. The last recaptured bass was reported on September 20, 2014. No recaptured bass were reported in 2015.

Growth of Tagged Bass

Length at age for both largemouth and smallmouth bass from Lake Simcoe are presented in Table 9. Bass of both species first entered the competitive fishery at age 2. Smallmouth bass in this sample lived longer and were consistently larger than largemouth bass at any given age.

Lake Simcoe bass grow very quickly (see Appendix 5). This can probably be attributed to an abundant forage base including the invasive round goby (M. Ridgway pers. comm.).

Table 9. Total length (cm) at age for bass captured during competitive fishing events on Lake Simcoe, 2006-2010.

	Smallmouth Bass		Largemouth Bass	
Age	**Sample Size**	**Mean (Range)**	**Sample Size**	**Mean (Range)**
2	4	32.6 (30.0-35.0)	2	30.5 (-)
3	25	35.8 (30.2-39.4)	15	34.8 (31.5-38.5)
4	35	39.9 (31.9-44.0)	11	37.4 (34.4-40.7)
5	44	42.8 (38.0-47.0)	10	40.5 (34.5-49.1)
6	36	45.7 (40.2-49.8)	7	41.7 (39.5-44.2)
7	31	47.8 (45.0-51.4)	4	44.8 (40.4-47.8)
8	62	48.2 (39.7-59.6)	4	45.1 (43.5-47.0)
9	49	49.9 (45.5-53.6)	5	47.7 (45.5-49.0)
10	26	50.0 (46.0-53.5)	1	44.8 (-)
11	26	51.0 (48.5-54.8)	1	47.5 (-)
12	12	51.5 (49.2-54.1)	1	49.6 (-)
13	7	52.5 (50.5-53.9)	1	50.4 (-)
14	6	50.9 (47.1-54.2)	-	-
15	2	51.9 (50.0-53.8)	-	-

Movements of Tagged Bass

Seventy-five bass (79.8% of the number recaptured) had the exact location of recapture reported. Most of the fish for whom their location was reported had been recaptured near their area of original capture. Based on a review of bass movements from release sites at competitive fishing events, Wilde (2003) reported that only 14% of largemouth bass and 32% of smallmouth bass returned to their site of capture.

Several accounts of tagged and recaptured bass are worthy of mention.

On November 5, 2006, a smallmouth bass weighing 5.5 lb. was tagged (#78) at LeFroy Harbour. On November 4, 2007, the same fish was angled between Georgina Island and Sibbald Point. The bass was angled again on November 4, 2008 at Thorah Island.

A bass tagged (#1288) and released in Lake Couchiching on October 23, 2010 was angled at the north end of Six Mile Lake almost three years later. This represents a movement of approximately 70 km from its release site.

Finally, another bass (tag #1346) was angled during the 2010 Bass Pro Shop Lake Simcoe Open and released into Lake Couchiching on October 23, 2010. It was reportedly angled at Burrows Bay in June 2011. During that period of time the fish had moved north through Lake Couchiching, through the Trent-Severn locks at Sparrow Lake, through Sparrow Lake, bypassed the Big Chute making its way into Six Mile Lake, over Whites Falls into Burrows Bay of Gloucester Pool. The total distance travelled from the release site was estimated at approximately 78 km.

Results of "Fizzing" Experiments

Of 94 bass which were recaptured, 52 fish (55.3%) had been "fizzed" while 35 (37.2%) had not (Table 10). Three dead fish which had been "fizzed" were also recorded. While it is encouraging that more than half of the recaptured bass had been "fizzed" prior to their release, it is impossible to draw any comprehensive conclusions from such a small sample.

Table 10. Recaptured bass which had been "fizzed" prior to release.

"Fizzed"?	No. Recaptures (% of Total)
Yes	52 (55.3%)
No	35 (37.2%
Unknown	7 (7.4%)
Total	94 (99.9%)

During the course of this bass tagging project, Bass Pro Shops (BPS) in Vaughan, who maintained a large public viewing aquarium in their store, participated in the "fizzing" experiment by holding six live bass (3 "fizzed" and 3 "unfizzed") captured during the BPS Lake Simcoe Open. The fish were closely monitored by store staff. One fish died and it was immediately sent to the laboratory of Dr. Bruce Tufts at Queen's University, Kingston. Dr Tufts tried to determine cause of death and was able to ascertain that the air bladder was still functional and did not contribute to the death of the fish.

Future efforts to determine immediate and delayed mortality (from both “fizzed and “unfizzed” fish) will require a different program design which includes additional holding facilities to fully evaluate short and long term mortality with a greater sample size of fish.

Discussion

Comparison with Tagging Studies on Other Waters

Similar studies have been conducted on several other comparably-sized waters in Ontario and the northeastern United States. When compared to other waters, Lake Simcoe bass recapture rates were low (Table 11) particularly for largemouth bass.

Table 11. Recapture rates of bass tagged at selective competitive fishing events in North America and recaptured by anglers.

	Recapture Rate (Proportion of Tagged Fish)		
Waterbody (Jurisdiction)	**Smallmouth Bass**	**Largemouth Bass**	**Reference**
Amon Carter Reservoir (Texas)	-	21.9%	Hysmith et al. (2014)
Baker’s Pond (Illinois)	-	60.5%	Lewis and Flickinger (1967)
Grand River (Ontario)	12.0%	-	Bunt et al. (2002)
Great Pond (Massachusetts)	-	21.8%	Quinn (1989)
Illinois River (Illinois)	-	24.9%	Raibley et al. (1998)
Kawartha lakes (Ontario)	4.1%	10.7%	Babin (1995)
Kawartha lakes (Ontario)	0.3%	3.4%	Roberge (2004)
Lake Simcoe (Ontario)	**6.8%**	**4.9%**	**This study**
Lake Winnipesaukee (New Hampshire)	4.2%	26.4%	Gries (2009)
Lakes Mead and Mohave (Arizona-Nevada)	-	6.2-8.3%	Allan (undated)
Rainy Lake (Ontario)	12.8%	-	McLeod (2004)
Six Florida lakes (Florida)	-	22.9%	Dequine and Hall (1950)
Turtle Lake Chain (Ontario)	7.6%	-	Jackson (2001)

Tournament caught bass from Lake Simcoe ranged from 2-15 years in age (Table 12). They first recruited to the tournament fishery at 2 years which is younger than that documented from most other areas of the province.

In terms of growth, both largemouth and smallmouth bass length at age sampled during this project were consistently larger than fish sampled at events in other Ontario waters (Table 13 and Appendix 5).

Table 12. Ages of bass entered in selected competitive fishing events in North America.

	Mean (Range) in Years		
Waterbody (Jurisdiction)	**Smallmouth Bass**	**Largemouth Bass**	**Reference**
Eastern Lake Ontario (Ontario)	- (4 - 17)	- (2 - 18)	Zhu (2015)
Kawartha lakes (Ontario)	5.9 (3 - 12)	5.7 (3 - 12)	Roberge (2004)
Lake Minnetonka (Minnesota)	- (-)	5.1-5.6 (3 - 13)	Pereira et al. (2002)
Lake Simcoe (Ontario)	**7.4 (2 - 15)**	**6.9 (2 - 13)**	**This study**
Lake of the Woods (Ontario)	7.5 (2 - 21)	6.4 (2 - 17)	C. Martin (pers. comm.)
Marmion Lake (Ontario)	8.0 - 9.4 (-)	-	Godwin (2013)
Rainy Lake (Ontario)	9.1 (3 - 19)	-	D. McLeod (pers. comm.)
Thirteen Nova Scotia lakes	- (3 - 14)	-	MacMillan et al. (2002)

Table 13. Size of bass angled in selected competitive fishing events in North America. Kawartha lakes bass were reported in terms of fork length.

	Mean (Range) in Total Length (cm)		
Waterbody (Jurisdiction)	**Smallmouth Bass**	**Largemouth Bass**	**Reference**
Kawartha lakes (Ontario)	- (-)	36.8 (21.5 – 57.4)	Roberge (2004)
Lake Champlain (New York)	42.1 (-)	41.4 (-)	Maynard et al. (2013)
Lake Minnetonka (Minnesota)	- (-)	33.1-38.3 (-)	Pereira et al. (2002)
Lake Simcoe (Ontario)	**45.8 (30.2-59.6)**	**41.1 (30.5-54.0)**	**This study**
Lake of the Woods (Ontario)	38.9 (25.6 – 50.5)	39.3 (27.5 – 51.3)	C. Martin (pers. comm.)
Marmion Lake (Ontario)	43.3 – 44.0 (-)	- (-)	Godwin (2013)
Rainy Lake (Ontario)	41.5 (30.3-51.2)	-	D. McLeod (pers. comm.)

Management Implications

This five year project demonstrated that sampling bass at competitive fishing events is an efficient and cost-effective technique to monitor adult bass populations. A similar conclusion has been reached by several other researchers (MacMillan et al. 2002, Roberge 2004, Corbett et al. 2006, Pereira et al. 2002, Godwin 2013, Zhu 2015).

Based on the results of this project a number of recommendations are offered for the future:

Implement Similar Projects on an Ongoing Basis – Lake Simcoe is host for many competitive fishing events in a given year. These events offer a unique, cost-effective opportunity to obtain information from which to monitor the status of the adult bass population.

