Pettibone Park Lagoon Habitat Enhancement Pre-Project Fisheries Summary, Navigation Pool 8 of the upper Mississippi River.

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Purpose

The purpose of this document is to summarize 2005 to 2010 fish survey work done in Pettibone Lagoon prior to construction and operation of a fisheries winter habitat enhancement project.

Introduction

Pettibone Park, located on Barron Island in the City of La Crosse, is an urban park containing a 21.4 acre lagoon that is an urban sport fishery (Figure 1). It has a maximum depth of 14ft during normal water levels. Although this waterbody is connected to the main channel of the Mississippi River, historically and presently, it suffers from inhospitably low dissolved oxygen levels, particularly in the winter (Figure 2). These low dissolved oxygen levels discourage winter fish use and cause winter fish kills. Observed low winter dissolved oxygen levels are probably due to decomposing vegetation, sediment oxygen demand and to a lesser degree, source water. During stable water levels, inflows into this system originate from groundwater, which generally contains little dissolved oxygen, although it does contain warm water, which also attract overwintering fish.

Overwintering fish, particularly members of the sunfish family, prefer wintering locations with very low current velocity, relatively warm water and adequate dissolved oxygen. In order to improve overwinter conditions in the lagoon, the City of La Crosse constructed a water conveyance system that delivers highly oxygenated water from the main channel of the Mississippi River. This system became operational in early November, 2010.

This report describes results from pre-project fisheries sampling in the Pettibone Lagoon. It is intended that these results will be compared to post-project fisheries characteristics to determine any changes resulting from the introduction of main channel water. Things that could be examined to detect future changes include: length distributions, mean length, proportional size structure (PSS), catch per unit effort (CPUE) and community analysis.

Methods

An 18 foot-long welded aluminum flat-bottomed maxi-boom electro shocking boat equipped with a Wisconsin Box was used on day-time runs conducted from May 2005 through November 2010. Two booms with metallic droppers extended 8 feet from the bow and the box controls were adjusted to produce approximately 16 amps. A total of 90 runs were done at eleven fixed stations during 35.97 hours of sampling (Figures 3 and 4). Six of these stations were sampled during 2005 while the remaining five were sampled from 2006 through 2010. Stations were generally sampled three times a year, once per each of spring, summer and fall season. Nearly all fish were counted, identified to species, measured by total length and returned to the river. When very large numbers of a particular species were present, individuals from a random subsample were measured.

Statistical tests were done using SAS® (2002-2003) software for Windows version 9.13's General linear models (ANOVA) and were done at the alpha=0.05 level. For catch per effort calculations, tests of means were done natural logarithm transformed data.

We generated estimated sample sizes, measured as the number of electro shocking runs that are needed to detect a given percent change in means. Log-transformed means and variances of the CPUE and the arithmetic means from lengths were used to estimate the sample sizes necessary to detect differences of a given size between the period before habitat project completion and after. The results are presented in terms of % change from current means for each taxon. The formula used is given below (see Sokal and Rohlf, 1981).

$$N = 2(Z\alpha + Z\beta)2s2 / \delta 2$$

where N = number of samples needed in each time period
α = significance level (we used $\alpha = 0.05$)
$1 - \beta$ = the power of the test, that is, the probability of rejecting the null hypothesis when it is not true (we used $1 - \beta = 0.8$)
Zx = normal deviate corresponding to probability x
s2 = variance of CPUE or total length
δ = the size of the difference between means, measured as a difference in CPUE or total length, but presented as % change from the current mean

Findings

The mean daily ambient water temperatures during 2005-2010 sampling was 14.8°C and varied as much as 24.0 ºC (Table 1). Seasonal temperatures were greatest in summer (June-August) (21.9-29.7°C) followed by spring (March-May) (7.6-17.5°C) and fall (September-November) (4.6-18.9°C). During sampling, the water surface elevation measured at the La Crosse, Wisconsin gage changed as much as 4.9 feet. Seasonal elevations were greatest in spring (632.88-635.85) followed by fall (631.06-633.9) and summer (630.96-633.99). The mean daily flow in cubic feet per second taken from Dam 7 was 41,517 and fluctuated as much as 72,100 cubic feet per second.

Relative Abundance

A total of 21,463 fish were recorded from 2005 through 2010 (Table 2). We counted a total of 46 taxa represented by at least 38 species. The most numerous taxon was bluegill (38.34%) followed by largemouth bass (23.81%), gizzard shad (17.66%), brook silverside (4.87%), black crappie (3.30%), and green sunfish (2.58%).

Relative abundance by year is presented in Tables 3 to 8. Relative abundance of individual taxa varied among years. The relative abundance of the ten most abundant species over time, which in total comprised at least 93% of the annual sample, is presented in Figure 5. The largest change between consecutive years was gizzard shad between 2007 and 2008 when is decreased by over 41 percentage points.

Catch Per Unit Effort

The mean 2005-2010 catch per electro shocking hour by species is given in Table 2.The most abundant fish was bluegill (201.98) followed by gizzard shad (137.55), largemouth bass (131.05), brook silverside (24.29), black crappie (17.15) and green sunfish (14.85). The mean catch per hour for all species combined was 584.13 (standard deviation = 700.26, n=90).

Mean catch per electro shocking hour by species and year are given in Tables 3 to 8. Catch rates of individual taxa varied among years. The catch rate of the ten most abundant species, which in total comprised at least 93% of the annual sample, is presented in Figure 6. The largest change between consecutive years was gizzard shad between 2007 and 2008 when is decreased by over 576 fish per hour.

CPUE was also calculated for quality and preferred sized fish species (Table 14). Values for these fish species ranged from 0.22 to 20.67 fish per hour.

Length Distribution

The frequency distributions for total length in inches for the 11 most abundant species are given in figures 6–11. The mean lengths of fish measured with more than 29 individuals per species from all years and seasons combined are given in Table 12. A total of 17.49 percent of black crappie and 61.54 percent of white crappie were greater than 9 inches. A total of 1.25 percent of bluegill was greater than 7 inches. A total of 7.67 percent of the largemouth bass was larger than 14 inches. A total of 24.01 percent of yellow perch was larger than 7 inches and 13.84 percent were larger than 8 inches.

The PSS_Q and PSS_P for electro shocked species are presented in Table 14. PSS_Q for black crappie (60.56) and PSS_P (7.22) were above the “acceptable” level of 40 and 5, respectively (WDNR, 2010). PSS_Q for

bluegill (12.27) and PSS_P (0.20) were well below the "acceptable" level of 40-60 and 5, respectively. White crappie PSS_Q (89.04) and PSS_P (58.90) were well above the "acceptable" standards 40 and 5, respectively. This suggests that electro shocked bluegill did not meet "acceptable" state standards for quality and preferred fish while crappies did.

Some fish species showed differences in mean length among seasons. For fish species that had adequate sample sizes to calculate mean lengths for each season, all but common carp appeared to have smaller mean size in the fall compared to spring and summer (Figure 18). Of the eight species examined, only largemouth bass and bluegill showed significantly different mean total length among all three seasons ($p < .0001$). Smaller fish in the fall may indicate the influence of relatively greater numbers of young-of-the-year fish vulnerable to our sampling gear and methods.

Comparison with Other Sampling

We examined differences in catch per effort and sizes of fish from other locations sampled in the fall. A comparison of bluegill CPUE between Pettibone and the Lawrence/Target Lake Unit, which includes and surrounds Pettibone, showed 9 of the 11 species examined had a higher catch rate in Pettibone than the Lawrence/Target Lake Unit (Table 20). Also, a comparison of CPUE for backwater game fishes of all sizes between Pettibone and all 21 Mississippi River lake units bordering Wisconsin sampled from 2007 through 2010 showed that all but one lake unit (Black River Channel) had lower catch rates than Pettibone. An identical comparison for these same game fishes, except greater the 3 inches in total length, provided similar results. This suggests that the Pettibone Lagoon attracts an unusually large number of fish in the fall compared to other locations on the Mississippi River bordering Wisconsin.

We also compared mean size of 5 species of fish collected in the fall between Pettibone and all other Mississippi River lake units. Black crappie, bluegill, largemouth bass and white crappie from Pettibone were smaller than fish from outside of Pettibone. Only yellow perch were not smaller (Table 21). This suggests Pettibone harbors smaller fish in the fall than other backwater areas on the Mississippi River.

Power Analysis for Future Sampling

To reasonably detect future changes in CPUE we calculated post-project sample sizes needed to detect a given change. For all seasons combined and all years, to detect a future 5% change in mean catch per hour for all species combined, a total of 166 shocking runs would be needed (Table 15). For a 10%, 15%, 20% and 25% change, a total of 42, 18, 10 and 7 shocking runs would be needed, respectively.

For individual species, required future sample sizes were larger and varied from 548,467 to 11 shocking runs. For important game fish species, sample sizes were usually within attainable ranges. For bluegill, we will be able to detect a 15% change in mean catch per hour with 62 post-project shocking runs. For largemouth bass, 69 future samples could detect a 10% change in measured abundance. These two species comprise 62.15% of the total sample.

Estimated future sample sizes were calculated by season (Tables 16-18). For all species and seasons combined, a total of 42 electro shocking runs would be needed to detect a 10% change in mean catch per hour compared with 42 for summer and 10 for fall. For bluegill, 35 runs would be required to detect a 20% change in all seasons, compared to 14 for summer and 11 for fall.

Since one of the potential outcomes of a successful habitat project may be more large fish, we also estimated sample sizes needed to detect changes in mean total length for selected fish taxa (Table 19). For all seasons and years combined, the largest number of fished needed to detect at 25% change in mean total length was 87 for gizzard shad. For all taxa examined, obtaining an adequate number of fish could be done easily with a relatively little effort.

Conclusions

1) The most dominant fish species was bluegill, followed by largemouth bass, gizzard shad, brook silverside, black crappie, and green sunfish. Gizzard shad and bluegill showed the greatest fluctuations in relative abundance.
2) CPUE was fairly stable. The largest inter-annual swings occurred for gizzard shad, largemouth bass and bluegill.
3) Length distributions showed a representation of several apparent year classes. Most game fish species met the acceptable standards for PSS. Bluegills did not suggesting that the relative abundance of larger bluegills was below the suggested State of Wisconsin standards. For most game fish species, Pettibone contained smaller sized fish compared to other locations on the Mississippi River.
4) Generally, Pettibone had higher fall catch rates for game fish species than other locations on the Mississippi River. This suggests that Pettibone is serving as a over wintering area for backwater fish species.

Recommendations

To evaluate the biotic changes from installation and operation of the water conveyance, fish sampling should continue. Summer sampling may be curtailed since summer fish use may not be directly or indirectly impacted by this habitat project. Continuation of fall sampling is the highest priority, followed by spring sampling. Because if inter-annual variation, sampling should continue for at least 5 years. To control for large-scale changes throughout the Mississippi River, other sampling should continue and can serve as a control for Pettibone monitoring. Anticipated future changes may include: a change in relative abundance or other community metrics, a change in CPUE, either taxon specific or size specific; and a change in the mean size, PSS or length distribution of fish particularly in the fall.

Literature Cited

Gabelhouse, D. W., Jr. 1984. A length categorization system to assess fish stocks. North American Journal of Fisheries Management 4:371–384.

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FIGURE 1. GENERAL LOCATION OF PETTIBONE LAGOON WITH MISSISSIPPI RIVER MILES IN THE CITY OF LA CROSSE, WISCONSIN (2010 NAIP PHOTO).

FIGURE 2. PETTIBONE DISSOLVED OXYGEN, 1993-2005. (LTRMP, WDNR DATA).

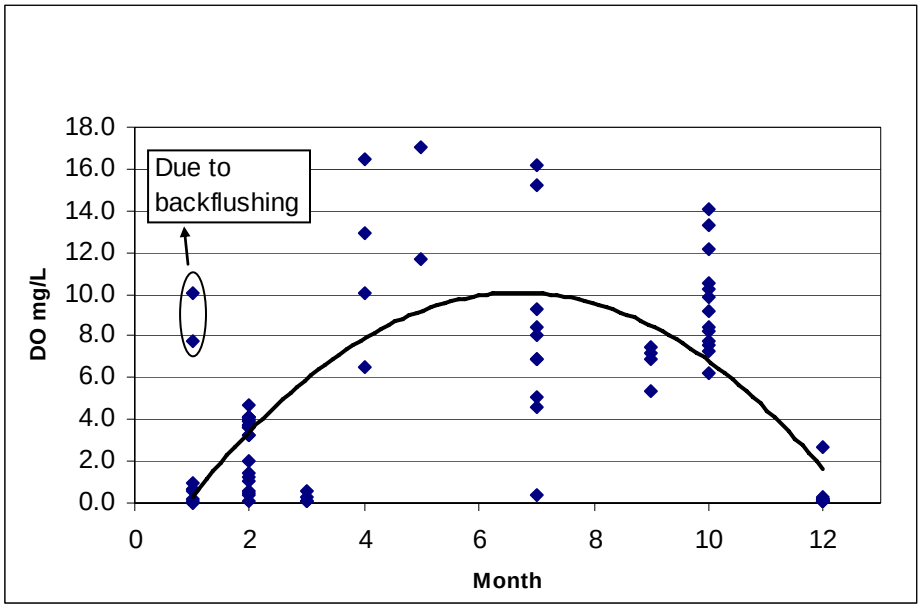


FIGURE 3. 2005 ELECTRO SHOCKING STATIONS, AND WATER CONVEYANCE STRUCTURE, PETTIBONE LAGOON. (2010 NAIP PHOTO).

