Fishery Interim Summary Series No. 08-03

Mooselookmeguntic Lake Fishery Management

By David P. Boucher

Caring for Maine's Outdoor Future

March, 2008
Maine Department of Inland
Fisheries and Wildlife
Division of Fisheries & Hatcheries

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DIVISION OF FISHERIES AND HATCHERIES
AUGUSTA, MAINE

MARCH 2008

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JOBS NO. F-011 AND F-014
INTERIM SUMMARY REPORT NO. 6 (2007)

SUMMARY

Mooselookmeguntic Lake is the largest of the Rangeley Chain of Lakes and supports sport fisheries for wild landlocked salmon and brook trout. These fisheries have been monitored by periodic season-long creel surveys and aerial angler counts since 1981. Growth rates for salmon declined considerably beginning in the late 1990's; brook trout growth also declined during that period but not as dramatically. The decline in fish quality for both species was attributed to a decline in harvest rates resulting from reduced fishing pressure and increased release rates of legal fish by anglers. Salmon regulations were liberalized slightly in 2000 to encourage harvest of smaller fish and improve fish quality. Salmon quality continued to deteriorate, so harvest regulations were further liberalized in 2006 (three salmon daily bag limit; minimum length limit 12 inches; only one may exceed 18 inches). Additional salmon harvest was also encouraged through an educational program involving signage, oral presentations, and written articles.

The more liberal salmon rules, combined with the education effort, appear to be resulting in an increased salmon harvest and improved growth rates, despite another decline in fishing pressure during the 2007 season. Nevertheless, we recommend continuance of the current liberalized harvest regulations until at least 2010 to encourage additional improvements in salmon quality.

Brook trout growth rates have stabilized since 2004, and older-age fish continue to be present in the fishery. Continued good growth rates of brook trout are attributed to the fact this species is less dependant on smelts for forage.

KEY WORDS: BKT,LLS,AGE AND GROWTH,ANGLER SURVEY,REGULATIONS

INTRODUCTION

Mooselookmeguntic Lake is the largest of the Rangeley Chain of Lakes and supports important sport fisheries for landlocked salmon (*Salmo salar*) and brook trout (*Salvelinus fontinalis*). Brook trout are native to the drainage; salmon were introduced in 1875. Neither trout nor salmon have been stocked since 1984. Mooselookmeguntic Lake has had moderately restrictive brook trout regulations (2 trout daily bag limit; minimum length 10 inches; only 1 may exceed 12 inches) since 1996. Salmon regulations were liberalized somewhat in 2000 (two salmon daily bag limit; minimum length 14 inches; only one may exceed 18 inches) to encourage harvest of smaller fish and improve fish quality. Salmon quality continued to deteriorate, so harvest regulations were further liberalized in 2006 (three salmon daily bag limit; minimum length limit 12 inches; only one may exceed 18 inches). Additional salmon harvest was also encouraged through an educational program of signage, oral presentations, and written articles.

The lake's sport fisheries have been monitored by season-long creel surveys and aerial angler counts since 1981. Abbreviated creel surveys (weekends from ice-out through July 4) are occasionally conducted between scheduled season-long surveys to supplement catch rate and fish growth information. Findings from earlier surveys were reported by Bonney (1982, 1987, 2000, 2004, and 2005), DeSandre (1991), and Boucher (1996 and 1999). This report summarizes the results of a season-long survey, voluntary angler information, and Kennebago River seining conducted in 2007. Where appropriate, characteristics of fish populations and fisheries in 2007 are compared to those from earlier surveys.

