

Compilation of alewife (*Alosa pseudoharengus*) trap net catch in Rat Cove, Otsego Lake, 1989-2002

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INTRODUCTION

Trap netting in the eulittoral area of Rat Cove began in 1989 (Foster, 1989) following the discovery of an alewife (*Alosa pseudoharengus*) in the stomach of a lake trout (*Salvelinus namaycush*) by Rufus J. Thayer on 15 May 1988 (Foster, 1989). Foster (1989) proposed that private citizens carried out the illegal introduction sometime in 1986 or 1987. Trap netting has continued annually to document alewife (and other littoral fish) population trends in order to determine the impact of the illegal introduction on the limnology of Otsego Lake.

Alewives are believed to have caused significant impacts on the ecology of Otsego Lake (Harman et al., 2002). The dramatic decline in the cisco (*Coregonus artedii*) and lake whitefish (*Coregonus clupeaformis*) populations are thought to be the result of competition for large zooplankters and predation on pelagic larvae and fry by the alewife (Harman et al., 1997). Alewives are efficient, size-selective predators of zooplankton; consequently, they have effectively changed the zooplankton community in Otsego Lake from a community dominated by relatively large cladocerans (e.g. *Daphnia pulex*) to one dominated by smaller cladocerans (e.g. *Bosmina coregoni*) and rotifers (Harman et al. 2002; Warner, 1999). This shift to a community comprised of smaller zooplankton has likely led to reduced grazing capacity (compared to large zooplankton) and decreased size of algal cells (Harman et al., 2002; Warner, 1999), which has led to drastically reduced transparency. Furthermore, there has been an increase in areal hypolimnetic oxygen demand, (Albright 2002) due to the oxygen demand of bacteria decomposing the algae. This likely limits the volume of water suitable for lake trout survival in the summer (Harman et al., 2002; Albright, 2001). Therefore, while the introduction of the alewife has dramatically improved lake trout growth (Harman et al., 1997) (and possibly abundance) because of an increased available forage base (Harman et al., 2002), the concurrent decline in late summer and fall hypolimnetic oxygen concentrations may negatively impact them in the future. Centrarchid fishes (except the bluegill [*Lepomis macrochirus*]) have exhibited slower growth rates following the alewife introduction (Gray, 2000).

The goal of this manuscript is to provide a compilation of available alewife trap net catch for 1989-2002. The intent is **not** necessarily to provide a syntheses or interpretation of those data. Provided are year-to-year fluctuations in alewife abundance, whether due to the normal cyclical nature of their populations (Smith, 1985) or to attempts to manage that population. This contribution will provide other researchers with information that will be useful in ongoing studies, which examine Otsego Lake ecology/alewife interactions. These studies may include lake trout egg and fry survival

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(Tibbits, in prep), walleye (*Stizostedion vitreum*) growth and survival (Cornwell in prep.) and alewife population dynamics (Warner et al. 2003.).

METHODS

A 1.2 m trap net with a 15.2 m lead was fished on the north side of Rat Cove (Figure 1.), Otsego Lake, New York during the summers of 1989, 1990, 1991, 1992, 1993, 1996, 1997, 1999, 2000, 2001, and 2002 according to Hubert (1996). Trap netting did not occur in 1994, 1995, and 1998. The 1999 sampling regiment was not as intensive as most years. Table 1 provides an overview of the number of trap sets, by month, for the years for which data are available.

