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## **Smallmouth Bass Tournament Assessment in the New York Waters of Lake Erie**



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# Smallmouth Bass Tournament Assessment in the New York Waters of Lake Erie

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## Executive Summary

The New York (NY) portion of Lake Erie has long supported a popular smallmouth bass recreational fishery and is consistently ranked as one of the premier smallmouth bass fishing destinations in North America. Angling quality on Lake Erie has been consistently high compared to other smallmouth bass populations, but increasingly variable catch rates in recent years have generated stakeholder concerns, specifically identifying bass tournaments as a possible cause. The recreational smallmouth bass fishery is monitored annually using a randomized direct contact angler survey which does not typically differentiate between recreational and tournament anglers.

### Study Objectives:

1. Evaluate the effectiveness of the open lake angler survey for documenting tournament effort and catch
2. Determine the magnitude and spatiotemporal scope of bass tournament angling
3. Determine if tournament induced mortality plays a substantial role in bass survival or population trends

During the 2020 open lake angler survey anglers were asked if they were participating in a bass tournament. We also implemented a desktop survey from 2018–2020 as an alternative method to document bass tournaments and estimate tournament effort and catch. Finally, we used tournament-related mortality rates for smallmouth bass from the published literature to estimate tournament-based bass mortality in the New York portion of Lake Erie.

The open lake angler survey did not effectively document tournament effort or catch, with the randomized survey schedule missing all 18 of the 2020 tournaments documented using the desktop method. All documented tournaments from 2018–2020 were based out of Buffalo's Small Boat Harbor. Bass tournament angling comprised 9.6% of total bass angling effort and 8.3% of total bass catch out of Buffalo. The estimated number of bass that died during tournaments was nine times lower than the total estimated bass harvest (2,799 bass) out of Buffalo. However, this estimate only included mortality that occurred during the weigh-in and release process and did not include mortality of any culled or caught-and-immediately-released bass. The current level of bass tournament pressure likely plays a relatively minor role in total bass mortality compared to recreational bass harvest which is at an historically low level. However, improving tournament fish handling practices would result in a net decrease in bass mortality in NY waters.

### Major conclusions:

1. Bass tournaments were not effectively documented using the open lake angler survey while the desktop survey successfully documented tournaments and will now be conducted annually.
2. Tournament pressure was localized to the Buffalo area, making it unlikely that tournaments are a major driver of bass population trends or fishing quality across the NY waters at this time.
3. Tournament induced mortality is not likely a major driver of adult smallmouth bass mortality at this time, however, improved fish handling throughout the tournament process will result in a net decrease in bass mortality.

## Introduction

The New York (NY) portion of Lake Erie has long supported a popular recreational smallmouth bass (*Micropterus dolomieu*) fishery and is consistently ranked as one of the premier smallmouth bass fishing destinations in North America (Straw, 2012; Robbins, 2019; Bassmaster, 2020). Angling quality on Lake Erie has been consistently high when compared to other smallmouth bass fisheries, but increasingly variable catch rates in recent years (Wilkins, 2021) have generated some concerns from stakeholders, who have specifically identified tournament bass fishing as a possible cause. This fishery is monitored annually using a direct contact angler survey, providing estimates of smallmouth bass angling quality, targeted angler effort, catch, and harvest (Einhouse, 2005; Wilkins, 2021). However, we do not have a good understanding of the role tournaments play in the smallmouth bass fishery and potential impacts they may have on the population.

Tournament angling for black bass (*Micropterus sp.*) is popular throughout the United States at both the professional and recreational level (Schramm et al., 1991; Beamesderfer and North, 1995; Kerr and Kamke, 2003), but there are typically many associated physiological stressors (e.g., barotrauma, thermal stress, livewell anoxia or hypoxia, etc.) that can lead to mortality (Siepker et al., 2007; Gravel and Cooke, 2008; Sullivan et al., 2015). Most tournaments require that anglers transport their catch to a predetermined location to be weighed and eventually released. Several of the activities or actions associated with this tournament style (e.g., livewell confinement, culling, weigh-in and release processes, etc.) have been documented to cause both initial and/or delayed bass mortality (Wilde, 1998; Cooke et al., 2002; Suski et al., 2004; Morrissey et al., 2005; Siepker et al., 2007;