STUDY AREA

Mooselookmeguntic Lake has a surface area of 16,300 acres and mean and maximum depths of 60 ft and 139 ft, respectively. A water storage dam (Upper Dam) partially impounds the lake and allows a maximum drawdown of about 12 feet. Summer water temperatures, oxygen concentrations, and the lake's physical habitat are ideal for coldwater fishes. The Kennebago River provides extensive spawning and nursery areas for wild salmon. Brook trout spawning and rearing occurs in the Kennebago River, the Cupsuptic River, Bemis Stream, and several smaller tributaries. Rainbow smelts (*Osmerus mordax*) provide the principal forage for the lake's salmonids, and spawn in most the tributaries. Landlocked alewives (*Alosa psuedoharengus*) were introduced in 1971 to augment the forage for salmon.

Mooselookmeguntic Lake is closed to ice fishing. Other fishing regulations currently in effect include: lake closed to the taking of smelts except by hook and line; tributaries closed to the taking of smelts; and use or possession of live fish as bait is prohibited.

Boat access to Mooselookmeguntic Lake is available at Haines Landing in Rangeley Township, near the mouth of the Cupsuptic River off Route 16, and near Toothaker Island at southern end of this 13-mile long lake.

METHODS

Aerial counts of boats were used to estimate fishing effort at Mooselookmeguntic Lake. Counts were made on a randomized schedule from ice-out to September 30, generally 3 days each week, including 1 weekend day per week. Counts were usually made between the hours of 0900 and 1200. Angler counts were expanded from a composite use curve developed from earlier surveys. Angler interviews conducted at the access points listed above provided catch and harvest data that were mostly from completed fishing trips. Clerks conducted interviews on one weekend day and two weekdays per week from ice out (early to mid May) to early July.

Length and weight of 2-stream year, age V+, angler-harvested fish were used to assess trends in growth rate and body condition (Fulton's K) of salmon. These data were supplemented with salmon collected annually in October from the Kennebago River spawning run. Growth and condition of brook trout were analyzed for age III+ and age IV+ fish, which were the dominant cohorts harvested by anglers. All statistical tests were made using SAS procedures (SAS 2003).

SUMMARY OF FINDINGS

Angler effort:

Angler effort in 2007 was estimated at 4,731 trips or 0.29 trips/surface acre. Effort was significantly less ($p<0.05$) in 2007 than during all other years surveyed (Table 1), and was only about 50% of the effort measured from 1981 to 1995. Declining angler use has been observed at most of the large lakes in the Rangeley Chain during this same period.

Landlocked salmon:

Anglers caught an estimated 3,596 legal-size salmon (≥12 inches) in 2007 and harvested about 1,088 of these (Table 2). The catch of legal salmon approximated that observed during most previous years, despite lower angler effort, indicating continued high abundance of this species. The salmon harvest nearly doubled since 2002 – this was partially attributable to the reduced legal length limit - but total harvest was still about 50% below that observed during most of the earlier surveys.

The ratio of legal fish released by clerk-surveyed anglers declined slightly from 76% in 2004 to 70% in 2007 (Table 3). The release rate reported by volunteers declined from about 85% in 2002-2004 to a range of 25% to 58% from 2005-2007 (Table 4). These data

suggest that our efforts to convince anglers to harvest additional salmon were at least partially effective.

Age V+ and VI+ salmon were the dominant cohorts harvested by anglers in 2007, representing 74% of the sample (Table 5). Age IV+ salmon accounted for 11% of the harvest, the highest level observed since 1995, indicating some anglers took advantage of the reduced length limit (from 14 inches to 12 inches) imposed in 2006; salmon in the 12 to 14-inch range accounted for 14% of the harvest. Older-age salmon (age VII+ and older) comprised 15% of the harvest in 2007. This level was lower than any year since 1998, but their consistent occurrence in the harvest indicates that Mooselookmeguntic Lake's salmon population continues to be lightly exploited by anglers and their abundance remains high.

The average length of harvested salmon examined by clerks ranged from 17 to 18 inches from 1995 to 2003; it decreased to 15.7 inches by 2004 before increasing slightly to 16.1 inches in 2007 (Table 3). Comparison of age V+, 2 stream-year salmon, which comprised the largest samples, indicated that fish sampled in 2007 were significantly ($p<0.05$) longer and heavier than in any year since 2001 (Table 6). Furthermore, salmon sampled in 2007 were significantly ($p<0.05$) more robust than those sampled since 1998.

