Initial Mortality in New Hampshire Black Bass Fishing Tournaments, 1997-2001

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Introduction

Fishing competitively is a prevailing use of freshwater fishery resources (Wilde et al. 1998). More than 29,000 competitive fishing events are held annually on inland waters of North America, with 78% of the events targeting black basses *Micropterus* spp. (Schramm et al. 1991). During the last decade, there was a 61% increase in the number of competitive black bass fishing tournaments held on New Hampshire waters as the number of permits issued for this type of tournament escalated from 303 in 1992 to 487 in 2001 (Figure 1). The intensity of competitive fishing for black bass has caused concerns that the mortality of black bass caught and brought to weigh-in stations may have negative effects on these fisheries (Wilde et al. 1998).

Mortality of black bass during competitive fishing events has been recorded since the early 1970s and these data show initial mortality (i.e. mortality that occurs prior to release) of black bass was greatest in the 1970s (19.5%), decreased in the 1980s (6.6%) and showed no further decrease during the 1990s (6.5%) (Wilde 1998). Much of the decrease in initial mortality between the 1970s and 1980s has been attributed to adoption of catch-and-release fishing practices (Barnhart 1989) and refinement of fish handling techniques (Schramm and Haydt 1985) by tournament participants and organizers. In New Hampshire, competitive black bass fishing tournaments operate under a regulatory requirement that all fish be released at the end of the event, while fish handling techniques are not regulated specifically.

The objective of this report is to present initial mortality rates, based on self-reported data, for largemouth bass (*Micropterus salmoides*) and smallmouth bass (*M. dolomieu*) caught and entered for weigh-in during competitive bass fishing events held on New Hampshire waters between 1997 and 2001. Additionally, initial mortality rates are compared between small (< 50 boats) and large (≥ 50 boats) tournaments.

Methods

In accordance with an administrative rule, all permitted fishing tournaments are to file a report with the New Hampshire Fish and Game Department (NHFGD) within 30 days after the conclusion of the event (Appendix Table I). The data utilized in calculating initial mortality rates were obtained from 1,859 useable bass tournament report forms filed between 1997 and 2001, which represents approximately 78% of the reports filed by permitted bass tournaments (Table 1). Initial mortality for each black bass species was calculated by month (April – October) and by year for comparative purposes. It should be noted that bass tournament reports filed for events that occurred between May 15 and June 15 were excluded from analysis for the respective months because all black bass must be immediately released during this time and therefore those permitted tournaments operate under a "paper" format rather than a "weigh-in" format.

Chi-square contingency analyses were used to detect significant differences ($\alpha = 0.05$) in initial mortality between smallmouth and largemouth bass; within species, among years and months; and, between large and small tournaments.

Results

There was a significant difference ($P<0.01$) in initial mortality between largemouth bass (LMB) and smallmouth bass (SMB) weighed-in during bass tournaments. Over the 5-year period, the initial mortality for largemouth bass averaged 1.41%; while for smallmouth bass it averaged 2.87% (Table 2). Initial mortalities for largemouth and smallmouth bass were also significantly different ($P=0.01$; $P<0.01$, respectively) among years. For both species, initial mortality was highest in 1999 and lowest in 2000 (Table 2). Initial mortality for largemouth and smallmouth bass differed significantly ($P<0.01$) among months as well. Initial mortalities were higher during the summer (June, July, and August) than they were during spring (April and May) or fall (September and October) (Table 3). Tournament size did not significantly ($P=0.19$) affect initial mortality for largemouth bass. However, for smallmouth bass, initial mortality was significantly higher ($P<0.01$) in smaller tournaments than it was in larger tournaments (Table 4).

Discussion

The low (≤5%) initial mortality occurring during New Hampshire competitive bass fishing tournaments is similar to those detailed in a number of other studies. Wilde et al. (2002) reported the mean annual initial mortality of black bass weighed in at fishing tournaments conducted by the Bass Anglers Sportsman Society during the 1990s was 1.9%. Ostrand et al. (1999) studied self-reported measurements of initial mortality of black bass in 2,072 Texas fishing tournaments and found that in total-weight tournaments, initial mortality was 4.0%. Kwak and Henry (1995) determined the initial mortality of largemouth bass during bass fishing tournaments held in Minnesota was 1.4%. However, Hartley and Moring (1995) described slightly higher initial mortalities for largemouth (3.2%) and smallmouth bass (8.9%) during nine weigh-in tournaments held on lakes in Maine, while Weathers and Newman (1997) noted the prerelease mortality of largemouth bass during 14 bass tournaments on a lake in Alabama averaged 8.9%.