Nguyen et al., 2009; Brooke et al., 2019). Initial mortality includes bass that die prior to or during weigh-in, whereas delayed mortality includes bass that are alive during weigh-in but die following release. Even though tournament-induced bass mortality has been studied for several decades, and despite advances in fish handling practices, tournament-induced bass mortality is still problematic and prevalent in today's bass tournaments (Cooke et al., 2020).

Bass tournaments occur regularly in the New York portion of Lake Erie, yet there has been no formal assessment of tournament angling effort. Quantifying the magnitude of bass tournament effort and determining how that effort is dispersed spatially and temporally within New York's portion of Lake Erie will improve our understanding of the smallmouth bass fishery and help determine how significant tournament induced mortality is to bass population trends.

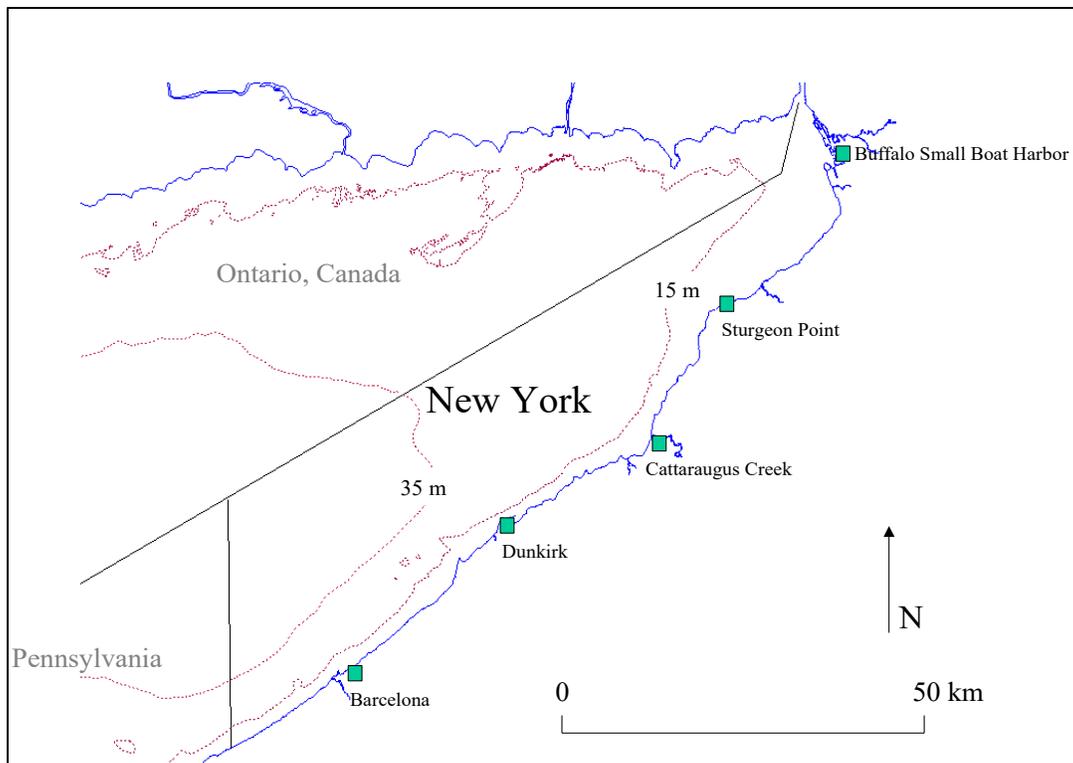
The objectives of this study were to:

1. Evaluate the effectiveness of the open lake angler survey for documenting tournament effort and catch.
2. Determine the magnitude and spatiotemporal scope of bass tournaments.
3. Determine if tournament induced mortality plays a substantial role in bass survival or population trends.

