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MOOSELOOKMEGUNTIC LAKE FISHERY MANAGEMENT

BY

DAVID HOWATT

AND

JASON SEIDERS

MAINE DEPARTMENT OF INLAND FISHERIES AND WILDLIFE
DIVISION OF FISHERIES AND HATCHERIES
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MOOSELOOKMEGUNTIC LAKE FISHERY MANAGEMENT
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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 creel surveys and season-long 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 16 inches). Additional salmon harvest was also encouraged through an educational program involving signage, oral presentations, and written articles.

Salmon growth has been steadily poor over recent years, but is now showing some signs of improvement. High salmon densities in a large waterbody, such as Mooselookmeguntic Lake, have required a long-term effort to improve growth. The more liberal salmon rules, combined with the education effort, have not resulted in the dramatically increased salmon harvest that must be sustained for a number of years to realize any improvements in growth rates and size quality. Nonetheless, we recommend continuance of the current liberalized harvest regulations to encourage additional progress in salmon quality.

Brook trout growth rates have also continued to be stable with older age fish present in the fishery. The combination of steady growth and a healthy population density indicates that brook trout have suitable habitat and available forage. Continued good growth rates of brook trout are attributed to the fact this that species is less dependent on smelts for forage.

KEY WORDS: AGE AND GROWTH , ANGLER EFFORT, ANGLER SURVEY, BKT, LLS, FORAGE, HARVEST, LAKE, CLERK 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, while 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 16 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 creel surveys and season-long aerial angler counts since 1981. The abbreviated creel surveys (from ice-out through early July) were conducted to collect catch rate and fish growth information. Findings from earlier surveys were reported by Bonney (1982, 1987, 2000, 2004, and 2005), DeSandre (1991), Boucher (1996, 1999, and 2008), and Seiders (2012). This report summarizes the results of the 2013 aerial count survey and 2014 clerk surveys (including voluntary angler information), and compares these data with preceding surveys. This report also summarizes data collected during the Kennebago River seining efforts which samples the lake's spawning salmon population during staging prior to spawning.

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. The dam is currently in the process of being rebuilt. This began in 2012 and is scheduled to be completed in 2015.

Summer water temperatures, oxygen concentrations, and the lake's physical habitat are ideal for coldwater fish species. 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 of 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 the southern end of this 13-mile long lake.

METHODS

Aerial counts of boats were used to estimate fishing effort at Mooselookmeguntic Lake in 2013. Counts were made on a randomized schedule from May 30 to September 30 (generally 3 days each week, including 1 weekend day per week). Counts were usually made between 9:00 AM and 1:30 PM. Angler counts were expanded from a composite use curve developed using complete angler trips from recent voluntary creel 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 early to mid-May to early July.

Length and weight of age V+, 2-stream year angler-harvested salmon were used to assess trends in growth rate and body condition using Fulton's K (Table 6). These data were supplemented with salmon collected annually in October from the Kennebago River spawning runs (Table 7). 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 2010 and 2013 increased significantly from that measured during the 1998 to 2007 period (Table 1), but remained well below historical estimates (1981-1995). Declining angler use was observed on other lakes in the Rangeley Chain during the same period, while on other nearby waters, it remained stable or increased slightly (Seiders 2011 and MDIFW, unpublished data). The declining quality of salmon in Mooselookmeguntic Lake, and stable or improved salmon quality in nearby lakes (MDIFW, unpublished data), likely influenced the angler use patterns observed.

Landlocked salmon:

Anglers caught an estimated 3,312 legal-size salmon (≥12 inches) in 2014 and harvested approximately 1,100 of these (Table 2). The total catch of legal salmon was in a range similar to previous years, but angler success at catching a legal-size salmon decreased slightly from 0.54 fish/angler in 2010 to 0.45 fish/angler in 2014. The number of sublegal salmon caught decreased during the same time period. Reduced numbers of sublegal salmon are possibly a sign of declining recruitment.

The percent of legal fish released by clerk surveyed anglers decreased from 70% in 2007 to 49% in 2010, but was back up to 66% in 2014 (Table 3). The release rate reported by volunteers remained relatively stable during this same 8-year period averaging 43%, but declined sharply from early in the decade. These data suggest that efforts to convince anglers to harvest additional salmon have been at least partially effective.

