An Evaluation of Changes in the White Perch (*Morone americana*) Population of Grafton Lake, Kejimkujik National Park After Dam Removal

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SUMMARY

During the period between July 1993 and September 1996, numerous studies were carried out to examine the physical, chemical and biological changes resulting from removal of the dam at Grafton Lake, Kejimkujik National Park. As part of these studies, several fish surveys were carried out to assess the changes occurring in the more dominant fish populations of the lake. The data collected during these surveys, however, was never fully analyzed with respect to evaluating what, if any, changes had occurred after removal of the dam. To partially remedy this deficiency, as well as provide a database spanning a longer time-period, a survey of the white perch (*Morone americana*) population was carried out in 2001, and the results of all surveys were subjected to a comparative analysis.

The results of the analyses suggest that little change has occurred in either growth rate or condition of the white perch population. This is in contrast to an earlier study that provided evidence of significant changes in the yellow perch population of Grafton Lake following removal of the dam. Possible reasons for the different responses observed for the two species studied include differences in habitats and life styles between the two species.

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1. Introduction

In 1938 the Federal Department of Fisheries constructed a dam on Grafton Brook in order to meet the water requirements for a salmon hatchery. The dam resulted in enlargement of the surface area of Grafton Lake from ca. 200 to 270 ha. The hatchery ceased operation in 1972 and in the early 1990s the Park Management team of Kejimkujik National Park decided to remove the dam allowing the system to revert to its original physical characteristics. This presented a unique opportunity to study and document the successional changes occurring in the terrestrial and aquatic communities within and around the lake resulting from removal of the dam. During the period July 1993 - September 1996 the Centre for Wildlife and Conservation Biology of Acadia University, together with a number of other agencies, carried out a multidisciplinary study to obtain data on the physical, chemical and biological characteristics of the lake prior to and after removal of the dam. Results of the study indicated significant changes in the lake's biology as a result of the decreased water depth and surface area, and it was concluded that changes will likely continue to occur for various lengths of time depending on the particular processes of interest (Brylinsky and others 1995; 1997).

Although the fish populations present in Grafton Lake formed a major portion of the monitoring effort of these studies, the data obtained was never adequately analyzed. This was unfortunate as it is likely that the fish community of the lake would experience major changes since the dam acted as a barrier to fish passage both into and out of the lake (Drysdale 1994). In order to correct this shortcoming, and to provide a somewhat longer-term database for evaluation of the changes that may have resulted from removal of the Grafton Lake dam, an additional fish survey of yellow perch (*Perca flavescens*) was carried during 2000. The objective was to carry out a comparative analysis of the population characteristics of this species, using the data collected for all survey years, in order to determine the extent to which the yellow perch population had changed over the four-year period since complete removal of the dam. The results have been reported by Brylinsky (2000). In 2001, a similar study, having the same objectives, was carried out on the white perch (*Morone americana*) population and forms the subject of this report.

2. Previous Ichthyology Studies at Grafton Lake

Kerekes (1975) carried out a preliminary survey of the fish populations present in Grafton Lake. Eight species of fish were reported. These included white perch (*Morone americana*), yellow perch (*Perca flavescens*), brown bullhead (*Ictalurus natalis*), white sucker (*Catostomus commersoni*), brook trout (*Salvelinus fontinalis*), golden shiner (*Notemigonus cryoleucas*), ninespine stickleback (*Pungititus pungititus*) and banded killifish (*Fundulus diaphanous*). Later studies (summarized by Brylinsky and others

1995; 1997) revealed the presence of American eel (*Anguilla rostrata*) and creek chub (*Semotilus atrmaculatus).*

The only comprehensive surveys of the fish populations in Grafton Lake were those carried out as part of the Grafton Lake Ecological Restoration Monitoring Project. Studies were initiated at the beginning of the project in 1993 and continued until the project ended in 1996. The populations studied most intensively during this period included white and yellow perch. These were the most abundant fish species in the lake and the only species collected in numbers great enough to allow detailed analyses of population characteristics. The initial study in 1993 was carried out by W. White, then of the Federal Department of Fisheries and Oceans, and is somewhat restricted with respect to the amount of data collected and the analyses carried out. This was largely due to delays in initiating the project that resulted in sample sizes too small for adequate analyses. The 1994 study, which is the most comprehensive, was carried out as part of an Honours Thesis (Olsen 1996) under the supervision of M. Dadswell of Acadia University. Summer research assistants working on the Grafton Lake project carried out the 1995 and 1996 fish surveys.

The 1993 and 1994 surveys were carried out prior to lowering of the dam. In September 1994, the dam was lowered by one meter and in 1995 another lowering of one meter was carried out. Thus, the 1995 and 1996 surveys were carried out during and after removal of the dam. After 1996, the dam's concrete spillway was removed which resulted in an additional lowering of about 2.3 m.

During the spring and summer of 2000, Brylinsky (2000) re-surveyed the yellow perch population of Grafton Lake and carried out a comparative analysis of abundance, growth and mortality using data collected from all previous surveys. The general conclusions were that there were increases in the age of the dominant year class, mean fork length, wet weight and growth rate, and a decrease in survival rate after removal of the dam.

3. Methods

In order to ensure comparable data, similar methodologies were employed during all surveys. White perch were collected using a box trap having 0.25-inch mesh net for the box and 0.75-inch mesh net for the wings. Each of the three wings were approximately 10 meters in length. In all years except 1994, the trap was set just offshore of one of the unnamed islands within Grafton Lake. In 1994, the box trap was periodically moved to other sites within the Lake. The locations are shown in Figure 3.1.

The box trap was typically set for one to three days at each site, and was checked at the end of each 24 hr period. After removal from the box trap, the fish were transported to a field station, measured for fork length to the nearest mm and weighed to the nearest 0.1 gm. Scale samples for age determination were collected from an area just below the dorsal fin. Scales were aged by mounting at least four scales from each fish between two glass slides and reading the ages with a compound microscope under 16X magnification.