It is recommended that an ongoing program be established on a regular (i.e., every 3 - 5 years) basis to supplement information collected by the Lake Simcoe Fisheries Assessment Unit. Sampling should be done at sites around the lake in order to be representative of the lake's bass population. Personnel could include district (Aurora and Midhurst) staff, Lake Simcoe Fisheries Assessment Unit staff and volunteers from local BASS organizations and other interest groups.

Future projects could examine lakewide growth dynamics, estimate mortality rates and develop improved/enhanced reporting procedures.

If there is consensus on monitoring some of the province's largest waterbodies having diverse and long-running competitive fishing events, efforts should be made to simplify and standardize guidelines for field staff in order to ensure consistency and enable comparisons among different events and waterbodies.

Changes to Tournament Procedures - Rules and procedures at competitive fishing events need to recognize the behavioural and physiological differences between smallmouth bass and largemouth bass. These two species are known to differ in terms of sensitivity to anoxia (Furmisky et al. 2003), rate of recapture (Wilde 2003), post-release mortality (Bennett et al. 1989, Hartley and Moring 1995, Cooke et al. 2002) and ability to return to their capture site after displacement (Ridgway 2002, Wilde 2003, Griers 2009). Based on new and existing science (see Appendix 4), event organizers should be encouraged to modify any tournament procedures which would enhance survival and post-release dispersal.

Improve Promotional Efforts to Increase Returns of Tagged Bass – Tagging studies are often hampered by low tag returns from anglers (Roberge 2004, Maynard et al. 2013, Allan undated, B. Corbett pers. comm.). If similar tagging studies are implemented in the future, enhanced efforts should be directed to promote reporting of tagged fish caught by anglers. This could include a monetary reward or other similar incentives.

Investigate Management Uses for Tournament-Derived Information – Competitive fishing events potentially represent a unique and proactive opportunity to utilize catch records for monitoring and management of local bass populations. Other information, requiring less labour intensive collection techniques, should be investigated for its usefulness. For example, readily available information could potentially include mean aggregate weight of the winning catch or the annual aggregate weights from the top ten anglers.

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Literature Cited

Allan, R. C. undated. A biological assessment of largemouth bass tournaments in southern Nevada. Nevada Department of Fish and Game. Las Vegas, Nevada.

Babin, A. 1995. Post-release movements, relative to the release site, of displaced tournament angled walleye, largemouth bass and smallmouth bass in the Kawartha lakes. M.Sc. Thesis. Trent University. Peterborough, Ontario. 233 p.

Bennett, D. H., L. K. Dunsmoor, R. L. Rohrer and B. E. Reiman. 1989. Mortality of tournament-caught largemouth and smallmouth bass in Iowa lakes and reservoirs. California Fish and Game 75:20-26.

Brown, D. T., J. A. Rice, C. D. Suski and D. D. Aday. 2015. Dispersal patterns of coastal largemouth bass in response to tournament displacement. North American Journal of Fisheries Management 35:431-439.

Bunt, C. M., S. J. Cooke and D. P. Philipp. 2002. Mobility of riverine smallmouth bass related to tournament displacement and seasonal movements. p. 356-363 *In* D. P. Philipp and M. S. Ridgway [eds.]. Black Bass: Ecology and Management. American Fisheries Society Symposium 31. Bethesda, Maryland.

Carter, M. W., D. E. Shoup, J. M. Dettmers and D. H. Wahl. 2010. Effects of turbidity and cover on prey selectivity of adult smallmouth bass. Transactions of the American Fisheries Society 139:353-361.

Cooke, S. J., J. F. Schreer, D. H. Wahl and D. P. Philipp. 2002. Physiological impacts of catch and release angling practices on largemouth bass and smallmouth bass. American Fisheries Society Symposium 31:489-512.

Corbett, B. W., L. A. Parsons and J. L. McNulty. 2006. Practical applications of tournament data for fisheries management. p. 61-73 *In* S. J. Kerr [ed.]. Bass Research and Management II. Ontario Ministry of Natural Resources, Peterborough, Ontario.

Demers, E., R. S. McKinley, A. H. Weatherley and D. J. McQueen. 1996. Activity patterns of largemouth and smallmouth bass determined with electromyogram biotelemetry. Transactions of the American Fisheries Society 125:434-439.

Dequine, J. F. and C. E. Hall. 1950. Results of some tagging studies of the Florida largemouth bass (*Micropterus salmoides floridanus*). Transactions of the American Fisheries Society 79:155-156.

Funnell, E. 2012. The smallmouth bass in Ontario. Biodiversity Branch. Ontario Ministry of Natural Resources. Peterborough, Ontario.61 p. + appendices.

Furimsky, M., S. J. Cooke, C. D. Suski, Y. Wang and B. L. Tufts. 2003. Respiratory and circulatory response to hypoxia in largemouth bass and smallmouth bass: Implications for live release angling tournaments. Transactions of the American Fisheries Society 132:1065-1075.

Godwin, A. 2013. Summary of data from the Atikokan Bass Classic, 2008-2012. Ontario Ministry of Natural Resources. Atikokan, Ontario. 15 p.

Gries, G. 2009. Evaluation of black bass movement after bass tournament weigh-in at Ames Farm Inn, Lake Winnipesuakee, 2007-2008. Project F-50-R-25. New Hampshire Fish and Game Department. Concord, New Hampshire. 18 p.

Hartley, R. A. and J. M. Moring. 1995. Differences in mortality between largemouth and smallmouth bass caught in tournaments. North American Journal of Fisheries Management 15:666-670.

Hysmith, B. T., J. H. Moczygemba, R. A. Myers, M. T. Driscoll and M. S. Allen. 2014. Population level impacts of largemouth bass mortality associated with tournaments in a Texas reservoir. Journal of the Southeastern Association of Fish and Wildlife Agencies 1:98-102.

Jackson, B. 2001. Redistribution of smallmouth bass following release from a catch and release tournament on Turtle/Crowrock/Dashwa lakes. Ontario Ministry of Natural Resources. Atikokan, Ontario.

Kerr, S. J. 1999. A survey of competitive fishing events in Ontario. p. 7-12 *In* S. J. Kerr and C. H. Olver [eds.]. Competitive Fishing in Ontario Workshop Proceedings. Publication WP-01. Southcentral Science Section. Ontario Ministry of Natural Resources. Kemptville, Ontario. 107 p.

Kerr, S. J. 2001. A review of "fizzing" – A technique for swim bladder deflation. Fish and Wildlife Branch, Ontario Ministry of Natural Resources. Peterborough, Ontario.13 p.

Kerr, S. J. 2004. A 2004 survey of competitive fishing events in Ontario. Fish and Wildlife Branch., Ontario Ministry of Natural Resources. Peterborough, Ontario. 14 p. + appendices.

Kerr, S. J. 2009. A survey of 2008 competitive fishing events in Ontario. Fish and Wildlife Branch, Ontario Ministry of Natural Resources. Peterborough, Ontario. 9 p. + appendices.

Kerr, S. J. 2012. A survey of 2012 competitive fishing events in Ontario. Biodiversity Branch. Ontario Ministry of Natural Resources. Peterborough, Ontario. 8 p. + appendices.

Lewis, W. M. and S. Flickenger. 1967. Home range tendency of the largemouth bass (*Micropterus salmoides*). Ecology 48:1020-1023.

Liddle, G. and M. D. Moles. 2012. A comprehensive summary of Lake Simcoe's recreational fishery. Science and Information Branch Technical Report 2012-3. Ontario Ministry of natural Resources. Sutton, Ontario. 49 p.

MacCrimmon, H. R. and E. Skobe. 1970. The fisheries of Lake Simcoe. Fish and Wildlife Branch. Ontario Department of Lands and Forests. Toronto, Ontario. 140 p.

MacMillan, J. I., A. J. McNeill, R. G. Heighton and M. S. Ridgway. 2002. Life history characteristics of smallmouth bass populations in Nova Scotia based on tournament monitoring. American Fisheries Society Symposium 31:535-544

Maynard, G. A., T. B. Mihuc, M. H. Malchoff, D. Garneau and V. A. Sotola. 2013. Post tournament release movements of black bass in Lake Champlain. Technical Report No. 77. Lake Champlain basin program. Plattsburgh, New York. 43 p.

McLeod, D. 2004. Movement and survival of tournament displaced smallmouth bass (*Micropterus dolomieu*) in Rainy Lake, Ontario. District Report Series No. 62. Ontario Ministry of Natural Resources. Fort Frances, Ontario. 41 p.

Moles, M. D. 2010. A fish species list for lake Simcoe. Lake Simcoe Fisheries Assessment Unit Update 2010-1. Ontario Ministry of Natural Resources. Sutton, Ontario.

Nguyen, C., M-A. Gravel, A. Mapleston, K. C. Hanson and S. J. Cooke. 2009. The post-release behaviour and fate of tournament-caught smallmouth bass after “fizzing” to alleviate distended swim bladders. Fisheries Research 96:313-318.

Ontario Ministry of Environment and Climate Change (MOECC). 2015. Minister’s five year report on Lake Simcoe: To protect and restore the ecological health of the Lake Simcoe watershed. Queens Printer for Ontario. 52 p.