Beginning in 2001, salmon have been sampled on their spawning run at Steep Bank Pool in the Kennebago River (Table 7). These data corroborate the clerk creel survey observations of slightly improving growth and body condition of salmon in Mooselookmeguntic Lake. However, the large numbers seined and the high component of older-age fish suggested an abundant population remained at large in 2007.

In summary, salmon abundance increased and growth rates continued to decline during the 2002-2005 period, despite a slight liberalization of harvest rules beginning in 2000. This regulation was intended to increase the salmon harvest rate by encouraging the harvest of salmon between the lengths of 14 and 18 inches, thereby reducing the number of salmon and the demand on smelts, the primary forage species. This regulation was clearly not effective in accomplishing the intended goal. Consequently, salmon fishing rules were further liberalized in 2006, and an intensive public relations program was initiated to encourage additional harvest.

The more liberal salmon rules (three fish per day, 12 inch minimum length with only one over 18 inches permitted), combined with the education effort, appeared to be successful in increasing salmon harvest. Growth rates and body condition of salmon improved measurably by 2007 but remained below historic levels. Therefore, we recommend continuance of the current liberalized harvest regulations until at least 2010 to encourage additional improvements in fish quality. Growth rates and condition will be monitored closely to evaluate trends in salmon abundance and growth rates.

Brook trout:

The catch and harvest of legal-size brook trout (10 inches and longer) has varied considerably at Mooselookmeguntic Lake since 1981 (Table 8). In 2007, total catch and harvest of brook trout were about 2,413 and 852 fish, respectively. Variable catch and harvest rates were probably the result of annual differences in natural recruitment success, common in wild brook trout populations. As with salmon, anglers released an increasing proportion of their catch of legal brook trout over the period. In 1981, anglers surveyed by clerks released only 5% of legal trout; by 2007 about 63% of legal trout were released. Release rates of legal trout appear to have stabilized in recent years, based on clerk survey data. The percent of legal-size trout released by voluntary anglers increased from 27% in 1991 to 50% in 2004 but has declined somewhat since then (Table 4).

New brook trout regulations were promulgated for the 1996 fishing season, and included a two-fish daily bag limit (reduced from five) with a 10-inch minimum length limit; only one trout may exceed 12 inches. These regulations were designed to distribute the catch among more anglers, direct harvest toward the more abundant age groups, and provide more protection to larger, older individuals that are of high aesthetic and genetic importance. The proportion of older age (IV+ and V+) trout in the catch remained high from 2003 through 2007 (Table 9), indicating that these regulations have maintained a greater abundance of older-age fish in the population.

Unlike salmon, growth indicators for brook trout fluctuated from 1998 to 2007, but there were no clear trends upward or downward (Table 10). We documented slight declines in trout growth and condition from 1986 to 1998 (Boucher 1996 and 1999, and Bonney 2004), but our most recent data suggest trout growth has stabilized. Continued good growth rates of brook trout are attributed to the fact this species is less dependant on smelts than salmon for forage.

CONCLUSION AND RECOMMENDATIONS

The size quality of wild landlocked salmon in Mooselookmeguntic Lake improved in 2007 as a consequence of liberalized regulations and increased harvest rates. We recommend that the current salmon regulations (three fish daily bag limit; 12-inch minimum length limit, only one over 18 inches permitted) be retained through the 2010 fishing season to achieve additional improvements in salmon size quality. We are not recommending more liberal brook trout regulations because their growth rates appear to have stabilized, and they are less reliant on smelts as forage than are salmon.

Mooselookmeguntic Lake's sport fisheries will be closely monitored through triennial clerk creel surveys and angler counts, beginning again in 2010, and by annual sampling of the salmon spawning run in the Kennebago River.