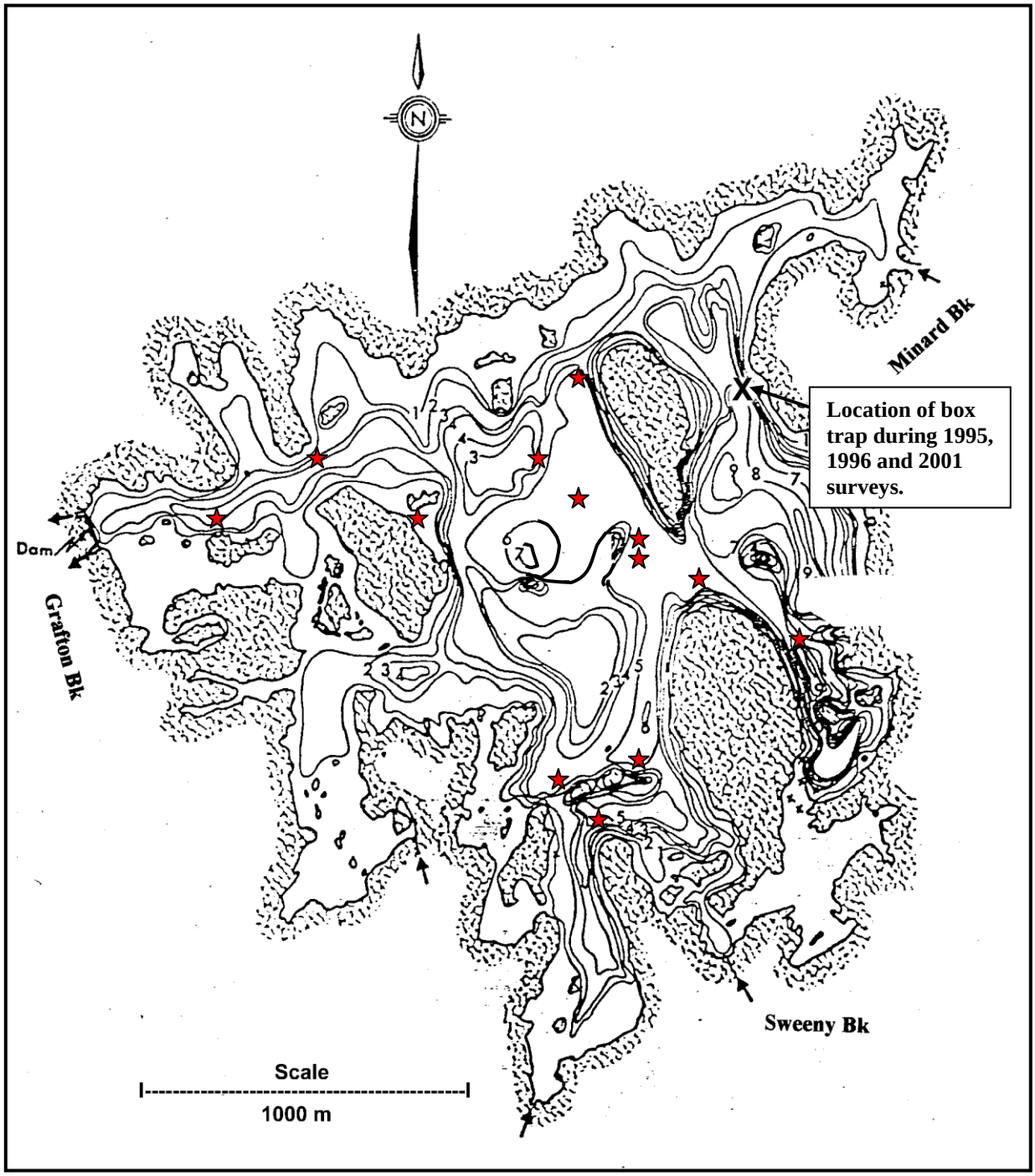

Figure 3.1. Map of Grafton Lake (modified from Kerekes 1973) showing location of box trap sets (stars indicate locations for the 1995 survey).

Statistical analyses were carried out using SYSTAT. For probabilities used in analysis of variance (ANOVA) hypothesis tests, a Bonferroni adjustment was used to reduce the chance of erroneous significance when calculating multiple probabilities. A significance level of 95% ($p = 0.05$) was used.

4. Database Used for Analyses

Surveys for white perch were carried out in 1993, 1994, 1995, 1996 and 2001. The 1993 survey produced very little data as only two white perch were collected and these were neither measured nor aged. The 1994 survey (Olson 1996) was the most comprehensive involving 14 trap sets between 16 May and 21 July in which a total of 341 white perch were collected.

Despite considerable effort involving 13 trap sets between mid-May and late August, the 1995 survey resulted in the capture of only 19 white perch. The reasons for the low catch rates are not known, but are likely related to improper setting of the box trap rather than a reduction in the number of fish in the Lake. Since 19 fish was considered too small a sample size for comparison with other survey years, the data collected during 1995 was not included in the analyses.

The 1996 survey was quite successful in terms of the number of fish collected. Twelve trap sets were made between 21 May and 20 August in which a total of 223 white perch were collected and processed.

The 2001 survey was carried out during June. Only three trap sets were made, but this resulted in a total of 120 fish collected, all of which were processed.

The complete database is contained in Appendix I and consists of the date of each collection, and the fork length, wet weight and age of all fish processed. Table 4.1 is a summary of the dates of collections, number of fish collected on each date and the number of fish processed for fork length, weight and age for all of the data used in the analyses.

5. Results

5.1 Length-frequency relationships

Figure 5.1.1 shows the fork length-frequency distribution for each of the three survey years for which sufficient data is available. There is little difference among years in the size of the dominant year class, but in 2001 a larger proportion of smaller fish were collected, and no large fish were collected.

Age analysis indicated the dominant size class to be three year old fish. The low number of fish less than three years of age is most likely a result of the selectivity of the box traps rather than their absence from the population. The number of older and larger fish collected was also very low in all years. In both 1994 and 1996 a very small percentage of the fish captured had fork lengths greater than 170 mm, which corresponds to an age of about seven years. In 2001, the largest fish captured had a fork length of 135 mm and was aged at five years. The lack of larger, older fish in 2001 is most likely a result of the

limited number of trap sets (three compared to 14 and 13 for 1994 and 1996 respectively). The low number of sets in 2001 would reduce the probability of capturing the less abundant larger fish. The increased number of smaller fish captured in 2001 compared to 1994 and 1996 is harder to explain, but may be a result of the fortuitous capture of a school of small fish. It may be that using a single trap net to survey a fish population that characteristically schools in groups of similar size, such as white perch, will result in a biased sample unless the sampling effort is relatively intense.

Table 4.1 Summary of data used in the analysis.

Collection Date	Number Collected	Number Measured	Number Weighed	Number Aged
16 May 1994	6	6	0	0
19 May 1994	1	1	0	0
21 May 1994	2	2	0	0
24 May 1994	4	4	0	0
26 May 1994	93	0	0	0
07 June 1994	76	76	76	45
09 June 1994	32	32	32	24
16 June 1994	0	0	0	0
20 June 1994	88	88	88	5
26 June 1994	20	20	20	1
29 June 1994	0	0	0	0
07 July 1994	0	0	0	0
15 July 1994	7	7	7	3
20 July 1994	9	9	9	0
21 July 1994	3	3	3	0
Totals for 1994	**341**	**341**	**235**	**79**
21 May 1996	9	9	9	4
22 May 1996	21	21	21	4
23 May 1996	18	18	18	6
24 May 1996	45	45	45	4
29 May 1996	1	1	1	1
05 June 1996	62	62	62	16
06 June 1996	19	19	19	13
20 June 1996	5	5	5	5
22 June 1996	17	16	16	5
23 July 1996	17	17	16	7
27 July 1996	4	4	4	1
20 August 1996	0	0	0	0
Totals for 1996	**223**	**223**	**222**	**66**
02 June 2001	0	0	0	0
09 June 2001	82	80	82	80
10 June 2001	42	40	42	40
Totals for 2001	**120**	**120**	**120**	**120**
Totals for All Years	**684**	**684**	**577**	**265**