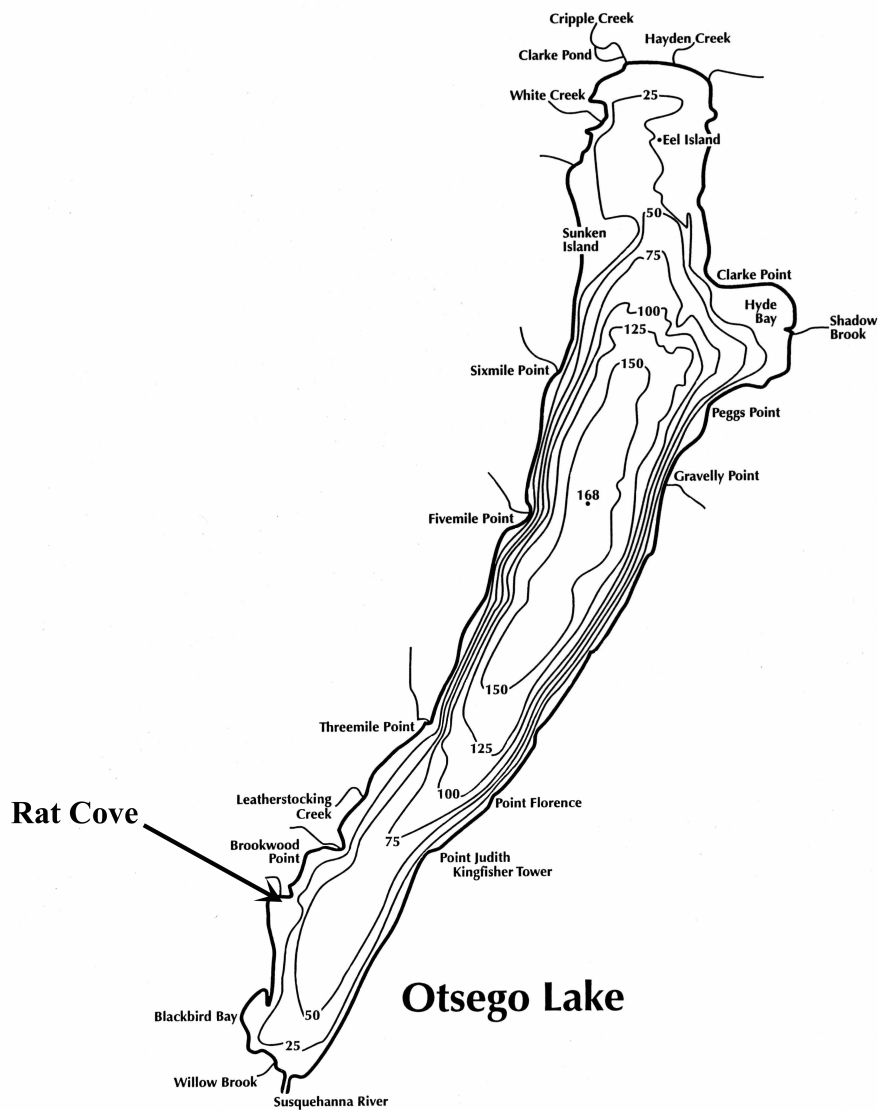


Figure 1. Otsego Lake, NY, showing Rat Cove, the site of trap netting in 1989-2002.

Year	June	July	August	Total
1989	7	11	10	28
1990	7	15	8	30
1991	7	15	7	29
1992	10	15	4	29
1993	15	18	3	36
1994	NA	NA	NA	NA
1995	NA	NA	NA	NA
1996	16	17	10	43
1997	10	17	3	30
1998	NA	NA	NA	NA
1999	11	1	0	12
2000	17	12	11	40
2001	16	6	0	22
2002	16	16	2	34
Totals	132	143	58	333

Table 1. Number of trap days (24 hours sets), by month, in Rat Cove, Otsego Lake, 1989-2002.

Trap net sampling typically began in early June and ceased in the beginning to middle of August. The trap was typically set on Monday mornings and pulled to collect fish every 24 h until Friday, when the net was pulled from the water until Monday. Each fish was identified, measured to the nearest millimeter (TL; total length) using a measuring board and weighed to the nearest gram using a spring scale. Fish scales were collected in some years for age determinations. All fish were then released back into the water, with the exception of alewives from 1997-2002. Alewives captured in 1997-2002 were brought back to the Biological Field Station for more accurate weighing, measuring and additional data collection (e.g. aging via otolith).

Alewife catch per unit effort (CPUE) is defined as number of alewives caught per 24 hour set. For weekly CPUE, the total alewife catch for the week was divided by the number of sample days (24 h sets) for that week. For monthly CPUE, the total number of alewives caught during the month was divided by the total number of sampling days for that month. Summertime CPUE was calculated by dividing the entire alewife catch for the summer by the total number of sample days for that year.

RESULTS

Table 2 provides the mean catch per unit effort (CPUE; per 24 hr set) of alewives on a monthly basis for each year for which data are available. Figure 2 summarizes the mean CPUE over the entire summers for which data are available. Figure 3 presents the same data, but on a monthly basis. Figures 4 through 14 provide mean CPUE on a weekly basis for the summers of 1989, 1990, 1991, 1992, 1993, 1996, 1997, 1999, 2000, 2001 and 2002, respectively. For these figures: Week 1= days 1-7, Week 2= days 8-14, Week 3= days 15-21, Week 4= days 22-28, Week 5= days 29-31. Because the CPUE for 1989 is significantly lower than other years, the 'y' scale for that graph is 1.2 CPUE. For Figures 5 through 14, it is 350 CPUE. The number of sets, number of alewives caught and the catch per unit effort over the study period are given in Appendices A-L.

Year	June	July	August	Total
1989	0.29	0.45	0.10	0.28
1990	13.14	18.73	11.50	14.46
1991	89.71	19.07	3.29	37.36
1992	18.00	21.53	1.75	13.76
1993	2.73	19.06	0.33	7.37
1996	60.06	17.53	0.20	25.93
1997	32.27	122.41	9.67	54.78
1999	32.27	147.00	NA	89.64
2000	45.18	70.93	2.09	39.40
2001	29.56	1.50	NA	15.53
2002	11.19	3.25	0.00	4.81
Mean	30.40	40.13	3.21	

Table 2. Mean catch per unit effort (CPUE; per 24 hr set) of alewives in Rat Cove, Otsego Lake, by month, 1989-2002.