Pereira, D. L., M. G. Halverson, R. E. Ramsell and M. T. Drake. 2002. Changes in the largemouth bass fishery of Lake Minnetonka, Minnesota: Evidence from tournament monitoring. American Fisheries Society Special Symposium 31:513-524

Quinn, WS. P. 1989. Recapture of voluntary release largemouth bass. North American Journal of Fisheries Management 9:86-91.

Raibley, P. T., T. M. O’Hara, K. S. Irons, K. D. Blodgett and R. E. Sparks. 1998. Mark and recapture studies and angling impacts on largemouth bass in LaGrange and Peoria reaches or the Illinois |River. Reprint No. 98-R008. Illinois Natural History Survey. Havana, Illinois.

Ridgway, M. S. 2002. Movements, home range and survival estimation of largemouth bass following displacement. American Fisheries Society Symposium 31:525-533.

Ridgway, M. S. and M. Roberge. 2007. The tri-lakes bass project, 1999-2003. p. 79-82 *In* S. J. Kerr [ed.]. Bass Research and Management II. Ontario Ministry of Natural Resources, Peterborough, Ontario.

Ridgway, M. S. and B. J. Shuter. 1996. Effects of displacement in the seasonal movements and home range of smallmouth bass in Lake Opeongo. North American Journal of Fisheries Management 16:371-377.

Ridgway, M. S., B. J. Shuter, T. A. Middell and M. L. Gross. 2002. Spatial ecology and density dependent processes in smallmouth bass: The juvenile transition hypothesis. American Fisheries Society Symposium 31:47-60.

Roberge, M.D. 2004. Population ecology of largemouth bass in a large lake system through tournament angling. M.Sc Thesis. Trent University. Peterborough, Ontario. 103 p.

Schultz, R. D. 2003. Seasonal mortality of black bass in Kansas reservoirs. Project No. F-30-R. Kansas Department of Wildlife and Parks. Emporia, Kansas. 13 p.

Suski, C. D. and M. S. Ridgway. 2009. Seasonal patterns of depth selection in smallmouth bass. Journal of Zoology 279:119-128.

Van Lendeghem, M. M., D. H. Wahl and C. D. Suski. 2013. Temporal Variation in the Physiological Responses in Largemouth Bass following Small Club Angling Tournaments. Transactions of the American Fisheries Society 142:157-167.

Wegman, W. 2006. Lake Simcoe: A world class fishery – an angler's perspective. p. 7-12 *In* S. J. Kerr [ed.]. Bass Research and Management II. Ontario Ministry of Natural Resources, Aurora, Ontario. 82 p. + appendices.

Wilde, G. R. 2003. Dispersal of tournament caught bass. *Fisheries* 28:10-17.

Zhu, C. 2015. Age and growth of black bass in eastern Lake Ontario and the Bay of Quinte as sampled through competitive fishing events. M.Sc. Thesis. Queens University. Kingston, Ontario. 103 p.

Additional Reading

General References

Brown, T.G., Runciman B., S. Pollard, A. D. A. Grant and M. J. Bradford. 2009. Biological synopsis of smallmouth bass (*Micropterus dolomieu*). Canadian Manuscript Report Fisheries and Aquatic Sciences 2887:50 p.

Gilliland, E. R. 2002. Livewell operating procedures to reduce mortality of black bass during summer tournaments. p. 477-487 *In* D. P. Philipp and M. S. Ridgway [eds.]. Black Bass: Ecology, Conservation and Management. American Fisheries Society Symposium 31. Bethesda, Maryland.

Holbrook, J. A. 1975. Bass fishing tournaments. p. 408-414 *In* J. Clepper [ed.]. Black bass biology and management. Sport Fishing Institute. Washington, D. C.

McMillan, J. L., A. J. McNeill, R. G. Heighton and M. S. Ridgway. 2002. Life history characteristics of smallmouth bass populations in Nova Scotia based on tournament monitoring. American Fisheries Society Symposium 31:535-544.

Pereria, D. L., M. G. Halverson, R. E. Ramsell and M. T. Drake. 2002. Changes in the largemouth bass fishery of Lake Minnetonka: Evidence from tournaments. American Fisheries Society Symposium 31:513-524.

Quertermus, C. J. 1991. Use of bass club tournament results to evaluate relative abundance and fishing quality. American Fisheries Society Symposium 12:515-519.

Ridgway, M. S. 2000. Tips for tournaments: A summary of effects of competitive fishing events on bass. Fisheries Research Section. Ontario Ministry of Natural Resources. Peterborough, Ontario. 6 p.

Schramm, H. L. and R. C. Heidinger. 1998. Live release of bass: A guide for anglers and tournament organizers. Temessee Wildlife Resource Agency. Nashville, Tennessee.

Schramm, H. L. and A. J. Felder. 1999. What competitive fishing can do for fishery management. p. 350-356 *In* J. L. Cooper and R. H. Hamre [eds.]. Warmwater Fisheries Symposium1. General Technical Report RM-207. Forest Service. U. S. Department of Agriculture. Scottsdale, Arizona.

Thomas, E. R. 1999. Ontario's policy on competitive fishing events. p. 3-6 *In* S. J. Kerr [ed.]. Competitive Fishing in Ontario Workshop Proceedings. Southcentral Sciences Section, Ontario Ministry of Natural Resources. Kemptville, Ontario. 107 p.

Wilde, G. R., R. K. Reichers and R. B. Ditton. 1998. Differences in attitudes, fishing motives and demographic characteristics between tournament and nontournament black bass anglers in Texas. North American Journal of Fisheries Management 18:422-431.

Willis, D. W. and R. F. Hartman. 1986. The Kansas black bass tournament monitoring program. *Fisheries* 11:7-10.

Bass Tagging Studies

Cline, T. J., B. C. Weidel, J. F. Kitchell and J. R. Hodgson. 2012. Growth response of largemouth bass (*Micropterus salmoides*) to catch-and-release angling: A 27 year mark-recapture study. Canadian Journal of Fisheries and Aquatic Sciences 69:224-230.

Cooke, S. J., C. M. Bunt and R. S. McKinley. 1998. Derby determined vital statistics and trends of the smallmouth bass *(Micropterus dolomieu*) recreational fishery in the middle reaches of the Grand River, Ontario. Canadian Field Naturalist 112:451-458.

Cuerrier, J.P. 1943. Results of the tagging of black basses caught in the Châteauguay River, Quebec, since 1941. Canadian Biological Reviews 2:545-548.

Moody, H. L. 1960. Recaptures of adult largemouth bass from the St. Johns River, Florida. Transactions of the American Fisheries Society 89:295-300.

Barotrauma and Fizzing

Esseltine, K. R., C. D. Suski and B. L. Tufts. 2006. Physiological impacts of deep water angling on smallmouth bass. Unpublished Manuscript. Queens University. Kingston, Ontario.

Esseltine, K. R., M. B. Morissey, C. D. Suski and B. L. Tufts. 2007. Decompression issues for bass: Implications for angling and tournament events. p. 47-52 *In* S. J. Kerr [ed.]. Bass Research and Management in Ontario II Workshop Proceedings. Ontario Ministry of Natural Resources. Peterborough, Ontario. 82 p. + appendices.

Feathers, M. G. and A. E. Knable. 1983. Effects of depressurization upon largemouth bass. North American Journal of Fisheries Management 3:86-90.

Gravel, M. A. and S. J. Cooke. 2008. Severity of barotrauma influences the physiological status, post-release behaviour and fate of tournament caught smallmouth bass. North American Journal of Fisheries Management 28:607-617.

Lee, D. P. 1992. Gas bladder deflation of depressurized largemouth bass. North American Journal of Fisheries Management 12:662-664.

Manns, R. and S. Quinn. 2000. Fizzing bass. p. 14-15 *In* In-Fisherman. October-November Issue. Brainerd, Minnesota.

Morrisey, M. B., C. D. Suski, K. R. Esseltine and B. L. Tufts. 2005. Incidence and physiological consequences of decompression in smallmouth bass after live release tournaments. Transactions of the American Fisheries Society 124:1038-1047.

Shasteen, S. P. and R. J. Sheehan. 1997. Laboratory evaluation of artificial swim bladder deflation in largemouth bass: Potential benefits for catch and release fisheries. North American Journal of Fisheries Management 17:32-37.

Tufts, B. L. 2007. The physiological impacts of tournaments. p. 53-60 *In* S. J. Kerr [ed.]. Bass Research and Management in Ontario II Workshop Proceedings. Ontario Ministry of Natural Resources. Peterborough, Ontario. 82 p. + appendices.

Competitive Fishing References

Bryan, C. H., C. Dlugokenshi, D. Corkran, D. Hannon, D. Kendrick, C. L. Moffett, A. Mills, M. J. Reeff, R. Scott and B. Schupp. 1996. A manual for organizing and conducting bass tournaments. Bass Anglers Sportsman Society. 32 p.

Chapman, P. and W. V. Fish. 1983. Largemouth bass tournament catch results in Florida. Proceedings of the Annual Conference of Southeastern Fish and Wildlife Agencies 37:495-505.

Corbett, B. W. 1999. Kenora Bass International tournament: Opportunities for fisheries management. p. 51-60 *In* S. J. Kerr [ed.]. Competitive Fishing in Ontario Workshop Proceedings. Southcentral Sciences Section, Ontario Ministry of Natural Resources. Kemptville, Ontario. 107 p.