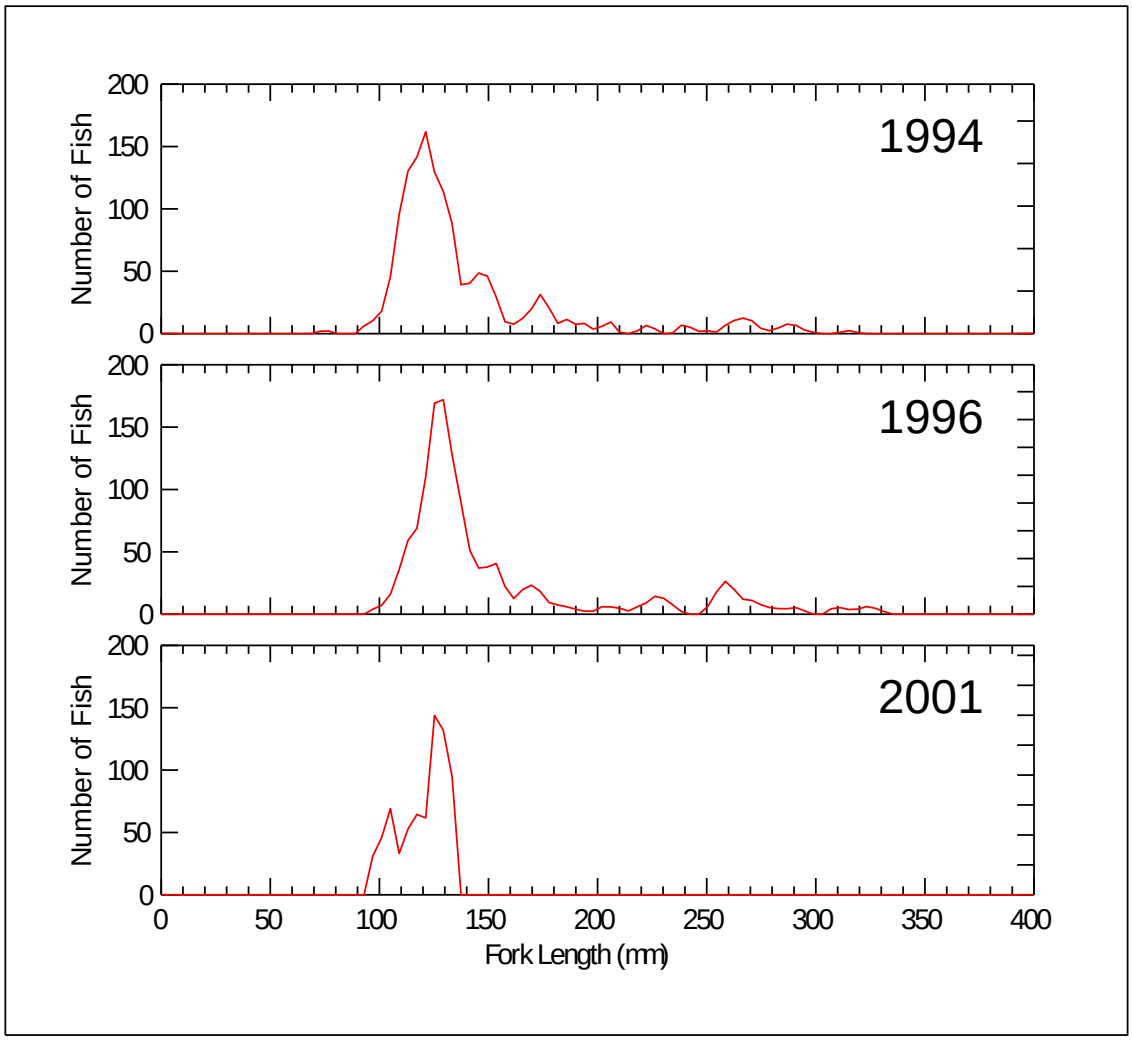

Figure 5.1.1 Length-frequency distribution of white perch for each survey year.

5.2 Length-weight relationships

Analysis of length-weight relationships was carried out using linear regression analysis on logarithmic transformed weights and lengths (Figure 5.2.1). An ANOVA indicated no significant between year differences in the regression slopes. The regression coefficients for the slopes are above three for all years, a value that is often considered indicative of good growth.

5.3 Length-age Relationships

Figure 5.3.2 shows the variation in fork length and weight with age grouped by year. Sufficient numbers of fish within the different age classes were available only for fish greater than one and less than six years of age and the comparisons are limited to these age groups. The only indication of any significant differences between years is that both

fork length and weight at age five in 1994 were greater than in the other years. A t-test of the differences in the means, however, showed that this difference is not significant.

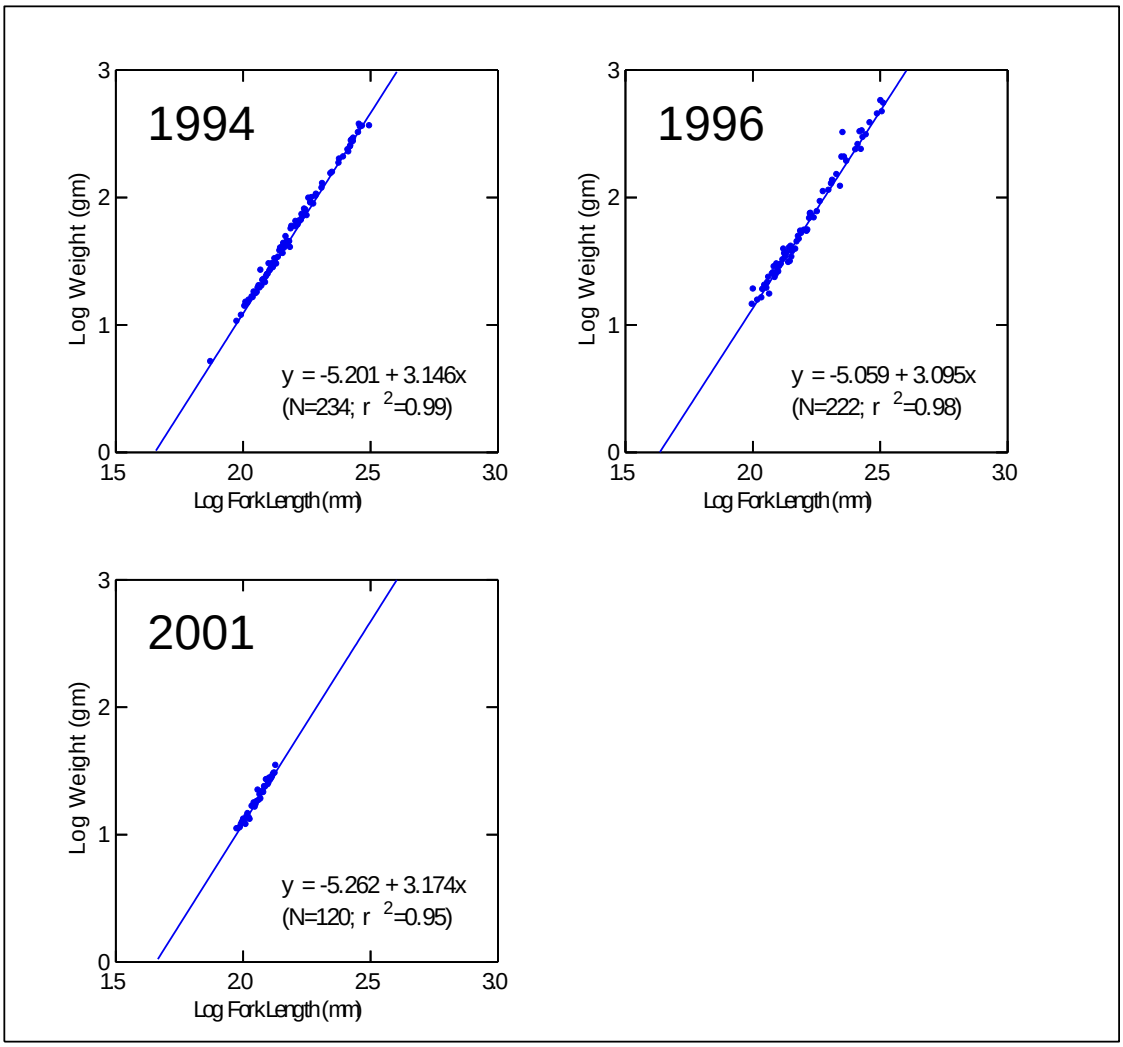

Figure 5.2.1 Length-weight relationships for each year.

