

Prey selection by predatory fish prior to and following walleye (*Sander vitreus*) stocking in Otsego Lake, summer 2008

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INTRODUCTION

In 2000, a project was initiated with the primary purpose of re-establishing the walleye (*Sander vitreus*) fishery in Otsego Lake, a meso-oligotrophic, glacially formed body of water located north of Cooperstown, New York (Harman et al. 1997). This project was both state and privately funded and is designed to enhance the efficiency of stocking by providing evidence as to the time of day that will reduce the predation of walleye fingerlings, critical to successful stocking (Cornwell 2005).

Historically, walleye had been present in the lake system throughout much of the twentieth century having been stocked from 1913-1938 (Cornwell 2005). The fish were abundant until 1955 when their reproduction was thought to be compromised due to the introduction of cisco (*Coregonus artedii*) (Harman et al. 1997). Walleye reproduction was further reduced by the illegal introduction of alewife (*Alosa pseudoharengus*) in 1986 (Lehman et al. 1991). Alewives have influenced major ecological changes throughout the lake while simultaneously preventing walleye reproduction by fry predation. The alewives are voracious visual predators which decimated the large body zooplankton populations. Reduced grazing has led to large algal blooms (Foster 1989), reducing water clarity, and reduced hypolimnetic oxygen levels (Harman et al. 2002). This lack of oxygen in the hypolimnion and competition for food threatens the Otsego Lake cold water fishery and led to the reduction of several species of fish including cisco and Otsego bass (*Coregonus clupeaformis*) (Foster 1993).

Lake trout predate strongly on the alewife from the late fall and early spring, but become spatially isolated due to stratification of the lake and the trout's need for cool water (Tibbitts 2008). The alewife are thus released from predation during their spawning period. The decision was made to stock walleye because they are a cool water fish that will follow the alewife into the warmer water and continue to feed on them year round (Cornwell, 2005). Studies by the Minnesota Department of Natural Resources found that walleye were an effective method for top down management of fathead minnows (*Pimephales promelas*) (Herwig et al. 2004). The stocking of walleye fingerlings is timed to coincide with the alewife spawning occurring in June and July. It is hypothesized that the walleye will imprint and forage primarily on alewife throughout their lives. However, the walleye must survive early heavy predation by a variety of predators.

Previous research has shown that piscivores, such as largemouth bass, smallmouth bass, chain pickerel rock bass and yellow perch will eat walleye fry (McDonnell 2002;

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Cheever 2004). It has been hypothesized that nighttime stocking might reduce predation on stocked fish if the suite of predators tended to be visually oriented. This study was designed to first determine what prey species each predator was selecting for before and after stocking and, secondly, whether stocking at night reduced predation on walleye fry. Six sites, evaluated since 2001, were chosen through the lake based on ease for haul seining, stocking purposes and bathymetric similarity (Figure 1). Three sites were chosen on the eastern shore and three on the western shore. The west shore was stocked during the day and those on the east shore were stocked during night. Both were sampled using methods similar to previous studies.