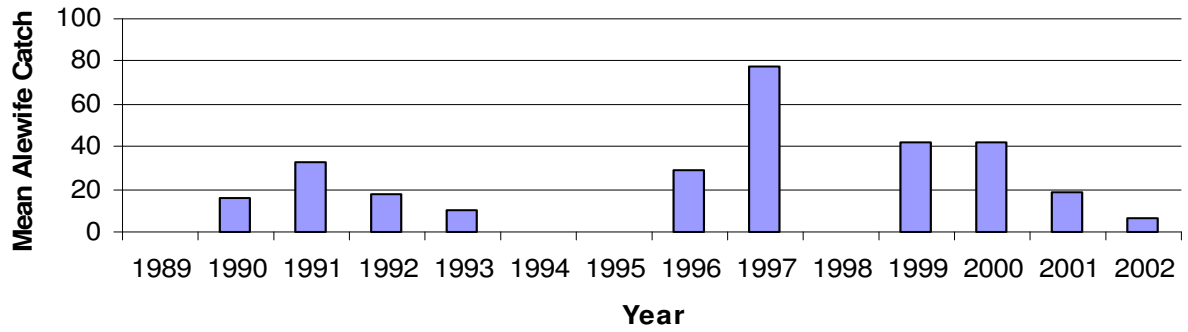


Figure 2. Mean alewife Catch Per Unit Effort (CPUE; per 24 hr set) in Rate Cove, Otsego Lake, by summer, 1989-2002.

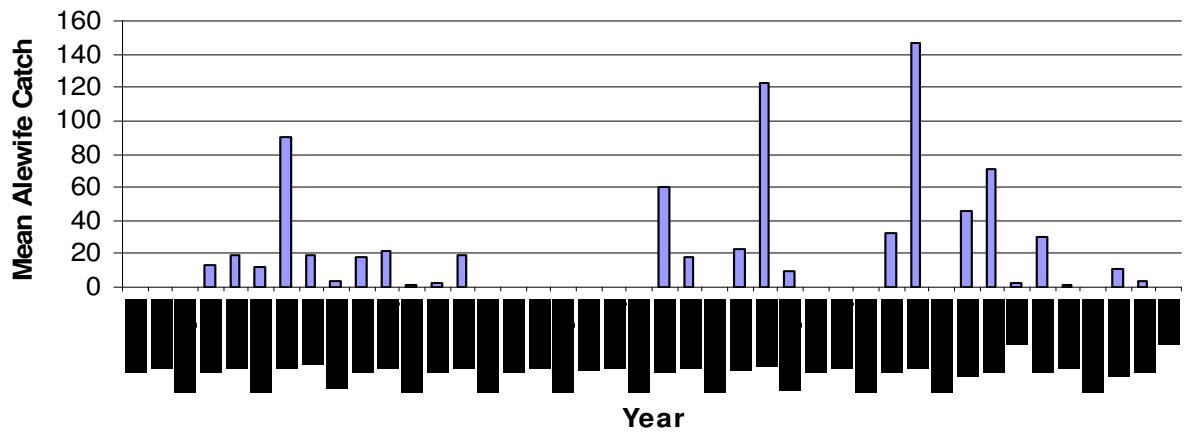


Figure 3. Mean alewife Catch Per Unit Effort (CPUE; per 24 hr set) in Rate Cove, Otsego Lake, by month, 1989-2002.

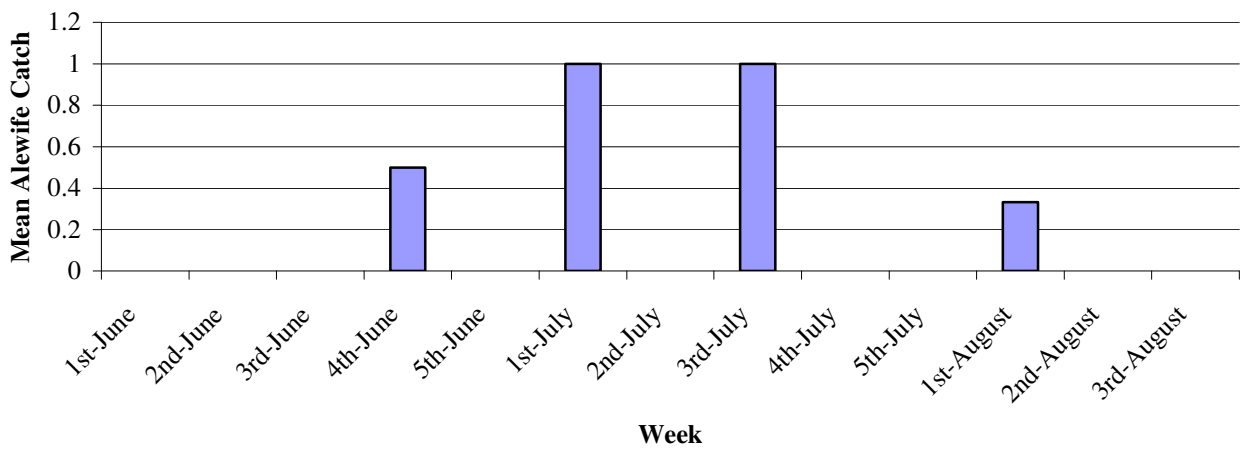


Figure 4. Mean alewife Catch Per Unit Effort (CPUE; per 24 hr set) in Rat Cove, Otsego Lake, by week, during the summer of 1989.