Duttweiler, M. W. 1985. Status of competitive fishing in the United States: Trends and state fisheries policies. *Fisheries* 10:5-7.

Guy, C. S., M. N. Burlingame, T. D. Mosher and D. D. Nygren. 1999. Exemption of bass tournaments from fishing regulations: An opinion survey. North American Journal of Fisheries Management 19:188-191.

Jackson, B. 2009. Analysis of smallmouth bass data from the Atikokan Bass Classic on Dashwa, Crowrock and Turtle lakes, 1994-2007. Ontario Ministry of Natural Resources. Atikokan, Ontario. 37 p.

Jackson, B. 2010. Summary of data from the Perch Lake bass challenge, 2008-2010. Ontario Ministry of Natural Resources. Atikokan, Ontario. 3 p.

Mathers, A., T. Lawrence and J. Hoyle. 1999. Competitive walleye angling in the Bay of Quinte. p. 75-78 *In* S. J. Kerr [ed.]. Competitive Fishing in Ontario Workshop Proceedings. Southcentral Sciences Section, Ontario Ministry of Natural Resources. Kemptville, Ontario. 107 p.

McLeod, D., B. Jackson and B. Corbett. 2012. Comparison of smallmouth bass tournaments in northwestern Ontario, 1995-2011. Ontario Ministry of Natural Resources. Fort Frances, Ontario. 4 p.

Mohr, L. C. 1999. Sport fish derbies in Lake Huron: Two case studies. p. 65-74 *In* S. J. Kerr [ed.]. Competitive Fishing in Ontario Workshop Proceedings. Southcentral Sciences Section, Ontario Ministry of Natural Resources. Kemptville, Ontario. 107 p.

Murray, A. 1999. Fishing for prizes: An introduction to competitive fishing events on Lake Erie and Lake St. Clair. p. 61-64 *In* S. J. Kerr [ed.]. Competitive Fishing in Ontario Workshop Proceedings. Southcentral Sciences Section, Ontario Ministry of Natural Resources. Kemptville, Ontario. 107 p.

Schramm, H. L., M. L. Armstrong, N. A. Funicelli, D. M. Green, D. P. Lee, R. E. Manns, B. D Taubert and S. J. Waters. 1991. The status of competitive sport fishing in North America. *Fisheries* 16:4-12.

Schramm, H. L. and K. M. Hunt. 2007. Issues, benefits and problems associated with fishing tournaments in the United States: A survey of fishery agency administrators. *Fisheries* 32:234-243.

Shupp, B. D. 1979. 1978 status of bass fishing tournaments in the United States. *Fisheries* 4:11-19.

Smith, I. 1999. Competitive fishing events for muskellunge in Canada: Experiences, practices and perspective from Muskies Canada. p. 91-97 *In* S. J. Kerr [ed.]. Competitive Fishing in Ontario Workshop Proceedings. Southcentral Sciences Section, Ontario Ministry of Natural Resources. Kemptville, Ontario. 107 p.

Stephen, J. L. 1997. Kansas black bass tournament monitoring. 1996 Annual Report. Kansas Department of Wildlife and Parks. Emporia, Kansas.

Suski, C. D., J. D. Kieffer, S. S. Killen and B. L. Tufts. 2007. Maintaining water quality during angling tournaments. p. 41-46 *In* S. J. Kerr [ed.]. Bass Research and Management II Workshop Proceedings. Ontario Ministry of Natural Resources. Peterborough, Ontario. 82 p. + appendices.

Wegman, W. 1999. Bass Anglers Sportsman Society (BASS): Organization and tournament ethics. p. 43-45 *In* S. J. Kerr [ed.]. Competitive Fishing in Ontario Workshop Proceedings. Southcentral Sciences Section, Ontario Ministry of Natural Resources. Kemptville, Ontario. 107 p.

Wilde, G. R., D. W. Strickland, K. G. Ostrand and M. I. Muoneke. 1986. Characteristics of Texas black bass fishing tournaments. North American Journal of Fisheries Management 18:972-977.

Impacts of Competitive Fishing Activities

Allen, M. S., M. W. Rogers, R. A. Myers and W. M. Bivin. 2004. Simulated impacts of tournament associated mortality on largemouth bass fisheries. North Americana Journal of Fisheries Management 24:1252-1261.

Bryan, H. 1980. Impacts of professional bass tournaments on orientation to fishing and disposition of fish. Sport Fishing Institute. Washington, D. C.

Cooke, S. J , J. F. Schreer, D. H. Wahl and D. P. Philipp. 2002. Physiological impacts of catch-and-release angling practices on largemouth bass and smallmouth bass. p. 489-512 In D. P. Philipp and M. S. Ridgway [eds.]. Black Bass: Ecology Conservation and Management. American Fisheries Society Symposium 31. Bethesda, Maryland.

Driscoll, M. T., J. L. Smith and R. A. Myers. 2007. Impacts of tournaments on largemouth bass populations at Sam Rayburn Reservoir, Texas. North American Journal of Fisheries Management 27: 425-433.

Edwards, G. P., R. M. Neumann, R. P. Jacobs and E. B. O'Donnell. 2004. Impacts of small club tournaments on black bass populations in Connecticut and the effects of regulation exemptions. North American Journal of Fisheries Management 24:811-821.

Grant, R. E. 1999. Potential impacts and concerns associated with competitive fishing events: A literature review. p. 13-26 *In* S. J. Kerr [ed.]. Competitive Fishing in Ontario Workshop Proceedings. Southcentral Sciences Section, Ontario Ministry of Natural Resources. Kemptville, Ontario. 107 p.

Hayes, D. B., W. W. Taylor and H. I. Schramm. 1995. Predicting the biological impact of competitive fishing. North American Journal of Fisheries Management15:457-472

Kamke, K. K and R. Bruch. 1991. A discussion of tournament mortality and associated problems on the lake Winnebago system. Wisconsin Department of Natural Resources. Oshkosh, Wisconsin.

Suski, C. D., S. S. Killen, M. B. Morrissey, S. G. Lund and B. L. Tufts. 2003. Physiological changes in largemouth bass caused by live release angling tournaments in southeastern Ontario. North American Journal of Fisheries Management 23:760-769.

Suski, C. D., S. S. Killen, S. J. Cooke, J. D. Kieffer, D. P. Philipp and B. L. Tufts. 2004. Physiological significance of the weigh-in during live release angling tournaments for largemouth bass. Transactions of the American Fisheries Society 133:1291-1303.

Suski, C. D S. S. Killlen, J. D. Kieffer and B. L. Tufts. 2006. Physiological changes in largemouth bass caused by live-release angling tournaments in southeastern Ontario. North American Journal of Fisheries Management 23:760-769.

Taillon, D. and D. McLeod. 2004. Effects of competitive fishing events on smallmouth bass (*Micropterus dolomieu)*: A literature review. District Report Series No. 55. Ontario Ministry of Natural Resources. Fort Frances, Ontario. 35 p.

Twiss, M. and J. Chevalier. 1999. Compliance issues at competitive fishing events. p. 35-41 *In* S. J. Kerr [ed.]. Competitive Fishing in Ontario Workshop Proceedings. Southcentral Sciences Section, Ontario Ministry of Natural Resources. Kemptville, Ontario. 107 p.

Post-Release Mortality

Drumm, D. 1990. Survival of tournament caught bass for two competitive fishing events on Rice lake, Ontario, July – August 1989. M. Sc. thesis. University of Waterloo. Waterloo, Ontario. 35 p.

Gilliland, E. R. 2002. Livewell operating procedures to reduce mortality of black bass during summer tournaments. American Fisheries Society Special Symposium 31:477-487.

Kwak, T. J. and M. G. Henry. 1995. Largemouth bass mortality and related causal factors during live release fishing tournaments on a large Minnesota lake. North American Journal of Fisheries Management 15:621-630.

Meals, K. O. and L. E. Miranda. 1994. Size-related mortality of tournament caught largemouth bass. North American Journal of Fisheries Management 14:460-463.

Muoneke, M. I. and W. M. Childress. 1994. Hooking mortality: A review for recreational fisheries. Reviews in Fisheries Science 14:131-139.

Neal, J. W. and D. Lopez-Clayton. 2001. Mortality of largemouth bass during catch-and-release tournaments in a Puerto Rico reservoir. North American Journal of Fisheries Management 21:834-842.

Ostrand, K. G., G. R. Wilde, D. W. Stickland and M. I. Muoneke. 1999. Initial mortality in Texas black bass fishing tournaments. North American Journal of Fisheries Management 19:1124-1128.

Plumb, J. A., J. M. Grizzle and W. A. Rogers. 1988. Survival of caught and released largemouth bass after containment in live wells. North American Journal of Fisheries Management 8:325-328.

Schramm, H. L., P. J. Haydt and N. A. Bruno. 1985. Survival of tournament caught largemouth bass in two Florida lakes. North American Journal of Fisheries Management 5:606-611.

Schramm, H. L., P. J. Hyadt and K. A. Portier. 1987. Evaluation of release, post release and total mortality of largemouth bass caught during tournaments in two Florida lakes. North American Journal of Fisheries Management 7:394-402.

Seidensticker, E. P. 1977. Mortality of largemouth bass for two tournaments utilizing a “don’t kill your catch” program. p. 99-102 *In* R. A. Barnhart and T. D. Roelofs [eds.]. A National Symposium on Catch and Release Fishing. |||Humboldt State Unviersity. Arcata, California.