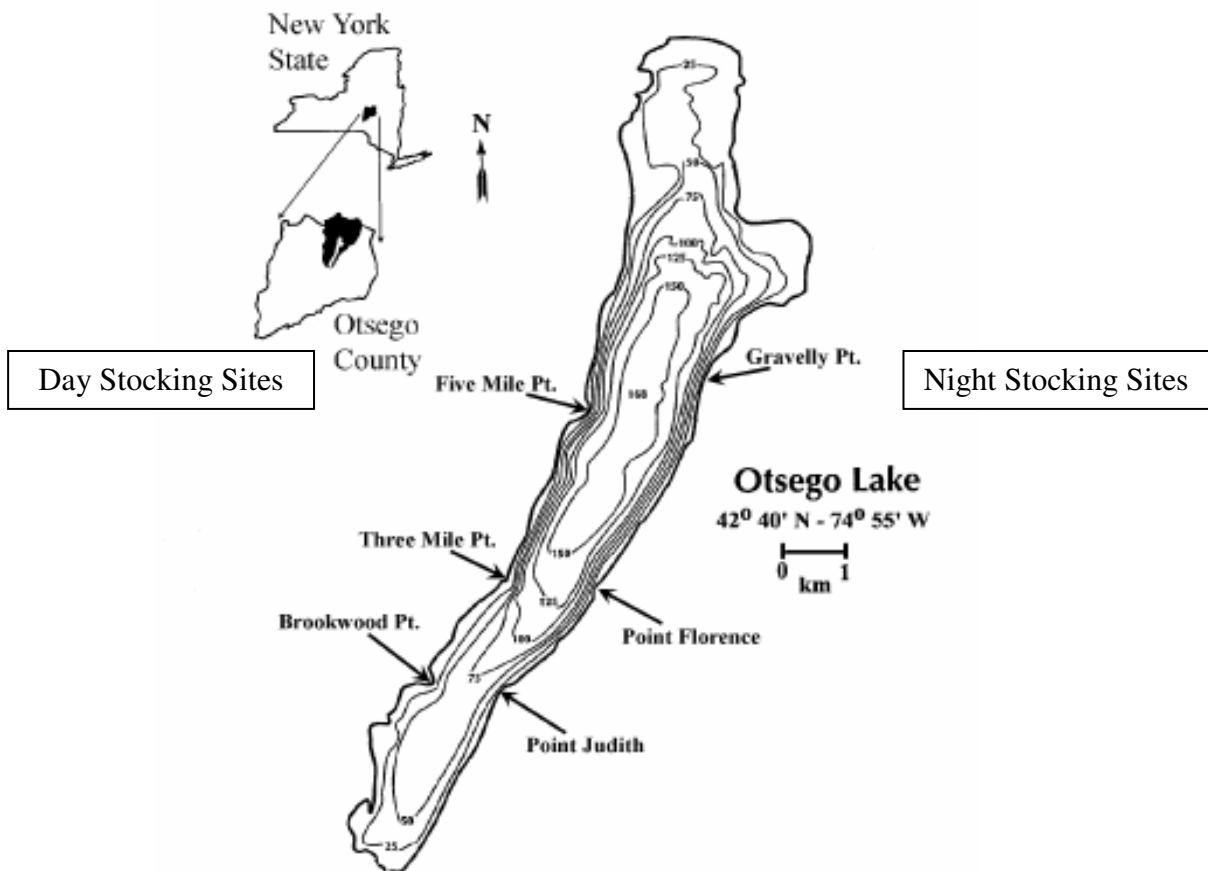


Figure 1: A bathymetric map of Otsego Lake with eastern and western stocking sites.

METHODS

The study was conducted in the summer of 2008 with samples collected prior and subsequent to stocking at three sites on the east shore (Point Judith, Point Florence and Gravelly Point), as well as three sites on the western shore (Three Mile Point, Five Mile

Point and Brookwood Point). The day stocking occurred on 25 June 2008 on the western shore and the night stocking occurred on 14 July 2008 on the eastern shore (see Figure 1).

Prior to stocking, fish were collected using methods outlined in Neilson et al. (1983) with a 200 ft. haul seine. All fish were collected and counted. All predatory fish over 100 mm were measured and lavaged according to Foster (1977). Each stomach sample was collected in Whirl-Pacs[®], preserved with 95% ethanol and refrigerated for later examination.

Walleye fingerlings were stocked by net in 5-7 meters of water at each site using the Biological Field station barge. Post stocking seining began 2-3 hours after day stocking and at first light after nighttime stocking. The fish are generally littorally oriented fish and thus not expected to travel between sites, so any walleye caught at each site is assumed to have been stocked there (Cornwell 2005). All fish were collected and handled in the same method as was done prior to stocking.

Analyzed stomach contents were first identified and then expressed according to their frequency of occurrence and percent composition by number. (Percent composition by weight was intended, but not accomplished). The frequency of occurrence is the proportion of fish that contain a particular prey item (Bowen 1996). The number of a particular prey item expressed as the percentage of the total contents is percent composition by number (Bowen 1996). The ratio of a prey item weight to the total stomach content weight is the percent composition by weight (Bowen 1996).

Fisheries management use selectivity indexes to evaluate the degree to which a predator chooses one prey item over another. The Strauss Index is used to determine predatory selection and is represented by the formula: $L = r_i - p_i$ (Bowen 1996). r_i is the ratio of a prey item in the total stomach contents and p_i is the ratio of the same prey item in the community. The value of L ranges from high selection for a prey item with a value of 1. A value of -1 indicates a strong selection against. A value of 0 indicates a ratio of predation equal to that of the environment.