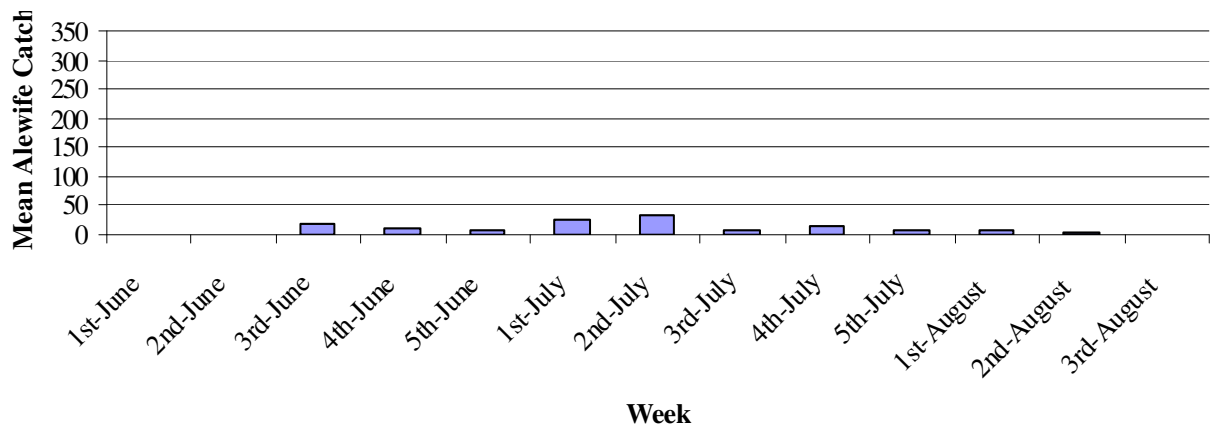


Figure 5. Mean alewife Catch Per Unit Effort (CPUE; per 24 hr set) in Rat Cove, Otsego Lake, by week, during the summer of 1990.

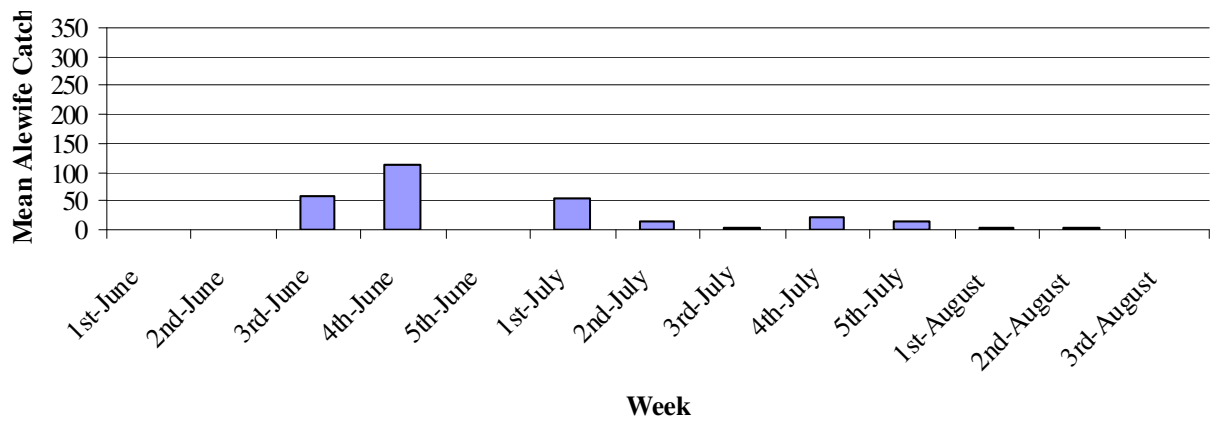


Figure 6. Mean alewife Catch Per Unit Effort (CPUE; per 24 hr set) in Rat Cove, Otsego Lake, by week, during the summer of 1991

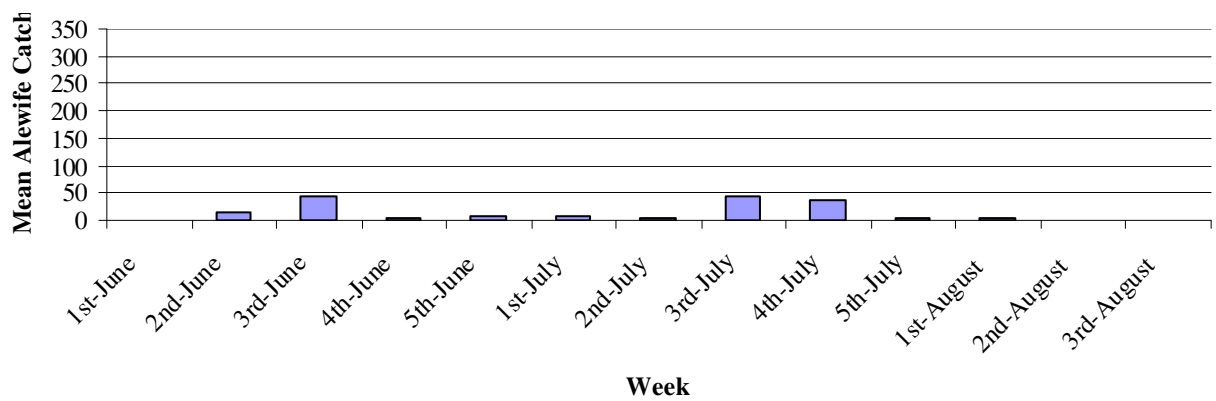


Figure 7. Mean alewife Catch Per Unit Effort (CPUE; per 24 hr set) in Rat Cove, Otsego Lake, by week, during the summer of 1992.