Even though initial mortality for black bass entered during weigh-in bass tournaments conducted on New Hampshire waters is low, wise stewardship of the State's black bass fisheries resources requires an understanding of the factors that cause initial mortality. The principal factors identified as having strong influences on initial mortality during bass fishing tournaments include water temperature, fish size, live-well conditions, and tournament procedures (Wilde 1998).

Surface water temperatures appear to play a considerable role in the initial mortality of largemouth and smallmouth bass kept for weigh-in during bass tournaments held on New Hampshire waters. Several comparisons between surface water temperature data (collected daily at the Lakeport Dam located on Lake Winnipesaukee from 1April-31October 1997-2001) and initial mortality show the existence of several significant relationships. Since monthly mean water temperatures were highest during July (72.6°F)

and August (73.2°F) (Table 5) and there was no significant difference (P=0.90) between the two means, these data were combined and pairwise multiple comparisons (Tukey Test) were made among years. This testing resulted in detecting the mean water temperature for these two months was significantly higher ($P \leq 0.05$) in 1999, versus all other years, and significantly lower ($P \leq 0.02$) in 2000, versus all other years. This corresponds to initial mortalities for largemouth and smallmouth bass being highest in 1999 and lowest in 2000. A strong positive correlation (Spearman Rank Order Correlation) also existed between monthly mean water temperatures and initial mortality of largemouth bass ($r=0.786$, $P=0.03$) and smallmouth bass ($r=0.929$, $P<0.01$). These findings correspond to a similar relationship reported by Hartley and Moring (1995). Because of this well-established correlation, bass tournament organizers should consider restricting tournament activity when water temperatures exceed 75°F (Wilde 1998).

Several investigations (Wilde 1998; Ostrand et al. 1999) have found tournament size negatively correlated with initial mortality, which coincides with the result for smallmouth bass presented in this report. This suggests larger tournaments may be better organized and conducted with rules and procedures that successfully reduce initial mortality. Some of the procedures includes expediting fish release by staggering start and weigh-in times, having shaded holding tanks with flow through circulation systems available at the weigh-in, and transporting fish from live-well to weigh-in in water-filled plastic bags (Kwak and Henry 1995). The time fish remain in water-filled plastic bags should be less than 10 minutes (Weathers and Newman 1997). Other effective measures involve reducing hooking-related mortalities by restricting terminal gears that tend to be swallowed deeply (Wilde 1998), having weight reduction penalties for dead fish, returning fish to water quickly via rubber nets or tubes with flowing water, and not holding weigh-ins when air temperatures are $\geq$ 90°F (Weathers and Newman 1997).

Although it was outside the scope of this report, other studies have found larger black bass experience greater initial mortality than smaller black bass, indicating capture and confinement in live-wells appears to be especially stressful to larger fish (Wilde 1998; Ostrand et al. 1999). It is essential losses of large black bass in northern populations are minimized since larger males and females spawn earlier in the spring (Ridgway et al. 1991), allowing the resulting progeny to accumulate more energy reserves prior to entering their first wintering period, which increases their chance for survival (Keast 1968 and 1970). Tournament organizers can address this issue by adopting big fish or big fish/hour formats that reduce the time large bass are held in live-wells before weigh-in and release (Wilde et al. 1998).

Maintaining acceptable temperature and dissolved oxygen concentrations in live-wells is another important component of minimizing initial mortality for black bass (Wilde 1998). Additionally, Kwak and Henry (1995) found the percentage of dead black bass in live-wells was significantly and inversely correlated with pH and un-ionized ammonia. In order to reduce concentrations of ammonia, it's recommended bass tournament participants maximize replacement of live-well water with lake water (Kwak and Henry 1995).