5.4. Comparison of age-size relationships

Table 5.4.1 lists the age-size relationships of the Grafton lake white perch population together with data available for some other lakes presented by Scott and Crossman (1973). The fork length and ages d on this limited comparison, it appears that the Grafton Lake population grows very slowly.

Table 5.4.1. Fork length-age relationships.

Age	Fork Length (mm)		
	Lake Jesse, N.S.	Oneida Lake, N.Y	Grafton Lake, N.S.*
2	110	190	115
3	127	226	124
4	138	244	131
5	155	257	144

*Average of all survey years.

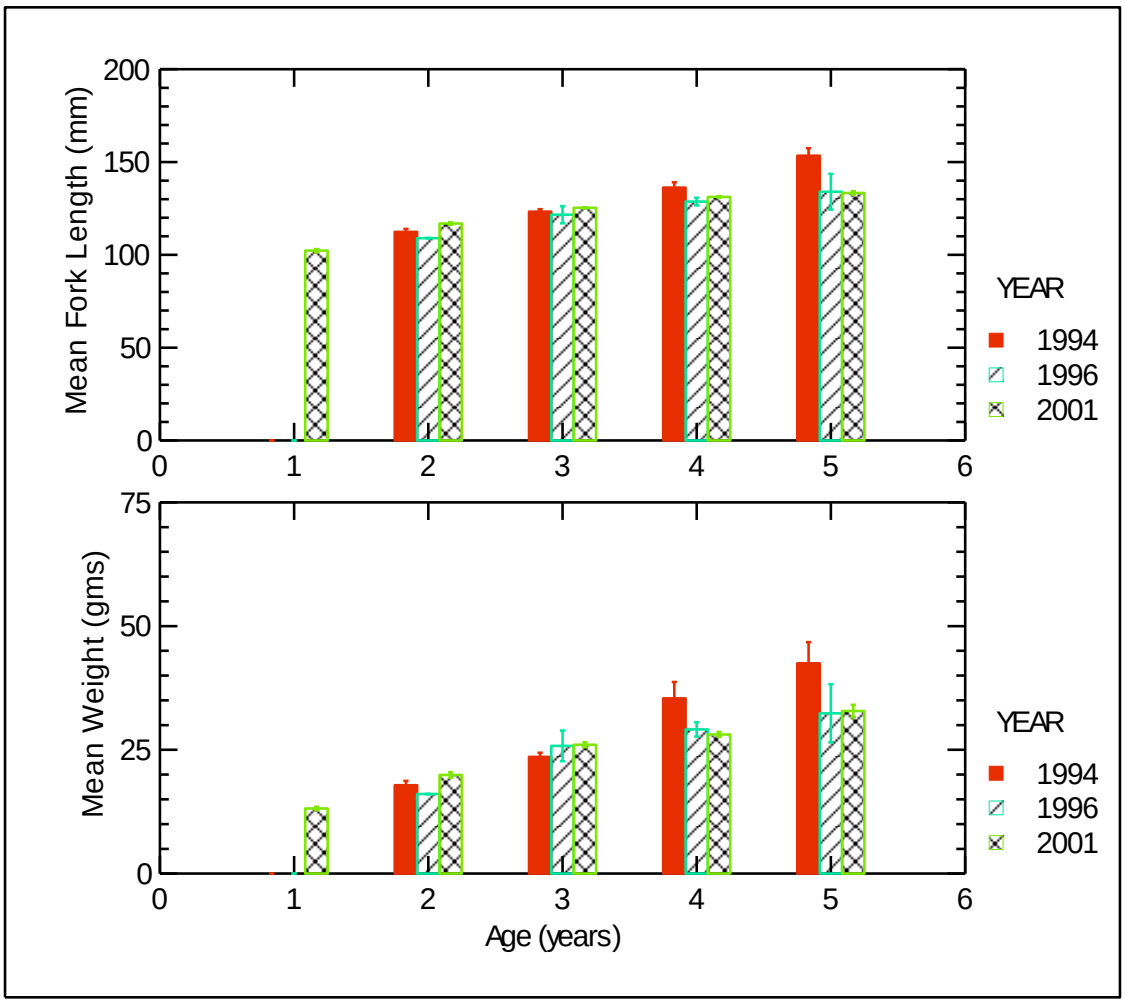

Figure 5.3.2 Variation in fork length and weight with age grouped by year.

5.4. Comparison of age-size relationships

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5.5 Survival Rates

Analysis of survival rate is typically made on the basis of the number of fish collected in each age class. Percent survival can be calculated as $(N_{i+t}/N_i) \times 100$ where N_i is the number of fish of age i and N_{i+t} is the number of fish one year (or more) older. A major assumption of this procedure, however, is that the fish population has been sampled in an unbiased manner and that all age classes are equally subject to being captured (Everhart and Youngs 1981). It is unlikely that the procedures used to sample the white perch population satisfy this requirement.

Despite this limitation, estimates of survival were calculated for three to five year age intervals assuming that fish within this age range were sampled with equal efficiency by the box trap. But it must be emphasized that the resulting survival rates may not be valid considering the sampling regime used. Figure 5.5.1 shows the frequency distribution (as percentages to aid comparison) of each age class for each year, and Table 5.5.1 lists the associated survival rates.

The survival rates calculated vary widely between survey years and no clear trends are evident.

Table 5.5.1 Percent survival from age 3 to 4, 4 to 5 and 3-5.

YEAR	PERCENT SURVIVAL		
	Age 3-4	**Age 4-5**	**Age 3-5**
1994	38.8	57.1	22.2
1996	40.0	25.0	10.0
2001	80.0	12.5	10.0