## Methods

### Study Area

New York's portion of Lake Erie covers 229 sq. km—6 percent of the lake's total surface area—and is situated in the southeastern area of the eastern basin (Wolfert, 1981; Fig. 1). The eastern basin has an average depth of 24.4 m (80 ft) and is the least productive and deepest portion of Lake Erie (Hartman, 1972). There are five major



**Figure 1.** Major New York harbors, state, and international boundaries on eastern basin of Lake Erie.

harbors used by boaters to access New York’s portion of Lake Erie (Fig. 1), with the majority of bass anglers typically launching out of Buffalo’s Small Boat Harbor or Dunkirk’s Holiday Harbor (Wilkins, 2021).

### Survey Methods

Two approaches—an angler survey and a desktop search—were used to characterize bass tournament effort in NY waters.

#### *Open Lake Angler Survey*

The daytime open lake sport fishery in New York’s portion of Lake Erie is assessed annually from May 1 thru October 31 using an “access point approach” angler survey (Pollock et al., 1994). Technicians collect boat counts and interview boaters at New York’s five major harbors (Fig. 1). The schedule is randomly stratified by day type (weekday or weekend/holiday), harbor, and month to create a statistically robust survey (Einhouse, 2005). Estimates of species-specific angler effort, catch,

and harvest are generated. Complete survey methods can be found in Einhouse (2005). During the 2020 survey, interviewed anglers were additionally asked if they were participating in a tournament to estimate tournament-based smallmouth bass effort for each month and harbor.

#### *Desktop Survey*

In addition to the open lake angler survey, a detailed desktop search was conducted via the internet, newspapers, social media, and by word of mouth, to identify and document bass tournaments occurring in NY waters from 2018–2020. For each identified tournament the following information was collected: date, harbor used, number of participants, estimated effort, tournament format, regulations (i.e., minimum length limits, bag limits, etc.), weight of reported bass, and number of bass weighed in (when available). When the number of bass weighed in was not reported (i.e., only bag weights provided), all bags with a non-zero

**Table 1.** Initial and delayed mortality estimates (%) for smallmouth bass tournaments from published literature.

State	Number of events	Month(s)	Year(s)	Initial mortality estimate (%)	Delayed mortality estimate (%)	Source
NY	1	Sep	1989	-	3.4	Klindt and Schiavone (1991)
ME	8	Jun-Oct	1989	7.0	4.9	Hartley and Moring (1995)
CT	99	Apr-Oct	2001–2002	4.8	2.8	Edwards et al. (2004)
NY	9	Jun-Sep	2011–2012	3.9	2.6	Maynard et al. (2013)

weight were assumed to be a full bag limit, resulting in a maximum calculated estimate of weighed in bass.

### Data analysis

The proportion of total bass effort accounted for by bass tournament angling was calculated by dividing tournament effort from the desktop survey by total targeted smallmouth bass angler effort from the angler survey for each harbor and year. Total catch for each tournament was estimated by multiplying tournament angler effort from the desktop survey by the directed smallmouth bass catch-per-effort (CPE, angler survey) for the harbor where the tournament occurred. The proportion of total catch made up by tournament angling was calculated by dividing the estimated tournament catch from the desktop survey by total bass catch from the angler survey for each harbor and year. Point estimates of initial and delayed tournament-induced mortality were calculated by multiplying the estimated tournament catch by the mean initial and delayed mortality rates from tournament-induced smallmouth bass mortality rates found in the literature (Table 1).<sup>1</sup> The range of tournament-induced mortality was also calculated by multiplying and summarizing the estimated tournament catch by the maximum and minimum tournament-induced smallmouth bass

initial and delayed mortality rates found in the literature (Table 1). The published mortality rates account for smallmouth bass that are dead when weighed in or die following the weigh in and release processes, but do not account for mortality of culled bass or caught-and-immediately-released bass.

### **Results**

The open lake angler survey did not adequately sample bass tournament anglers in 2020. Six percent (102 of 1,789) of the anglers interviewed during the 2020 survey stated that they were participating in a tournament. However, only a single interviewed angler identified as a bass tournament participant with the rest targeting walleye (i.e., walleye tournament anglers). This extremely low sample size made it impossible to estimate bass tournament catch and effort using only the angler survey data. Therefore, all results reported below are associated with the desktop survey.