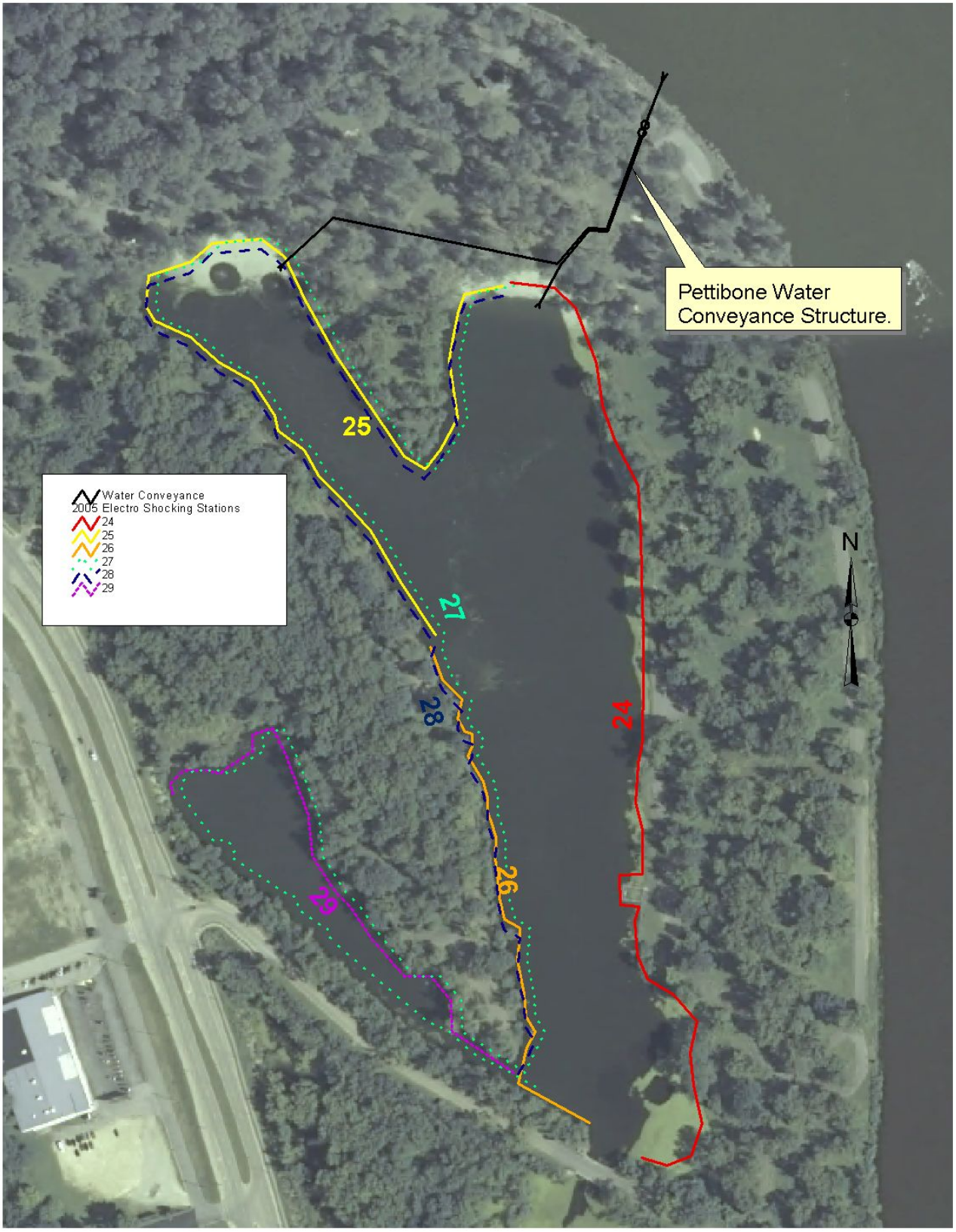


FIGURE 4. 2006-2010 ELECTRO SHOCKING STATIONS, AND WATER CONVEYANCE STRUCTURE, PETTIBONE LAGOON. (2010 NAIP PHOTO).

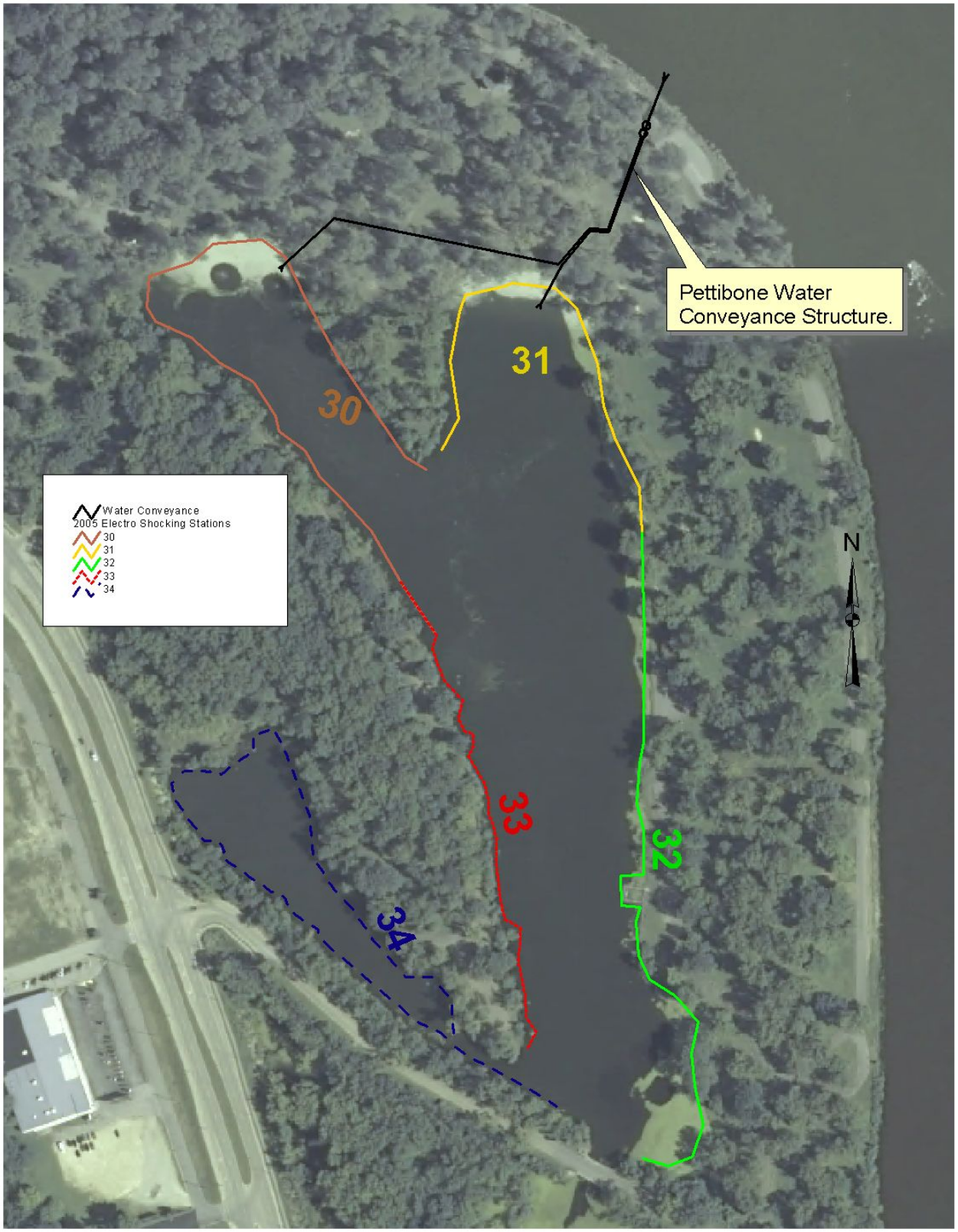


TABLE 1. PETTIBONE LAGOON MEAN DAILY AND SEASONAL TEMPERATURE, ELEVATION AT LA CROSSE AND FLOW AT LOCK AND DAM 7 (CUBIC FEET PER SECOND) DURING FISH SAMPLING.

Date/Season	Temperature (ºC)	Elevation (ft)	Flow (cfs)
05/04/2005	12.0	632.88	49200
09/30/2005	16.6	632.32	35800
11/22/2005	4.7	631.73	32700
04/04/2006	8.3	635.12	81300
11/16/2006	4.9	631.06	15200
03/27/2007	8.0	634.48	68400
08/10/2007	23.0	631.02	9200
10/04/2007	18.4	632.62	37500
11/14/2007	7.1	631.54	28800
04/16/2008	10.0	635.85	76900
04/17/2008	9.2	635.48	77400
07/08/2008	26.3	631.97	32300
08/26/2008	25.2	631.11	12900
11/12/2008	6.4	631.30	21000
11/13/2008	6.3	631.50	23700
04/15/2009	13.4	633.92	64700
06/04/2009	23.2	631.42	23000
07/24/2009	23.8	631.40	16300
07/28/2009	25.2	630.96	11700
11/17/2009	7.9	631.78	34600
04/15/2010	16.7	633.66	63800
07/16/2010	28.6	633.99	50300
11/17/2010	7.3	633.90	67200
MEAN (by date)	**14.8**	**632.68**	**41517**
SPRING	11.3	634.27	67163
SUMMER	25.1	631.79	23881
FALL	9.1	632.02	34106

TABLE 2. RELATIVE ABUNDANCE, MEAN CATCH PER HOUR (CPH), ELECTRO SHOCKING, PETTIBONE LAGOON, 2005-2010, ALL SEASONS.

	TAXON	FREQ.	PERCENT	MEAN CPH	STANDARD DEV.	MIN.	MAX.	NO. OF RUNS	TOTAL HRS
1	bigmouth buffalo	29	0.14	0.92	2.64	0.00	15.00	90	35.97
2	black crappie	709	3.30	17.15	27.07	0.00	136.96	90	35.97
3	bluegill	8228	38.34	201.98	206.92	0.00	717.31	90	35.97
4	bowfin	43	0.20	1.30	2.41	0.00	10.60	90	35.97
5	brook silverside	1046	4.87	24.29	159.32	0.00	1218.61	90	35.97
6	bullheads o05-07	1	0.00	0.06	0.53	0.00	5.00	90	35.97
7	chestnut lamprey	6	0.03	0.16	0.72	0.00	4.35	90	35.97
8	common carp	182	0.85	5.08	5.59	0.00	20.00	90	35.97
9	common shiner	6	0.03	0.15	0.89	0.00	6.48	90	35.97
10	emerald shiner	221	1.03	7.78	32.31	0.00	243.45	90	35.97
11	flathead catfish	2	0.01	0.05	0.33	0.00	2.31	90	35.97
12	freshwater drum	21	0.10	0.57	1.55	0.00	7.19	90	35.97
13	gizzard shad	3790	17.66	137.55	568.62	0.00	4583.33	90	35.97
14	golden redhorse	26	0.12	0.91	2.54	0.00	13.33	90	35.97
15	golden shiner	7	0.03	0.21	0.84	0.00	4.29	90	35.97
16	green sunfish	554	2.58	14.85	24.66	0.00	108.00	90	35.97
17	green sunfish x bluegill	17	0.08	0.45	1.32	0.00	8.00	90	35.97
18	green sunfish x pumpkinseed	1	0.00	0.04	0.39	0.00	3.70	90	35.97
19	green sunfish x warmouth	2	0.01	0.03	0.21	0.00	1.76	90	35.97
20	largemouth bass	5110	23.81	131.05	119.46	11.55	433.33	90	35.97
21	longnose gar	6	0.03	0.23	1.19	0.00	9.22	90	35.97
22	minnows & cyprinidae carps unsp.	541	2.52	11.14	96.63	0.00	914.55	90	35.97
23	northern pike	39	0.18	1.25	2.44	0.00	11.98	90	35.97
24	orangespotted sunfish	10	0.05	0.23	1.71	0.00	15.56	90	35.97
25	pumpkinseed	11	0.05	0.26	0.78	0.00	3.33	90	35.97
26	pumpkinseed x bluegill	3	0.01	0.10	0.58	0.00	5.00	90	35.97
27	quillback	3	0.01	0.07	0.36	0.00	2.22	90	35.97
28	river redhorse	4	0.02	0.14	0.89	0.00	8.00	90	35.97
29	shorthead redhorse	55	0.26	1.45	3.15	0.00	16.79	90	35.97
30	shortnose gar	1	0.00	0.03	0.29	0.00	2.73	90	35.97
31	silver redhorse	22	0.10	0.72	2.15	0.00	15.00	90	35.97
32	smallmouth bass	13	0.06	0.51	2.07	0.00	13.83	90	35.97
33	smallmouth buffalo	8	0.04	0.23	0.97	0.00	6.67	90	35.97
34	spottail shiner	8	0.04	0.39	2.60	0.00	23.95	90	35.97
35	spotted sucker	198	0.92	5.80	8.37	0.00	41.92	90	35.97
36	tadpole madtom	5	0.02	0.18	0.95	0.00	7.07	90	35.97
37	undetermined cyprinid hybrid	1	0.00	0.02	0.22	0.00	2.13	90	35.97
38	walleye	31	0.14	1.05	2.32	0.00	11.63	90	35.97
39	warmouth	37	0.17	0.92	2.33	0.00	15.00	90	35.97
40	warmouth x bluegill	4	0.02	0.12	0.76	0.00	6.67	90	35.97
41	weed shiner	1	0.00	0.03	0.25	0.00	2.33	90	35.97
42	white bass	9	0.04	0.27	1.20	0.00	6.67	90	35.97
43	white crappie	91	0.42	2.21	5.00	0.00	34.70	90	35.97
44	yellow bass	1	0.00	0.04	0.40	0.00	3.75	90	35.97
45	yellow bullhead	6	0.03	0.17	0.73	0.00	5.00	90	35.97
46	yellow perch	354	1.65	12.02	27.08	0.00	183.52	90	35.97
	ALL TAXA	**21463**	**100.00**	**584.13**	**700.26**	**23.68**	**4983.33**	**90**	**35.97**

TABLE 3. RELATIVE ABUNDANCE, MEAN CATCH PER HOUR (CPH), ELECTRO SHOCKING, PETTIBONE LAGOON, 2005, ALL SEASONS.

	TAXON	FREQ.	PERCENT	MEAN CPH	STANDARD DEV.	MIN.	MAX.	NO. OF RUNS	TOTAL HRS
1	bigmouth buffalo	1	0.03	0.23	0.64	0.00	1.82	8	4.47
2	black crappie	114	3.11	19.87	22.33	0.00	69.10	8	4.47
3	bluegill	890	24.25	195.28	146.22	0.00	476.36	8	4.47
4	bowfin	3	0.08	0.48	0.89	0.00	2.00	8	4.47
5	brook silverside	1027	27.98	266.82	498.85	0.00	1218.61	8	4.47
6	common carp	21	0.57	4.31	4.92	0.00	11.63	8	4.47
7	emerald shiner	4	0.11	1.18	2.19	0.00	4.80	8	4.47
8	gizzard shad	92	2.51	20.71	35.45	0.00	100.00	8	4.47
9	golden redhorse	3	0.08	0.58	1.28	0.00	3.64	8	4.47
10	green sunfish	54	1.47	12.38	14.30	0.00	45.46	8	4.47
11	green sunfish x bluegill	1	0.03	0.13	0.35	0.00	1.00	8	4.47
12	largemouth bass	849	23.13	195.21	127.16	23.68	418.42	8	4.47
13	minnows & cyprinidae carps unsp.	535	14.58	123.62	320.64	0.00	914.55	8	4.47
14	northern pike	2	0.05	0.39	0.74	0.00	1.82	8	4.47
15	quillback	1	0.03	0.23	0.64	0.00	1.82	8	4.47
16	shorthead redhorse	2	0.05	0.25	0.71	0.00	2.00	8	4.47
17	smallmouth bass	3	0.08	0.81	1.68	0.00	4.65	8	4.47
18	smallmouth buffalo	3	0.08	0.38	1.06	0.00	3.00	8	4.47
19	spotted sucker	31	0.84	6.47	11.51	0.00	34.55	8	4.47
20	walleye	12	0.33	2.94	4.36	0.00	11.63	8	4.47
21	weed shiner	1	0.03	0.29	0.82	0.00	2.33	8	4.47
22	white crappie	18	0.49	3.86	7.39	0.00	21.82	8	4.47
23	yellow perch	3	0.08	0.65	0.98	0.00	2.40	8	4.47
	ALL TAXA	**3670**	**100.00**	**857.05**	**686.74**	**23.68**	**2072.73**	**8**	**4.47**

TABLE 4. RELATIVE ABUNDANCE, MEAN CATCH PER HOUR (CPH), ELECTRO SHOCKING, PETTIBONE LAGOON, 2006, ALL SEASONS.