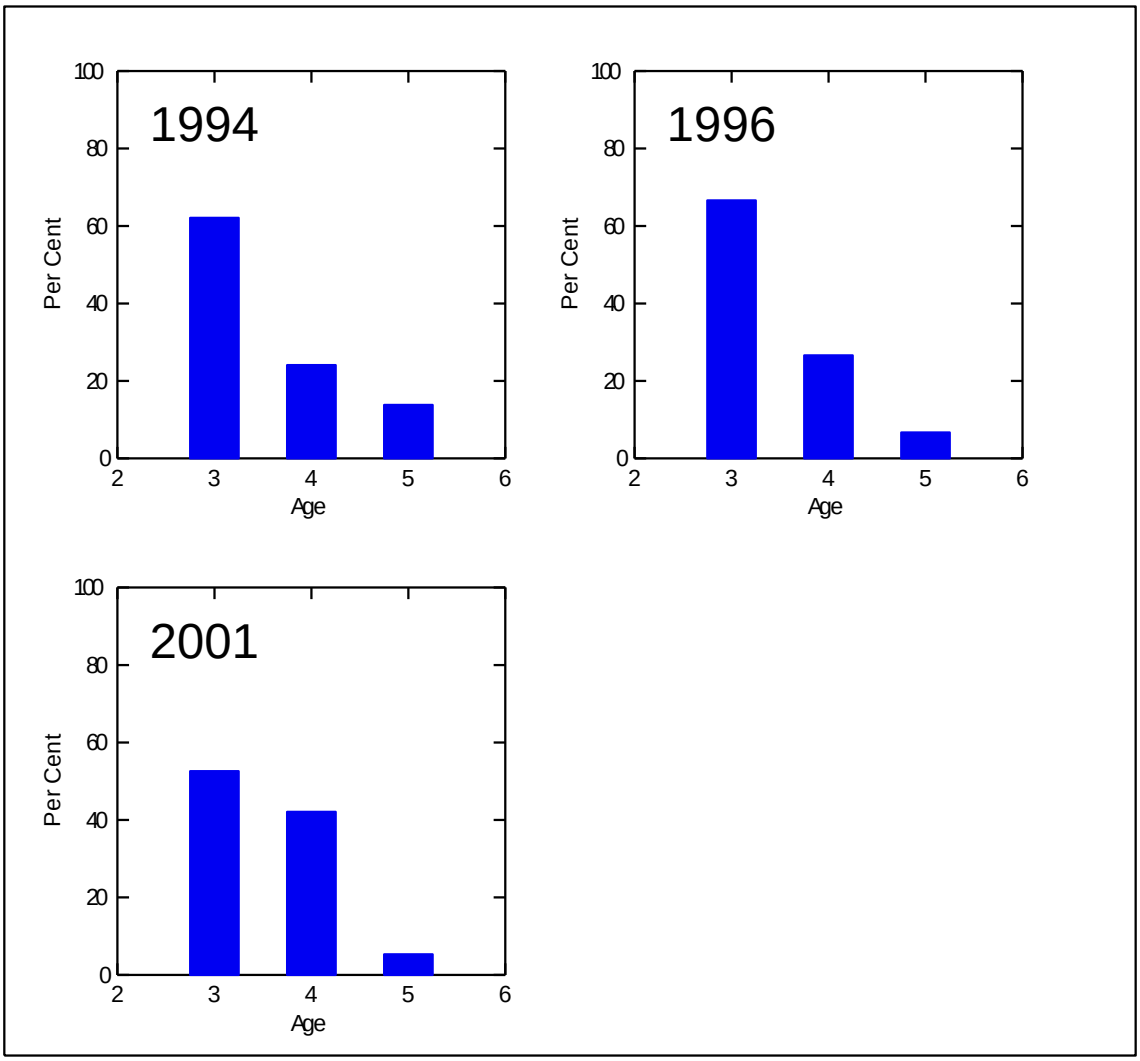

Figure 5.5.1 Frequency distribution of age classes for 3-5 year old fish.

6. Discussion

It appears there has been little change in the white perch population of Grafton Lake since removal of the dam. Although the fish collected during the 2001 survey contained more young fish and fewer older fish, this is most likely a result of the differences in sampling intensity for this year relative to the other survey years, rather than a real change in the size structure of the population. There was little difference in either length-weight relationships or age-size relationships between years, and no clear differences could be noted in survival rates between years.

These results are in contrast to those observed for a similar study of yellow perch (Brylinsky 2000), in which there was evidence of a number changes after removal of the

dam. These changes included increases in the age of the dominant year class, mean fork lengths, wet weights and growth rates, and a decrease in survival rates.

The different responses may be a result of the differences that exist between the habitat requirements and niche characteristics of the two species. Yellow perch tend to be more closely associated with littoral habitats than do white perch, particularly with respect to spawning and feeding habitat, and in the use of littoral macrophytes for predator escape cover. The loss of a well developed littoral habitat containing established macrophyte populations was one of the results of removal of the dam, and it is likely this had a substantial impact on the habitat available for yellow perch.

White perch, in contrast, tend to be more closely associated with pelagic habitats. Although they do prefer to spawn in shallow littoral zones, they do not appear to have a preference for vegetated areas. They spend most of their time in the pelagic zone. Small white perch feed mainly on microzooplankton, and larger white perch feed mainly on smaller fish. As a result, they are more pelagic than yellow perch, and it is likely that removal of the dam caused relatively less change within the pelagic zone than within the littoral zone of Grafton Lake.

Although, based on the length-weight relationships, the white perch population of Grafton Lake appears to be in good condition, its growth rate appears to be slow in comparison to other systems. This, however, is not unexpected for an oligotrophic lake. Although white perch can grow rapidly and reach large sizes, the conditions that allow this are usually associated with anadromous populations along the Atlantic seaboard, or newly expanding populations such as those in some of the Great Lakes. Landlocked populations in oligotrophic lakes, such as Grafton Lake, usually have much slower rates of growth (Scott and Crossman (1973).

7. Acknowledgements

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8. Appendix I

White Perch Database for Surveys Carried Out at Grafton Lake Between 1993 and 2001

Collection Date	Fork Length	Wet Weight	Age (Years)
16-May-1994	115		
16-May-1994	130		
16-May-1994	175		
16-May-1994	185		8
16-May-1994	270		
16-May-1994	280		
19-May-1994	150		
21-May-1994	122		
21-May-1994	131		
24-May-1994	111		
24-May-1994	117		
24-May-1994	124		
24-May-1994	132		
26-May-1994	103		
26-May-1994	105		
26-May-1994	106		
26-May-1994	106		
26-May-1994	107		
26-May-1994	108		
26-May-1994	108		
26-May-1994	108		
26-May-1994	109		
26-May-1994	109		
26-May-1994	109		
26-May-1994	109		
26-May-1994	110		
26-May-1994	110		
26-May-1994	110		
26-May-1994	110		
26-May-1994	111		
26-May-1994	112		
26-May-1994	112		
26-May-1994	112		
26-May-1994	112		
26-May-1994	113		
26-May-1994	113		
26-May-1994	113		
26-May-1994	115		
26-May-1994	115		
26-May-1994	115		
26-May-1994	116		
26-May-1994	117		

26-May-1994	117		
26-May-1994	117		
26-May-1994	117		
26-May-1994	118		
26-May-1994	118		
26-May-1994	118		
26-May-1994	119		
26-May-1994	120		
26-May-1994	120		
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26-May-1994	130		
26-May-1994	132		

26-May-1994	132		
26-May-1994	132		
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26-May-1994	135		
26-May-1994	139		
26-May-1994	142		
26-May-1994	142		
26-May-1994	143		
26-May-1994	146		
26-May-1994	147		
26-May-1994	150		
26-May-1994	169		
26-May-1994	174		
26-May-1994	176		
7-Jun-1994	106	15.5	2
7-Jun-1994	109	17.2	
7-Jun-1994	110	15.5	2
7-Jun-1994	111	17.5	
7-Jun-1994	112	19.6	
7-Jun-1994	113	19.7	2
7-Jun-1994	115	18.7	
7-Jun-1994	115	18.7	2
7-Jun-1994	115	19.9	2
7-Jun-1994	116	19.7	2
7-Jun-1994	116	20.6	3
7-Jun-1994	118	19.3	3
7-Jun-1994	118	19.4	
7-Jun-1994	119	21.8	
7-Jun-1994	120	24.4	2
7-Jun-1994	121	21.7	
7-Jun-1994	121	23.5	
7-Jun-1994	122	23.3	
7-Jun-1994	124	22.1	
7-Jun-1994	124	27.3	2
7-Jun-1994	125	21.6	3
7-Jun-1994	125	22	3
7-Jun-1994	125	27.7	
7-Jun-1994	129	25.2	
7-Jun-1994	129	28.8	4
7-Jun-1994	130	26.3	3