RESULTS AND DISCUSSION

The first objective of this study was to determine the selection of prey species by predators before and after stocking on both sides of Otsego Lake. It is important to note that due to a reduced sample size, statements cannot be made with 95% confidence, however the data suggest meaningful differences. Pre-stocking prey selection focused mostly on crayfish which were found in a large number of stomachs. The frequency of occurrence ranged from 0.25 to 0.64 for all the predators with the exception of chain pickerels. While most of the chain pickerels that were captured had empty stomachs, the sample size was only three fish. The second and third most abundant types of prey were large aquatic insect larvae, from the orders ephemeroptera and odonata, having frequency ranges of 0.25 to 0.5 and 0.18 to 0.65, respectively.

From Tables 1 – 5 it is possible to get a sense for which types of prey each predatory species is selecting. With the largemouth bass, the prey type seems to be larger items such as crayfish, large odonate larvae and small fish. The smallmouth bass is more of a generalist type of hunter eating anything that moves and this is seen from the variety of prey items eaten by the predator (Smith 1985). Both the yellow perch and the rock bass tended towards benthic insect fauna but with a portion of tessellated darter, a known bottom dwelling fish (Smith 1985).

For all species except for rock bass and chain pickerel, walleye were found in some proportion of the total stomach samples. For both largemouth and smallmouth bass species, the walleye fingerlings were found in 50% of the stomachs but comprised less than 35% of the total stomach contents. The rock bass and chain pickerels that were caught contained no walleye although previous studies have shown these fish to be heavy predators of newly stocked fish (McDonnell 2002; Cheever 2004).

Largemouth Bass PREY		Day Prior		Day Subsequent		Night Prior		Night Subsequent	
		N= 3		N= 2		N= 4		N= 5	
		FOO	% by Number	FOO	% by Number	FOO	% by Number	FOO	% by Number
Fish	Walleye	0.00	0.00	0.50	12.50	0.00	0.00	0.50	25.00
	Alewife	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Centrarchidae	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Largemouth Bass	0.00	0.00	0.00	0.00	0.00	0.00	0.40	40.00
	Spottailed Shiner	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Cyprinidae	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Bluntnose Minnow	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Tessellated Darter	0.00	0.00	0.00	0.00	0.00	0.00	0.20	20.00
	Unidentified Fish	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crustacea	Amphipod	0.33	29.90	0.00	0.00	0.00	0.00	0.00	0.00
	Decapoda	0.33	33.33	1.00	45.83	0.25	2.50	0.20	20.00
Mollusca	Gastropoda	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Insecta	Odonata	0.33	3.43	1.00	41.67	0.25	22.50	0.20	20.00
	Coleoptera	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Diptera	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Ephemeroptera	0.00	0.00	0.00	0.00	0.25	25.00	0.00	0.00
	Hemiptera	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Annelida	Oligiocheta	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Empty		0.33	0.33	0.00	0.00	0.50	50.00	0.00	0.00

Table 1: A comparison of the frequency of occurrences and percent by number for each prey item for largemouth bass on each side of Otsego lake before and after stocking. Items that are in bold pertain to walleye fingerlings. Day stocking occurred on the west side of the lake, night stocking on the east side.