Lastly, initial mortality has also been positively correlated with bag size, and mean weight and number of fish per angler, with logistic regression showing that bag size was the single most influential variable affecting initial mortality (Wilde et al. 2002). Tournament organizers can address this concern by implementing reduced bag limits such as restricting a two-person team's lake or statewide bag limit to a one-person lake or statewide bag limit.

Table 1. Useable bass tournament reports, 1997-2001.

	1997	1998	1999	2000	2001	5-Yr Total
Number of Permitted Bass Tournaments	497	466	459	472	487	2381
Number of Useable Bass Tournament Reports	339	321	372	392	435	1859
Percentage of Permitted Bass Tournaments with Useable Reports	68.2%	68.9%	81.0%	83.1%	89.3%	78.1%

Table 2. Initial mortality for largemouth and smallmouth bass weighed-in during permitted bass fishing tournaments, by year, 1997-2001.

	1997	1998	1999	2000	2001	5-Yr Total
Number of LMB Weighed In	5590	6281	7333	8079	9705	36988
Number of LMB Initial Mortality	87	75	119	89	151	521
Percent LMB Initial Mortality	1.56%	1.19%	1.62%	1.10%	1.56%	1.41%
Number of SMB Weighed In	7748	8355	10504	12192	11290	50089
Number of SMB Initial Mortality	213	254	360	269	341	1437
Percent SMB Initial Mortality	2.75%	3.04%	3.43%	2.21%	3.02%	2.87%

Table 3. Initial mortality for largemouth and smallmouth bass weighed-in during permitted bass fishing tournaments, by month, 1997-2001.

	April 5-Yr Total	May 5-Yr Total	June 5-Yr Total	July 5-Yr Total	August 5-Yr Total	Sept. 5-Yr Total	October 5-Yr Total
Number of LMB Weighed In	982	2377	4685	10118	9276	6895	2655
Number of LMB Initial Mortality	0	16	91	202	143	63	6
Percent LMB Initial Mortality	0.00%	0.67%	1.94%	2.00%	1.54%	0.91%	0.23%
Number of SMB Weighed In	1056	3438	5160	12244	12482	11575	4134
Number of SMB Initial Mortality	1	20	156	492	483	257	28
Percent SMB Initial Mortality	0.09%	0.58%	3.02%	4.02%	3.87%	2.22%	0.68%

Table 4. Initial mortality for largemouth and smallmouth bass weighed-in during small (< 50 boats) and large (≥50 boats) permitted bass fishing tournaments, 1997-2001.

	Small Tournaments	Large Tournaments
Number of Tournaments (N)	1686	122
Number of LMB Weighed In	29317	6134
Number of LMB Initial Mortality	404	98
Percent LMB Initial Mortality	1.4%	1.6%
Number of SMB Weighed In	31440	16322
Number of SMB Initial Mortality	1044	354
Percent SMB Initial Mortality	3.3%	2.2%

Table 5. A summary of surface water temperatures (°F) recorded daily (1April-31October) at the Lakeport Dam on Lake Winnipesaukee, 1997-2001.

Year	April Mean Water Temperature	May Mean Water Temperature	June Mean Water Temperature	July Mean Water Temperature	August Mean Water Temperature	September Mean Water Temperature	October Mean Water Temperature
1997	37.1	46.2	64.7	72.7	72.2	66.6	55.6
1998	42.8	56.5	63.8	72.0	74.1	69.1	57.5
1999	42.5	56.9	69.7	75.5	73.3	69.0	55.9
2000	40.2	52.5	63.4	71.2	71.2	67.3	55.6
2001	36.5	53.6	66.8	71.8	75.0	68.9	58.4
All Yrs.	39.8	53.1	65.6	72.6	73.2	68.2	56.6
S.D.	3.8	5.7	5.0	2.2	2.0	3.4	3.9
N	150	155	150	155	155	150	155