Forty-eight bass tournaments (20 eight-hour, 28 three-hour) were documented in NY waters using the desktop survey from 2018–2020, with all of the tournaments being based out of Buffalo’s Small Boat Harbor. Sixteen additional tournaments were cancelled (weather, COVID-19) or moved to the Upper Niagara River. An

<sup>1</sup> Each of the studies in Table 1 provided both largemouth and smallmouth bass mortality rates, however only smallmouth bass mortality rates were used in this report as they are the primary target species for bass tournament anglers in Lake Erie. Three of the studies involve lakes deep enough to have barotrauma-related issues for angled smallmouth bass (Klindt and Schiavone, 1991; Hartley and Moring, 1995; Maynard et al., 2013). The Maynard et al. 2013 study focused on Lake Champlain bass tournaments, which was the closest comparison in terms of depth and barotrauma risk for smallmouth bass.

average of 45 anglers (range: 18-338) participated per 8-hour tournament and an average of 144 bass (range: 5-1,487) were weighed in per 8-hour tournament (Table 2). For 3-hour tournaments, 27 anglers (range: 11-43) participated and 29 bass (range: 12-51) were weighed in per event (Table 2). From 2018–2020, tournament angling comprised 9.6% of total bass angling effort and 8.3% of total bass catch out of Buffalo’s Small Boat Harbor (Table

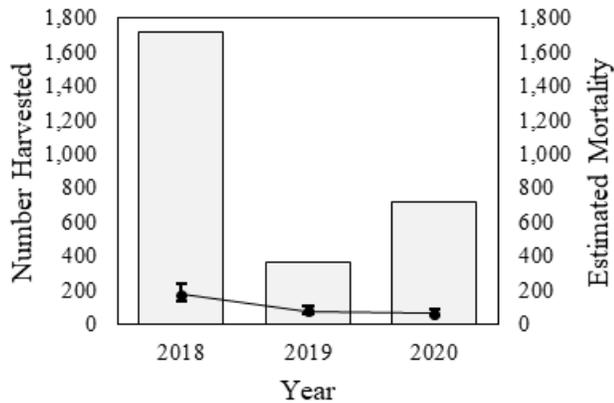
3). During the same period, bass tournament angling comprised 5.9% of total bass angler effort and 4.8% of total bass catch in the NY portion of Lake Erie. Of the 3,698 bass weighed in at tournaments from 2018–2020, an estimated 321 (range: 240–442) would have died due to the tournament weigh in and release process, which is nine times lower than total estimated bass harvest (2,799 bass) out of Buffalo’s Small Boat Harbor during that period (Fig. 2).

**Table 2.** Summary results of 3-hour and 8-hour smallmouth bass tournaments held in New York portion of Lake Erie from 2018–2020. Tournament results include mean and range number of participants (number of anglers competing), bass (estimated number of bass weighed in), and weight (total weight, in pounds, of bass weighed in) per tournament. The large tournament (338 participant, 1,487 bass weighed-in) in 2018 was the FLW Costa Series, which was shortened from three days to one due to weather.

Year	Format	Tournaments	Participants (range)	Bass (range)	Weight in lbs. (range)
2018	3 Hour	6	26 (11-43)	31 (15-39)	106 (39-159)
	8 Hour	6	81 (18-338)	308 (5-1,487)	1,074 (26-5,058)
2019	3 Hour	10	27 (16-43)	27 (12-45)	100 (51-180)
	8 Hour	8	33 (18-40)	80 (16-192)	306 (73-639)
2020	3 Hour	12	28 (11-41)	30 (12-51)	110 (49-193)
	8 Hour	6	26 (20-38)	65 (45-110)	262 (129-434)
Overall	3 Hour	28	27 (11-43)	29 (12-51)	105 (39-193)
	8 Hour	20	45 (18-338)	144 (5-1,487)	523 (26-5,058)

**Table 3.** Summary results of smallmouth bass tournaments held in New York portion of Lake Erie from 2018–2020 with corresponding open lake angler survey estimates over the same period. Tournament results include effort (in hours), estimated catch (number of smallmouth bass captured), and the range in estimated total mortality (M Low, M High) based on initial and delayed mortality estimates from table 1. Estimated catch was calculated for harbor each year using the directed CPE (catch per targeted effort) from the angler survey. Percent effort and percent catch were calculated for each harbor and each year.