Smallmouth Bass PREY		Day Prior		Day Subsequent		Night Prior		Night Subsequent	
		N= 3		N= 12		N= 11		N= 5	
		FOO	% by Number	FOO	% by Number	FOO	% by Number	FOO	% by Number
Fish	Walleye	0.00	0.00	0.50	30.09	0.00	0.00	0.20	20.00
	Alewife	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Centrarchidae	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Largemouth Bass	0.00	0.00	0.00	0.00	0.36	19.09	0.20	20.00
	Spottailed Shiner	0.08	7.69	0.08	2.78	0.00	0.00	0.00	0.00
	Cyprinidae	0.31	9.29	0.25	6.17	0.09	0.26	0.00	0.00
	Bluntnose Minnow	0.00	0.00	0.08	0.31	0.09	4.55	0.00	0.00
	Tessellated Darter	0.31	19.55	0.00	0.00	0.09	3.64	0.00	0.00
	Unidentified Fish	0.00	0.00	0.00	0.00	0.09	0.91	0.40	40.00
Crustacea	Amphipod	0.00	0.00	0.08	8.33	0.00	0.00	0.00	0.00
	Decapoda	0.46	17.31	0.42	17.77	0.64	20.04	0.00	0.00
Mollusca	Gastropoda	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Insecta	Odonata	0.23	7.69	0.17	3.70	0.18	20.78	0.00	0.00
	Hymenoptera	0.08	2.56	0.08	2.78	0.18	4.85	0.00	0.00
	Diptera	0.23	7.05	0.08	4.17	0.36	7.51	0.20	13.33
	Ephemeroptera	0.46	16.03	0.50	15.56	0.55	49.37	0.20	6.67
	Hemiptera	0.08	5.13	0.00	0.00	0.09	3.03	0.00	0.00
	Coleoptera	0.00	0.00	0.00	0.00	0.09	3.64	0.00	0.00
Empty		0.08	7.69	0.08	8.33	0.09	9.09	0.00	0.00

Table 2: A comparison of the frequency of occurrences and percent by number for each prey item for small mouth bass on each side of Otsego lake before and after stocking. Items that are in bold hatched pertain to walleye fingerlings. Day stocking occurred on the west side of the lake, night stocking on the east side.

Rock Bass PREY		Day Prior		Day Subsequent		Night Prior		Night Subsequent	
		N= 6		N= 12		N= 11		N= 10	
		FOO	% by Number	FOO	% by Number	FOO	% by Number	FOO	% by Number
Fish	Walleye	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Alewife	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Centrarchidae	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Largemouth Bass	0.00	0.00	0.00	0.00	0.00	0.00	0.10	2.50
	Spottailed Shiner	0.00	0.00	0.00	0.00	0.00	0.00	0.10	3.33
	Cyprinidae	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Bluntnose Minnow	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Tessellated Darter	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Unidentified Fish	0.17	1.85	0.08	1.67	0.00	0.00	0.10	10.00
Crustacea	Amphipod	0.00	0.00	0.08	8.33	0.00	0.00	0.00	0.00
	Decapoda	0.67	28.89	0.67	39.17	0.64	56.82	0.40	17.22
Mollusca	Gastropoda	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Insecta	Odonata	0.33	13.89	0.33	15.83	0.27	22.73	0.20	10.00
	Coleoptera	0.00	0.00	0.00	0.00	0.09	2.27	0.20	13.33
	Diptera	0.17	0.93	0.08	4.17	0.00	0.00	0.10	3.33
	Ephemeroptera	0.50	18.52	0.25	14.17	0.00	0.00	0.40	27.78
	Hemiptera	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Trichoptera	0.50	35.93	0.25	16.67	0.00	0.00	0.10	2.50
Empty		0.00	0.00	0.00	0.00	0.27	22.73	0.10	10.00

Table 3: A comparison of the frequency of occurrences and percent by number for each prey item for rock bass on each side of Otsego lake before and after stocking. Items that are in bold pertain to walleye fingerlings. Day stocking occurred on the west side of the lake, night stocking on the east side.

Yellow Perch PREY		Day Prior		Day Subsequent		Night Prior		Night Subsequent	
		N= 20		N=		N= 63		N= 15	
		FOO	% by Number	FOO	% by Number	FOO	% by Number	FOO	% by Number
Fish	Walleye	0.00	0.00	0.25	5.19	0.00	0.00	0.13	12.00
	Alewife	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Centrarchidae	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Largemouth Bass	0.00	0.00	0.00	0.00	0.40	25.16	0.07	6.67
	Spottailed Shiner	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Cyprinidae	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Bluntnose Minnow	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Tessellated Darter	0.05	3.75	0.08	1.04	0.00	0.00	0.00	0.00
	Unidentified Fish	0.05	0.67	0.08	1.19	0.02	0.40	0.00	0.00
Crustacea	Amphipod	0.40	12.48	0.17	4.90	0.19	14.33	0.00	0.00
	Decapoda	0.30	17.41	0.75	22.94	0.32	11.31	0.20	6.73
Mollusca	Gastropoda	0.10	0.61	0.00	0.00	0.00	0.00	0.00	0.00
Insecta	Odonata	0.65	33.94	0.58	17.07	0.41	13.99	0.27	14.37
	Coleoptera	0.00	0.00	0.08	0.64	0.02	0.23	0.00	0.00
	Diptera	0.00	0.00	0.08	0.33	0.41	13.99	0.00	0.00
	Ephemeroptera	0.55	20.37	0.58	31.78	0.41	20.67	0.60	42.46
	Hemiptera	0.10	0.61	0.33	11.00	0.00	0.00	0.00	0.00
	Trichoptera	0.40	8.59	0.17	3.91	0.16	2.35	0.07	4.44
Empty		0.00	0.00	0.00	0.00	0.06	4.76	0.13	13.33