Steeger, T. M., J. M. Grizzle, K. Weathers and M. Newman. 1994. Bacterial diseases and mortality of angler caught largemouth bass released after tournaments on Walter F. George Reservoir, Alabama-Georgia. North American Journal of Fisheries Management 14:435-441.

Tanner, F. F. and D. K. Whitehurst. 1988. Mortality study of black bass caught during the 1988 BASS Masters Classic, James River, Virginia. Virginia Department of Game and Inland Fisheries. Henrico, Virginia.

Weathers, K. C. and M. J. Newman. 1997. Effects of organizational procedures on mortality of largemouth bass during summer tournaments. North American Journal of Fisheries Management 17:131-135.

Wilde, G. R., C. E. Shavlik and K. L. Page. 2002. Initial mortality of black bass in B.A.S.S. events. North American Journal of Fisheries Management 22:950-954.

Wilde, G. R., D. H. Larson, W. H. Redwell and G. R. Wilde III,. 2002. Mortality of black bass in three Texas fishing tournaments. Texas Journal of Science 54:125-132.

Post-Release Movements

Beam, J. D. 1990. Daily and seasonal movement, as related to habitat use, of smallmouth bass in the Huron River, Michigan. M.S. Thesis, University of Michigan, Ann Arbor, Michigan.

Blake, L. M. 1981. Movement of tournament caught and released bass. New York Fish and Game Journal 28:115-117.

Cole, M. B., and J. R. Moring. 1997. Relation of adult size to movements and distribution of smallmouth bass in a central Maine lake. Transactions of the American Fisheries Society 126:815–821.

Garren, D. A., J. J. Ney, and P. E. Bugas, Jr. 2001. Seasonal movement and distribution of smallmouth bass in a Virginia impoundment. Proceedings of the Annual Conference of Southeastern Association Fish and Wildlife Agencies 55:165–174.

Gerber, G. P., and J. M. Haynes. 1988. Movements and behavior of smallmouth bass*, Micropterus dolomieui*, and rock bass, *Ambloplites rupestris,* in southcentral Lake Ontario and two tributaries. Journal of Freshwater Ecology 4:425–439.

Gilliland, E. R. 1999. Dispersal of black bass following tournament release in an Oklahoma reservoir. Proceedings of the Annual Conference of Southeastern Fish and Wildlife Agencies. 53:144-149.

Hasler, A. D. and W. J. Wisby. 1958. The return of displaced largemouth bass and green sunfish to a home area. Ecology 39:289-293.

Healey, T. P. 1990. Movement and survival of tournament caught black bass at Shasta Lake. California Fish and Game 76:36-42.

Kaemingk, M., T. Galarowicz, J. Clevenger and D. Clapp. 2011. Movement of smallmouth bass within the Beaver Island Archipelago, northern Lake Michigan, Journal of Great Lakes Research 37:625-631.

Kraai, J. E., C. R. Munger, and W. E. Whitworth. 1991. Home range, movements, and habitat utilization of smallmouth bass in Meredith Reservoir, Texas. p. 44–48 *In* D.C. Jackson [ed.]. Proceedings of the First International Smallmouth Bass Symposium, Mississippi Agricultural and Forestry Experimental Station, Mississippi State University. Starkville, Mississippi.

Langhurst, R. W., and D. L. Schoenike. 1990. Seasonal migration of smallmouth bass in the Embarrass and Wolf Rivers, Wisconsin. North American Journal of Fisheries Management 10:224–227.

Lantz, K. E. and D. C. Carver. 1975. Dispersal of tournament caught bass from a central release point. Proceedings of the Annual Conference of Southeastern Association of Game and Fish Commissioners 29:115-118.

Pearson, J. 2002. Movements of displaced largemouth bass in two Indiana natural lakes. Lake and Reservoir Management 18:257-262.

Richardson-Heft, C. A., A. A. Heft, L. Fewlass and S. B. Brandt. 2000. Movement of largemouth bass in northern Chesapeake Bay: Relevance to sport fishing tournaments. North American Journal of Fisheries Management 20:493-501.

Ricks, B. R. and M. J. Maceina. 2008. Effects of catch-and-release tournament fishing on dispersal and population metrics of black bass in Lake Martin, Alabama. p. 293-308 *In* M. S. Allen, S. M. Sammons and M. J. Maceina [eds.]. Balancing fisheries management and water uses for impounded river systems. American Fisheries Symposium 62. Bethesda, Maryland.

Seibold, S. E. 1991. Homing behaviour of displaced largemouth bass (*Micropterus salmoides*) in the tidal Potomac River. M.Sc. Thesis. University of Maryland. College Park, Maryland.

Sparrevohn, C. R., A. Nielsen and J. G. Stɸttrup. 2002. Diffusion of fish from a single release point. Canadian Journal of Fisheries and Aquatic Sciences 59:844-853.

Stang, D. L., D. M. Green, R. M. Klindt, T. L. Chiotti and W. W. Miller. 1996. Black bass movements after release from fishing tournaments in four New York waters. American Fisheries Society Symposium 16:163-171.

Straw, M. 2011. The parade of winter smallmouths. In-Fisherman. July 22 issue. Brainerd, Minnesota.

Todd, B. L., and C. F. Rabeni. 1989. Movement and habitat use by stream-dwelling smallmouth bass. Transactions of the American Fisheries Society 118:229–242.

Van Arnum, C., Gunderson, J., Buynak, G.L., and Ross, J.R. 2004. Movement of smallmouth bass in Elkhorn Creek Kentucky. North American Journal of Fisheries Management 24:311-315.

Wilde, G. R. and L. J. Paulson. 2003. Movement and dispersal of tournament caught largemouth bass in Lake Mead, Arizona-Nevada. Journal of Freshwater Ecology 18:339-342.

Glossary

Barotrauma - Physical damage to body tissues caused by a difference in pressure between a gas space inside, or in contact with the body, and the surrounding fluid. Barotrauma typically occurs when the organism is exposed to a significant change in ambient pressure such as a fish being quickly reeled up from deep water.

Competitive Fishing – Any organized event in which a group of anglers fish for inducements (i.e., prizes, awards, recognition, etc.) in addition to the catch or satisfaction of catching fish. Competitive fishing events include derbies, tournaments and contests.

Fizzing - A procedure to deflate gas from the distended swim bladder of a fish. The procedure involves insertion of a hypodermic syringe through the body wall and into the swim bladder.

Appendix 1. Records of Fish Tagging Activities at Competitive Fishing Events on Lake Simcoe, 2006-2010.

Year (Date)	Event	Site	Number of Fish Tagged: Largemouth Bass	Number of Fish Tagged: Smallmouth Bass	Number of Fish Tagged: Total	Number of Fish "Fizzed"
2006						
July 21	Aurora Bassmasters Club Tournament	Cook's Bay	29	11	40	0
Oct. 15	Rick White Memorial	Cook's Bay	2	27	29	9
Nov. 5	Crackle Cup	LeFroy Harbour	0	57	57	55
2006 Summary	**3 events**	**-**	**31**	**95**	**126**	**64**

Year (Date)	Event	Site	Number of Fish Tagged: Largemouth Bass	Number of Fish Tagged: Smallmouth Bass	Number of Fish Tagged: Total	Number of Fish "Fizzed"
2007						
July 31	Aurora Bassmaster Club Tournament	Cook's Bay	11	0	11	0
Sept. 16	Aurora Bassmaster Club Tournament	Cook's Bay	21	7	28	0
Oct. 21	Barrie Basssmaster Club Tournament	Kempenfelt Bay	0	44	44	19
Oct. 27	Bass Pro Shops Lake Simcoe Open	Lakewide	0	115	115	102
2007 Summary	**4 events**	**-**	**32**	**166**	**198**	**121**

Number of Fish Tagged

Year (Date)	Event	Site	Largemouth Bass	Smallmouth Bass	Total	Number of Fish "Fizzed"
2008						
Sept. 28	Aurora Bassmaster Club Tournament	Cook's Bay	17	0	17	3
Oct. 19	Barrie Bassmasters Open	Kempenfelt Bay	1	35	36	17
Oct. 25	Bass Pro Shop Lake Simcoe Open	Sutton	16	92	108	97
2008 Summary	**3 events**	**-**	**34**	**127**	**161**	**117**

Number of Fish Tagged

Year (Date)	Event	Site	Largemouth Bass	Smallmouth Bass	Total	Number of Fish "Fizzed"
2009						
July 22-24	Eastern Division BASS Federation National Championship	Lakes Simcoe and Couchiching	168	234	402	0
Sept. 19	Aurora Bassmasters Club Tournament	Cook's Bay	21	5	26	3
Oct. 18	Barrie Bassmasters Lake Simcoe Open	Lake Simcoe	0	33	33	17
Oct. 24	Bass Pro Shop Lake Simcoe Open	Lakes Simcoe and Couchiching	1	148	149	102
2009 Summary	**4 events**	**-**	**190**	**420**	**610**	**122**

Number of Fish Tagged

Year (Date)	Event	Site	Largemouth Bass	Smallmouth Bass	Total	Number of Fish "Fizzed"
2010						
Sept. 12	Aurora Bassmasters Club Tournament	Cook's Bay	30	0	30	0
Oct. 3	Aurora Bassmasters Club Tournament	Cook's Bay (Pasedena Marina)	4	28	32	3
Oct. 17	Barrie Bassmasters Simcoe Open	Kempenfelt Bay	1	56	57	20
Oct. 23	Bass Pro Shops Lake Simcoe Open	Lakes Simcoe and Couchiching	5	232	237	234
Oct. 30	Tufts "Fizzing" Experiment	Kempenfelt Bay	0	17	17	3
2010 Summary	**5 Events**	**-**	**40**	**333**	**373**	**260**

Appendix 2. Lengths of Bass Captured at Competitive Fishing Events on Lake Simcoe, 2006-2010.