	TAXON	FREQ.	PERCENT	MEAN CPH	STANDARD DEV.	MIN.	MAX.	NO. OF RUNS	TOTAL HRS
1	bigmouth buffalo	1	0.10	0.192	0.608	0	1.923	10	3.103
2	black crappie	79	8.23	23.565	25.213	0	66.667	10	3.103
3	bluegill	85	8.85	32.989	31.846	0	90	10	3.103
4	brook silverside	1	0.10	0.27	0.855	0	2.703	10	3.103
5	bullheads o05-07	1	0.10	0.5	1.581	0	5	10	3.103
6	chestnut lamprey	3	0.31	0.94	1.617	0	4.348	10	3.103
7	common carp	18	1.88	5.2	3.305	0	9.615	10	3.103
8	emerald shiner	1	0.10	0.238	0.753	0	2.381	10	3.103
9	gizzard shad	323	33.65	88.396	158.039	0	505.405	10	3.103
10	green sunfish	34	3.54	12.917	33.621	0	108	10	3.103
11	green sunfish x bluegill	2	0.21	0.8	2.53	0	8	10	3.103
12	largemouth bass	377	39.27	142.104	134.624	21.739	422.222	10	3.103
13	northern pike	4	0.42	1.214	2.609	0	7.143	10	3.103
14	smallmouth bass	1	0.10	0.4	1.265	0	4	10	3.103
15	spotted sucker	19	1.98	5.41	4.987	0	13.514	10	3.103
16	white crappie	3	0.31	0.992	2.535	0	8	10	3.103
17	yellow perch	8	0.83	2.841	4.169	0	13.043	10	3.103
	ALL TAXA	**960**	**100.00**	**318.968**	**176.209**	**52.174**	**610.811**	**10**	**3.103**

TABLE 5. RELATIVE ABUNDANCE, MEAN CATCH PER HOUR (CPH), ELECTRO SHOCKING, PETTIBONE LAGOON, 2007, ALL SEASONS.

	TAXON	FREQ.	PERCENT	MEAN CPH	STANDARD DEV.	MIN.	MAX.	NO. OF RUNS	TOTAL HRS
1	bigmouth buffalo	9	0.12	0.99	2.19	0	6.98	19	7.09
2	black crappie	301	3.92	36.38	46.33	0	136.96	19	7.09
3	bluegill	2456	32.00	328.33	203.7	8	708.7	19	7.09
4	bowfin	9	0.12	1.28	2.17	0	6.67	19	7.09
5	brook silverside	4	0.05	0.42	1.38	0	5.66	19	7.09
6	common carp	28	0.36	3.67	4.5	0	13.33	19	7.09
7	common shiner	1	0.01	0.12	0.51	0	2.22	19	7.09
8	emerald shiner	72	0.94	8.37	30.61	0	134.04	19	7.09
9	flathead catfish	1	0.01	0.12	0.53	0	2.31	19	7.09
10	freshwater drum	2	0.03	0.28	0.85	0	3.13	19	7.09
11	gizzard shad	3301	43.00	585.12	1146.28	0	4583.33	19	7.09
12	golden redhorse	2	0.03	0.32	1.02	0	4	19	7.09
13	golden shiner	2	0.03	0.32	1.01	0	4	19	7.09
14	green sunfish	200	2.61	26.17	34.01	0	96	19	7.09
15	green sunfish x bluegill	7	0.09	0.92	1.71	0	6.67	19	7.09
16	green sunfish x pumpkinseed	1	0.01	0.19	0.85	0	3.7	19	7.09
17	largemouth bass	1146	14.93	148.08	119.99	13.333	422.92	19	7.09
18	northern pike	2	0.03	0.23	0.69	0	2.22	19	7.09
19	orangespotted sunfish	10	0.13	1.07	3.67	0	15.56	19	7.09
20	pumpkinseed	3	0.04	0.36	0.87	0	2.86	19	7.09
21	pumpkinseed x bluegill	1	0.01	0.1	0.43	0	1.89	19	7.09
22	river redhorse	3	0.04	0.54	1.88	0	8	19	7.09
23	shorthead redhorse	6	0.08	1.03	1.99	0	6.67	19	7.09
24	silver redhorse	3	0.04	0.31	0.75	0	2.22	19	7.09
25	smallmouth buffalo	1	0.01	0.12	0.51	0	2.22	19	7.09
26	spotted sucker	15	0.20	2.2	3.09	0	9.09	19	7.09
27	undetermined cyprinid hybrid	1	0.01	0.11	0.49	0	2.13	19	7.09
28	walleye	3	0.04	0.76	1.96	0	6.67	19	7.09
29	warmouth	7	0.09	0.82	1.51	0	4.44	19	7.09
30	warmouth x bluegill	1	0.01	0.11	0.48	0	2.08	19	7.09
31	white bass	7	0.09	0.94	2.26	0	6.67	19	7.09
32	white crappie	14	0.18	1.56	4.13	0	17.39	19	7.09
33	yellow bullhead	1	0.01	0.12	0.53	0	2.31	19	7.09
34	yellow perch	56	0.73	7.8	11.55	0	48.89	19	7.09
	ALL TAXA	**7676**	**100.00**	**1159.26**	**1201.15**	**86.667**	**4983.33**	**19**	**7.09**

TABLE 6. RELATIVE ABUNDANCE, MEAN CATCH PER HOUR (CPH), ELECTRO SHOCKING, PETTIBONE LAGOON, 2008, ALL SEASONS.

	TAXON	FREQ.	PERCENT	MEAN CPH	STANDARD DEV.	MIN.	MAX.	NO. OF RUNS	TOTAL HRS
1	bigmouth buffalo	13	0.37	1.83	3.62	0.00	14.99	19	8.22
2	black crappie	108	3.04	11.11	10.22	0.00	43.48	19	8.22
3	bluegill	2127	59.80	187.39	224.47	6.93	668.33	19	8.22
4	bowfin	13	0.37	1.89	2.99	0.00	10.60	19	8.22
5	brook silverside	1	0.03	0.23	0.99	0.00	4.29	19	8.22
6	chestnut lamprey	3	0.08	0.28	0.92	0.00	3.75	19	8.22
7	common carp	70	1.97	9.11	6.81	0.00	20.00	19	8.22
8	common shiner	5	0.14	0.60	1.83	0.00	6.48	19	8.22
9	emerald shiner	16	0.45	1.82	5.38	0.00	23.10	19	8.22
10	flathead catfish	1	0.03	0.11	0.48	0.00	2.07	19	8.22
11	freshwater drum	7	0.20	0.80	2.15	0.00	7.19	19	8.22
12	gizzard shad	54	1.52	8.66	17.34	0.00	70.00	19	8.22
13	golden redhorse	17	0.48	3.09	4.59	0.00	13.33	19	8.22
14	golden shiner	3	0.08	0.35	1.10	0.00	4.28	19	8.22
15	green sunfish	81	2.28	8.60	13.37	0.00	50.66	19	8.22
16	green sunfish x bluegill	4	0.11	0.26	0.82	0.00	3.24	19	8.22
17	green sunfish x warmouth	1	0.03	0.04	0.19	0.00	0.83	19	8.22
18	largemouth bass	829	23.31	82.33	77.71	11.55	270.17	19	8.22
19	minnows & cyprinidae carps unsp.	6	0.17	0.73	3.18	0.00	13.86	19	8.22
20	northern pike	15	0.42	2.12	2.71	0.00	7.49	19	8.22
21	pumpkinseed	2	0.06	0.14	0.45	0.00	1.82	19	8.22
22	pumpkinseed x bluegill	1	0.03	0.09	0.37	0.00	1.62	19	8.22
23	quillback	1	0.03	0.12	0.51	0.00	2.22	19	8.22
24	shorthead redhorse	18	0.51	2.15	3.71	0.00	13.33	19	8.22
25	silver redhorse	6	0.17	1.16	3.55	0.00	15.00	19	8.22
26	smallmouth bass	1	0.03	0.15	0.66	0.00	2.86	19	8.22
27	smallmouth buffalo	3	0.08	0.70	1.87	0.00	6.67	19	8.22
28	spottail shiner	2	0.06	0.16	0.71	0.00	3.08	19	8.22
29	spotted sucker	43	1.21	5.43	6.78	0.00	21.54	19	8.22
30	tadpole madtom	1	0.03	0.26	1.15	0.00	5.00	19	8.22
31	walleye	8	0.22	1.51	2.11	0.00	6.67	19	8.22
32	warmouth	5	0.14	0.61	1.53	0.00	5.46	19	8.22
33	white bass	1	0.03	0.11	0.49	0.00	2.14	19	8.22
34	white crappie	27	0.76	2.55	3.33	0.00	11.26	19	8.22
35	yellow bullhead	3	0.08	0.42	1.23	0.00	5.00	19	8.22
36	yellow perch	61	1.71	8.11	16.30	0.00	67.50	19	8.22
	ALL TAXA	**3557**	**100.00**	**345.02**	**297.96**	**62.86**	**971.86**	**19**	**8.22**

TABLE 7. RELATIVE ABUNDANCE, MEAN CATCH PER HOUR (CPH), ELECTRO SHOCKING, PETTIBONE LAGOON, 2009, ALL SEASONS.

	TAXON	FREQ.	PERCENT	MEAN CPH	STANDARD DEV.	MIN.	MAX.	NO. OF RUNS	TOTAL HRS
1	bigmouth buffalo	4	0.13	1.03	3.54	0.00	15.00	19	7.12
2	black crappie	80	2.57	9.63	13.01	0.00	46.00	19	7.12
3	bluegill	1754	56.45	232.08	244.25	27.65	717.31	19	7.12
4	bowfin	9	0.29	1.34	2.38	0.00	8.00	19	7.12
5	brook silverside	2	0.06	0.35	1.53	0.00	6.67	19	7.12
6	common carp	31	1.00	4.51	5.48	0.00	15.01	19	7.12
7	emerald shiner	6	0.19	1.12	3.38	0.00	12.01	19	7.12
8	freshwater drum	7	0.23	1.03	1.90	0.00	5.63	19	7.12
9	gizzard shad	12	0.39	1.46	4.01	0.00	16.89	19	7.12
10	golden redhorse	4	0.13	0.67	1.61	0.00	5.00	19	7.12
11	green sunfish	98	3.15	14.18	20.52	0.00	83.33	19	7.12
12	green sunfish x bluegill	3	0.10	0.45	1.13	0.00	3.53	19	7.12
13	green sunfish x warmouth	1	0.03	0.09	0.41	0.00	1.76	19	7.12
14	largemouth bass	832	26.78	116.65	82.67	30.00	343.33	19	7.12
15	longnose gar	4	0.13	0.75	2.35	0.00	9.22	19	7.12
16	northern pike	9	0.29	1.29	2.46	0.00	8.00	19	7.12
17	pumpkinseed	1	0.03	0.13	0.57	0.00	2.50	19	7.12
18	pumpkinseed x bluegill	1	0.03	0.26	1.15	0.00	5.00	19	7.12
19	quillback	1	0.03	0.10	0.43	0.00	1.88	19	7.12
20	river redhorse	1	0.03	0.10	0.43	0.00	1.88	19	7.12
21	shorthead redhorse	11	0.35	1.31	2.27	0.00	7.51	19	7.12
22	silver redhorse	7	0.23	1.22	2.17	0.00	8.00	19	7.12
23	smallmouth bass	4	0.13	0.83	3.18	0.00	13.83	19	7.12
24	smallmouth buffalo	1	0.03	0.09	0.39	0.00	1.72	19	7.12
25	spottail shiner	1	0.03	0.24	1.06	0.00	4.61	19	7.12
26	spotted sucker	59	1.90	8.23	9.85	0.00	32.00	19	7.12
27	tadpole madtom	2	0.06	0.37	1.62	0.00	7.07	19	7.12
28	walleye	4	0.13	0.60	1.27	0.00	4.00	19	7.12
29	warmouth	15	0.48	1.73	3.97	0.00	15.00	19	7.12
30	warmouth x bluegill	3	0.10	0.44	1.56	0.00	6.67	19	7.12
31	white bass	1	0.03	0.24	1.06	0.00	4.61	19	7.12
32	white crappie	14	0.45	1.99	2.60	0.00	8.00	19	7.12
33	yellow bullhead	2	0.06	0.27	0.84	0.00	3.33	19	7.12
34	yellow perch	123	3.96	21.13	34.30	0.00	119.82	19	7.12
	ALL TAXA	**3107**	**100.00**	**425.90**	**313.33**	**134.83**	**1016.67**	**19**	**7.12**

TABLE 8. RELATIVE ABUNDANCE, MEAN CATCH PER HOUR (CPH), ELECTRO SHOCKING, PETTIBONE LAGOON, 2010, ALL SEASONS.