Table 4: A comparison of the frequency of occurrences and percent by number for each prey item for yellow perch on each side of Otsego lake before and after stocking. Items that are in bold pertain to walleye fingerlings. Day stocking occurred on the west side of the lake, night stocking on the east side.

Chain Pickerel PREY		Day Prior		Day Subsequent		Night Prior		Night Subsequent	
		N= 0		N= 1		N= 0		N= 2	
		FOO	% by Number	FOO	% by Number	FOO	% by Number	FOO	% by Number
Fish	Walleye	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Alewife	0.00	0.00	0.00	0.00	0.00	0.00	0.50	50.00
	Centrarchidae	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Largemouth Bass	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Spottailed Shiner	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Cyprinidae	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Bluntnose Minnow	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Tessellated Darter	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Ichthyoplankton	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crustacea	Amphipod	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Decapoda	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mollusca	Gastropoda	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Insecta	Odonata	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Coleoptera	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Diptera	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Ephemeroptera	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
	Hemiptera	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Annelida	Oligiocheta	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Empty		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 5: A comparison of the frequency of occurrences and percent by number for each prey item for chain pickerel on each side of Otsego lake before and after stocking. Items that are in bold pertain to walleye fingerlings. Day stocking occurred on the west side of the lake, night stocking on the east side.

Table 6 compares the relative abundances of the prey items in the littoral zones as collected by net and those found by analysis of stomach contents. The eastern shore had a larger prey community collected by the haul seine. This table also shows the Strauss index values for each type of prey species in the system. It is important to note that during the night stocking approximately 20,000 fingerlings were put into the lake as compared to approximately 40,000 during the day stocking. This combined with a relatively high mortality rate of the stocked walleye (~40%) reduced the relative abundance at each site on the eastern shore. This decreased the strength of the Strauss index due to the dissimilarity in stocking volume and inability to account for survivability of the fish.

Largemouth Bass		#Netted		#Consumed		Strauss Index	
		Pre stock	post stock	Pre stock	post stock	Pre stock	post stock
DAY STOCKING	Walleye	0	180	0	1	0.000	0.336
Pre stock: n=3	Alewife	0	0	0	0	0.000	0.000
Post stockt: n=2	Tessellated Darter	85	31	0	0	-0.258	-0.114
	Ichythyoplankton	0	0	0	0	0.000	0.000
	Largemouth Bass	28	28	0	0	-0.085	-0.103
	Rock Bass	1	0	0	0	-0.003	0.000
	Unidentified Centrachid	7	2	0	0	-0.021	-0.007
	Bluntnose Minnow	3	1	0	0	-0.009	-0.004
	Emerald Shiner	2	0	0	0	-0.006	0.000
	Spottailed Shiner	204	29	1	0	0.382	-0.107
	Unidentified Cyprinidae	0	0	0	0	0.000	0.000
	Empty						
	Total	330	271	1	1		
Largemouth Bass	Walleye	0	27	0	0	0.000	-0.018
NIGHT STOCKING	Alewife	0	0	0	0	0.000	0.000
Prior: n=4	Tessellated Darter	136	63	0	1	-0.218	0.157
Subsequent: n=2	Ichythyoplankton	0	0	0	0	0.000	0.000
	Largemouth Bass	281	683	0	0	-0.450	-0.462
	Rock Bass	2	19	0	2	-0.003	0.387
	Unidentified Centrachid	72	152	0	0	-0.115	-0.103
	Bluntnose Minnow	1	5	0	0	-0.002	-0.003
	Emerald Shiner	0	0	0	0	0.000	0.000
	Spottailed Shiner	66	261	0	0	-0.106	-0.177
	Unidentified Cyprinidae	0	1	0	0	0.000	-0.001
	Empty			2	0		
	Total	625	1478	2	5		

Table 6: The pooled number of fish in the sampled environment (“# netted”), the number of prey items consumed by large mouth bass, and the Strauss index of those prey items by large mouth bass, day stocking vs. night stocking.