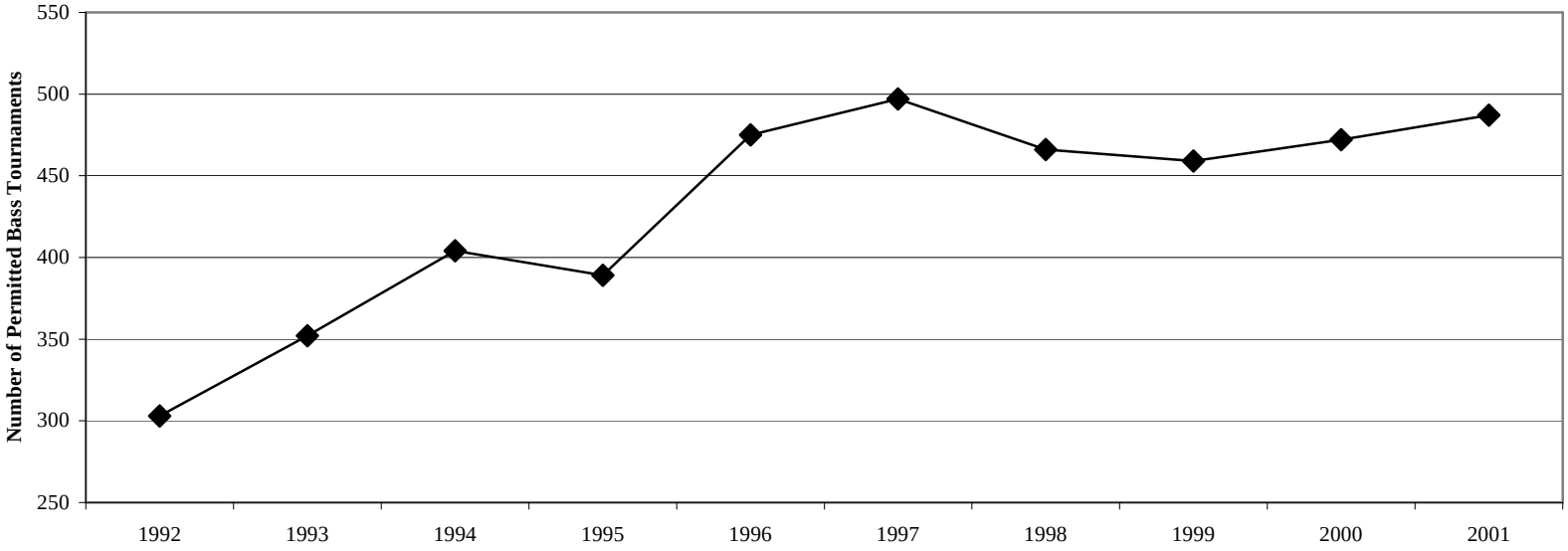

Figure 1. The number of bass tournament permits issued from 1992 – 2001.

Appendix Table I. New Hampshire Fish and Game Department Fishing Tournament Record Form.

CLUB NAME:			
CONTACT NAME AND ADDRESS:			
TOURNAMENT LOCATION:			
TOURNAMENT DATE:		←Please fill in one sheet for each date of your contest	
TOURNAMENT HOURS:	**START:**	**END:**	
TOTAL NUMBER OF PARTICIPANTS:		**TOTAL TOURNAMENT HOURS:**	
TOTAL ANGLER HOURS:		**MINIMUM BASS LENGTH:**	
TOTAL NUMBER OF LARGEMOUTH BASS CAUGHT:		**TOTAL NUMBER OF SMALLMOUTH BASS CAUGHT:**	
TOTAL NUMBER OF LARGEMOUTH BASS RELEASED ALIVE:		**TOTAL NUMBER OF SMALLMOUTH BASS RELEASED ALIVE:**	
TOTAL WEIGHT OF ALL LARGEMOUTH:		**TOTAL WEIGHT OF ALL SMALLMOUTH:**	
AVERAGE WEIGHT OF LARGEMOUTH:		**AVERAGE WEIGHT OF SMALLMOUTH:**	
WEIGHT OF LARGEST LARGEMOUTH:		**WEIGHT OF LARGEST SMALLMOUTH:**	
TOTAL TOURNAMENT WEIGHT:		Please use the comments section to give us any other information relevant, ie: weather, conditions, etc:	
COMMENTS:			

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