Age VI+ and older salmon were the dominant cohorts harvested by anglers in 2014, representing 89% of the sample (Table 5). Age VI+ salmon accounted for 48% of the harvest, the highest level observed since the 1998 survey. Older-age salmon (age VIII+ and older) comprised 21% of the harvest in 2014. This level is higher than that observed for this cohort in any of the previous surveys. The high percentage of older-age salmon indicates that salmon density remains high, and harvest remains relatively low.

The average length of harvested salmon examined by clerks ranged from 17 to 18 inches from 1995 to 2003. Average length decreased to 15.8 inches in 2004 before increasing slightly to 16.1 inches in 2007 (Table 3). In 2014, the average length of harvested salmon increased to 17.4 inches. This increase may have been influenced by the large percentage of older aged salmon in the harvest or may be attributed to angler preference for keeping larger fish. Comparison of age V+, 2 stream-year salmon (although a very small sample size of just 4 fish in 2014) indicate that fish sampled in the most recent survey exhibited increases in length, weight, and condition factor when compared to previous years (Table 6). The small sample size of age V+, 2 stream-year salmon appears to be the result of anglers keeping only larger older fish.

Beginning in 2001, salmon have been sampled on their spawning run at Steep Bank Pool in the Kennebago River (Table 7). These data corroborated the clerk creel survey observations of decreased body condition of salmon in Mooselookmeguntic Lake since 2007. These data also indicated that large numbers of older-age fish remained abundant and salmon densities remained high, despite a reduced angler release rate.

In summary, salmon abundance remained high and overall growth rates have continued to be poor during the period from 2002-2014, 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.

Initially, the liberalized 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 having minimal success in increasing salmon harvest and encouraging anglers to harvest smaller sized salmon. Growth rates and body condition of salmon improved measurably by 2007, but have decreased to levels observed in the early 2000's.

Improving salmon growth at Mooselookmeguntic Lake is complicated by the lake's immense size and persistent high recruitment of wild salmon from the Kennebago River, particularly following several years of favorable flows and temperatures in this large nursery area. We believe it will take several years of consistently high harvest to begin to reduce salmon densities and increase smelt numbers. Therefore, we recommend continuance of the current liberalized harvest regulations to encourage improvements in salmon growth. Salmon growth rates will be monitored to evaluate trends in abundance and condition.

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 2014, the estimated total catch and harvest of brook trout were approximately 2,650 and 1,104 fish, respectively. Data collected through clerk and voluntary surveys showed an increase in brook trout catch rates through 2007, but slightly decreasing trends in recent years (Tables 3 & 4). These surveys also indicated steady or improved brook trout growth during the same time period. Anglers continued to release a high proportion of legal-size brook trout (58%), although that was a decline from a high of 68% documented in 2004. Release rates of legal trout appear to have stabilized in recent years, based on clerk angler data (Table 3). The percent of legal-size trout released by voluntary anglers varied greatly from 2005 to 2013, with 2010 having the highest release rate of 76% (Table 4).

Brook trout regulations became more restrictive 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 2014 (Table 9), indicating that these regulations had the intended effects.

Growth indicators for brook trout fluctuated from 1998 to 2014, but there were no clear trends upward or downward (Table 10). Declines in brook trout growth and condition were observed from 1986 to 1998 (Boucher 1996 and 1999, and Bonney 2004). However, recent data suggest brook trout growth has stabilized. Brook trout catch rates have increased in recent years, indicating a robust population. The stabilization of growth rates during this increase in population density indicates suitable habitat and forage availability. The continued improvement in brook trout growth is attributed to the fact that this species is more dependent upon alewives and macroinvertebrates for forage rather than smelts.

CONCLUSION AND RECOMMENDATIONS

The size quality of wild landlocked salmon in Mooselookmeguntic Lake has improved slightly in recent years with liberalized regulations to increase harvest rates. However, improvement in salmon growth, in a waterbody as large as Mooselookmeguntic Lake, will require more years of consistently high salmon harvest to attain the desired goal. MDIFW’s outreach to anglers regarding salmon harvest initially appears to be showing little results and will require more time to realize its intended effect. We recommend that the current salmon regulations (three fish daily bag limit; 12-inch minimum length limit, only one over 16 inches permitted) be retained 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 monitored through triennial clerk creel surveys and angler counts, beginning again in 2017, and by annual sampling of the salmon spawning run in the Kennebago River.