	TAXON	FREQ.	PERCENT	MEAN CPH	STANDARD DEV.	MIN.	MAX.	NO. OF RUNS	TOTAL HRS
1	bigmouth buffalo	1	0.04	0.40	1.55	0.00	5.99	15	5.97
2	black crappie	27	1.08	4.26	6.94	0.00	23.98	15	5.97
3	bluegill	916	36.74	138.54	134.48	32.70	530.00	15	5.97
4	bowfin	9	0.36	1.85	3.06	0.00	9.22	15	5.97
5	brook silverside	11	0.44	2.00	5.66	0.00	22.08	15	5.97
6	common carp	14	0.56	2.80	4.90	0.00	17.96	15	5.97
7	emerald shiner	122	4.89	31.56	67.80	0.00	243.45	15	5.97
8	freshwater drum	5	0.20	0.76	1.69	0.00	5.63	15	5.97
9	gizzard shad	8	0.32	1.37	3.13	0.00	10.90	15	5.97
10	golden shiner	2	0.08	0.41	1.18	0.00	4.29	15	5.97
11	green sunfish	87	3.49	11.87	23.16	0.00	87.50	15	5.97
12	largemouth bass	1077	43.20	147.83	171.12	18.93	433.33	15	5.97
13	longnose gar	2	0.08	0.40	1.17	0.00	4.29	15	5.97
14	northern pike	7	0.28	1.85	3.50	0.00	11.98	15	5.97
15	pumpkinseed	5	0.20	0.73	1.34	0.00	3.33	15	5.97
16	shorthead redhorse	18	0.72	2.87	5.29	0.00	16.79	15	5.97
17	shortnose gar	1	0.04	0.18	0.70	0.00	2.73	15	5.97
18	silver redhorse	6	0.24	0.93	2.20	0.00	7.51	15	5.97
19	smallmouth bass	4	0.16	1.15	3.19	0.00	11.24	15	5.97
20	spottail shiner	5	0.20	1.82	6.18	0.00	23.95	15	5.97
21	spotted sucker	31	1.24	7.69	11.72	0.00	41.92	15	5.97
22	tadpole madtom	2	0.08	0.25	0.70	0.00	2.50	15	5.97
23	walleye	4	0.16	1.07	2.91	0.00	10.00	15	5.97
24	warmouth	10	0.40	1.54	2.40	0.00	6.67	15	5.97
25	white crappie	15	0.60	2.82	8.89	0.00	34.70	15	5.97
26	yellow bass	1	0.04	0.25	0.97	0.00	3.75	15	5.97
27	yellow perch	103	4.13	22.98	46.94	0.00	183.52	15	5.97
	ALL TAXA	**2493**	**100.00**	**390.16**	**269.57**	**88.18**	**952.50**	**15**	**5.97**

TABLE 9. RELATIVE ABUNDANCE, MEAN CATCH PER HOUR (CPH), ELECTRO SHOCKING, PETTIBONE LAGOON, 2005-2010, SPRING.

	TAXON	FREQ.	PERCENT	MEAN CPH	STANDARD DEV.	MIN.	MAX.	NO. OF RUNS	TOTAL HRS
1	bigmouth buffalo	5	0.11	0.57	1.46	0.00	5.99	28	10.14
2	black crappie	261	5.50	22.17	31.83	0.00	131.11	28	10.14
3	bluegill	1116	23.52	115.58	129.23	0.00	426.67	28	10.14
4	bowfin	12	0.25	1.02	2.51	0.00	10.60	28	10.14
5	brook silverside	1032	21.75	76.86	281.96	0.00	1218.61	28	10.14
6	chestnut lamprey	3	0.06	0.34	1.04	0.00	4.35	28	10.14
7	common carp	58	1.22	5.24	6.29	0.00	18.73	28	10.14
8	common shiner	1	0.02	0.08	0.42	0.00	2.22	28	10.14
9	emerald shiner	218	4.59	24.76	54.83	0.00	243.45	28	10.14
10	freshwater drum	5	0.11	0.43	0.99	0.00	3.33	28	10.14
11	gizzard shad	141	2.97	13.90	39.49	0.00	176.68	28	10.14
12	green sunfish	43	0.91	4.47	6.62	0.00	30.00	28	10.14
13	green sunfish x bluegill	2	0.04	0.24	1.26	0.00	6.67	28	10.14
14	green sunfish x pumpkinseed	1	0.02	0.13	0.70	0.00	3.70	28	10.14
15	largemouth bass	769	16.21	75.97	58.22	11.55	253.33	28	10.14
16	minnows & cyprinidae carps unsp.	541	11.40	35.82	172.80	0.00	914.55	28	10.14
17	northern pike	22	0.46	2.27	3.33	0.00	11.98	28	10.14
18	pumpkinseed	1	0.02	0.12	0.63	0.00	3.33	28	10.14
19	quillback	1	0.02	0.06	0.34	0.00	1.82	28	10.14
20	shorthead redhorse	24	0.51	2.00	4.00	0.00	16.79	28	10.14
21	silver redhorse	2	0.04	0.18	0.68	0.00	3.00	28	10.14
22	smallmouth bass	10	0.21	1.34	3.49	0.00	13.83	28	10.14
23	smallmouth buffalo	1	0.02	0.08	0.42	0.00	2.22	28	10.14
24	spottail shiner	8	0.17	1.25	4.60	0.00	23.95	28	10.14
25	spotted sucker	104	2.19	10.11	10.22	0.00	41.92	28	10.14
26	undetermined cyprinid hybrid	1	0.02	0.08	0.40	0.00	2.13	28	10.14
27	walleye	15	0.32	1.41	3.21	0.00	11.63	28	10.14
28	warmouth	2	0.04	0.22	0.82	0.00	3.75	28	10.14
29	weed shiner	1	0.02	0.08	0.44	0.00	2.33	28	10.14
30	white bass	6	0.13	0.64	1.91	0.00	6.67	28	10.14
31	white crappie	41	0.86	3.55	7.56	0.00	34.70	28	10.14
32	yellow bass	1	0.02	0.13	0.71	0.00	3.75	28	10.14
33	yellow perch	297	6.26	32.90	41.37	0.00	183.52	28	10.14
	ALL TAXA	**4745**	**100.00**	**434.00**	**461.52**	**23.68**	**2072.73**	**28**	**10.14**

TABLE 10. RELATIVE ABUNDANCE, MEAN CATCH PER HOUR (CPH), ELECTRO SHOCKING, PETTIBONE LAGOON, 2005-2010, SUMMER.

	TAXON	FREQ.	PERCENT	MEAN CPH	STANDARD DEV.	MIN.	MAX.	NO. OF RUNS	TOTAL HRS
1	bigmouth buffalo	18	1.14	2.00	4.17	0.00	15.00	27	9.35
2	black crappie	56	3.54	5.46	8.81	0.00	43.48	27	9.35
3	bluegill	649	41.05	70.74	40.02	8.00	150.00	27	9.35
4	bowfin	25	1.58	2.68	2.88	0.00	9.22	27	9.35
5	brook silverside	1	0.06	0.16	0.83	0.00	4.29	27	9.35
6	common carp	60	3.80	6.65	5.44	0.00	20.00	27	9.35
7	common shiner	1	0.06	0.19	0.96	0.00	5.00	27	9.35
8	flathead catfish	2	0.13	0.16	0.59	0.00	2.31	27	9.35
9	freshwater drum	15	0.95	1.33	2.43	0.00	7.19	27	9.35
10	gizzard shad	66	4.17	8.76	14.97	0.00	70.00	27	9.35
11	golden redhorse	23	1.45	2.87	3.99	0.00	13.33	27	9.35
12	golden shiner	5	0.32	0.48	1.24	0.00	4.29	27	9.35
13	green sunfish	44	2.78	5.35	7.96	0.00	33.33	27	9.35
14	largemouth bass	411	26.00	46.60	23.80	13.33	100.00	27	9.35
15	longnose gar	6	0.38	0.75	2.12	0.00	9.22	27	9.35
16	northern pike	10	0.63	1.13	2.25	0.00	8.00	27	9.35
17	pumpkinseed x bluegill	1	0.06	0.19	0.96	0.00	5.00	27	9.35
18	quillback	2	0.13	0.15	0.55	0.00	2.22	27	9.35
19	river redhorse	4	0.25	0.45	1.61	0.00	8.00	27	9.35
20	shorthead redhorse	29	1.83	2.68	3.57	0.00	13.33	27	9.35
21	shortnose gar	1	0.06	0.10	0.52	0.00	2.73	27	9.35
22	silver redhorse	18	1.14	2.07	3.52	0.00	15.00	27	9.35
23	smallmouth bass	1	0.06	0.11	0.55	0.00	2.86	27	9.35
24	smallmouth buffalo	2	0.13	0.43	1.57	0.00	6.67	27	9.35
25	spotted sucker	68	4.30	6.77	8.77	0.00	32.00	27	9.35
26	tadpole madtom	1	0.06	0.19	0.96	0.00	5.00	27	9.35
27	walleye	11	0.70	1.51	2.19	0.00	6.67	27	9.35
28	warmouth	7	0.44	0.73	2.99	0.00	15.00	27	9.35
29	white bass	1	0.06	0.08	0.41	0.00	2.14	27	9.35
30	white crappie	11	0.70	1.19	2.08	0.00	6.67	27	9.35
31	yellow bullhead	3	0.19	0.35	1.11	0.00	5.00	27	9.35
32	yellow perch	29	1.83	3.45	6.28	0.00	27.65	27	9.35
	ALL TAXA	**1581**	**100.00**	**175.75**	**79.47**	**62.86**	**370.00**	**27**	**9.35**

TABLE 11. RELATIVE ABUNDANCE, MEAN CATCH PER HOUR (CPH), ELECTRO SHOCKING, PETTIBONE LAGOON, 2005-2010, FALL.

	TAXON	FREQ.	PERCENT	MEAN CPH	STANDARD DEV.	MIN.	MAX.	NO. OF RUNS	TOTAL HRS
1	bigmouth buffalo	6	0.04	0.38	1.36	0.00	6.98	35	16.47
2	black crappie	392	2.59	22.16	29.98	0.00	136.96	35	16.47
3	bluegill	6463	42.70	372.35	218.82	10.81	717.31	35	16.47
4	bowfin	6	0.04	0.47	1.26	0.00	5.56	35	16.47
5	brook silverside	13	0.09	0.85	1.67	0.00	6.67	35	16.47
6	bullheads o05-07	1	0.01	0.14	0.85	0.00	5.00	35	16.47
7	chestnut lamprey	3	0.02	0.15	0.68	0.00	3.75	35	16.47
8	common carp	64	0.42	3.73	4.88	0.00	18.76	35	16.47
9	common shiner	4	0.03	0.19	1.10	0.00	6.48	35	16.47
10	emerald shiner	3	0.02	0.19	0.86	0.00	4.80	35	16.47
11	freshwater drum	1	0.01	0.09	0.53	0.00	3.13	35	16.47
12	gizzard shad	3583	23.67	335.83	882.44	0.00	4583.33	35	16.47
13	golden redhorse	3	0.02	0.13	0.63	0.00	3.64	35	16.47
14	golden shiner	2	0.01	0.17	0.75	0.00	4.00	35	16.47
15	green sunfish	467	3.09	30.48	33.12	0.00	108.00	35	16.47
16	green sunfish x bluegill	15	0.10	0.95	1.69	0.00	8.00	35	16.47
17	green sunfish x warmouth	2	0.01	0.07	0.33	0.00	1.76	35	16.47
18	largemouth bass	3930	25.96	240.26	117.44	50.00	433.33	35	16.47
19	northern pike	7	0.05	0.51	1.25	0.00	5.00	35	16.47
20	orangespotted sunfish	10	0.07	0.58	2.73	0.00	15.56	35	16.47
21	pumpkinseed	10	0.07	0.56	1.05	0.00	3.33	35	16.47
22	pumpkinseed x bluegill	2	0.01	0.10	0.41	0.00	1.89	35	16.47
23	shorthead redhorse	2	0.01	0.06	0.34	0.00	2.00	35	16.47
24	silver redhorse	2	0.01	0.11	0.46	0.00	2.22	35	16.47
25	smallmouth bass	2	0.01	0.17	0.73	0.00	4.00	35	16.47
26	smallmouth buffalo	5	0.03	0.18	0.63	0.00	3.00	35	16.47
27	spotted sucker	26	0.17	1.61	2.79	0.00	13.51	35	16.47
28	tadpole madtom	4	0.03	0.31	1.26	0.00	7.07	35	16.47
29	walleye	5	0.03	0.39	1.24	0.00	5.56	35	16.47
30	warmouth	28	0.18	1.64	2.42	0.00	7.50	35	16.47
31	warmouth x bluegill	4	0.03	0.30	1.20	0.00	6.67	35	16.47
32	white bass	2	0.01	0.13	0.75	0.00	4.44	35	16.47
33	white crappie	39	0.26	1.92	3.81	0.00	17.39	35	16.47
34	yellow bullhead	3	0.02	0.17	0.64	0.00	3.33	35	16.47
35	yellow perch	28	0.18	1.93	2.80	0.00	9.23	35	16.47
	ALL TAXA	**15137**	**100.00**	**1019.27**	**873.91**	**350.00**	**4983.33**	**35**	**16.47**

FIGURE 5. 2005-2010 RELATIVE ABUNDANCE OF THE TEN MOST ABUNDANT PETTIBONE FISH SPECIES BY YEAR.

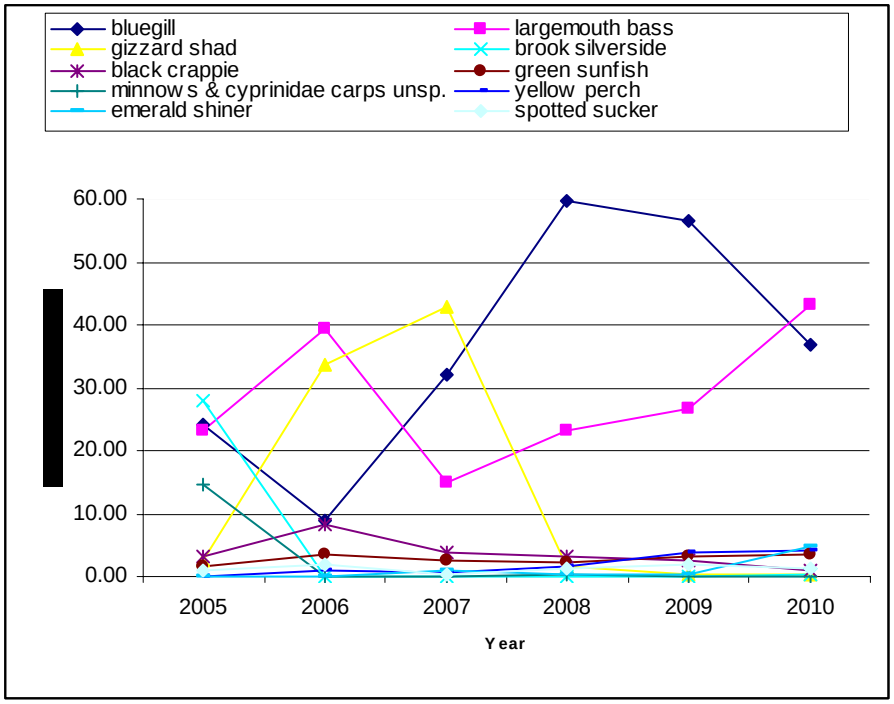


FIGURE 6. 2005-2010 CATCH PER HOUR OF THE TEN MOST ABUNDANT PETTIBONE FISH SPECIES BY YEAR.