		Number of Fish Measured		Mean Total Length (cm)		Number of Bass ≥ 50 cm	
Event	Year(s) Sampled	Smallmouth Bass	Largemouth Bass	Smallmouth Bass	Largemouth Bass	Smallmouth Bass	Largemouth Bass
Aurora Bassmasters Club	2006	11	29	45.1	41.2	0	3
Tournament	2007 (2)	7	32	40.8	40.5	1	1
	2008	0	17	-	39.2	0	0
	2009	5	21	33.0	39.6	0	0
	2010 (2)	28	34	42.9	39.1	5	0
Barrie Bassmasters Club	2007	44	0	45.1	-	11	0
Tournament	2008	35	1	47.8	47.8	9	0
	2009	33	0	45.5	-	9	0
	2010	56	1	46.4	48.1	9	
Rick White Memorial	2006	27	2	45.6	43.8	2	0
Crackle Cup	2006	57	0	47.2	-	18	0
Bass Pro Shops Lake Simcoe	2007	114	0	46.0	-	30	0
Open	2008	92	16	47.1	39.8	33	0
	2009	148	1	47.7	37.0	49	0
	2010	232	5	46.3	42.1	70	0
BASS Federation National Championship (Eastern Division)	2009	234	168	43.9	42.0	38	1

Appendix 3. Weights or Bass Captured at Competitive Fishing Events on Lake Simcoe, 2006-2010.

Event	Year(s) Sampled	Number of Fish Weighed		Mean Total Weight (kg)		Number of Bass ≥ 2.5 kg	
		Smallmouth Bass	Largemouth Bass	Smallmouth Bass	Largemouth Bass	Smallmouth Bass	Largemouth Bass
Aurora Bassmasters Club	2006	0	0	-	-	-	-
Tournament	2007 (2)	7	32	1.4	1.3	0	0
	2008	0	17	-	1.0	0	0
	2009	5	21	1.1	1.4	0	0
	2010 (2)	2	30	2.5	1.2	1	1
Barrie Bassmasters Club	2007	44	0	1.9	-	6	0
Tournament	2008	33	1	2.0	2.0	10	0
	2009	33	0	1.9	-	4	0
	2010	56	1	2.0	1.9	8	0
Rick White Memorial	2006	27	2	1.7	1.4	2	0
Crackle Cup	2006	57	0	1.9	-	9	0
Bass Pro Shops Lake Simcoe	2007	113	0	1.9	-	24	0
Open	2008	92	15	1.9	1.1	19	0
	2009	147	1	2.6	1.3	92	0
	2010	107	3	2.0	1.4	43	0
BASS Federation National Championship (Eastern Division)	2009	233	165	1.6	1.4	17	3

Appendix 4. Records of Tagged Bass which were Recaptured from Lakes Simcoe and Couchiching, 2006-2010.

		Tagging Information		Recapture Information			
Tag Number	**Bass Species**	**Date**	**Location**	**Date**	**Location**	"Fizzed"	**Elapsed Time (days)**
41	Smallmouth	Oct. 15, 2006	Lake Simcoe (Cook's Bay)	July 9, 2008	Lake Simcoe (McRae Shoal)	No	643
72	Smallmouth	Nov. 5, 2006	Lake Simcoe (LeFroy Harbour)	July 31, 2007	Lake Simcoe (Thorah Island)	Yes	268
78	Smallmouth	Nov. 5, 2006	Lake Simcoe (LeFroy Harbour)	Nov. 4, 2007	Lake Simcoe (Between Georgina and Sibbald)	Yes	364
				Nov. 4, 2008	Lake Simcoe (Thorah Island)	Yes	729
81	Smallmouth	Nov. 5, 2006	Lake Simcoe (LeFroy Harbour)	July 1, 2007	Lake Simcoe (Cook's Bay)	No	238
84	Smallmouth	Nov. 5, 2006	Lake Simcoe (LeFroy Harbour)	Nov. 14, 2006	Lake Simcoe (Little Cedar Point)	Yes	9
87	Smallmouth	Nov. 5, 2006	Lake Simcoe (LeFroy Harbour)	Nov. 8, 2009	Lake Simcoe (Little Cedar Point)	Yes	1,099
93	Smallmouth	Nov. 5, 2006	Lake Simcoe (LeFroy Harbour)	June 27, 2007	Lake Simcoe (McGinnis Point)	Yes	207
				August, 2008	Lake Simcoe (Strawberry Island)	Yes	-
94	Smallmouth	Nov. 5, 2006	Lake Simcoe (LeFroy Harbour)	August (?)	Lake Simcoe (Strawberry Island)	Yes	-

Tag Number	Bass Species	Date	Location	Date	Location	"Fizzed"	Elapsed Time (days)
95	Smallmouth	Nov. 5, 2006	Lake Simcoe (LeFroy Harbour)	July 18, 2007	Lake Simcoe (Shoal between Georgina and Thorah Islands)	Yes	255
				August, 2008	Lake Simcoe (Strawberry Island)	Yes	-
98	Smallmouth	Nov. 5, 2006	Lake Simcoe (LeFroy Harbour)	Sept. 7, 2007	Lake Simcoe (Orillia)	Yes	306
100	Smallmouth	Nov. 5, 2006	Lake Simcoe (LeFroy Harbour)	July 8, 2007	Lake Simcoe (Innisfil)	No	244
111	Smallmouth	Nov. 5, 2006	Lake Simcoe (LeFroy Harbour)	Sept. 22, 2007	Lake Simcoe (Kempenfelt Bay)	Yes	321
122	Smallmouth	Nov. 5, 2006	Lake Simcoe (LeFroy Harbour)	July 6, 2008	Lake Simcoe (Willow Beach)	Yes	609
126	Smallmouth	Nov. 5, 2006	Lake Simcoe (LeFroy Harbour)	June 30, 2007	Lake Simcoe (Snake Island)	Yes	603
127	Largemouth	July 31, 2007	Lake Simcoe (Cook's Bay)	August 14, 2007	Lake Simcoe (Cook's Bay)	No	15
135	Largemouth	July 13, 2007	Lake Simcoe (Cook's Bay)	August 5, 2007	Lake Simcoe (Cook's Bay)	?	23
160	Smallmouth	Sept. 16, 2007	Lake Simcoe (Cook's Bay)	July 9, 2008	Lake Simcoe (Thorah Island)	Yes	297
168	Smallmouth	Oct. 21, 2007	Lake Simcoe (Kempenfelt Bay)	Nov. 16, 2007	Lake Simcoe (Kempenfelt Bay)	Yes	26
170	Smallmouth	Oct. 21, 2007	Lake Simcoe (Kempenfelt Bay)	July 4, 2008	Lake Simcoe (Kempenfelt Bay	Yes	257

Tag Number	Bass Species	Date	Location	Date	Location	"Fizzed"	Elapsed Time (days)
172	Smallmouth	Oct. 21, 2007	Lake Simcoe (Kempenfelt Bay)	July 8, 2008	Lake Simcoe (Kempenfelt Bay)	Yes	252
179	Smallmouth	Oct. 21, 2007	Lake Simcoe (Kempenfelt Bay)	Nov. 4, 2007	Lake Simcoe (Kempenfelt Bay)	Yes	14
187	Smallmouth	Oct. 21, 2007	Lake Simcoe (Kempenfelt Bay)	July 9, 2008	Lake Simcoe (Between Kempenfelt Bay and Oro)	No	253
194	Smallmouth	Oct. 21, 2007	Lake Simcoe (Kempenfelt Bay)	July 23, 2009	Lake Simcoe (North end)	No	641
206	Smallmouth	Oct. 21, 2007	Lake Simcoe (Kempenfelt Bay)	Nov. 25, 2007	Lake Simcoe (Little Cedar Point)	Yes	35
216	Smallmouth	Oct. 27, 2007	Lake Simcoe	July, 2008	Lake Simcoe	Yes	-
219	Smallmouth	Oct. 27, 2007	Lake Simcoe	Nov. 6, 2008	Lake Simcoe (Kempenfelt Bay)	Yes	376
230	Smallmouth	Oct. 27, 2007	Lake Simcoe (Georgina Island)	May 15, 2008	Lake Simcoe (Beaverton Harbour)	Yes	201
269	Smallmouth	Oct. 27, 2007	Lake Simcoe (Georgina Island)	Oct. 30, 2007	Lake Simcoe (Georgina Island)	Yes	3
270	Smallmouth	Oct. 27, 2007	Lake Simcoe (Georgina Island)	June 5, 2008	Lake Simcoe (Island Grove)	Yes	252