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Prepared by:
David Howatt and Jason Seiders
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Table 1. Angler effort estimates for Mooselookmeguntic Lake, 1981-2013.

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)
2010	7,860 (6,507-9,213)	0.48 (0.40-0.56)
2013	7,360 (5,829-8,891)	0.45 (0.36-0.55)

Table 2. Estimated catch and harvest of **salmon** from Mooselookmeguntic Lake, 1981-2014. Confidence values (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
2010	4,244 (3,514-4,974)	2,200 (1,822-2,578)	49
2014*	3,312 (2,623-4,001)	1,104 (874-1,334)	66

*Note: 2014 values use 2013 aerial count data

Table 3. Clerk creel survey summary, Mooselookmeguntic Lake, 1999-2014.
(LLS=landlocked salmon; BKT=brook trout)

Statistic		Survey year						
		1999	**2002**	**2003**	**2004**	**2007**	**2010**	**2014**
No. anglers surveyed		502	495	355	315	374	438	300
No. angler hours surveyed		2,107	1,949	1,576	1,483	1,493	2,080	1295
	Species							
Percent successful anglers	LLS	26	22	26	27	43	34	34
	BKT	15	13	16	17	34	38	27
No. legal fish[1] kept	LLS	81	48	53	32	86	121	46
	BKT	53	38	40	19	69	109	46
No. (%) legal fish released	LLS	111 (58)	71 (60)	71 (64)	100 (76)	198 (70)	115 (49)	89 (66)
	BKT	39 (42)	64 (63)	28 (41)	40 (68)	120 (63)	124 (53)	63 (58)
No. (%) sublegal fish released	LLS	305 (61)	495 (81)	518 (81)	414 (76)	169 (37)	335 (59)	95 (41)
	BKT	55 (37)	57 (36)	22 (24)	4 (6)	120 (63)	171 (42)	42 (27)
No. legals caught/angler	LLS	0.38	0.24	0.35	0.42	0.76	0.54	0.45
	BKT	0.18	0.21	0.19	0.19	0.51	0.53	0.36
No. legals kept/angler	LLS	0.16	0.10	0.15	0.10	0.23	0.28	0.15
	BKT	0.11	0.08	0.11	0.06	0.18	0.25	0.15
Hours to catch a legal fish	LLS	11.0	16.4	12.7	11.2	5.3	8.8	9.6
	BKT	22.9	19.1	23.2	23.2	7.9	8.9	11.9
Mean length±SE of harvested fish (in)	LLS	18.0±0.3	17.4±0.4	16.9±0.3	15.8±0.3	16.1±0.2	15.0±0.1	17.4±0.4
	BKT	13.8±0.4	12.2±0.2	13.9±0.5	14.7±0.7	13.0±0.3	13.2±0.2	15.7±0.4
Mean weight±SE of harvested fish (lbs)	LLS	2.03±0.12	1.89±0.15	1.45±0.13	1.28±0.12	1.40±0.07	1.12±0.14	1.56±0.12
	BKT	1.24±0.12	0.73±0.04	1.33±0.28	1.67±0.35	0.87±0.12	0.78±0.12	1.81±0.18

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

Table 4. Voluntary creel survey summary, Mooselookmeguntic Lake, 2005-2013.
(LLS=landlocked salmon; BKT=brook trout)