ACKNOWLEDGEMENTS

Sincere thanks to the following anglers who provided records of their fishing trips at Mooselookmeguntic Lake: B. Barrows, B. Basso, S. Blaisdell, R. Bolduc, M. Cushman, B. Dinsmoor, J. Howatt, S. Miller, B. Morse, G. Swenson, and M. Webster. Fishery Biologists Forrest Bonney and David Basley reviewed a draft of the report and offered helpful suggestions.

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March 2008

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Table 1. Angler effort estimates for Mooselookmeguntic Lake, 1981-2007

Year	Angler days (95% CI)	Angler days/acre (95% CI)
1981	10,126 (8,142-12,106)	0.62 (0.50-0.74)
1986	10,196 (8,859-11,533)	0.63 (0.55-0.71)
1991	9,148 (8,002-10,294)	0.56 (0.49-0.63)
1995	9,580 (7,884-11,276)	0.59 (0.49-0.69)
1998	6,081 (5,269-6,893)	0.37 (0.32-0.42)
2002	6,304 (5,247-7,361)	0.39 (0.32-0.45)
2007	**4,731 (3,878-5,584)**	**0.29 (0.24-0.34)**

Table 2. Estimated catch and harvest of ***salmon*** from Mooselookmeguntic Lake, 1981-2007. Confidence limits (95%) are in parentheses.

Year	No. legal salmon caught	No. legal salmon harvested	Percent legals released
1981	2,734 (2,198-3,270)	2,430 (1,954-2,906)	11
1986	3,671 (3,190-4,152)	2,753 (2,392-3,114)	27
1991	3,934 (3,441-4,427)	1,738 (1,526-1,956)	57
1995	3,934 (3,441-4,427)	3,161 (2,592-3,730)	65
1998	3,405 (2,950-3,860)	1,459 (1,264-1,654)	57
2002	1,513 (1,259-1,767)	630 (524-736)	60
2007	**3,596 (2,947-4,244)**	**1,088 (892-1,284)**	**70**

Table 3. ***Clerk creel survey*** summary, Mooselookmeguntic Lake, 1998-2007.
(LLS=Landlocked salmon; BKT=Brook trout)

Statistic		Survey year					
		1998	**1999**	**2002**	**2003**	**2004**	**2007**
No. anglers surveyed		350	502	495	355	315	374
No. angler hours surveyed		1,394	2,107	1,949	1,576	1,483	1,493
	Species						
Percent successful anglers	LLS	36	26	22	26	27	43
	BKT	28	15	13	16	17	34
No. legal fish[1] kept	LLS	84	81	48	53	32	86
	BKT	71	53	38	40	19	69
No. (%) legal fish released	LLS	113 (57)	111 (58)	71 (60)	71 (64)	100 (76)	198 (70)
	BKT	75 (51)	39 (42)	64 (63)	28 (41)	40 (68)	120 (63)
No. (%) sublegal fish released	LLS	407 (67)	305 (61)	495 (81)	518 (81)	414 (76)	169 (37)
	BKT	62 (30)	55 (37)	57 (36)	22 (24)	4 (6)	120 (63)
No. legals caught/angler	LLS	0.56	0.38	0.24	0.35	0.42	0.76
	BKT	0.42	0.18	0.21	0.19	0.19	0.51
No. legals kept/angler	LLS	0.24	0.16	0.10	0.15	0.10	0.23
	BKT	0.20	0.11	0.08	0.11	0.06	0.18
Hours to catch a legal fish	LLS	7.1	11.0	16.4	12.7	11.2	5.3
	BKT	9.5	22.9	19.1	23.2	23.2	7.9
Mean length±SE of harvested fish (in)	LLS	17.1±0.2	18.0±0.3	17.4±0.4	16.9±0.3	15.8±0.3	16.1±0.2
	BKT	12.9±0.2	13.8±0.4	12.2±0.2	13.9±0.5	14.7±0.7	13.0±0.3
Mean weight±SE of harvested fish (lb)	LLS	1.6±0.06	2.0±0.12	1.9±0.15	1.5±0.13	1.3±0.12	1.4±0.07
	BKT	0.8±0.7	1.2±0.12	0.7±0.04	1.3±0.28	1.7±0.35	0.9±0.12

[1] Legal salmon were 14 inches prior to 2006 and 12 inches thereafter.