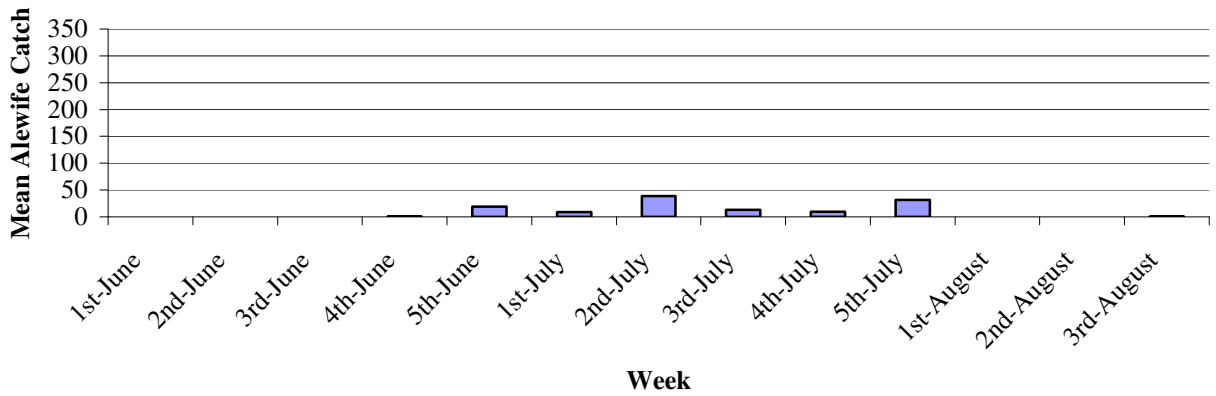


Figure 8. Mean alewife Catch Per Unit Effort (CPUE; per 24 hr set) in Rat Cove, Otsego Lake, by week, during the summer of 1993.

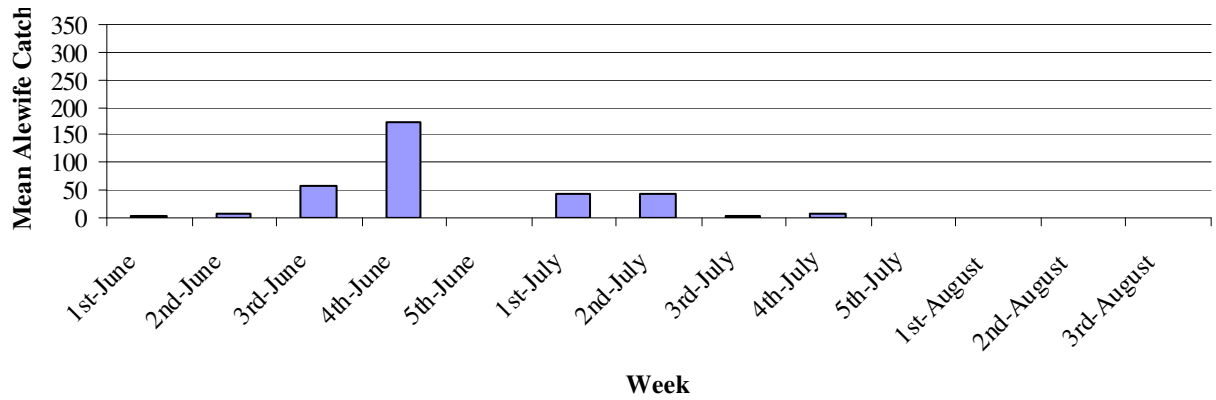


Figure 9. Mean alewife Catch Per Unit Effort (CPUE; per 24 hr set) in Rat Cove, Otsego Lake, by week, during the summer of 1996.