7-Jun-1994	130	28.7	4
7-Jun-1994	134	32.2	
7-Jun-1994	140	37.8	5
7-Jun-1994	143	42.4	
7-Jun-1994	145	38.9	
7-Jun-1994	145	44	5
7-Jun-1994	145	49.1	4
7-Jun-1994	147	41.9	
7-Jun-1994	148	48.8	5
7-Jun-1994	150	45.7	
7-Jun-1994	150	49.3	4
7-Jun-1994	150	50	7
7-Jun-1994	155	52.9	
7-Jun-1994	156	58.7	5
7-Jun-1994	167	64.7	8
7-Jun-1994	170	63.7	
7-Jun-1994	170	66.1	5
7-Jun-1994	170	67	
7-Jun-1994	171	72.8	5
7-Jun-1994	172	71.2	8
7-Jun-1994	174	71.7	
7-Jun-1994	175	73.2	
7-Jun-1994	175	79.1	
7-Jun-1994	175	80.4	
7-Jun-1994	175	89.2	7
7-Jun-1994	176	76.8	
7-Jun-1994	177	79.1	
7-Jun-1994	182	97.8	8
7-Jun-1994	185	90.1	
7-Jun-1994	186	90.4	8
7-Jun-1994	195	105.3	10
7-Jun-1994	205	99	9
7-Jun-1994	205	125.9	8
7-Jun-1994	205	130.1	9
7-Jun-1994	206	127.7	
7-Jun-1994	222	139.2	
7-Jun-1994	225	156	8
7-Jun-1994	239	184.2	11
7-Jun-1994	240	196.1	11
7-Jun-1994	240	200.8	11
7-Jun-1994	259	231.7	12
7-Jun-1994	259	236.7	14
7-Jun-1994	265	238.5	15
7-Jun-1994	265	256.4	
7-Jun-1994	272	272.6	15

7-Jun-1994	285	320.3	
7-Jun-1994	287	372.5	12
7-Jun-1994	290	332	17
7-Jun-1994	290	377.6	15
7-Jun-1994	315	362	18
9-Jun-1994	75	5.1	1
9-Jun-1994	99	12.2	2
9-Jun-1994	109	16.4	
9-Jun-1994	110	15.4	2
9-Jun-1994	113	17.2	2
9-Jun-1994	113	18.4	2
9-Jun-1994	114	17	2
9-Jun-1994	115	18.6	2
9-Jun-1994	115	21.3	
9-Jun-1994	117	19.5	3
9-Jun-1994	118	19.9	3
9-Jun-1994	121	23	3
9-Jun-1994	121	25	3
9-Jun-1994	122	22.1	
9-Jun-1994	123	18.3	2
9-Jun-1994	126	26.8	3
9-Jun-1994	128	23.7	
9-Jun-1994	128	28.8	4
9-Jun-1994	130	27.5	3
9-Jun-1994	130	29.6	3
9-Jun-1994	132	27.5	3
9-Jun-1994	132	29.7	4
9-Jun-1994	135	28.9	4
9-Jun-1994	135	30.2	
9-Jun-1994	135	31.2	
9-Jun-1994	141	39.9	4
9-Jun-1994	147	46.7	5
9-Jun-1994	150	36.8	
9-Jun-1994	150	44.8	5
9-Jun-1994	155	59.7	6
9-Jun-1994	266	252.4	
9-Jun-1994	295	358.9	15
20-Jun-1994	95	10	
20-Jun-1994	95	10.5	
20-Jun-1994	95	11.2	
20-Jun-1994	99	11.4	2
20-Jun-1994	103	13.3	
20-Jun-1994	103	16.7	
20-Jun-1994	105	14.3	
20-Jun-1994	105	14.4	

20-Jun-1994	105	14.5	
20-Jun-1994	109	15.2	
20-Jun-1994	109	16.1	
20-Jun-1994	109	17.3	
20-Jun-1994	110	16.8	
20-Jun-1994	110	17.2	
20-Jun-1994	111	18.4	
20-Jun-1994	112	16.3	2
20-Jun-1994	112	16.8	
20-Jun-1994	113	16	
20-Jun-1994	113	16.8	
20-Jun-1994	113	16.9	
20-Jun-1994	113	17.1	
20-Jun-1994	113	17.3	
20-Jun-1994	113	17.9	3
20-Jun-1994	114	17.3	
20-Jun-1994	115	18	
20-Jun-1994	115	18.8	
20-Jun-1994	115	19.5	
20-Jun-1994	115	21	
20-Jun-1994	117	19.1	
20-Jun-1994	118	21.7	
20-Jun-1994	118	22	
20-Jun-1994	118	27.6	
20-Jun-1994	119	19.5	
20-Jun-1994	119	20	
20-Jun-1994	119	21.5	
20-Jun-1994	120	20.8	
20-Jun-1994	120	21.4	
20-Jun-1994	120	21.7	
20-Jun-1994	120	22.1	
20-Jun-1994	120	22.3	
20-Jun-1994	121	21.3	
20-Jun-1994	121	21.3	
20-Jun-1994	121	22.2	
20-Jun-1994	122	22	3
20-Jun-1994	122	23.2	
20-Jun-1994	123	22	
20-Jun-1994	123	22.9	
20-Jun-1994	124	22.1	
20-Jun-1994	125	23.7	
20-Jun-1994	125	26.2	
20-Jun-1994	126	23	
20-Jun-1994	128	26.2	
20-Jun-1994	129	26.5	

20-Jun-1994	129	26.9	
20-Jun-1994	129	27.2	
20-Jun-1994	130	25.5	
20-Jun-1994	130	26.7	
20-Jun-1994	131	28	
20-Jun-1994	131	28.1	
20-Jun-1994	131	33.2	
20-Jun-1994	132	26.9	
20-Jun-1994	132	26.9	
20-Jun-1994	132	28.4	
20-Jun-1994	133	29.3	
20-Jun-1994	134	29.1	
20-Jun-1994	136	29.8	
20-Jun-1994	138	33.1	
20-Jun-1994	138	34.3	
20-Jun-1994	142	36.2	
20-Jun-1994	142	36.6	
20-Jun-1994	142	36.9	
20-Jun-1994	142	39.9	
20-Jun-1994	143	38	
20-Jun-1994	144	36	
20-Jun-1994	146	39.6	
20-Jun-1994	149	41.7	
20-Jun-1994	149	45.2	
20-Jun-1994	151	37.1	
20-Jun-1994	151	47	
20-Jun-1994	152	43.8	
20-Jun-1994	152	45.4	
20-Jun-1994	153	44.6	
20-Jun-1994	190	88	
20-Jun-1994	194	110.6	
20-Jun-1994	222	167	8
20-Jun-1994	249	206	
20-Jun-1994	267	275.8	
20-Jun-1994	273	289.3	
26-Jun-1994	109	16.3	
26-Jun-1994	112	17.4	
26-Jun-1994	114	19.2	
26-Jun-1994	115	17.5	
26-Jun-1994	115	20.3	
26-Jun-1994	119	16.6	
26-Jun-1994	119	20.4	
26-Jun-1994	119	21.2	
26-Jun-1994	120	22.5	
26-Jun-1994	122	21.3	3