Table 4. ***Voluntary creel survey*** summary, Mooselookmeguntic Lake, 2002-2007.
(LLS=Landlocked salmon; BKT=Brook trout)

Statistic		Survey year					
		2002	**2003**	**2004**	**2005**	**2006**	**2007**
No. anglers reporting		96	111	76	26	48	74
No. angler hours reporting		543	516	381	137	174	352
	Species						
Percent successful anglers	LLS	50	60	47	12	52	67
	BKT	32	19	21	27	33	51
No. legal fish[1] kept	LLS	9	16	11	3	20	44
	BKT	20	15	9	4	16	29
No. (%) legal fish released	LLS	51 (85)	92 (85)	41 (80)	1 (25)	13 (39)	60 (58)
	BKT	11 (36)	8 (35)	9 (50)	10 (71)	8 (33)	16 (32)
No. (%) sublegal fish released	LLS	172 (74)	234 (68)	62 (55)	24 (86)	31 (48)	45 (30)
	BKT	8 (21)	7 (23)	2 (10)	0 (0)	7 (23)	12 (19)
No. legals caught/angler	LLS	0.63	0.97	0.67	0.15	0.69	1.41
	BKT	0.32	0.21	0.24	0.53	0.50	0.68
No. legals kept/angler	LLS	0.09	0.14	0.13	0.12	0.42	0.60
	BKT	0.21	0.14	0.12	0.15	0.33	0.39
Hours to catch a legal fish	LLS	9.1	4.8	7.5	34.1	5.3	3.4
	BKT	17.5	22.4	21.2	9.8	7.3	7.0
Mean length±SE of harvested fish (in)	LLS	16.4±0.3	16.1±0.2	15.6±0.3	18.4±2.8	14.2±0.3	15.0±0.3
	BKT	12.6±0.4	12.6±0.4	11.8±0.4	14.2±0.8	12.4±0.5	12.0±0.2

[1] Legal salmon were 14 inches prior to 2006 and 12 inches thereafter.

Table 5. Age group composition of harvested ***salmon***, Mooselookmeguntic Lake, 1998-2007.

	Number (%) at age						
Year	**III+**	**IV+**	**V+**	**VI+**	**VII+**	**VIII+ and older**	**No. fish**
1998	0	3 (4)	25 (31)	41 (51)	8 (10)	4 (5)	81
1999	0	3 (4)	21 (30)	15 (21)	26 (37)	6 (9)	71
2002	0	2 (5)	14 (34)	11 (27)	12 (29)	2 (5)	41
2003	0	1 (2)	10 (21)	17 (35)	15 (31)	5 (10)	48
2004	0	0	11 (38)	11 (38)	6 (21)	1 (4)	29
2007	**0**	**9 (11)**	**38 (45)**	**25 (29)**	**8 (9)**	**5 (6)**	**85**

Table 6. Mean size and condition (Fulton's K) of age V+, 2 stream-year ***salmon*** from Mooselookmeguntic Lake, 1998-2007. Means with the same Duncan Group letter designation are not significantly different (p>0.05).