Statistic		Survey year								
		2005	2006	2007	2008	2009	2010	2011	2012	2013
No. anglers reporting		26	48	74	66	40	61	34	41	37
No. angler hours reporting		137	174	352	216	166	330	155	116	173
	Species									
Percent successful anglers	LLS	12	52	67	71	65	56	74	44	65
	BKT	27	33	51	47	50	62	62	44	59
No. legal fish[1] kept	LLS	3	20	44	40	32	39	31	24	24
	BKT	4	16	29	31	22	23	19	20	19
No. (%) legal fish released	LLS	1 (25)	13 (39)	60 (58)	45 (53)	21 (40)	25 (39)	12 (28)	6 (20)	12 (33)
	BKT	10 (71)	8 (33)	16 (32)	36 (54)	10 (31)	71 (76)	19 (50)	10 (33)	7 (27)
No. (%) sublegal fish released	LLS	24 (86)	31 (48)	45 (30)	42 (33)	12 (19)	39 (38)	13 (26)	22 (45)	31 (46)
	BKT	0 (0)	7 (23)	12 (19)	9 (12)	9 (24)	13 (12)	4 (10)	13 (30)	6 (19)
No. legals caught/angler	LLS	0.15	0.69	1.41	1.29	1.28	1.05	1.09	0.66	0.84
	BKT	0.53	0.50	0.68	1.02	0.73	1.54	1.12	0.76	0.68
No. legals kept/angler	LLS	0.12	0.42	0.60	0.61	0.75	0.64	0.91	0.59	0.68
	BKT	0.15	0.33	0.39	0.47	0.48	0.38	0.56	0.51	0.49
Hours to catch a legal fish	LLS	34.1	5.3	3.4	2.5	3.3	5.2	3.9	4.3	5.6
	BKT	9.8	7.3	7.0	3.2	5.7	3.5	3.8	3.7	6.9
Mean length±SE of harvested fish (in)	LLS	18.4±2.8	14.2±0.3	15.0±0.3	14.8±0.2	15.3±0.3	14.7±0.2	15.2±0.2	14.0±0.4	14.8±0.4
	BKT	14.2±0.8	12.4±0.5	12.0±0.2	12.3±0.3	12.5±0.3	12.9±0.2	12.9±0.3	12.2±0.4	12.0±0.4

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

Table 5. Age group composition of harvested **salmon**, Mooselookmeguntic Lake, 1998-2014.

	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
2010	2 (2)	37 (33)	34 (30)	12 (11)	16 (14)	11 (10)	112
2014	0	0	4 (11)	18 (48)	7 (20)	8 (21)	37

Table 6. Mean size and condition (Fulton's K) of age V+, 2 stream-year **salmon** from Mooselookmeguntic Lake, 1998-2014.

Year	No. sampled	Length (in)		Weight (lb)		Condition (K)
1998	30	16.1		1.28		0.85
1999	21	16.0		1.23		0.86
2001	28	15.8		1.30		0.86
2002	54	14.6		0.94		0.81
2003	60	14.3		0.85		0.78
2004	60	14.5		0.92		0.81
2006	49	14.7		0.99		0.84
2007	75	15.2		1.15		0.90
2010	30	14.4		0.89		0.78
2014	4	15.6		1.30		0.95

Table 7. Mean length (inches) and condition (Fulton's K) of **salmon** sampled from the Kennebago River spawning run, 2001-2009 and 2012-2013 (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
2008	152	14.1	0.82	15.2	0.84	16.9	0.85	18.1	0.86
2009	183	14.3	0.75	15.6	0.74	16.5	0.75	17.7	0.75
2012	143	14.0	0.78	15.6	0.80	17.1	0.83	17.8	0.87
2013	160	13.5	0.76	15.5	0.82	16.4	0.83	18.2	0.84

Table 8. Estimated catch and harvest of **brook trout** from Mooselookmeguntic Lake, 1981-2014. 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
2010	4,166 (3,449-4,883)	1,965 (1,627-2,303)	53
2014*	2,650 (2,098-3,201)	1,104 (874-1,334)	58

*Note: 2014 values use 2013 aerial count data

Table 9. Age group composition of harvested **brook trout**, Mooselookmeguntic Lake, 1998-2010.

	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
2010	52 (50)	40 (38)	12 (11)	1 (1)	105
2014	4 (12)	13 (39)	12 (37)	4 (12)	33

Table 10. Mean size and condition (Fulton's K) of age III+ and IV+ **brook trout** from Mooselookmeguntic Lake, 1998-2014.

Age	**Year**	**No. sampled**	**Length (in)**		**Weight (lbs)**		**Condition (K)**
III+	1998	49	12.2		0.62		0.94
	1999	24	12.2		0.67		0.98
	2001	10	10.8		0.47		0.93
	2002	21	11.9		0.63		1.00
	2007	34	12.0		0.60		0.93
	2010	52	11.8		0.52		0.88
	2014	4	12.2		0.67		1.01
IV+	1998	12	13.5		0.84		0.97
	1999	17	14.2		1.20		1.07
	2002	13	12.7		0.79		1.03
	2003	20	13.6		0.98		1.06
	2007	27	12.9		0.78		0.97
	2010	40	13.9		0.99		1.00
	2014	13	14.6		1.35		1.11