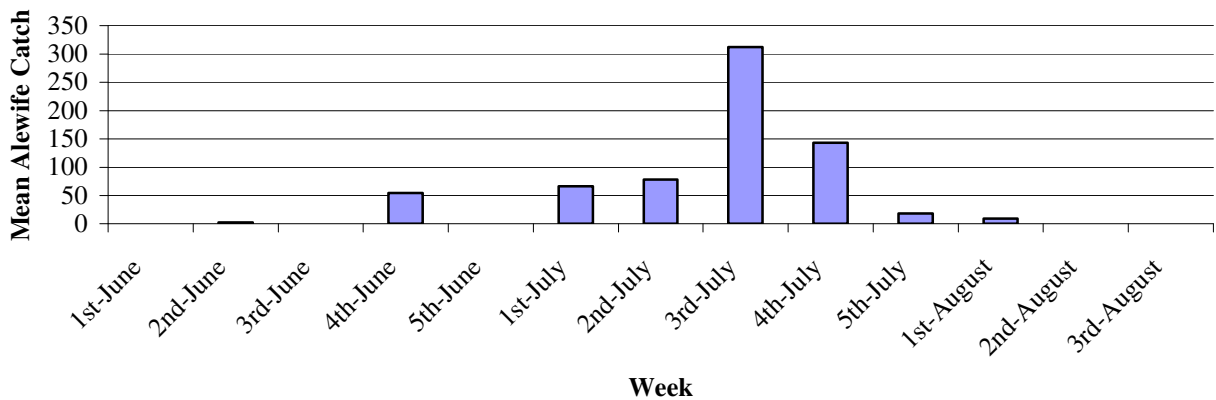


Figure 10. Mean alewife Catch Per Unit Effort (CPUE; per 24 hr set) in Rat Cove, Otsego Lake, by week, during the summer of 1997.

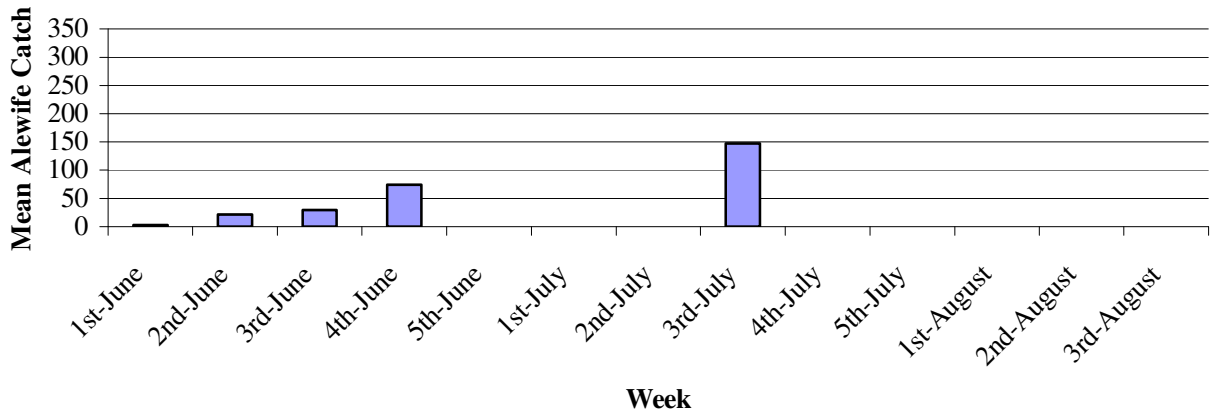


Figure 11. Mean alewife Catch Per Unit Effort (CPUE; per 24 hr set) in Rat Cove, Otsego Lake, by week, during the summer of 1999.

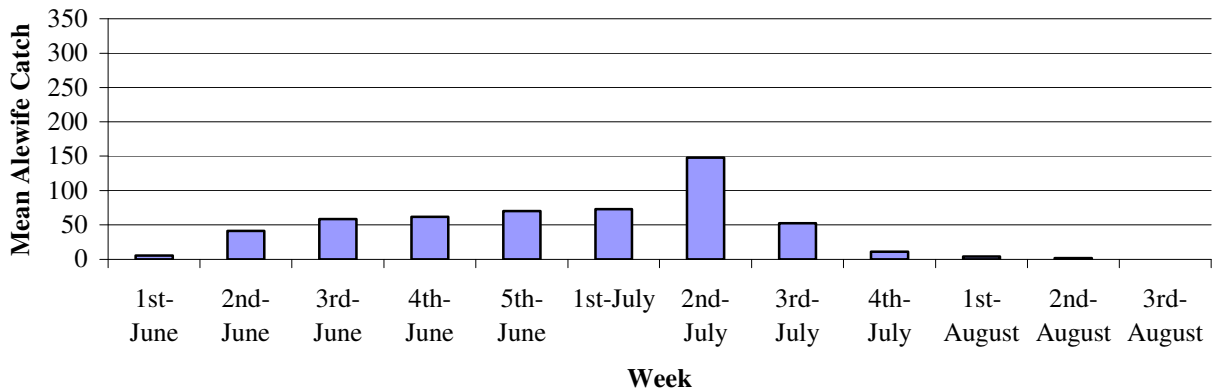


Figure 12. Mean alewife Catch Per Unit Effort (CPUE; per 24 hr set) in Rat Cove, Otsego Lake, by week, during the summer of 2000.