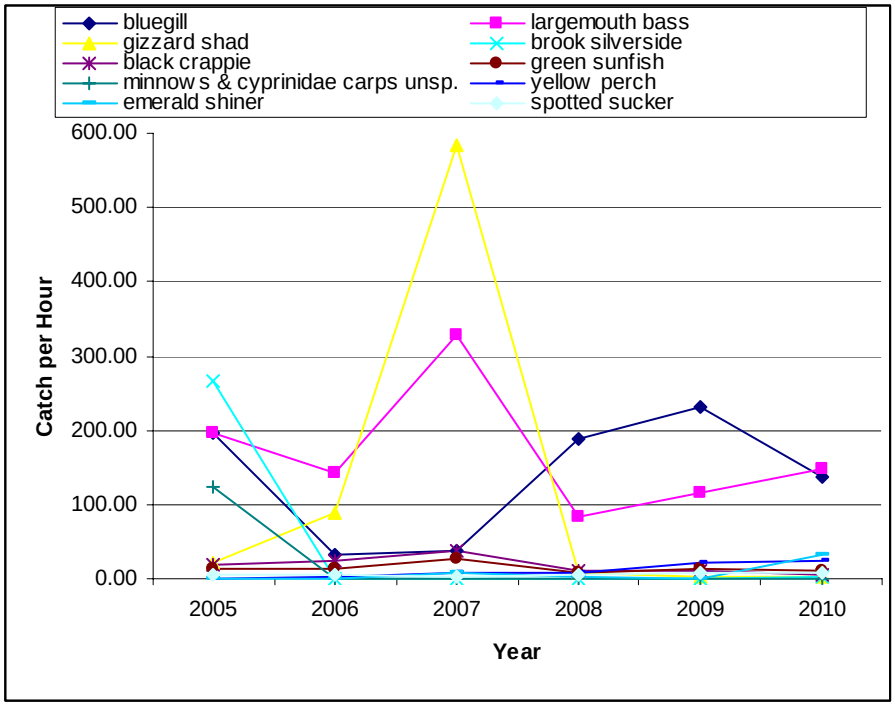
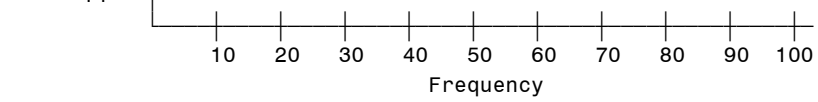


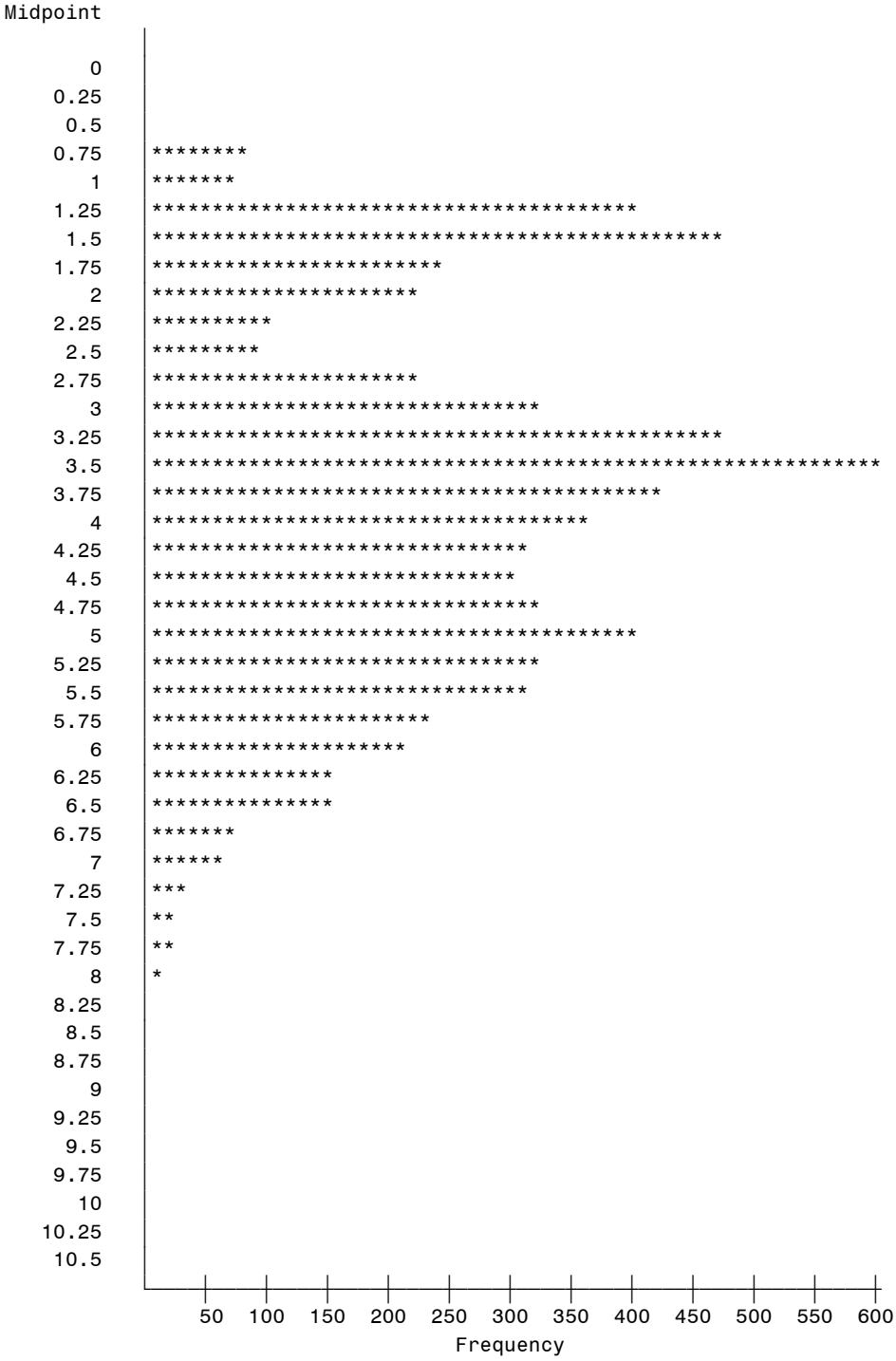
FIGURE 7. BLACK CRAPPIE LENGTH DISTRIBUTION (INCHES), PETTIBONE LAGOON ELECTRO SHOCKING, 2005-2010.



Midpoint	Freq	Cum. Freq	Percent	Cum. Percent
0	0	0	0.00	0.00
0.5	3	3	0.42	0.42
1	1	4	0.14	0.56
1.5	1	5	0.14	0.71
2	1	6	0.14	0.85
2.5	20	26	2.82	3.67
3	66	92	9.31	12.98
3.5	57	149	8.04	21.02
4	7	156	0.99	22.00
4.5	10	166	1.41	23.41
5	16	182	2.26	25.67
5.5	17	199	2.40	28.07
6	26	225	3.67	31.73
6.5	16	241	2.26	33.99
7	41	282	5.78	39.77
7.5	60	342	8.46	48.24
8	101	443	14.25	62.48
8.5	94	537	13.26	75.74
9	79	616	11.14	86.88
9.5	39	655	5.50	92.38
10	19	674	2.68	95.06
10.5	19	693	2.68	97.74
11	7	700	0.99	98.73
11.5	4	704	0.56	99.29
12	3	707	0.42	99.72
12.5	0	707	0.00	99.72
13	1	708	0.14	99.86
13.5	0	708	0.00	99.86
14	1	709	0.14	100.00

N	Mean	Std Dev	Minimum	Maximum
709	6.996	2.458	0.394	13.976

FIGURE 8. BLUEGILL LENGTH DISTRIBUTION (INCHES), PETTIBONE LAGOON ELECTRO SHOCKING, 2005-2010.



Midpoint	Freq	Cum. Freq	Percent	Cum. Percent
0	0	0	0.00	0.00
0.25	0	0	0.00	0.00
0.5	3	3	0.04	0.04
0.75	77	80	1.10	1.15
1	72	152	1.03	2.18
1.25	400	552	5.73	7.91
1.5	469	1021	6.72	14.64
1.75	241	1262	3.45	18.09
2	217	1479	3.11	21.20
2.25	104	1583	1.49	22.69
2.5	91	1674	1.30	24.00
2.75	223	1897	3.20	27.19
3	318	2215	4.56	31.75
3.25	471	2686	6.75	38.50
3.5	604	3290	8.66	47.16
3.75	419	3709	6.01	53.17
4	355	4064	5.09	58.26
4.25	313	4377	4.49	62.74
4.5	295	4672	4.23	66.97
4.75	322	4994	4.62	71.59
5	401	5395	5.75	77.34
5.25	317	5712	4.54	81.88
5.5	309	6021	4.43	86.31
5.75	231	6252	3.31	89.62
6	214	6466	3.07	92.69
6.25	146	6612	2.09	94.78
6.5	154	6766	2.21	96.99
6.75	65	6831	0.93	97.92
7	63	6894	0.90	98.82
7.25	33	6927	0.47	99.30
7.5	19	6946	0.27	99.57
7.75	17	6963	0.24	99.81
8	5	6968	0.07	99.89
8.25	1	6969	0.01	99.90
8.5	0	6969	0.00	99.90
8.75	1	6970	0.01	99.91
9	2	6972	0.03	99.94
9.25	1	6973	0.01	99.96
9.5	0	6973	0.00	99.96
9.75	0	6973	0.00	99.96
10	0	6973	0.00	99.96
10.25	1	6974	0.01	99.97
10.5	2	6976	0.03	100.00

N	Mean	Std Dev	Minimum	Maximum
6976	3.7905668	1.6156207	0.5510000	10.5000000

FIGURE 9. COMMON CARP LENGTH DISTRIBUTION (INCHES), PETTIBONE LAGOON ELECTRO SHOCKING, 2005-2010.

```
total length in inches                                          Cum.              Cum.
Midpoint                                                  Freq  Freq  Percent  Percent
       0  |                                                   0     0     0.00     0.00
       1  |                                                   0     0     0.00     0.00
       2  |                                                   0     0     0.00     0.00
       3  |                                                   0     0     0.00     0.00
       4  |                                                   0     0     0.00     0.00
       5  |****                                               2     2     1.10     1.10
       6  |                                                   0     2     0.00     1.10
       7  |******                                             3     5     1.65     2.75
       8  |                                                   0     5     0.00     2.75
       9  |********                                           4     9     2.20     4.95
      10  |                                                   0     9     0.00     4.95
      11  |**                                                 1    10     0.55     5.49
      12  |**                                                 1    11     0.55     6.04
      13  |**                                                 1    12     0.55     6.59
      14  |**********                                         5    17     2.75     9.34
      15  |**************                                     7    24     3.85    13.19
      16  |******                                             3    27     1.65    14.84
      17  |**************                                     7    34     3.85    18.68
      18  |******************                                 9    43     4.95    23.63
      19  |**********************************                17    60     9.34    32.97
      20  |************************                          12    72     6.59    39.56
      21  |**********                                         5    77     2.75    42.31
      22  |**********************************                17    94     9.34    51.65
      23  |**********************************                17   111     9.34    60.99
      24  |****************************************          20   131    10.99    71.98
      25  |****************************                      14   145     7.69    79.67
      26  |**************************                        13   158     7.14    86.81
      27  |****************                                   8   166     4.40    91.21
      28  |**************                                     7   173     3.85    95.05
      29  |********                                           4   177     2.20    97.25
      30  |****                                               2   179     1.10    98.35
      31  |****                                               2   181     1.10    99.45
      32  |**                                                 1   182     0.55   100.00
          |----+----+----+----+----+----+----+----+----+----|
               2    4    6    8   10   12   14   16   18   20
                          Frequency
```

N	Mean	Std Dev	Minimum	Maximum
182	21.3248242	5.1899676	4.9000000	31.6930000

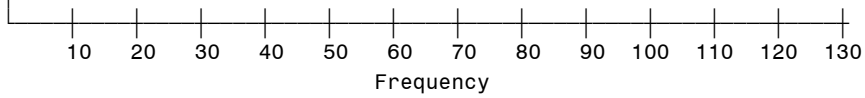
FIGURE 10. EMERALD SHINER LENGTH DISTRIBUTION (INCHES), PETTIBONE LAGOON ELECTRO SHOCKING, 2005-2010.

```
total length in inches
Midpoint
       0  |
    0.25  |
     0.5  |
    0.75  |
       1  |*
    1.25  |*
     1.5  |**
    1.75  |*****
       2  |************************************
    2.25  |*************
     2.5  |********
    2.75  |**************
       3  |********************
    3.25  |*********
     3.5  |***
    3.75  |*
       4  |
    4.25  |*
     4.5  |
          |_____|_____|_____|_____|_____|_____|_____|
                10    20    30    40    50    60    70
                          Frequency
```

Midpoint	Freq	Cum. Freq	Percent	Cum. Percent
0	0	0	0.00	0.00
0.25	0	0	0.00	0.00
0.5	0	0	0.00	0.00
0.75	0	0	0.00	0.00
1	1	1	0.45	0.45
1.25	1	2	0.45	0.90
1.5	3	5	1.36	2.26
1.75	10	15	4.52	6.79
2	75	90	33.94	40.72
2.25	25	115	11.31	52.04
2.5	15	130	6.79	58.82
2.75	27	157	12.22	71.04
3	39	196	17.65	88.69
3.25	17	213	7.69	96.38
3.5	5	218	2.26	98.64
3.75	1	219	0.45	99.10
4	0	219	0.00	99.10
4.25	2	221	0.90	100.00
4.5	0	221	0.00	100.00

N	Mean	Std Dev	Minimum	Maximum
221	2.4568824	0.5505116	1.1000000	4.2520000

FIGURE 11. GIZZARD SHAD LENGTH DISTRIBUTION (INCHES), PETTIBONE LAGOON ELECTRO SHOCKING, 2005-2010.



total length in inches Midpoint		Freq	Cum. Freq	Percent	Cum. Percent
0		0	0	0.00	0.00
0.5	*	1	1	0.13	0.13
1		0	1	0.00	0.13
1.5	*******	13	14	1.65	1.77
2	**********	129	143	16.33	18.10
2.5	**********	51	194	6.46	24.56
3	**********	39	233	4.94	29.49
3.5	**********	59	292	7.47	36.96
4	**********	72	364	9.11	46.08
4.5	**********	117	481	14.81	60.89
5	**********	79	560	10.00	70.89
5.5	**********	66	626	8.35	79.24
6	**********	40	666	5.06	84.30
6.5	**********	42	708	5.32	89.62
7	**********	20	728	2.53	92.15
7.5	*****	9	737	1.14	93.29
8	**	3	740	0.38	93.67
8.5		0	740	0.00	93.67
9		0	740	0.00	93.67
9.5	*	1	741	0.13	93.80
10		0	741	0.00	93.80
10.5	*	1	742	0.13	93.92
11		0	742	0.00	93.92
11.5		0	742	0.00	93.92
12	***	5	747	0.63	94.56
12.5	***	6	753	0.76	95.32
13	*****	10	763	1.27	96.58
13.5	****	8	771	1.01	97.59
14	***	5	776	0.63	98.23
14.5	*	2	778	0.25	98.48
15	**	3	781	0.38	98.86
15.5	*	2	783	0.25	99.11
16	**	3	786	0.38	99.49
16.5	*	1	787	0.13	99.62
17		0	787	0.00	99.62
17.5	*	1	788	0.13	99.75
18	*	1	789	0.13	99.87
18.5		0	789	0.00	99.87
19	*	1	790	0.13	100.00
19.5		0	790	0.00	100.00