Smallmouth Bass		#Netted		#Consumed		Strauss Index	
		Pre stock	post stock	Pre stock	post stock	Pre stock	post stock
DAY STOCKING Prior: n=13 Subsequent: n=12	Walleye	0	180	0	30	0.000	0.169
	Alewife	0	0	0	0	0.000	0.000
	Tessellated Darter	85	31	6	0	0.204	-0.114
	Ichythyoplankton	0	0	0	0	0.000	0.000
	Largemouth Bass	28	28	0	0	-0.085	-0.103
	Rock Bass	1	0	0	0	-0.003	0.000
	Unidentified Centrachid	7	2	6	4	0.440	0.104
	Bluntnose Minnow	3	1	0	1	-0.009	0.024
	Emerald Shiner	2	0	0	0	-0.006	0.000
	Spottailed Shiner	204	29	1	1	-0.541	-0.079
	Unidentified Cyprinidae	0	0	0	0	0.000	0.000
	Empty						
	Total		330	271	13	36	
Smallmouth Bass NIGHT STOCKING Prior: n=11 Subsequent: n=5	Walleye	0	27	0	1	0.000	0.073
	Alewife	0	0	0	0	0.000	0.000
	Tessellated Darter	136	63	2	0	-0.159	-0.043
	Ichythyoplankton	0	0	0	0	0.000	0.000
	Largemouth Bass	281	683	13	2	-0.067	-0.280
	Rock Bass	2	19	0	0	-0.003	-0.013
	Unidentified Centrachid	72	152	0	0	-0.115	-0.103
	Bluntnose Minnow	1	5	1	0	0.028	-0.003
	Emerald Shiner	0	0	0	0	0.000	0.000
	Spottailed Shiner	66	261	0	0	-0.106	-0.177
	Unidentified Cyprinidae	0	1	2	3	0.059	0.272
	Empty						
	Total		625	1478	34	11	

Table 8: The pooled number of fish in the sampled environment (“# netted”), the number of prey items consumed by small mouth bass, and the Strauss index of those prey items by small mouth bass, day stocking vs. night stocking.

Rock Bass		#Netted		#Consumed		Strauss Index	
		Pre stock	post stock	Pre stock	post stock	Pre stock	post stock
DAY STOCKING Prior: n=6 Subsequent: n=12	Walleye	0	180	0	0	0.000	-0.664
	Alewife	0	0	0	0	0.000	0.000
	Tessellated Darter	85	31	0	0	-0.258	-0.114
	Ichythyoplankton	0	0	0	0	0.000	0.000
	Largemouth Bass	28	28	0	0	-0.085	-0.103
	Rock Bass	1	0	0	0	-0.003	0.000
	Unidentified Centrachid	7	2	1	1	0.979	0.993
	Bluntnose Minnow	3	1	0	0	-0.009	-0.004
	Emerald Shiner	2	0	0	0	-0.006	0.000
	Spottailed Shiner	204	29	0	0	-0.618	-0.107
	Unidentified Cyprinidae	0	0	0	0	0.000	0.000
	Empty						
	Total		330	271	1	1	
Rock Bass NIGHT STOCKING Prior: n=11 Subsequent: n=10	Walleye	0	27	0	0	NA	-0.018
	Alewife	0	0	0	0	NA	0.000
	Tessellated Darter	136	63	0	0	NA	-0.043
	Ichythyoplankton	0	0	0	0	NA	0.000
	Largemouth Bass	281	683	0	1	NA	-0.262
	Rock Bass	2	19	0	0	NA	-0.013
	Unidentified Centrachid	72	152	0	0	NA	-0.103
	Bluntnose Minnow	1	5	0	0	NA	-0.003
	Emerald Shiner	0	0	0	0	NA	0.000
	Spottailed Shiner	66	261	0	1	NA	0.023
	Unidentified Cyprinidae	0	1	0	1	NA	0.199
	Empty						
	Total		625	1478	0	5	

Table 9: The pooled number of fish in the sampled environment (“# netted”), the number of prey items consumed by rock bass, and the Strauss index of those prey items by rock bass, day stocking vs. night stocking.