Year	**No. sampled**	**Length (in)**	**Duncan group**		**Weight (lb)**	**Duncan group**		**Condition (K)**	**Duncan group**
1998	30	16.1	A,B		1.28	B		0.85	A,B
1999	21	16.0	A,B,C		1.23	B,C		0.86	A,B
2001	28	15.8	B,C		1.30	B		0.86	A,B
2002	54	14.6	D		0.94	E,D		0.81	B
2003	60	14.3	D		0.85	E		0.78	B
2004	60	14.5	D		0.92	E,D		0.81	B
2006	49	14.7	D		0.99	C,D,E		0.84	A,B
2007	**75**	**15.2**	**D,C**		**1.15**	**B,C,D**		**0.90**	**A**

Table 7. Mean length (inches) and condition (Fulton's K) of ***salmon*** sampled from the Kennebago River spawning run, 2001-2007 (principal cohorts only).

		Age							
		IV+		V+		VI+		VII+	
Year	**No. fish**	**Length**	**K**	**Length**	**K**	**Length**	**K**	**Length**	**K**
2001	71	13.5	0.83	16.1	0.87	16.5	0.87	19.0	0.88
2002	113	12.7	0.74	14.2	0.79	15.6	0.79	17.9	0.87
2003	160	12.9	0.78	14.2	0.77	16.0	0.83	17.9	0.87
2004	103	12.8	0.76	14.4	0.79	15.6	0.81	19.9	0.86
2006	150	13.4	0.85	14.6	0.84	15.7	0.88	16.9	0.87
2007	**174**	**13.4**	**0.88**	**14.8**	**0.92**	**16.1**	**0.91**	**17.8**	**0.94**

Table 8. Estimated catch and harvest of ***brook trout*** from Mooselookmeguntic Lake, 1981-2007. Confidence limits (95%) are in parentheses.

Year	No. legal trout caught	No. legal trout harvested	Percent legals released
1981	911 (732-1090)	871 (700-1,042)	5
1986	2,039 (1,772-2,306)	1,835 (1,595-2,075)	12
1991	1,281 (1,121-1,441)	1,098 (960-1,236)	15
1995	2,065 (1,693-2,437)	1,437 (1,183-1,691)	33
1998	1, 824 (1,566-2,048)	1,216 (1,068-1,398)	51
2002	1,324 (1,102-1,546)	504 (420-589)	63
2007	**2,413 (1,978-2,848)**	**852 (698-1,005)**	**63**

Table 9. Age group composition of harvested ***brook trout***, Mooselookmeguntic Lake, 1998-2007.

	Number (%) at age				
Year	**III+**	**IV+**	**V+**	**VI+**	**No. fish**
1998	49 (72)	12 (18)	5 (7)	2 (3)	68
1999	24 (55)	17 (39)	3 (7)	0	44
2002	21 (60)	13 (37)	1 (3)	0	35
2003	8 (24)	20 (61)	4 (12)	1 (3)	33
2004	7 (39)	8 (44)	3 (17)	0	18
2007	**34 (52)**	**27 (41)**	**5 (8)**	**0**	**66**

Table 10. Mean size and condition (Fulton's K) of age III+ and IV+ ***brook trout*** from Mooselookmeguntic Lake, 1998-2007. Means with the same Duncan Group letter designation are not significantly different (p>0.05).

Age	Year	No. sampled	Length (in)	Duncan group	Weight (lb)	Duncan group	Condition (K)	Duncan group
III+	**1998**	49	12.2	A	0.62	A	0.94	A,B
	1999	24	12.2	A	0.67	A	0.98	A,B
	2001	10	10.8	B	0.47	B	0.93	B
	2002	21	11.9	A	0.63	A	1.00	A
	2007	**34**	**12.0**	**A**	**0.60**	**A,B**	**0.93**	**B**
IV+	**1998**	12	13.5	A,B	0.84	B	0.97	A
	1999	17	14.2	A	1.20	A	1.07	A
	2002	13	12.7	B	0.79	B	1.03	A
	2003	20	13.6	A,B	0.98	A,B	1.06	A
	2007	**27**	**12.9**	**B**	**0.78**	**B**	**0.97**	**A**