Year	Site	Directed CPE	Directed HPE	Tournament			Angler Survey				
				Effort	Catch	Mortality (range)	Targeted effort	Catch	Harvest	% Effort	% Catch
2018	Buffalo	1.07	0.04	4,340	4,635	176 (132-243)	37,118	43,505	1,722	11.7	10.7
	All						69,852	93,465	2,138	6.2	5.0
2019	Buffalo	0.96	0.01	2,893	2,773	79 (59-109)	33,632	37,296	361	8.6	7.4
	All						50,507	56,848	701	5.7	4.9
2020	Buffalo	0.75	0.03	2,252	1,689	65 (49-90)	28,446	28,519	718	7.3	5.5
	All						39,845	39,694	865	5.2	3.9
Overall	Buffalo			9,485	9,097	321 (240-442)	99,196	109,320	2,801	9.4	8.2
	All						160,204	190,007	3,704	5.8	4.7



**Figure 2.** Grey bars represent number of bass harvested by anglers fishing out of Buffalo’s Small Boat Harbor from 2018–2020. Black dots represent annual tournament-based mortality totals from 2018–2020 using the average of published estimates in Table 1. Error bars represent the range of possible mortalities based on published estimates.

### Discussion

The study found that tournaments in the NY portion of Lake Erie were limited in number, localized to Buffalo’s Small Boat Harbor, and usually consisted of relatively small groups of local anglers. Tournament-induced bass mortality was relatively minor when compared with recreational bass harvest in NY waters, which is already at historically low levels (Wilkins, 2021). Despite using the highest possible estimate of weighed-in bass, the bass harvest in Buffalo’s Small Boat Harbor was still nine times higher than the estimated tournament-related mortality over the three-year survey period.

Bass tournament fishing effort and catch was not effectively documented during the open lake angler survey in 2020. Because tournaments are non-random, typically occurring on set weeknights and weekends with consistent start and end times, a randomized angler survey may overlap with them some years and miss them entirely in others. Bass tournament anglers also commonly return to boat launches as a group, making it easy to count the tournament boats but difficult to conduct multiple interviews. The

combination of factors likely leads to highly variable estimates of tournament effort. The angler survey overlapped with documented bass tournaments several times in 2018 and 2019, but the randomized schedule missed all of the documented tournaments in 2020. Although the survey does not typically identify tournament anglers specifically and does not produce accurate single-year estimates of tournament effort, survey estimates are likely to broadly incorporate tournament anglers in long-term trends, overestimating them in some years and missing them entirely in others. To further test this assumption, survey technicians will continue to ask interviewed anglers if they are participating in a tournament.

The desktop survey proved to be a simple and effective alternative for estimating tournament catch and effort and provided more consistent estimates than the angler survey. The majority of bass clubs and organizations that host tournaments use webpages to post schedules and results. Many of these webpages also include past years results that could potentially be used to evaluate annual variation in tournament participation, effort, and catch.

Although the angler survey did not effectively document tournaments in 2020, we used the angler survey CPE data to estimate tournament catch as it was still the most robust bass catch rate available for NY waters. All but two of the tournaments documented by the desktop survey were hosted by local angler groups, many of whom recreationally target bass on Lake Erie and contribute to the angler survey catch rate for bass. Therefore, we assumed that the bass catch rates from our angler survey would be similar to tournament catch rates.