26-Jun-1994	123	22.2	
26-Jun-1994	124	23.2	
26-Jun-1994	124	23.8	
26-Jun-1994	128	25.1	
26-Jun-1994	128	27	
26-Jun-1994	130	28	
26-Jun-1994	145	41.5	
26-Jun-1994	147	39.6	
26-Jun-1994	154	40.2	
26-Jun-1994	165	62.1	
15-Jul-1994	105	15.6	2
15-Jul-1994	125	27.1	3
15-Jul-1994	128	27.3	3
15-Jul-1994	130	29.2	
15-Jul-1994	134	37.7	
15-Jul-1994	172	68.2	
15-Jul-1994	194	93.1	
20-Jul-1994	118	95.6	
20-Jul-1994	127	29.9	
20-Jul-1994	141	39.5	
20-Jul-1994	161	58.5	
20-Jul-1994	162	64.3	
20-Jul-1994	165	58.5	
20-Jul-1994	179	71.3	
20-Jul-1994	187	98.9	
20-Jul-1994	261	225.6	
21-Jul-1994	102	13.9	
21-Jul-1994	131	31	
21-Jul-1994	269	280.4	
5-Jun-1995	115	19.9	
21-May-1996	135	32.9	
21-May-1996	150	48.5	
21-May-1996	170	66.9	
21-May-1996	205	127.1	9
21-May-1996	215	150.22	10
21-May-1996	230	184.7	13
21-May-1996	255	310.3	
21-May-1996	260	210	
21-May-1996	320	570	15
22-May-1996	110	20.14	
22-May-1996	115	20.7	4
22-May-1996	115	22.63	
22-May-1996	125	35.58	
22-May-1996	130	27.6	
22-May-1996	130	31.71	

22-May-1996	130	33.86	
22-May-1996	132	31.08	
22-May-1996	135	30.05	
22-May-1996	135	31.47	
22-May-1996	140	35.98	
22-May-1996	140	40.8	
22-May-1996	140	42.62	
22-May-1996	235	190.95	10
22-May-1996	255	206.2	11
22-May-1996	260	258.1	
22-May-1996	260	275.58	15
22-May-1996	260	284.98	
22-May-1996	260	291.2	
22-May-1996	290	418.91	
22-May-1996	310	486.17	
23-May-1996	110	18.42	
23-May-1996	115	22.29	
23-May-1996	116	23.46	4
23-May-1996	120	22.07	4
23-May-1996	120	27.98	
23-May-1996	125	36.97	
23-May-1996	125	37.32	
23-May-1996	135	35.82	
23-May-1996	135	35.82	
23-May-1996	135	36.71	
23-May-1996	140	40.58	4
23-May-1996	142	38.37	4
23-May-1996	142	44.55	
23-May-1996	152	51.56	
23-May-1996	155	54.14	
23-May-1996	255	229.2	
23-May-1996	265	325.12	16
23-May-1996	270	352.95	14
24-May-1996	100	14.37	
24-May-1996	101	18.96	
24-May-1996	112	21.5	
24-May-1996	115	20.3	
24-May-1996	115	21	
24-May-1996	115	21.02	
24-May-1996	120	27.79	
24-May-1996	121	25.7	
24-May-1996	121	26.5	
24-May-1996	122	28.18	
24-May-1996	123	25.5	
24-May-1996	124	25.28	

24-May-1996	125	27.71	
24-May-1996	125	29.66	
24-May-1996	125	31.8	
24-May-1996	128	29.55	
24-May-1996	128	30	4
24-May-1996	128	32.2	
24-May-1996	128	32.64	
24-May-1996	129	24.86	
24-May-1996	129	32.15	
24-May-1996	130	30.31	
24-May-1996	130	31.37	
24-May-1996	132	35.7	
24-May-1996	135	37.3	
24-May-1996	140	36.39	
24-May-1996	140	37.08	
24-May-1996	140	40.61	
24-May-1996	140	45.73	
24-May-1996	150	47.71	
24-May-1996	150	48.68	
24-May-1996	155	54.3	7
24-May-1996	156	53.3	6
24-May-1996	168	67.9	
24-May-1996	170	73.2	6
24-May-1996	170	75.7	
24-May-1996	170	77.75	
24-May-1996	170	78.7	
24-May-1996	185	92.2	
24-May-1996	225	205.2	
24-May-1996	230	215	
24-May-1996	230	219	
24-May-1996	255	206.2	
24-May-1996	260	258.1	
24-May-1996	280	297.18	
29-May-1996	150	48.5	6
5-Jun-1996	109	16.2	
5-Jun-1996	110	17.47	
5-Jun-1996	110	19.07	
5-Jun-1996	115	18.4	
5-Jun-1996	115	19.9	
5-Jun-1996	123	19.7	
5-Jun-1996	123	24.32	
5-Jun-1996	123	24.32	4
5-Jun-1996	124	19.7	
5-Jun-1996	124	22	
5-Jun-1996	124	25.28	

5-Jun-1996	124	26	
5-Jun-1996	124	28	
5-Jun-1996	124	28	
5-Jun-1996	125	25.5	
5-Jun-1996	125	26.9	
5-Jun-1996	125	27.68	
5-Jun-1996	125	28.02	3
5-Jun-1996	126	26.2	
5-Jun-1996	126	26.9	4
5-Jun-1996	126	27.3	
5-Jun-1996	127	24.7	5
5-Jun-1996	127	28.3	
5-Jun-1996	128	24.9	
5-Jun-1996	128	25.2	
5-Jun-1996	128	27.1	
5-Jun-1996	128	27.1	
5-Jun-1996	128	32.2	
5-Jun-1996	129	29	
5-Jun-1996	129	29	4
5-Jun-1996	129	30.65	
5-Jun-1996	129	30.65	
5-Jun-1996	130	24.1	
5-Jun-1996	130	26.9	
5-Jun-1996	130	31.1	4
5-Jun-1996	130	31.42	
5-Jun-1996	130	32.3	
5-Jun-1996	132	31.08	
5-Jun-1996	132	31.5	
5-Jun-1996	133	38.6	
5-Jun-1996	133	39.39	3
5-Jun-1996	134	35.7	
5-Jun-1996	134	35.7	4
5-Jun-1996	134	36.2	
5-Jun-1996	134	36.2	
5-Jun-1996	135	31.27	
5-Jun-1996	135	31.74	
5-Jun-1996	135	33.6	
5-Jun-1996	135	33.6	
5-Jun-1996	135	34	
5-Jun-1996	136	35.95	4
5-Jun-1996	137	36.6	
5-Jun-1996	137	36.6	4
5-Jun-1996	139	29.2	
5-Jun-1996	139	32.1	3
5-Jun-1996	143	33.8	4