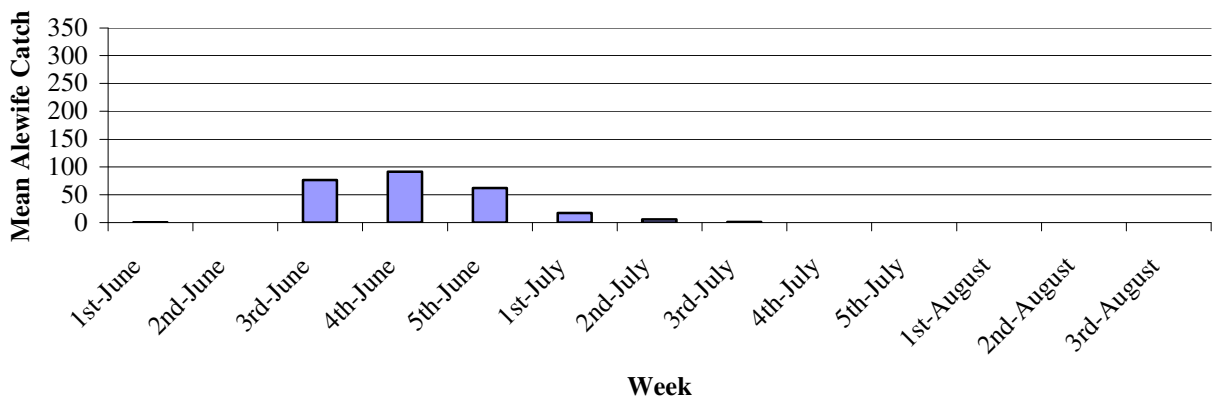


Figure 13. Mean alewife Catch Per Unit Effort (CPUE; per 24 hr set) in Rat Cove, Otsego Lake, by week, during the summer of 2001.

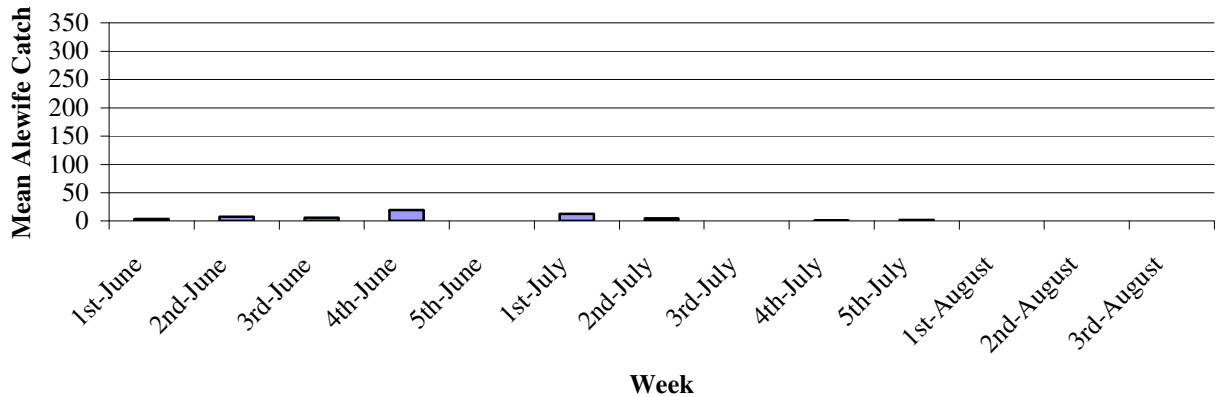


Figure 14. Mean alewife Catch Per Unit Effort (CPUE; per 24 hr set) in Rat Cove, Otsego Lake, by week, during the summer of 2002.

DISCUSSION

The data presented here illustrate the cyclical nature of alewife abundance (Figure 2). The data show that the highest catch rates were observed in 1991 and 1997. Based on length at age data from Warner et al. (2003), the length of the fish caught in 1997 (mean = 118 mm) suggests they were members of the 1996 year class. Alewives from these year classes were large likely large enough to minimize recruitment of subsequent year classes via cannibalistic predation on larval alewives and fry. Subsequent declines in catch rates could be attributable to the dominant year-classes being themselves declining in abundance due to predation by piscivores. When that year class declined to the point of being unable to limit recruitment from subsequent year classes, a new strong class emerged.

Given the above, one would expect a resurgence in alewife abundance in 2003, following the 2002 decline. However, recent attempts to re-establish walleye in Otsego Lake may avert that resurgence. Walleye were stocked in 2000-2002 with the primary goal of reestablishing that population. Concurrent with stocking efforts are monitoring strategies designed to evaluate declines in alewife abundance, due to predation by walleye, as well as to document any lake-wide trophic changes that might result from declining alewife abundance (Cornwell, 2000). A stable, low alewife trap catch in ensuing years would imply that increased predation afforded by walleye is successfully managing alewife numbers.

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Appendix B. Number of trap sets, alewives caught, and alewife CPUE by week, 1989.

<i>1989 - Week</i>	Number of sets	Number of Alewives	CPUE
1st-June			
2nd-June			
3rd-June	1	0	0
4th-June	4	2	0.5
5th-June	2	0	0
1st-July	2	2	1
2nd-July	0	0	0
3rd-July	3	3	1
4th-July	4	0	0
5th-July			
1st-August	3	1	0.33333
2nd-August	3	0	0
3rd-August	4	0	0

Appendix C. Number of trap sets, alewives caught, and alewife CPUE by week, 1990.

<i>1990 - Week</i>	Number of sets	Number of Alewives	CPUE
1st-June			
2nd-June			
3rd-June	2	37	18.500
4th-June	4	49	12.250
5th-June	1	6	6.000
1st-July	2	53	26.500
2nd-July	4	127	31.750
3rd-July	4	33	8.250
4th-July	4	62	15.500
5th-July	1	6	6.000
1st-August	3	26	8.667
2nd-August	3	58	19.333
3rd-August	2	8	4.000

Appendix D. Number of trap sets, alewives caught, and alewife CPUE by week, 1991.