N	Mean	Std Dev	Minimum	Maximum
790	4.7346544	2.8131780	0.7480000	19.0550000

FIGURE 12. GREEN SUNFISH LENGTH DISTRIBUTION (INCHES), PETTIBONE LAGOON ELECTRO SHOCKING, 2005-2010.

fish total length to 0.1 inches

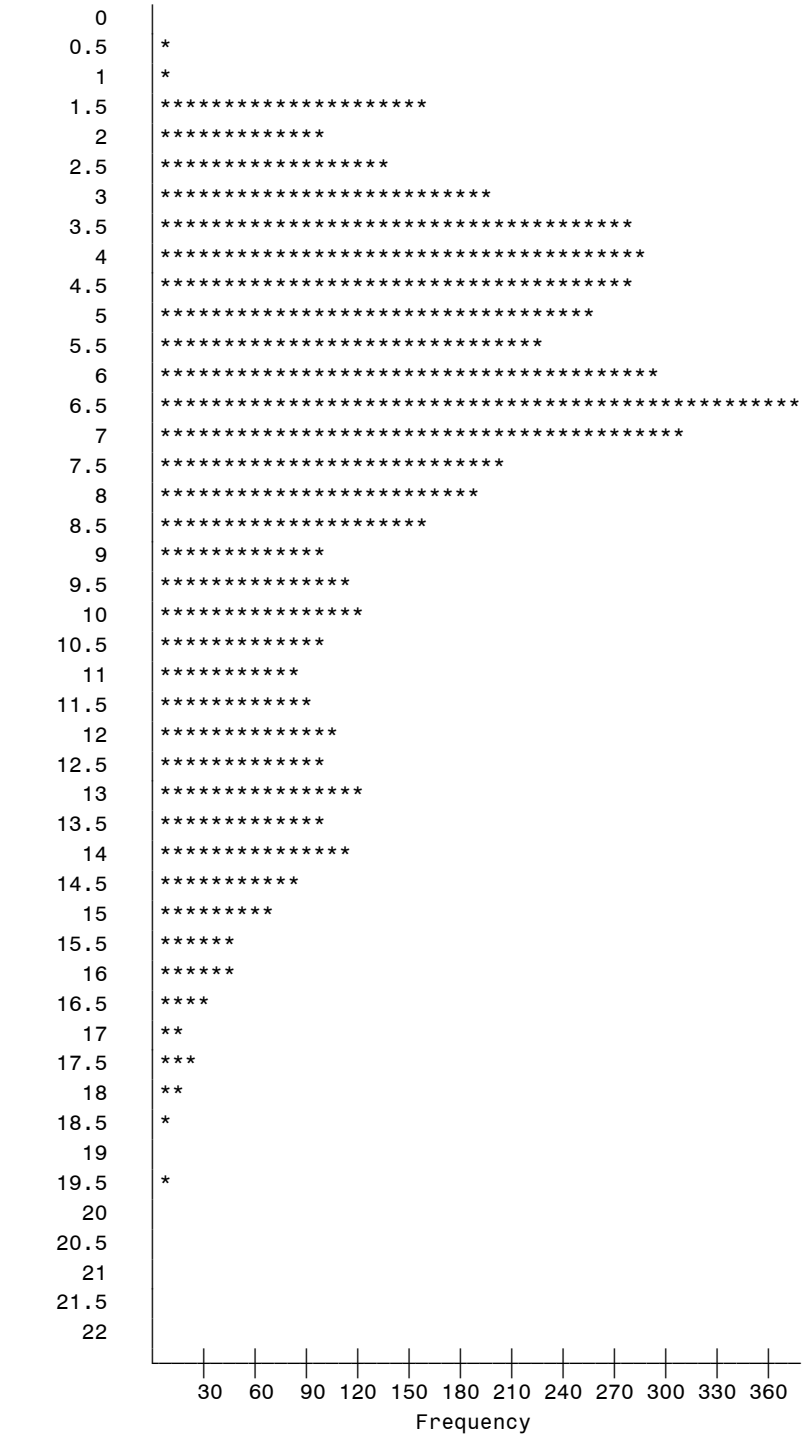
Midpoint		Freq	Cum. Freq	Percent	Cum. Percent
0		0	0	0.00	0.00
0.25		0	0	0.00	0.00
0.5		0	0	0.00	0.00
0.75	******	6	6	1.08	1.08
1	**********	14	20	2.53	3.62
1.25	**********	30	50	5.42	9.04
1.5	**********	39	89	7.05	16.09
1.75	**********	47	136	8.50	24.59
2	**********	25	161	4.52	29.11
2.25	**********	12	173	2.17	31.28
2.5	**********	13	186	2.35	33.63
2.75	**********	18	204	3.25	36.89
3	**********	24	228	4.34	41.23
3.25	**********	33	261	5.97	47.20
3.5	**********	47	308	8.50	55.70
3.75	**********	33	341	5.97	61.66
4	**********	42	383	7.59	69.26
4.25	**********	29	412	5.24	74.50
4.5	**********	33	445	5.97	80.47
4.75	**********	28	473	5.06	85.53
5	**********	31	504	5.61	91.14
5.25	**********	20	524	3.62	94.76
5.5	**********	11	535	1.99	96.75
5.75	*****	5	540	0.90	97.65
6	*****	5	545	0.90	98.55
6.25	*****	5	550	0.90	99.46
6.5		0	550	0.00	99.46
6.75		0	550	0.00	99.46
7	*	1	551	0.18	99.64
7.25		0	551	0.00	99.64
7.5		0	551	0.00	99.64
7.75		0	551	0.00	99.64
8		0	551	0.00	99.64
8.25		0	551	0.00	99.64
8.5		0	551	0.00	99.64
8.75		0	551	0.00	99.64
9	**	2	553	0.36	100.00

5 10 15 20 25 30 35 40 45

Frequency

N	Mean	Std Dev	Minimum	Maximum
553	3.3109204	1.4265317	0.7090000	9.1000000

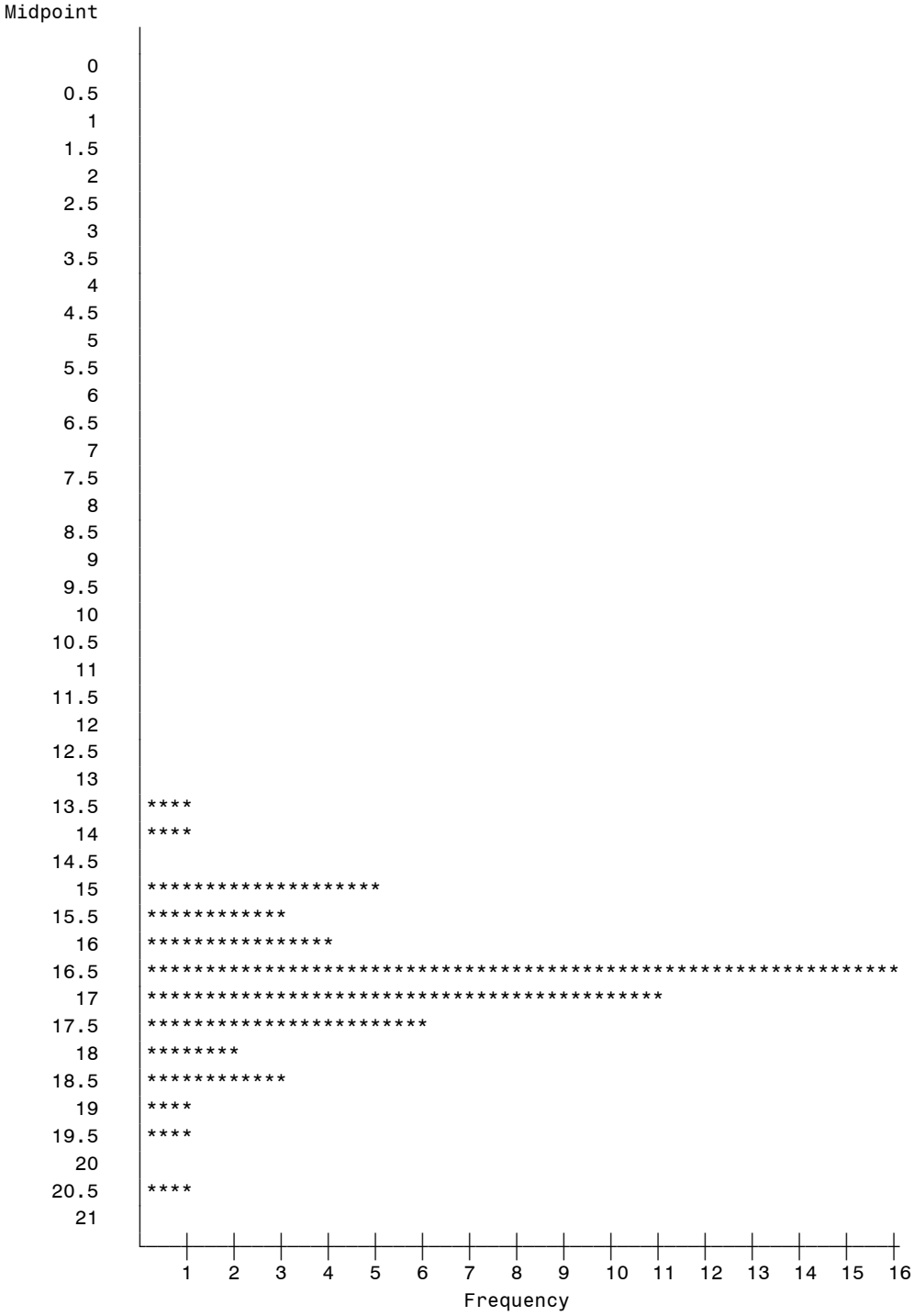
FIGURE 13. LARGEMOUTH BASS LENGTH DISTRIBUTION (INCHES), PETTIBONE LAGOON ELECTRO SHOCKING, 2005-2010.



Midpoint	Freq	Cum. Freq	Percent	Cum. Percent
0	0	0	0.00	0.00
0.5	5	5	0.10	0.10
1	11	16	0.22	0.32
1.5	160	176	3.25	3.57
2	100	276	2.03	5.60
2.5	135	411	2.74	8.35
3	195	606	3.96	12.30
3.5	280	886	5.69	17.99
4	285	1171	5.79	23.78
4.5	278	1449	5.64	29.42
5	254	1703	5.16	34.58
5.5	227	1930	4.61	39.19
6	295	2225	5.99	45.18
6.5	374	2599	7.59	52.77
7	305	2904	6.19	58.96
7.5	202	3106	4.10	63.07
8	184	3290	3.74	66.80
8.5	160	3450	3.25	70.05
9	97	3547	1.97	72.02
9.5	114	3661	2.31	74.34
10	121	3782	2.46	76.79
10.5	98	3880	1.99	78.78
11	82	3962	1.66	80.45
11.5	87	4049	1.77	82.21
12	103	4152	2.09	84.30
12.5	100	4252	2.03	86.34
13	118	4370	2.40	88.73
13.5	94	4464	1.91	90.64
14	114	4578	2.31	92.95
14.5	84	4662	1.71	94.66
15	66	4728	1.34	96.00
15.5	47	4775	0.95	96.95
16	48	4823	0.97	97.93
16.5	33	4856	0.67	98.60
17	16	4872	0.32	98.92
17.5	19	4891	0.39	99.31
18	16	4907	0.32	99.63
18.5	8	4915	0.16	99.80
19	3	4918	0.06	99.86
19.5	4	4922	0.08	99.94
20	0	4922	0.00	99.94
20.5	1	4923	0.02	99.96
21	0	4923	0.00	99.96
21.5	1	4924	0.02	99.98
22	1	4925	0.02	100.00

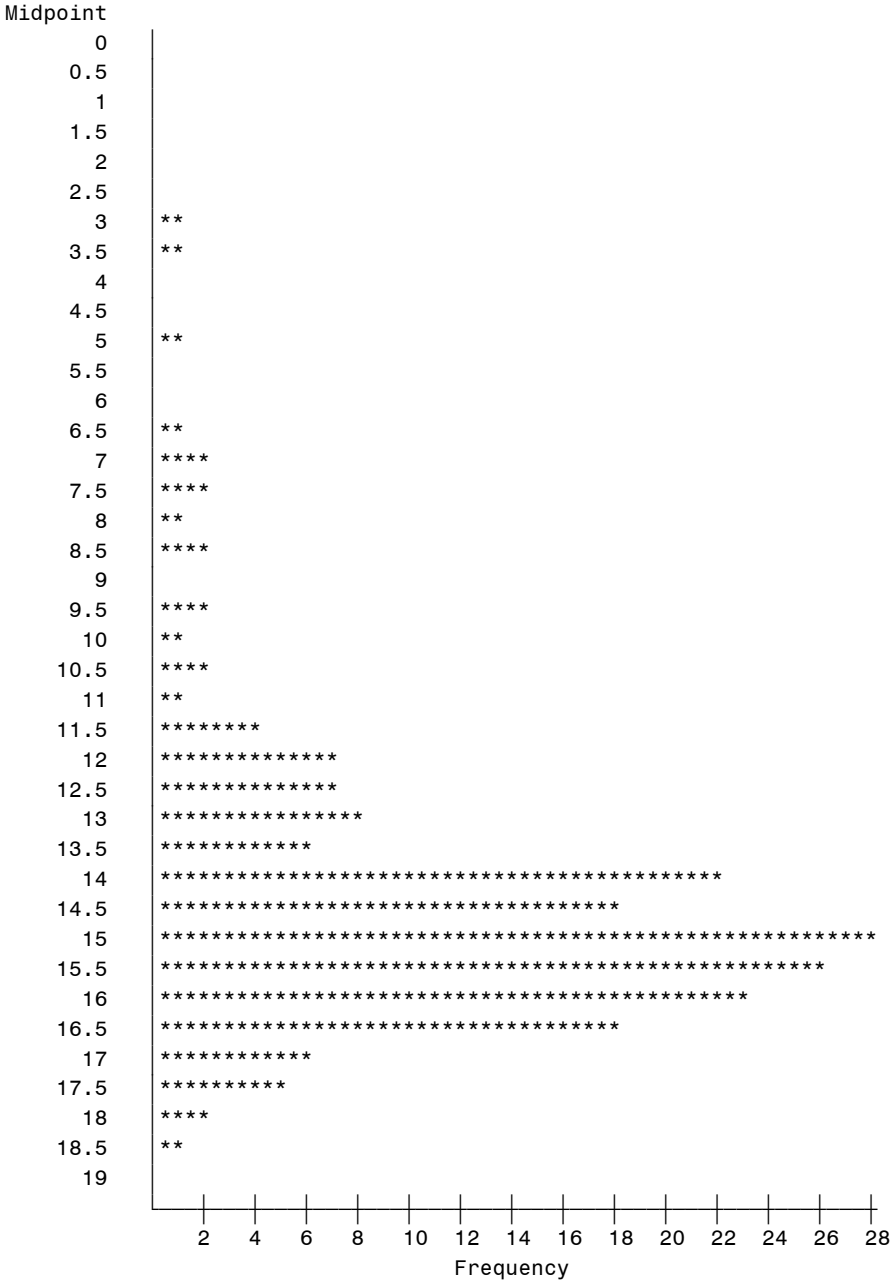
N	Mean	Std Dev	Minimum	Maximum
4925	7.3939953	3.9462927	0.4330000	21.8500000

FIGURE 14. SHORTHEAD REDHORSE LENGTH DISTRIBUTION (INCHES), PETTIBONE LAGOON ELECTRO SHOCKING, 2005-2010.