Tag Number	Bass Species	Date	Location	Date	Location	"Fizzed"	Elapsed Time (days)
272	Smallmouth	Oct. 27, 2007	Lake Simcoe (Georgina Island)	June 5, 2008	Lake Simcoe (Island Grove)	Yes	252
				June 29, 2008	Lake Simcoe (Beaverton)	Yes	266
273	Smallmouth	Oct. 27, 2007	Lake Simcoe (Georgina Island)	June 6, 2008	Lake Simcoe (Island Grove)	Yes	192
				June 27, 2008	Lake Simcoe (Island Grove)	Yes	213
283	Smallmouth	Oct. 27, 2007	Lake Simcoe (Georgina Island)	Nov. 1, 2009	Unknown	Yes	736
285	Smallmouth	Oct. 27, 2007	Lake Simcoe	May 15, 2008	Lake Simcoe (Beaverton Harbour)	Yes	201
340	Smallmouth	Oct. 19, 2008	Lake Simcoe (Kempenfelt Bay)	Nov. 15, 2009	Lake Simcoe (Kempenfelt Bay)	No	392
348	Smallmouth	Oct. 19, 2008	Lake Simcoe (Kempenfelt Bay)	Oct. 29, 2009	Lake Simcoe (Kempenfelt Bay)	Yes	375
349	Smallmouth	Oct. 19, 2008	Lake Simcoe (Kempenfelt Bay)	Nov. 8, 2008	Lake Simcoe (Kempenfelt Bay)	Yes	385
354	Smallmouth	Oct. 19, 2008	Lake Simcoe (Kempenfelt Bay)	Oct. 30, 2008	Lake Simcoe (Kempenfelt Bay)	Yes	11
358	Smallmouth	Oct. 19, 2008	Lake Simcoe (Kempenfelt Bay)	Nov. 11, 2008	Lake Simcoe (Kempenfelt Bay)	Yes	389
366	Smallmouth	Oct. 19, 2008	Lake Simcoe (Kempenfelt Bay)	Oct. 30, 2011	Lake Simcoe (Kempenfelt Bay)	No	1,106

Tag Number	Bass Species	Date	Location	Date	Location	"Fizzed"	Elapsed Time (days)
371	Smallmouth	Oct. 19, 2008	Lake Simcoe (Kempenfelt Bay)	Nov. 25, 2008	Lake Simcoe (Kempenfelt Bay)	No	37
372	Smallmouth	Oct. 19, 2008	Lake Simcoe (Kempenfelt Bay)	Aug. 4, 2009	Lake Simcoe (Kempenfelt Bay)	No	289
408	Largemouth	Oct. 25, 2008	Lake Simcoe (Sutton)	Oct. 1, 2009	Lake Simcoe (Georgina Island)	Yes	340
450	Smallmouth	Oct. 25, 2008	Lake Simcoe (Sutton)	July 24, 2009	Lake Simcoe (North end)	Yes	272
462	Smallmouth	Oct. 25, 2008	Lake Simcoe (Sibbald Point)	Nov. 1, 2009	Lake Simcoe (Kempenfelt Bay)	Yes	372
466	Smallmouth	Oct. 25, 2008	Lake Simcoe (Sutton)	Nov. 16, 2012	Lake Simcoe (Mara Point)	Yes	1,482
490	Smallmouth	July 22, 2009	Lake Couchiching	Aug. 11, 2009	Lake Couchiching	No	20
498	Smallmouth	July 22, 2009	Lake Couchiching	July 13, 2010	Lake Simcoe (NE shore)	No	356
502	Smallmouth	July 22, 2009	Lake Couchiching	Sept. 12, 2009	Lake Couchiching	No	52
544	Largemouth	July 22, 2009	Lake Couchiching	July 28, 2010	Lake Couchiching	No	371
587	Smallmouth	July 23, 2009	Lake Couchiching	Unknown	Unknown	?	-
613	Largemouth	July 23, 2009	Lake Couchiching	Sept. 27, 2011	Atherly Narrows	No	796

Tag Number	Bass Species	Date	Location	Date	Location	"Fizzed"	Elapsed Time (days)
658	Largemouth	July 23, 2009	Lake Couchiching	Aug. 25, 2009	Lake Couchiching (Orillia)	No	33
696	Smallmouth	July 24, 2009	Lake Couchiching	Oct. 29, 2009	Lake Simcoe (Kempenfelt Bay)	No	36
699	Smallmouth	July 24, 2009	Lake Couchiching	Aug. 2009	Unknown	?	-
722	Largemouth	July 24, 2009	Lake Couchiching	July 3, 2010	Lake Couchiching	No	344
723	Largemouth	July 24, 2009	Lake Couchiching	Aug. 17, 2009	Lake Couchiching	No	24
727	Smallmouth	July 24, 2009	Lake Couchiching	Unknown	Unknown	?	-
740	Largemouth	July 24, 2009	Lake Couchiching	July 15, 2011	Lake Couchiching (Big Chief Island)	No	561
778	Largemouth	July 24, 2009	Lake Couchiching	October 7, 2011	Lake Couchiching (Big Chief Island)	No	805
823	Largemouth	July 24, 2009	Lake Couchiching	Sep. 26, 2009	Atherly Narrows	No	64
828	Smallmouth	July 24, 2009	Lake Couchiching	Sept. 20, 2014	Lake Couchiching (north end)	?	1,883
830	Largemouth	July 24, 2009	Lake Couchiching	Sep. 12, 2009	Lake Couchiching	?	5
850	Smallmouth	July 24, 2009	Lake Couchiching	July 31, 2009	Lake Couchiching	No	7
859	Largemouth	July 24, 2009	Lake Couchiching	July 31, 2009	Lake Couchiching (Orillia)	No	7

Tag Number	Bass Species	Date	Location	Date	Location	"Fizzed"	Elapsed Time (days)
867	Largemouth	Sept. 19, 2009	Lake Simcoe (Cook's Bay)	Aug., 2011	Lake Simcoe (Cook's Bay)	No	-
907	Smallmouth	Oct. 18, 2009	Kempenfelt Bay	Oct. 18, 2010	Lake Simcoe	No	365
964	Smallmouth	Oct. 24, 2009	Lake Couchiching	Aug. 17, 2010	Lake Simcoe	No	297
1007	Smallmouth	Oct. 24, 2009	Lake Couchiching	Nov. 8, 2011	Lake Simcoe (Beaverton)	Yes	746
1065	Smallmouth	Oct. 24, 2009	Lake Couchiching	Oct. 29, 2011	Lake Simcoe (Kempenfelt Bay)	No	736
1100	Largemouth	Sep. 12, 2010	Lake Simcoe (Cook's Bay)	June 4, 2011	Lake Simcoe (Cook's Bay)	No	265
1103	Largemouth	Sep. 12, 2010	Lake Simcoe (Cook's Bay)	July, 2011	Lake Simcoe	Yes	-
1107	Smallmouth	Oct. 3, 2010	Lake Simcoe (Cook's Bay)	July 7, 2011	Lake Simcoe	No	278
1127	Smallmouth	Oct. 3, 2010	Lake Simcoe (Cook's Bay)	July 14, 2011	Lake Simcoe	No	285
1146	Smallmouth	Oct. 17, 2010	Lake Simcoe (Kempenfelt Bay)	Aug. 2, 2011	Lake Simcoe (NE shore)	No	289
1156	Smallmouth	Oct. 17, 2010	Lake Simcoe (Kempenfelt Bay)	Unknown	Unknown	No	-
1233	Smallmouth	Oct. 23, 2010	Lake Couchiching	July 7, 2011	Lake Simcoe	Yes	257
1239	Smallmouth	Oct. 23, 2010	Lake Couchiching	Oct. 20, 2012	Lake Simcoe (North end)	Yes	727

Tag Number	Bass Species	Date	Location	Date	Location	"Fizzed	Elapsed Time (days)
1267	Smallmouth	Oct. 23, 2010	Lake Couchiching	June, 2012	Lake Simcoe (Mara Shoal)	Yes	-
1274	Smallmouth	Oct. 23, 2010	Lake Couchiching	Oct. 22, 2011	Lake Simcoe (Georgina Island)	Yes	364
1284	Smallmouth	Oct. 23, 2010	Lake Couchiching	July 8, 2012	Lake Simcoe (Strawberry Island)	Yes	624
1288	Smallmouth	Oct. 23, 2010	Lake Couchiching	August 11, 2013	Six Mile Lake (North end)	Yes	1,023
1338	Smallmouth	Oct. 23, 2010	Lake Couchiching	June 26, 2013	Lake Simcoe (Cathrew Bay)	Yes	611
1346	Smallmouth	Oct. 23, 2010	Lake Couchiching	June, 2011	Gloucester Pool (Burrows Bay)	Yes	-
1350	Smallmouth	Oct. 23, 2010	Lake Couchiching	Aug. 1, 2011	Lake Couchiching (Ship Island)	Yes	282
1399	Smallmouth	Oct. 23, 2010	Lake Couchiching	March (?)	Lake Couchiching (Big Chief Island)	Yes	-
1401	Smallmouth	Oct. 23, 2010	Lake Couchiching	July, 2011	Lake Couchiching (Chief Island)	Yes	-
1402	Smallmouth	Oct. 23, 2010	Lake Couchiching	July 19, 2011	Lake Simcoe (McRae Shoal)	Yes	269
1407	Smallmouth	Oct. 23, 2010	Lake Couchiching	July 20, 2012	Lake Simcoe (Goffat Island)	Yes	605
1420	Smallmouth	Oct. 23, 2010	Lake Couchiching	June 16, 2011	Lake Couchiching (Shingle Bay)	Yes	36
1437	Smallmouth	Oct. 30, 2010	Lake Simcoe Kempenfelt Bay	July 19, 2011	Lake Simcoe (Dry Shoal Island)	No	262

Tag Number	Bass Species	Date	Location	Date	Location	"Fizzed	Elapsed Time (days)
1440	Smallmouth	Oct. 30, 2010	Lake Simcoe (Kempenfelt Bay)	July 10, 2011	Lake Simcoe	No	253
1455	Smallmouth	Unknown	Unknown	Nov. 1, 2012	Lake Simcoe (Kempenfelt Bay)	Yes	-
3087	Smallmouth	Oct. 23, 2010	Lake Couchiching	Sept. 24, 2011	Lake Simcoe (Kempenfelt Bay)	Yes	336
?	Smallmouth	Unknown	Unknown	Nov. 24, 2011	Lake Simcoe (Kempenfelt Bay)	?	-

Appendix 5. A Comparison of Smallmouth Bass Growth Rates from Fish Sampled during Competitive Fishing Events on Selected Waters.