<i>1991 - Week</i>	Number of sets	Number of Alewives	CPUE
1st-June			
2nd-June			
3rd-June	3	170	56.667
4th-June	4	458	114.500
5th-June			
1st-July	2	109	54.500
2nd-July	4	57	14.250
3rd-July	3	13	4.333
4th-July	4	81	20.250
5th-July	2	26	13.000
1st-August	4	13	3.250
2nd-August	3	10	3.333
3rd-August			

Appendix E. Number of trap sets, alewives caught, and alewife CPUE by week, 1992.

<i>1992 - Week</i>	Number of sets	Number of Alewives	CPUE
1st-June			
2nd-June	2	30	15
3rd-June	3	133	44.333
4th-June	4	10	2.500
5th-June	1	7	7.000
1st-July	3	25	8.333
2nd-July	3	12	4.000
3rd-July	3	132	44.000
4th-July	4	148	37.000
5th-July	2	6	3.000
1st-August	3	7	2.333
2nd-August			
3rd-August	1	0	0.000

Appendix F. Number of trap sets, alewives caught, and alewife CPUE by week, 1993.

<i>1993 - Week</i>	Number of sets	Number of Alewives	CPUE
1st-June	1	0	0
2nd-June	4	0	0
3rd-June	4	0	0.000
4th-June	4	3	0.750
5th-June	2	38	19.000
1st-July	4	35	8.750
2nd-July	4	155	38.750
3rd-July	4	53	13.250
4th-July	4	37	9.250
5th-July	2	63	31.500
1st-August			
2nd-August			
3rd-August	3	1	0.333

Appendix G. Number of trap sets, alewives caught, and alewife CPUE by week, 1996.

<i>1996 - Week</i>	Number of sets	Number of Alewives	CPUE
1st-June	4	10	2.500
2nd-June	4	27	6.750
3rd-June	4	232	58.000
4th-June	4	692	173.000
5th-June			
1st-July	2	88	44.000
2nd-July	4	172	43.000
3rd-July	4	8	2.000
4th-July	4	30	7.500
5th-July	2	0	0.000
1st-August	4	2	0.500
2nd-August	4	0	0.000
3rd-August	2	0	0.000

Appendix H. Number of trap sets, alewives caught, and alewife CPUE by week, 1997.

<i>1997 - Week</i>	Number of sets	Number of Alewives	CPUE
1st-June			
2nd-June	4	8	2.000
3rd-June	2	0	0.000
4th-June	4	219	54.750
5th-June			
1st-July	3	200	66.667
2nd-July	4	314	78.500
3rd-July	3	937	312.333
4th-July	4	574	143.500
5th-July	3	56	18.667
1st-August	3	29	9.667
2nd-August			
3rd-August			

Appendix I. Number of trap sets, alewives caught, and alewife CPUE by week, 1999.

<i>1999 - Week</i>	Number of sets	Number of Alewives	CPUE
1st-June	1	3	3.000
2nd-June	4	87	21.750
3rd-June	3	117	39.000
4th-June	2	148	74.000
5th-June			
1st-July			
2nd-July			
3rd-July	1	147	147.000
4th-July			
5th-July			
1st-August			
2nd-August			
3rd-August			

Appendix J. Number of trap sets, alewives caught, and alewife CPUE by week, 2000.

<i>2000 - Week</i>	Number of sets	Number of Alewives	CPUE
1st-June	2	22	11.000
2nd-June	3	124	41.333
3rd-June	4	235	58.750
4th-June	4	247	61.750
5th-June	2	140	70.000
1st-July	2	146	73.000
2nd-July	4	592	148.000
3rd-July	4	210	52.500
4th-July	4	45	11.250
5th-July			
1st-August	4	16	4.000
2nd-August	4	7	1.750
3rd-August	3	0	0.000

Appendix K. Number of trap sets, alewives caught, and alewife CPUE by week, 2001.

<i>2001 - Week</i>	Number of sets	Number of Alewives	CPUE
1st-June	4	2	0.500
2nd-June	4	1	0.250
3rd-June	4	305	76.250
4th-June	4	364	91.000
5th-June	1	62	62.000
1st-July	4	68	17.000
2nd-July	4	22	5.500
3rd-July	3	4	1.333
4th-July	4	1	0.250
5th-July	1	0	0.000
1st-August	4	1	0.250
2nd-August	4	0	0.000
3rd-August	3	0	0.000

Appendix L. Number of trap sets, alewives caught, and alewife CPUE by week, 2002.

<i>2002 - Week</i>	Number of sets	Number of Alewives	CPUE
1st-June	4	14	3.500
2nd-June	4	32	8.000
3rd-June	4	25	6.250
4th-June	4	108	27.000
5th-June			
1st-July	2	26	13.000
2nd-July	4	20	5.000
3rd-July	4	1	0.250
4th-July	4	2	0.500
5th-July	2	3	1.500
1st-August	2	0	0.000
2nd-August			
3rd-August			