N	Mean	Std Dev	Minimum	Maximum
55	16.7243273	1.2783006	13.4000000	20.3000000

FIGURE 15. SPOTTED SUCKER LENGTH DISTRIBUTION (INCHES), PETTIBONE LAGOON ELECTRO SHOCKING, 2005-2010.



Midpoint	Freq	Cum. Freq	Percent	Cum. Percent
0	0	0	0.00	0.00
0.5	0	0	0.00	0.00
1	0	0	0.00	0.00
1.5	0	0	0.00	0.00
2	0	0	0.00	0.00
2.5	0	0	0.00	0.00
3	1	1	0.51	0.51
3.5	1	2	0.51	1.01
4	0	2	0.00	1.01
4.5	0	2	0.00	1.01
5	1	3	0.51	1.52
5.5	0	3	0.00	1.52
6	0	3	0.00	1.52
6.5	1	4	0.51	2.02
7	2	6	1.01	3.03
7.5	2	8	1.01	4.04
8	1	9	0.51	4.55
8.5	2	11	1.01	5.56
9	0	11	0.00	5.56
9.5	2	13	1.01	6.57
10	1	14	0.51	7.07
10.5	2	16	1.01	8.08
11	1	17	0.51	8.59
11.5	4	21	2.02	10.61
12	7	28	3.54	14.14
12.5	7	35	3.54	17.68
13	8	43	4.04	21.72
13.5	6	49	3.03	24.75
14	22	71	11.11	35.86
14.5	18	89	9.09	44.95
15	28	117	14.14	59.09
15.5	26	143	13.13	72.22
16	23	166	11.62	83.84
16.5	18	184	9.09	92.93
17	6	190	3.03	95.96
17.5	5	195	2.53	98.48
18	2	197	1.01	99.49
18.5	1	198	0.51	100.00
19	0	198	0.00	100.00

N	Mean	Std Dev	Minimum	Maximum
198	14.3485253	2.5303947	2.9130000	18.5040000

FIGURE 16. WHITE CRAPPIE LENGTH DISTRIBUTION (INCHES), PETTIBONE LAGOON ELECTRO SHOCKING, 2005-2010.

```
total length in inches                                                                    Cum.              Cum.
Midpoint                                                                        Freq  Freq  Percent  Percent
       0  |                                                                       0     0     0.00     0.00
     0.5  |****                                                                   1     1     1.10     1.10
       1  |                                                                       0     1     0.00     1.10
     1.5  |                                                                       0     1     0.00     1.10
       2  |                                                                       0     1     0.00     1.10
     2.5  |************                                                           3     4     3.30     4.40
       3  |************                                                           3     7     3.30     7.69
     3.5  |************                                                           3    10     3.30    10.99
       4  |****************                                                       4    14     4.40    15.38
     4.5  |****************                                                       4    18     4.40    19.78
       5  |                                                                       0    18     0.00    19.78
     5.5  |****                                                                   1    19     1.10    20.88
       6  |                                                                       0    19     0.00    20.88
     6.5  |********                                                               2    21     2.20    23.08
       7  |************                                                           3    24     3.30    26.37
     7.5  |********                                                               2    26     2.20    28.57
       8  |****                                                                   1    27     1.10    29.67
     8.5  |************************                                               6    33     6.59    36.26
       9  |********                                                               2    35     2.20    38.46
     9.5  |*******************************************                           11    46    12.09    50.55
      10  |************************************                                   9    55     9.89    60.44
    10.5  |*****************************************************************     16    71    17.58    78.02
      11  |************************                                               6    77     6.59    84.62
    11.5  |************************************                                   9    86     9.89    94.51
      12  |****************                                                       4    90     4.40    98.90
    12.5  |                                                                       0    90     0.00    98.90
      13  |                                                                       0    90     0.00    98.90
    13.5  |****                                                                   1    91     1.10   100.00
      14  |                                                                       0    91     0.00   100.00
          |----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+
               1    2    3    4    5    6    7    8    9   10   11   12   13   14   15   16
                                        Frequency
```

N	Mean	Std Dev	Minimum	Maximum
91	8.6488242	3.0072322	0.4330000	13.7010000

FIGURE 17. YELLOW PERCH LENGTH DISTRIBUTION (INCHES), PETTIBONE LAGOON ELECTRO SHOCKING, 2005-2010.

fish total length to 0.1 inches

Midpoint		Freq	Cum. Freq	Percent	Cum. Percent
0		0	0	0.00	0.00
0.25		0	0	0.00	0.00
0.5		0	0	0.00	0.00
0.75		0	0	0.00	0.00
1		0	0	0.00	0.00
1.25		0	0	0.00	0.00
1.5		0	0	0.00	0.00
1.75		0	0	0.00	0.00
2		0	0	0.00	0.00
2.25		0	0	0.00	0.00
2.5	********	4	4	1.13	1.13
2.75	**	1	5	0.28	1.41
3	**********	8	13	2.26	3.67
3.25	********	4	17	1.13	4.80
3.5	**********	18	35	5.08	9.89
3.75	**********	14	49	3.95	13.84
4	**********	13	62	3.67	17.51
4.25	**********	16	78	4.52	22.03
4.5	**********	20	98	5.65	27.68
4.75	**********	21	119	5.93	33.62
5	**********	23	142	6.50	40.11
5.25	**********	18	160	5.08	45.20
5.5	**********	22	182	6.21	51.41
5.75	**********	11	193	3.11	54.52
6	**********	21	214	5.93	60.45
6.25	**********	16	230	4.52	64.97
6.5	**********	19	249	5.37	70.34
6.75	**********	7	256	1.98	72.32
7	**********	19	275	5.37	77.68
7.25	**********	10	285	2.82	80.51
7.5	**********	9	294	2.54	83.05
7.75	**********	7	301	1.98	85.03
8	**********	7	308	1.98	87.01
8.25	**********	5	313	1.41	88.42
8.5	**********	8	321	2.26	90.68
8.75	**********	5	326	1.41	92.09
9	********	4	330	1.13	93.22
9.25	****	2	332	0.56	93.79
9.5	****	2	334	0.56	94.35
9.75	********	4	338	1.13	95.48
10	******	3	341	0.85	96.33
10.25	**********	5	346	1.41	97.74
10.5	****	2	348	0.56	98.31
10.75	**	1	349	0.28	98.59
11	****	2	351	0.56	99.15
11.25	****	2	353	0.56	99.72
11.5		0	353	0.00	99.72
11.75		0	353	0.00	99.72
12		0	353	0.00	99.72
12.25	**	1	354	0.28	100.00

2 4 6 8 10 12 14 16 18 20 22

Frequency

N	Mean	Std Dev	Minimum	Maximum
354	5.8862401	1.8976802	2.4020000	12.3000000

TABLE 12. MEAN LENGTH IN INCHES FOR SELECTED TAXA, ELECTRO SHOCKING, PETTIBONE LAGOON, 2005-2010, ALL SEASONS.

TAXON	MEAN LENGTH	STANDARD DEV.	MIN.	MAX.	N
black crappie	7.00	2.46	0.39	13.98	709
bluegill	3.79	1.62	0.55	10.50	6976
bowfin	21.48	4.13	10.20	28.10	43
brook silverside	2.52	0.53	1.10	3.74	45
common carp	21.32	5.19	4.90	31.69	182
emerald shiner	2.46	0.55	1.10	4.25	221
gizzard shad	4.73	2.81	0.75	19.06	790
green sunfish	3.31	1.43	0.71	9.10	553
largemouth bass	7.39	3.95	0.43	21.85	4925
minnows & cyprinidae carps unsp.	2.18	0.52	1.50	3.15	41
northern pike	25.34	6.06	10.87	35.63	39
shorthead redhorse	16.72	1.28	13.4	20.3	55
spotted sucker	14.35	2.53	2.91	18.5	198
walleye	16.7	4.19	8.3	24.5	31
warmouth	4.36	1.29	1.54	6.22	37
white crappie	8.65	3.01	0.43	13.7	91
yellow perch	5.89	1.9	2.4	12.3	354

TABLE 13. LIST OF STOCK SIZE, QUALITY SIZE (PSS_Q) AND PREFERRED SIZE (PSS_P) IN INCHES FOR SELECTED FISH SPECIES.

FISH SPECIES	PSS SOURCE	STOCK	QUALITY	PREFERRED
black crappie	Gabelhouse (1984)	5.0	8.0	10.0
bluegill	Gabelhouse (1984)	3.0	6.0	8.0
largemouth bass	Gabelhouse (1984)	8.0	12.0	15.0
pumpkinseed	Gabelhouse (1984)	3.0	6.0	8.0
white crappie	Gabelhouse (1984)	5.0	8.0	10.0
yellow perch	Gabelhouse (1984)	5.0	8.0	10.0

TABLE 14. COMPARISON OF MEAN CATCH PER HOUR AND PSS FOR SELECTED SPECIES OF SELECTED SIZES, ELECTRO SHOCKING, PETTIBONE LAGOON, 2005-2010, FALL.

SPECIES	MEAN CPH	STD. DEV. CPH	N	# OF STOCK	PSS_Q	PSS_P
BLACK CRAPPIE				540	60.56	7.22
QUALITY (≥ 8 INCHES)	7.57	11.10	90			
PREFERRED (≥ 10 INCHES)	0.89	1.94	90			
BLUEGILL				4946	12.27	0.20
QUALITY (≥ 6 INCHES)	15.97	20.73	90			
PREFERRED (≥ 8 INCHES)	0.22	0.67	90			
LARGEMOUTH BASS				1725	47.77	13.68
QUALITY (≥ 12 INCHES)	20.67	19.12	90			
PREFERRED (≥ 15 INCHES)	6.07	7.15	90			
WHITE CRAPPIE				73	89.04	58.9
QUALITY (≥ 8 INCHES)	1.64	3.96	90			
PREFERRED (≥ 10 INCHES)	1.05	3.37	90			
YELLOW PERCH				226	22.12	6.64
QUALITY(≥ 8 INCHES)	1.63	4.23	90			
PREFERRED (≥ 10 INCHES)	0.48	1.55	90			

FIGURE 18. MEAN SEASONAL TOTAL LENGTH (INCHES), PETTIBONE LAGOON ELECTRO SHOCKING, 2005-2010.

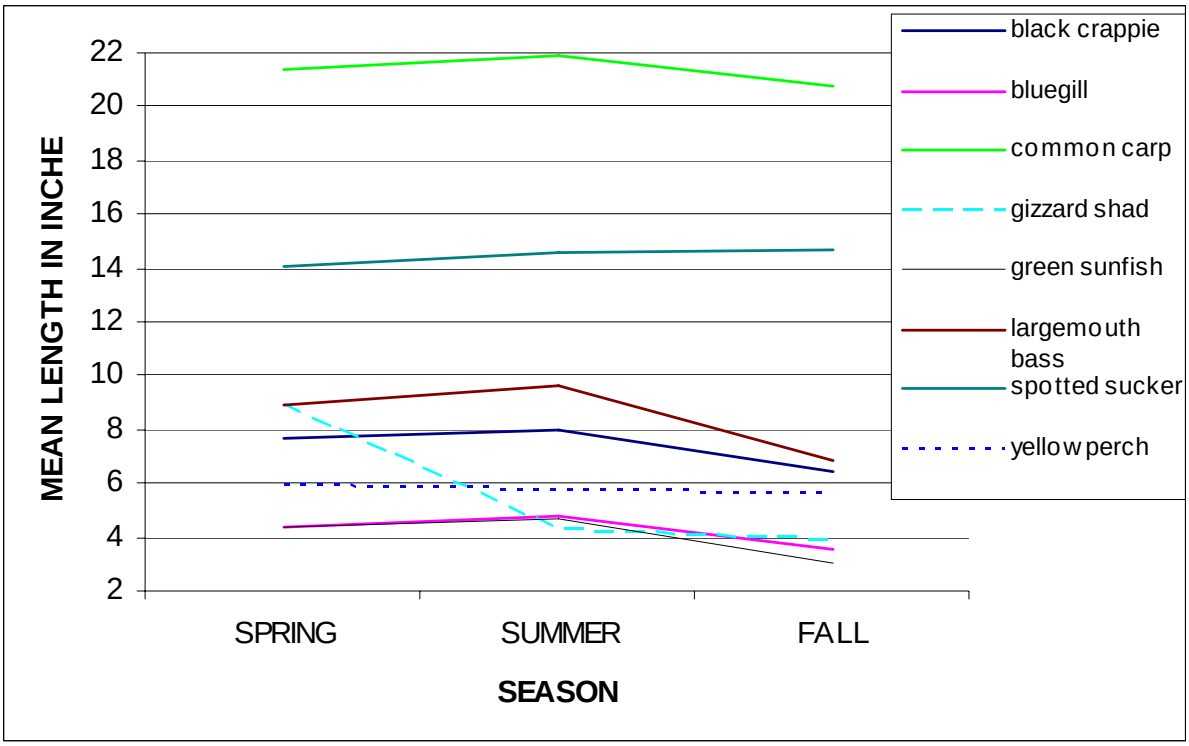


TABLE 15. NUMBER OF SHOCKING RUNS NEEDED TO DETECT A GIVEN PERCENT CHANGE IN MEAN OF THE LOG TRANSFORMED CATCH PER HOUR BY SPECIES, PETTIBONE LAGOON, 2005-2010, ALL SEASONS.