All documented bass tournaments in NY waters were based solely out of Buffalo’s Small Boat Harbor. Given the size of the harbor and proximity to the city, it is not surprising that tournament pressure was highest in Buffalo,

although we expected to see some tournament effort out of the other launches. The localized nature of the observed tournament pressure makes it unlikely that tournaments are a major driver of bass population trends or fishing quality across the NY portion of Lake Erie. This is further supported by the relative stability of bass angler catch rates and similarity of survey gillnet catch rates in the Buffalo area compared to areas without tournament pressure (NYSDEC unpublished data).

The published estimates we used to calculate tournament induced mortality do not account for mortality associated with culled bass or caught-and-immediately-released bass. This underestimation is unlikely to alter our conclusion that tournament fishing is not a major driver of adult bass mortality or population trends. Culled bass experience the same stressors from capture and livewell confinement as bass that are weighed-in, only they experience these stressors for shorter durations (Siepker et al., 2007). Catch-and-immediate-release of bass can also produce stressors that result in mortality especially when barotrauma is common (Cooke et al., 2002; Schreer et al., 2009; Siepker et al., 2007). Even with culled bass mortality and caught-and-immediately-released bass mortality included, the total tournament mortality would still fall well short of the current bass harvest out of Buffalo's Small Boat Harbor alone. If the highest published initial and delayed tournament mortality rates were applied (Table 1), the culling and catch-and-release mortality rate would still have to exceed 25% for estimated tournament induced mortality to equal the Buffalo bass harvest.

The risk of mortality due to barotrauma for angled smallmouth bass in the New York portion of Lake Erie is likely greater than in most other water bodies due to limited shallow water habitat availability outside of the major harbors. Mortality associated with barotrauma is increased during tournaments when angled smallmouth bass are kept in a livewell for up to

eight hours prior to release (Nguyen et al., 2009). Barotrauma is common in late summer and fall when smallmouth are targeted at depths greater than 30 ft. Tournament anglers and organizers advocate the practice of “fizzing” the majority of weighed-in bass during this time of the year. Although the act of fizzing—deflating the distended swim bladder with hypodermic needle to relieve pressure—can be successful in helping fish regain equilibrium and return to depth upon release, it has little to no effect on the physiological damage associated with barotrauma (Morrissey et al., 2005, Scheer et al., 2009). A catch-weigh-release tournament format would bring barotrauma induced mortality in line with recreational catch-and-release angling and has already been adopted by at least one major pro bass tour. The shortened handling time associated with this format reduces time at the surface and the need for most fizzing.

Bass tournaments do not appear to be a primary driver of the adult smallmouth bass population or the associated fishery in the New York portion of Lake Erie at this time. However, tournament-induced mortality surely accounts for some portion of adult mortality, meaning that improving fish handling throughout the tournament process will result in a net decrease in bass mortality across NY waters. Passive monitoring of bass tournaments (i.e., desktop method) will be included in our annual assessment, in conjunction with the open lake angler survey, to effectively document smallmouth bass tournament fishing effort, and monitor trends in tournament effort in response to environmental or regulatory changes.

## References

- Beamesderfer, R. C., and J. A. North. 1995. Growth, natural mortality, and predicted response to fishing for largemouth bass and smallmouth bass populations in North America. *North American Journal of Fisheries Management* 15(3):688-704.
- Bassmaster. 2020. Best Bass Lakes of the Decade. *Bassmaster Magazine* (June 27).

<https://www.bassmaster.com/best-bass-lakes/slideshow/best-bass-lakes-2010s>.