5-Jun-1996	148	38.9	6
5-Jun-1996	150	36.6	
5-Jun-1996	152	46.6	7
5-Jun-1996	153	43.9	5
5-Jun-1996	153	49.2	
5-Jun-1996	164	53.7	6
6-Jun-1996	109	16.07	2
6-Jun-1996	110	19.07	3
6-Jun-1996	112	19.12	3
6-Jun-1996	114	19.26	3
6-Jun-1996	115	28.8	
6-Jun-1996	117	17.3	4
6-Jun-1996	120	25.09	
6-Jun-1996	124	22.2	
6-Jun-1996	126	26.2	
6-Jun-1996	126	27.28	
6-Jun-1996	130	27.9	
6-Jun-1996	135	34	3
6-Jun-1996	141	31.15	4
6-Jun-1996	169	73.9	7
6-Jun-1996	175	72.2	6
6-Jun-1996	207	135.2	9
6-Jun-1996	272	293.4	13
6-Jun-1996	324	466	19
6-Jun-1996	328	544.5	14
20-Jun-1996	121	24.08	4
20-Jun-1996	160	54.8	6
20-Jun-1996	180	76.7	9
20-Jun-1996	222	121.3	10
20-Jun-1996	268	236	15
22-Jun-1996	105	15.5	3
22-Jun-1996	115	22.5	6
22-Jun-1996	120	23.5	
22-Jun-1996	120	23.83	4
22-Jun-1996	124	26	4
22-Jun-1996	126	25.1	
22-Jun-1996	128	24.9	
22-Jun-1996	130	24.1	
22-Jun-1996	130	31.9	
22-Jun-1996	130	32.3	
22-Jun-1996	135	31.27	
22-Jun-1996	142	40.3	
22-Jun-1996	155	53	
22-Jun-1996	160	54.8	
22-Jun-1996	180	76.6	

22-Jun-1996	222	121.3	
22-Jun-1996	280	317.46	17
23-Jul-1996	115	19.7	
23-Jul-1996	122		8
23-Jul-1996	122	28.5	5
23-Jul-1996	125	25.5	
23-Jul-1996	130	31.1	
23-Jul-1996	132	31.5	4
23-Jul-1996	150	37.9	
23-Jul-1996	150	44.6	
23-Jul-1996	150	44.82	
23-Jul-1996	156	50.3	
23-Jul-1996	190	110.2	11
23-Jul-1996	200	113.1	11
23-Jul-1996	227	220	12
23-Jul-1996	260	236	
23-Jul-1996	270	309	
23-Jul-1996	290	348	
23-Jul-1996	310	414	12
27-Jul-1996	115	21.52	
27-Jul-1996	144	37.3	
27-Jul-1996	165	55.1	7
27-Jul-1996	175	64.8	
9-Jun-2001	125	28.02	
9-Jun-2001	126	27.3	
10-Jun-2001	126	25.1	
10-Jun-2001	127	24.7	
9-Jun-2001	95	10.9	1
9-Jun-2001	95	11	1
9-Jun-2001	97	11.1	1
9-Jun-2001	98	10.2	1
9-Jun-2001	98	12.2	1
9-Jun-2001	99	11	1
9-Jun-2001	99	11.9	1
9-Jun-2001	99	12.1	1
9-Jun-2001	99	12.6	1
9-Jun-2001	99	12.9	1
9-Jun-2001	100	11.9	1
9-Jun-2001	100	12.9	1
9-Jun-2001	101	13.1	1
9-Jun-2001	102	12.7	1
9-Jun-2001	104	12.9	1
9-Jun-2001	105	14.1	1
9-Jun-2001	105	14.1	1
9-Jun-2001	105	14.8	1

9-Jun-2001	106	13.1	1
9-Jun-2001	106	13.9	1
9-Jun-2001	109	16.5	1
9-Jun-2001	110	15.9	1
9-Jun-2001	110	17.6	1
9-Jun-2001	111	15.7	1
9-Jun-2001	112	15.7	2
9-Jun-2001	112	17.2	2
9-Jun-2001	114	16.9	2
9-Jun-2001	114	17.4	2
9-Jun-2001	115	21.3	2
9-Jun-2001	115	23	2
9-Jun-2001	116	17.7	2
9-Jun-2001	116	19.4	2
9-Jun-2001	117	19.1	2
9-Jun-2001	117	21.3	2
9-Jun-2001	118	19.8	2
9-Jun-2001	120	18.3	2
9-Jun-2001	120	22	2
9-Jun-2001	120	25.7	2
9-Jun-2001	122	22.4	2
9-Jun-2001	122	24.1	2
9-Jun-2001	123	23	3
9-Jun-2001	123	23.3	3
9-Jun-2001	123	23.4	3
9-Jun-2001	123	23.7	3
9-Jun-2001	124	25.8	3
9-Jun-2001	124	26.8	3
9-Jun-2001	125	23.5	3
9-Jun-2001	125	24.9	3
9-Jun-2001	125	25	3
9-Jun-2001	125	26	3
9-Jun-2001	125	26	3
9-Jun-2001	125	31.4	3
9-Jun-2001	126	23.9	3
9-Jun-2001	126	25	3
9-Jun-2001	127	24.6	3
9-Jun-2001	127	24.7	3
9-Jun-2001	127	24.9	3
9-Jun-2001	127	25.4	3
9-Jun-2001	127	26.5	3
9-Jun-2001	128	27.3	3
9-Jun-2001	128	27.9	3
9-Jun-2001	129	24.1	4
9-Jun-2001	129	26.2	4

9-Jun-2001	129	27.2	4
9-Jun-2001	129	28.4	4
9-Jun-2001	130	22	4
9-Jun-2001	130	26.7	4
9-Jun-2001	130	28	4
9-Jun-2001	130	28.1	4
9-Jun-2001	130	31.1	4
9-Jun-2001	131	28.1	4
9-Jun-2001	132	25.9	4
9-Jun-2001	132	29.4	4
9-Jun-2001	132	29.9	4
9-Jun-2001	132	32.2	4
9-Jun-2001	133	27	4
9-Jun-2001	134	27.9	4
9-Jun-2001	134	30	4
9-Jun-2001	134	30	4
9-Jun-2001	134	32.2	4
10-Jun-2001	95	10.6	1
10-Jun-2001	95	11.5	1
10-Jun-2001	98	11.5	1
10-Jun-2001	99	11	1
10-Jun-2001	99	12.2	1
10-Jun-2001	100	12.5	1
10-Jun-2001	102	12.2	1
10-Jun-2001	103	11.9	1
10-Jun-2001	104	14.7	1
10-Jun-2001	105	14.9	1
10-Jun-2001	107	12.7	1
10-Jun-2001	107	13.4	1
10-Jun-2001	110	16.2	1
10-Jun-2001	111	19.6	1
10-Jun-2001	112	16	2
10-Jun-2001	113	17.1	2
10-Jun-2001	114	19.8	2
10-Jun-2001	116	18.1	2
10-Jun-2001	117	20.7	2
10-Jun-2001	118	18.1	2
10-Jun-2001	120	21.4	2
10-Jun-2001	121	21.2	2
10-Jun-2001	122	24.2	2
10-Jun-2001	123	23.4	3
10-Jun-2001	124	25.2	3
10-Jun-2001	124	28.9	3
10-Jun-2001	125	23.9	3
10-Jun-2001	125	26.7	3

10-Jun-2001	125	27.7	3
10-Jun-2001	125	36.7	3
10-Jun-2001	128	25.7	3
10-Jun-2001	128	29.5	3
10-Jun-2001	129	27	4
10-Jun-2001	130	26	4
10-Jun-2001	130	30.6	4
10-Jun-2001	132	28.2	4
10-Jun-2001	132	30.4	5
10-Jun-2001	133	33.5	5
10-Jun-2001	134	30.4	4
10-Jun-2001	135	34.6	5