Mean Total Length (cm)

Age Class	Grand Pond	Lake of the Woods	Lake Ontario*	Lake Simcoe	Nova Scotia Waters
2	23.3	-	17.6	32.6	-
3	27.8	31.3	23.1	35.8	22.8
4	31.6	33.5	29.0	39.9	26.0
5	34.8	35.5	33.9	42.8	29.0
6	37.7	37.2	38.5	45.7	31.4
7	43.1	38.6	41.6	47.8	34.3
8	46.1	40.0	43.3	48.2	35.9
9	49.8	41.1	45.0	49.9	41.1
10	-	42.1	46.2	50.0	41.5
11	-	43.0	-	51.0	45.7
12	-	43.8	-	51.5	45.6
13	-	44.5	-	52.5	47.3
14	-	45.1	-	50.9	45.9
15	-	45.6	-	51.9	-

* Includes fish from eastern Lake Ontario, Bay of Quinte and St. Lawrence River.

Appendix 6. Key Findings from Tagging and Telemetry Studies involving Bass.

Waterbody (Jurisdiction)	Bass Species	Study Period	Tag Type	Number of Fish Marked	Key Findings	Reference
Albemarle Sound (North Carolina)	Largemouth	2012 - 2013	Radio tags	40	• Dispersal from release point occurred within 21 days. • Long distance displacement inhibits return to site of capture.	Brown et al. (2015)
Amon G. Carter Reservoir (Texas)	Largemouth	Oct – Nov. 2007	T bar tags	786	• Tag return rate of 21.9% (172 fish). • Tournament angling had more of an impact on largemouth bass population than on other reservoirs.	Hysmith et al. (2014)
Big Rideau Lake (Ontario)	Largemouth	1996 - 1998	Ultrasonic tags Radio tags	20 12	• Stayed longer at release sites than smallmouth bass. • Lower proportion returned to capture site than smallmouth bass. • No return when displacement exceeded 8 km.	Ridgway (2002)
Bloomington and Evergreen Lakes (Illinois)	Largemouth	2008	N/A	96	• Initial mortality ranged from 0.0 – 4.0%; delayed mortality 0.0%	VanLandeghem et al. (2013)

Waterbody (Jurisdiction)	Bass Species	Study Period	Tag Type	Number of Fish Marked	Key Findings	Reference
Eastern Lake Ontario-Bay of Quinte	Smallmouth Largemouth	2012-2014	T-tags	2,199 2,991	• Growth in Lake Ontario Smallmouth Bass was found to be greater than growth in Largemouth Bass, which is in contrast to findings of growth studies on other North American bass populations. • Growth in present day Smallmouth Bass also exceeds growth of historical Smallmouth Bass from Lake Ontario.	Zhu (2015)
Grand River (Ontario)	Smallmouth	1995-1999	Radio tags External tags	18 108	• Upstream and downstream movements to overwinter. • Displaced bass remained in release areas for extended periods of time (×=54 days). • 5 of 14 bass eventually returned to the site of capture. • Longest detected movement was 40 km downstream (over three weirs).	Bunt et al. (2002)

Waterbody (Jurisdiction)	Bass Species	Study Period	Tag Type	Number of Fish Marked	Key Findings	Reference
Great Pond (Massachusetts)	Largemouth	1979-1983	Floy tags	339	• 21.9% recapture rate of tagged fish. • Time from release to recapture averaged 254 days (1-884 days)	Quinn (1989)
Illinois River (Illinois)	Largemouth	1992-1994	Floy tags	4507	• 24.9% tag recaptures. • Most recaptures were less than 1.6 km from release location.	Raibley et al. (1998)
Kawartha lakes (Ontario)	Smallmouth Largemouth	1989-1990	Floy tags Radio tags	758 4,064 23	• Largemouth bass did not travel extensively from release site. • Low number of recaptured smallmouth bass. • Significant movement behaviour of largemouth bass from different waterbodies.	Babin (1995)
Lake Champlain	Largemouth Smallmouth	2011-2012	T-tags Radio tags	1160 smallmouth and 1141 largemouth 532 smallmouth and 38 largemouth	• Level of stress increased with amount of time in livewell. • Level of stress influenced post-release dispersal. • Low short term mortality of both species. • Considerable lag time between release and dispersal.	Maynard et al. 2013

Waterbody (Jurisdiction)	Bass Species	Study Period	Tag Type	Number of Fish Marked	Key Findings	Reference
Lake Champlain (cont'd)					• Smallmouth bass disperse greater distances than largemouth bass.	
Lakes Mead and Mohave (Nevada)	Largemouth	1974-1977	Disc tags	300	• Post-release mortality closely related to temperature.	Allan (undated)
Lake Opeongo (Ontario)	Smallmouth			18	• 15 of 18 bass returned to their home ranges. • Displaced fish will return to home ranges after spending a short period of time (1-9 days) at release site.	Ridgway and Shuter (1996)
	Smallmouth				• Home ranges can be large (200-400 ha) and fish travel extensively (1-9 km) most days.	Ridgway et al. (2002)
	Smallmouth				• Shallow (2-5 m) in summer moving to deeper (12-15 m) in winter.	Suski and Ridgway (2009)
Lake Winnipesaukee (New Hampshire)	Smallmouth and Largemouth	2007	Floy tags	1,836	• Smallmouth bass moved greater distances from release site than largemouth bass. • Smallmouth bass at large longer before being recaptured (319) days compared to largemouth bass (38-49 days).	Gries (2009)

Waterbody (Jurisdiction)	Bass Species	Study Period	Tag Type	Number of Fish Marked	Key Findings	Reference
Pigeon, Buckhorn and Chemong (Ontario)	Smallmouth and Largemouth	1999-2002	T tags (double tagged)	610 4,426	• Competitive angling does not represent a sustainability issue on these waters. • Low number of tag recaptures.	Roberge (2004), Ridgway and Roberge (2007)
Rainy Lake (Ontario)	Smallmouth	September, 2007	External radio transmitters	-	• Fizzed fish displayed greater movements after release than non-fizzed fish.	Nguyen et al. (2009)
Ranger Lake	Smallmouth				• Both species exhibit diurnal activity patterns. • Largemouth bass movements rarely involved large distances.	Demers et al. (1996)
Six connected Florida lakes	Largemouth	-	-	1616	• 22.9% of marked fish were recaptured. • Mean elapse time until recapture was 102.9 days. • Maximum distance travelled was 20.1 km (most were less than 8 km).	Dequine and Hall (1950)
Thirteen Canadian and U.S. waters	Smallmouth and Largemouth	-	-	-	• Only 14% of largemouth bass and 32% of smallmouth bass returned to their site of capture.	Wilde (2003)

Waterbody (Jurisdiction)	Bass Species	Study Period	Tag Type	Number of Fish Marked	Key Findings	Reference
Thirteen Canadian and U.S. waters (cont'd)					• 51% of largemouth bass and 26% of smallmouth bass dispersed less than 1.6 km from their release sites. • Smallmouth bass dispersed greater distances (7.3 km) than largemouth bass (3.5 km). • Success of largemouth bass in returning to their capture site was inversely related to displacement distance. • 22% of largemouth bass and 15% of smallmouth bass caught and released at fishing tournaments were subsequently recaptured by anglers.	
Thirteen Nova Scotia lakes	Smallmouth	1995-1998			• Mean catch rate was 0.21fish per tournament angler hour. • Tournament derived data were used to determine life history characteristics • Bass populations not governed by any losses occurring through competitive fishing activity.	MacMillan et al. (2002)

Waterbody (Jurisdiction)	Bass Species	Study Period	Tag Type	Number of Fish Marked	Key Findings	Reference
Three Kansas reservoirs (Kansas)	Smallmouth, Largemouth and Spotted	1999-2001	-	-	• Initial mortality was lower than delayed mortality. • Total mortality (both species) averaged 10.1%. • High mortality occurred when tournaments were poorly organized and when tournament anglers neglected angled bass in live wells.	Schultz (2003)