Yellow Perch		#Netted		#Consumed		Strauss Index		
		Pre stock	post stock	Pre stock	post stock	Pre stock	post stock	
DAY STOCKING Prior: n=20 Subsequent: n= 12	Walleye	0	180	0	5	0.000	0.050	
	Alewife	0	0	0	0	0.000	0.000	
	Tessellated Darter	85	31	3	1	0.342	0.028	
	Ichythyoplankton	0	0	0	0	0.000	0.000	
	Largemouth Bass	28	28	0	1	-0.085	0.040	
	Rock Bass	1	0	0	0	-0.003	0.000	
	Total Centrarchidae	36	30	2	1	0.291	0.032	
	Bluntnose Minnow	3	1	0	0	-0.009	-0.004	
	Emerald Shiner	2	0	0	0	-0.006	0.000	
	Spottailed Shiner	204	29	0	0	-0.618	-0.107	
	Total Cyprinidae	209	30	0	0	-0.633	-0.111	
	Empty			0	0			
	Total		330	271	5	7		
	Yellow Perch NIGHT STOCKING Prior: n=63 Subsequent: n=15	Walleye	0	27	0	5	0.000	0.443
Alewife		0	0	0	0	0.000	0.000	
Tessellated Darter		136	63	0	0	-0.139	-0.027	
Ichythyoplankton		0	0	0	0	0.000	0.000	
Largemouth Bass		281	683	64	2	0.194	-0.111	
Rock Bass		2	19	0	0	-0.002	-0.008	
Total Centrarchidae		355	854	65	2	0.126	-0.184	
Bluntnose Minnow		1	5	0	0	-0.001	-0.002	
Emerald Shiner		0	0	0	0	0.000	0.000	
Spottailed Shiner		66	261	0	0	-0.067	-0.112	
Unidentified Cyprinidae		0	1	0	0	0.000	0.000	
Empty				3	2			
Total			980	2332	133	11		

Table 10: The pooled number of fish in the sampled environment (“# netted”), the number of prey items consumed yellow perch, and the Strauss index of those prey items by yellow perch, day stocking vs. night stocking.

Chain Pickerel		#Netted		#Consumed		Strauss Index		
		Pre stock	post stock	Pre stock	post stock	Pre stock	post stock	
DAY STOCKING Prior: n = 0 Subsequent: n=1	Walleye	0	180	0	0	0.000	-0.664	
	Alewife	0	0	0	0	0.000	0.000	
	Tessellated Darter	85	31	0	0	-0.258	-0.114	
	Ichythyoplankton	0	0	0	0	0.000	0.000	
	Largemouth Bass	28	28	0	0	-0.085	-0.103	
	Rock Bass	1	0	0	0	-0.003	0.000	
	Unidentified Centrarchid	7	2	0	0	-0.021	-0.007	
	Bluntnose Minnow	3	1	0	0	-0.009	-0.004	
	Emerald Shiner	2	0	0	0	-0.006	0.000	
	Spottailed Shiner	204	29	0	0	-0.618	-0.107	
	Unidentified Cyprinidae	0	0	0	0	0.000	0.000	
	Empty							
	Total		330	271	0	0		
	Chain Pickerel NIGHT STOCKING Prior: n=0 Subsequent: n=2	Walleye	0	27	0	0	NA	-0.018
Alewife		0	0	0	1	NA	1.000	
Tessellated Darter		136	63	0	0	NA	-0.043	
Ichythyoplankton		0	0	0	0	NA	0.000	
Largemouth Bass		281	683	0	0	NA	-0.462	
Rock Bass		2	19	0	0	NA	-0.013	
Unidentified Centrarchid		72	152	0	0	NA	-0.103	
Bluntnose Minnow		1	5	0	0	NA	-0.003	
Emerald Shiner		0	0	0	0	NA	0.000	
Spottailed Shiner		66	261	0	0	NA	-0.177	
Total Cyprinidae		67	267	0	0	NA	-0.181	
Empty								
Total			625	1478	0	1		

Table 11: The pooled number of fish in the sampled environment (“# netted”), the number of prey items consumed by chain pickerel, and the Strauss index of those prey items by large mouth bass, day stocking vs. night stocking.