- Brooke, T. C., C. W. Elliott, J. Holden, Y. Wang, R. L. Hornsby, and B. L. Tufts. 2019. The importance of live-well transport in the physiological disturbance experienced by smallmouth bass in tournaments on large water bodies. *North American Journal of Fisheries Management* 39(6):1260-1268.
- Cooke, S. J., A. E. Abrams, A. J. Zolderdo, and C. D. Suski. 2020. On improved care of black bass during live-release competitive angling events-recent innovations and associated research needs. *Fisheries* 45(4):178-183.
- 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. Pages 489-512 in D. P. Philipp and M. S. Ridgway, editors. *Black bass: ecology, conservation, and management*. American Fisheries Society, Symposium 31, Bethesda, Maryland.
- Edwards Jr., G. P., R. M. Neumann, R. P. Jacobs, and E. B. O'Donnell. 2004. Factors related to mortality of black bass caught during small club tournaments in Connecticut. *North American Journal of Fisheries Management* 24(3):801-810.
- Einhouse, D. W. 2005. *Angler Survey Methods for Lake Erie's Open Water Sport Fishery*. New York State Department of Environmental Conservation, Albany, New York. 68 pp.
- Gravel, M. A., and S. J. Cooke. 2008. Severity of barotrauma influences the physiological status, postrelease behavior, and fate of tournament-caught smallmouth bass. *North American Journal of Fisheries Management* 28(2):607-617.
- Hartley, R. A., and J. R. Moring. 1995. Differences in mortality between largemouth and smallmouth bass caught in tournaments. *North American Journal of Fisheries Management* 15(3):666-670.
- Hartman, W. L. 1972. Lake Erie: effects of exploitation, environmental changes and new species on the fishery resources. *Journal of the Fisheries Research Board of Canada* 29:899-912.
- Kerr, S. J., and K. K. Kamke. 2003. Competitive fishing in freshwaters of North America: a survey of Canadian and US jurisdictions. *Fisheries* 28(3):26-31.
- Klindt, R. M., and A. Schiavone Jr. 1991. Post-release mortality and movements of tournament-caught largemouth and smallmouth bass in the St. Lawrence River. New York State Department of Environmental Conservation, Watertown, New York, USA.
- 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. *Lake Champlain Basin Program Technical Report*, 77.
- Morrissey 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 angling tournaments. *Transactions of the American Fisheries Society* 134(4):1038-1047.
- Nguyen, V., 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(2-3):313-318.
- Pollock, K. H. 1994. *Angler survey methods and their application in fisheries management*. American Fisheries Society, Special Publication 25, Bethesda, Maryland, USA.
- Robbins, P. 2019. The 10 Best Fall Fishing Smallmouth Hotspots. *Field & Stream* (October 2). <https://www.fieldandstream.com/best-fall-smallmouth-hotspots/>.
- Schramm, H. L., M. L. Armstrong, A. J. Fedler, N. A. Funicelli, D. M. Green, J. L. Hahn, D. P. Lee, R. E. Manns Jr., S. P. Quinn, and S. J.

- Waters. 1991. Sociological, economic, and biological aspects of competitive fishing. *Fisheries* 16(3):13-21.
- Schreer, J. F., J. Gokey, and V. J. DeGhett. 2009. The incidence and consequences of barotrauma in fish in the St. Lawrence River. *North American Journal of Fisheries Management* 29(6):1707-1713.
- Siepkner, M. J., K. G. Ostrand, S. J. Cooke, D. P. Philipp, and D. H. Wahl. 2007. A review of the effects of catch-and-release angling on black bass, *Micropterus spp.*: implications for conservation and management of populations. *Fisheries Management and Ecology* 14(2):91-101.
- Straw, M. 2012. The World's Top 10 Smallmouth Locations. In-Fisherman (August 21). <https://www.in-fisherman.com/editorial/the-worlds-top-10-smallmouth-locations/155142>.
- Sullivan, C., C. Hasler, and C. D. Suski. 2015. Do live-well temperatures differ from ambient water during black bass tournaments? *North American Journal of Fisheries Management* 35(5):1064-1069.
- 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 from largemouth bass. *Transactions of the American Fisheries Society* 133(6):1291-1303.
- Wilde, G. R. 1998. Tournament-associated mortality in black bass. *Fisheries* 23(10):12-22.
- Wilkins, P. W. 2021. Open lake sport fishing survey. Section J *In* NYSDEC Lake Erie 2020 Annual Report. New York State Department of Environmental Conservation, Albany, New York, USA.
- Wolfert, D. R. 1981. The Commercial fishery for walleyes in New York waters of Lake Erie, 1959-1978. *North American Journal of Fisheries Management* 1(2):112-126.