Figure 2 compares the Strauss Index values subsequent to both night and day stocking for predation of yellow perch, large mouth and small mouth bass, rock bass and chain pickerel on stocked walleye. Results of the stomach analysis showed mixed results for selection during the day stocking efforts. For all predators except yellow perch, selection for walleye following night stocking was near zero (that is, the rate of selection approximated their ratio of the local prey community). Chain pickerel and rock bass selected strongly against walleye during the day while yellow perch selected for walleye for both day and night. For both bass species, the selection preference was less during the night. This is different from previous studies. In 2002, McDonnell (2003) recorded decreased selection by pickerel during night stocking, and unchanged or increased selection by other predators. In 2004, Cheever (2005) found that the selection for yellow perch and small mouth bass were lower following night stocking, but rock bass and large mouth bass selected for walleye more strongly following night stocking.

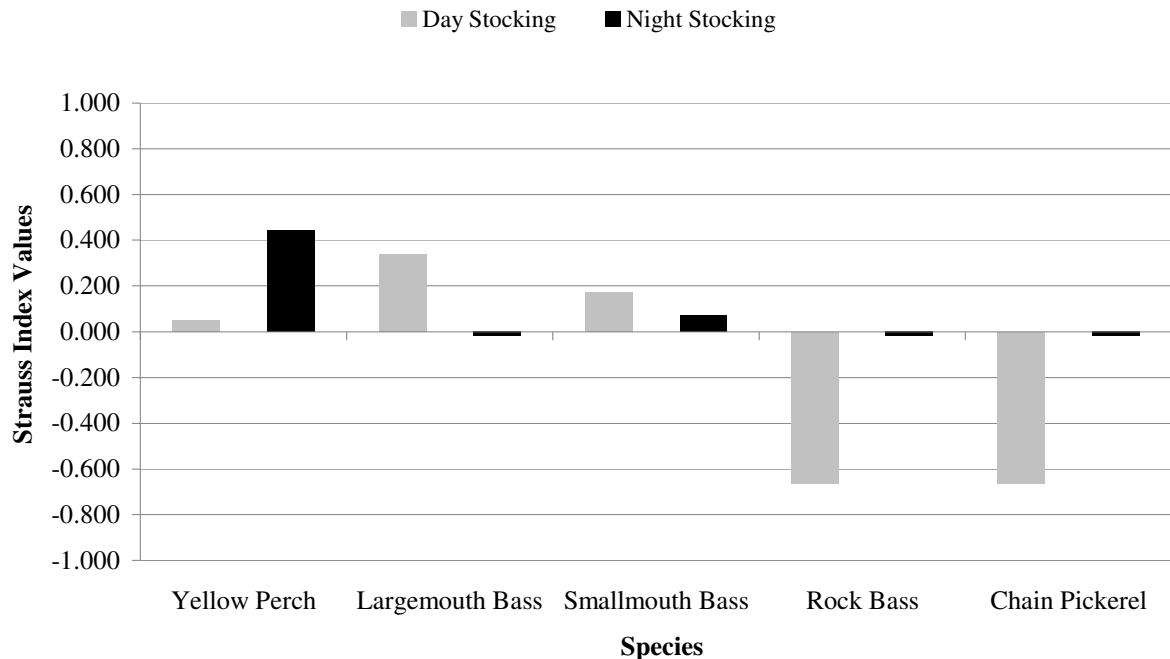


Figure 2: Strauss Index values for each predatory fish on walleye, subsequent to day and night time stocking.

CONCLUSIONS

Despite the small sample size, it appears that the stocking of walleye during the night will only reduce the selection by certain species. Conversely, night stocking indicated increased selection by yellow perch, and there was no difference in selectivity by chain pickerel or rock bass. Previous years showed pickerel and rock bass as significant predators, though that was not the case in 2008. The inconsistent findings between the studies related to day vs. night selectivity are unclear; the main predators and their influence by time of stocking have been variable. At this point it is unclear if any of these studies have had a large enough sample size in any one year to determine if night

stocking reduces predation. The answer may lie in a compilation of years in order to account for a lack of sample size.

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