	TAXON	MEAN CPH	STANDARD DEVIATION CPH	N, 5% CHANGE	N, 10% CHANGE	N, 15% CHANGE	N, 20% CHANGE	N, 25% CHANGE
1	bigmouth buffalo	0.29	0.68	32277	8069	3586	2017	1291
2	black crappie	2.02	1.43	3066	766	341	192	123
3	bluegill	4.62	1.40	560	140	62	35	22
4	bowfin	0.48	0.76	15421	3855	1714	964	617
5	brook silverside	0.36	1.15	61628	15407	6848	3852	2465
6	bullheads o05-07	0.02	0.19	548467	137117	60941	34279	21939
7	chestnut lamprey	0.07	0.31	109478	27369	12164	6842	4379
8	common carp	1.28	1.11	4626	1156	514	289	185
9	common shiner	0.06	0.31	187272	46818	20808	11704	7491
10	emerald shiner	0.56	1.25	30107	7527	3345	1882	1204
11	flathead catfish	0.03	0.17	271442	67861	30160	16965	10858
12	freshwater drum	0.22	0.56	38952	9738	4328	2434	1558
13	gizzard shad	1.70	2.23	10499	2625	1167	656	420
14	golden redhorse	0.28	0.69	36721	9180	4080	2295	1469
15	golden shiner	0.09	0.36	89530	22382	9948	5596	3581
16	green sunfish	1.76	1.45	4134	1033	459	258	165
17	green sunfish x bluegill	0.19	0.49	40696	10174	4522	2544	1628
18	green sunfish x pumpkinseed	0.02	0.16	548467	137117	60941	34279	21939
19	green sunfish x warmouth	0.02	0.12	288920	72230	32102	18058	11557
20	largemouth bass	4.46	0.95	276	69	31	17	11
21	longnose gar	0.08	0.37	142885	35721	15876	8930	5715
22	minnows & cyprinidae carps unsp.	0.15	0.89	203665	50916	22629	12729	8147
23	northern pike	0.44	0.76	17882	4471	1987	1118	715
24	orangespotted sunfish	0.05	0.35	286022	71506	31780	17876	11441
25	pumpkinseed	0.13	0.38	52433	13108	5826	3277	2097
26	pumpkinseed x bluegill	0.04	0.24	194339	48585	21593	12146	7774
27	quillback	0.04	0.20	179257	44814	19917	11204	7170
28	river redhorse	0.05	0.28	200392	50098	22266	12525	8016
29	shorthead redhorse	0.45	0.81	20050	5013	2228	1253	802
30	shortnose gar	0.01	0.14	548467	137117	60941	34279	21939
31	silver redhorse	0.25	0.61	34849	8712	3872	2178	1394
32	smallmouth bass	0.15	0.53	70807	17702	7867	4425	2832
33	smallmouth buffalo	0.09	0.36	93943	23486	10438	5871	3758
34	spottail shiner	0.09	0.43	152365	38091	16929	9523	6095
35	spotted sucker	1.25	1.18	5364	1341	596	335	215
36	tadpole madtom	0.07	0.32	147968	36992	16441	9248	5919
37	undetermined cyprinid hybrid	0.01	0.12	548467	137117	60941	34279	21939
38	walleye	0.37	0.71	22626	5656	2514	1414	905
39	warmouth	0.32	0.68	28490	7122	3166	1781	1140
40	warmouth x bluegill	0.05	0.27	198641	49660	22071	12415	7946
41	weed shiner	0.01	0.13	548467	137117	60941	34279	21939
42	white bass	0.10	0.41	108722	27180	12080	6795	4349
43	white crappie	0.63	0.90	12641	3160	1405	790	506
44	yellow bass	0.02	0.16	548467	137117	60941	34279	21939
45	yellow bullhead	0.08	0.32	94927	23732	10547	5933	3797
46	yellow perch	1.39	1.44	6591	1648	732	412	264
	ALL SPECIES	**5.91**	**0.98**	**166**	**42**	**18**	**10**	**7**

TABLE 16. NUMBER OF SHOCKING RUNS NEEDED TO DETECT A GIVEN PERCENT CHANGE IN MEAN OF THE LOG TRANSFORMED CATCH PER HOUR BY SPECIES, PETTIBONE LAGOON, 2005-2010, SPRING.

	TAXON	MEAN CPH	STANDARD DEVIATION CPH	N, 5% CHANGE	N, 10% CHANGE	N, 15% CHANGE	N, 20% CHANGE	N, 25% CHANGE
1	bigmouth buffalo	0.24	0.55	32388	8097	3599	2024	1296
2	black crappie	2.30	1.47	2502	626	278	156	100
3	bluegill	3.91	1.62	1041	260	116	65	42
4	bowfin	0.34	0.72	26857	6714	2984	1679	1074
5	brook silverside	0.65	1.89	51004	12751	5667	3188	2040
6	bullheads o05-07	0.00	0.00					
7	chestnut lamprey	0.15	0.45	54537	13634	6060	3409	2181
8	common carp	1.21	1.21	6066	1517	674	379	243
9	common shiner	0.04	0.22	170634	42659	18959	10665	6825
10	emerald shiner	1.70	1.73	6332	1583	704	396	253
11	flathead catfish	0.00	0.00					
12	freshwater drum	0.22	0.48	30026	7506	3336	1877	1201
13	gizzard shad	0.88	1.57	19368	4842	2152	1210	775
14	golden redhorse	0.00	0.00					
15	golden shiner	0.00	0.00					
16	green sunfish	1.08	1.13	6641	1660	738	415	266
17	green sunfish x bluegill	0.07	0.38	170634	42659	18959	10665	6825
18	green sunfish x pumpkinseed	0.06	0.29	170634	42659	18959	10665	6825
19	green sunfish x warmouth	0.00	0.00					
20	largemouth bass	4.07	0.77	215	54	24	13	9
21	longnose gar	0.00	0.00					
22	minnows & cyprinidae carps unsp.	0.49	1.56	60625	15156	6736	3789	2425
23	northern pike	0.74	0.93	9639	2410	1071	602	386
24	orangespotted sunfish	0.00	0.00					
25	pumpkinseed	0.05	0.28	170634	42659	18959	10665	6825
26	pumpkinseed x bluegill	0.00	0.00					
27	quillback	0.04	0.20	170634	42659	18959	10665	6825
28	river redhorse	0.00	0.00					
29	shorthead redhorse	0.56	0.94	17279	4320	1920	1080	691
30	shortnose gar	0.00	0.00					
31	silver redhorse	0.09	0.33	83000	20750	9222	5187	3320
32	smallmouth bass	0.35	0.81	32127	8032	3570	2008	1285
33	smallmouth buffalo	0.04	0.22	170634	42659	18959	10665	6825
34	spottail shiner	0.28	0.75	44258	11065	4918	2766	1770
35	spotted sucker	1.96	1.07	1800	450	200	113	72
36	tadpole madtom	0.00	0.00					
37	undetermined cyprinid hybrid	0.04	0.22	170634	42659	18959	10665	6825
38	walleye	0.41	0.83	25594	6398	2844	1600	1024
39	warmouth	0.10	0.36	83673	20918	9297	5230	3347
40	warmouth x bluegill	0.00	0.00					
41	weed shiner	0.04	0.23	170634	42659	18959	10665	6825
42	white bass	0.21	0.61	53008	13252	5890	3313	2120
43	white crappie	0.83	1.05	9691	2423	1077	606	388
44	yellow bass	0.06	0.29	170634	42659	18959	10665	6825
45	yellow bullhead	0.00	0.00					
46	yellow perch	2.71	1.51	1891	473	210	118	76
	ALL SPECIES	**5.67**	**0.94**	**166**	**42**	**18**	**10**	**7**

TABLE 17. NUMBER OF SHOCKING RUNS NEEDED TO DETECT A GIVEN PERCENT CHANGE IN MEAN OF THE LOG TRANSFORMED CATCH PER HOUR BY SPECIES, PETTIBONE LAGOON, 2005-2010, SUMMER.

	TAXON	MEAN CPH	STANDARD DEVIATION CPH	N, 5% CHANGE	N, 10% CHANGE	N, 15% CHANGE	N, 20% CHANGE	N, 25% CHANGE
1	bigmouth buffalo	0.29	0.68	32277	8069	3586	2017	1291
2	black crappie	2.02	1.43	3066	766	341	192	123
3	bluegill	4.62	1.40	560	140	62	35	22
4	bowfin	0.48	0.76	15421	3855	1714	964	617
5	brook silverside	0.36	1.15	61628	15407	6848	3852	2465
6	bullheads o05-07	0.02	0.19	548467	137117	60941	34279	21939
7	chestnut lamprey	0.07	0.31	109478	27369	12164	6842	4379
8	common carp	1.28	1.11	4626	1156	514	289	185
9	common shiner	0.06	0.31	187272	46818	20808	11704	7491
10	emerald shiner	0.56	1.25	30107	7527	3345	1882	1204
11	flathead catfish	0.03	0.17	271442	67861	30160	16965	10858
12	freshwater drum	0.22	0.56	38952	9738	4328	2434	1558
13	gizzard shad	1.70	2.23	10499	2625	1167	656	420
14	golden redhorse	0.28	0.69	36721	9180	4080	2295	1469
15	golden shiner	0.09	0.36	89530	22382	9948	5596	3581
16	green sunfish	1.76	1.45	4134	1033	459	258	165
17	green sunfish x bluegill	0.19	0.49	40696	10174	4522	2544	1628
18	green sunfish x pumpkinseed	0.02	0.16	548467	137117	60941	34279	21939
19	green sunfish x warmouth	0.02	0.12	288920	72230	32102	18058	11557
20	largemouth bass	4.46	0.95	276	69	31	17	11
21	longnose gar	0.08	0.37	142885	35721	15876	8930	5715
22	minnows & cyprinidae carps unsp.	0.15	0.89	203665	50916	22629	12729	8147
23	northern pike	0.44	0.76	17882	4471	1987	1118	715
24	orangespotted sunfish	0.05	0.35	286022	71506	31780	17876	11441
25	pumpkinseed	0.13	0.38	52433	13108	5826	3277	2097
26	pumpkinseed x bluegill	0.04	0.24	194339	48585	21593	12146	7774
27	quillback	0.04	0.20	179257	44814	19917	11204	7170
28	river redhorse	0.05	0.28	200392	50098	22266	12525	8016
29	shorthead redhorse	0.45	0.81	20050	5013	2228	1253	802
30	shortnose gar	0.01	0.14	548467	137117	60941	34279	21939
31	silver redhorse	0.25	0.61	34849	8712	3872	2178	1394
32	smallmouth bass	0.15	0.53	70807	17702	7867	4425	2832
33	smallmouth buffalo	0.09	0.36	93943	23486	10438	5871	3758
34	spottail shiner	0.09	0.43	152365	38091	16929	9523	6095
35	spotted sucker	1.25	1.18	5364	1341	596	335	215
36	tadpole madtom	0.07	0.32	147968	36992	16441	9248	5919
37	undetermined cyprinid hybrid	0.01	0.12	548467	137117	60941	34279	21939
38	walleye	0.37	0.71	22626	5656	2514	1414	905
39	warmouth	0.32	0.68	28490	7122	3166	1781	1140
40	warmouth x bluegill	0.05	0.27	198641	49660	22071	12415	7946
41	weed shiner	0.01	0.13	548467	137117	60941	34279	21939
42	white bass	0.10	0.41	108722	27180	12080	6795	4349
43	white crappie	0.63	0.90	12641	3160	1405	790	506
44	yellow bass	0.02	0.16	548467	137117	60941	34279	21939
45	yellow bullhead	0.08	0.32	94927	23732	10547	5933	3797
46	yellow perch	1.39	1.44	6591	1648	732	412	264
	ALL SPECIES	**5.91**	**0.98**	**166**	**42**	**18**	**10**	**7**

TABLE 18. NUMBER OF SHOCKING RUNS NEEDED TO DETECT A GIVEN PERCENT CHANGE IN MEAN OF THE LOG TRANSFORMED CATCH PER HOUR BY SPECIES, PETTIBONE LAGOON, 2005-2010, FALL.

	TAXON	MEAN CPH	STANDARD DEVIATION CPH	N, 5% CHANGE	N, 10% CHANGE	N, 15% CHANGE	N, 20% CHANGE	N, 25% CHANGE
1	bigmouth buffalo	0.14	0.47	69656	17414	7740	4354	2786
2	black crappie	2.40	1.39	2046	512	227	128	82
3	bluegill	5.63	0.94	170	43	19	11	7
4	bowfin	0.20	0.51	39332	9833	4370	2458	1573
5	brook silverside	0.36	0.64	19372	4843	2152	1211	775
6	bullheads o05-07	0.05	0.30	213293	53323	23699	13331	8532
7	chestnut lamprey	0.07	0.31	109620	27405	12180	6851	4385
8	common carp	1.01	1.08	6956	1739	773	435	278
9	common shiner	0.06	0.34	213293	53323	23699	13331	8532
10	emerald shiner	0.08	0.34	110320	27580	12258	6895	4413
11	flathead catfish	0.00	0.00					
12	freshwater drum	0.04	0.24	213293	53323	23699	13331	8532
13	gizzard shad	2.61	2.84	7253	1813	806	453	290
14	golden redhorse	0.06	0.28	119155	29789	13239	7447	4766
15	golden shiner	0.08	0.33	106940	26735	11882	6684	4278
16	green sunfish	2.69	1.46	1791	448	199	112	72
17	green sunfish x bluegill	0.43	0.64	13613	3403	1513	851	545
18	green sunfish x pumpkinseed	0.00	0.00					
19	green sunfish x warmouth	0.05	0.20	110544	27636	12283	6909	4422
20	largemouth bass	5.34	0.59	75	19	8	5	3
21	longnose gar	0.00	0.00					
22	minnows & cyprinidae carps unsp.	0.00	0.00					
23	northern pike	0.23	0.53	32183	8046	3576	2011	1287
24	orangespotted sunfish	0.13	0.55	109396	27349	12155	6837	4376
25	pumpkinseed	0.29	0.52	19520	4880	2169	1220	781
26	pumpkinseed x bluegill	0.06	0.24	103760	25940	11529	6485	4150
27	quillback	0.00	0.00					
28	river redhorse	0.00	0.00					
29	shorthead redhorse	0.03	0.19	213293	53323	23699	13331	8532
30	shortnose gar	0.00	0.00					
31	silver redhorse	0.06	0.25	104686	26172	11632	6543	4187
32	smallmouth bass	0.08	0.32	108668	27167	12074	6792	4347
33	smallmouth buffalo	0.10	0.32	69070	17267	7674	4317	2763
34	spottail shiner	0.00	0.00					
35	spotted sucker	0.59	0.80	11202	2801	1245	700	448
36	tadpole madtom	0.12	0.42	77861	19465	8651	4866	3114
37	undetermined cyprinid hybrid	0.00	0.00					
38	walleye	0.16	0.48	53908	13477	5990	3369	2156
39	warmouth	0.61	0.83	11344	2836	1260	709	454
40	warmouth x bluegill	0.12	0.42	74804	18701	8312	4675	2992
41	weed shiner	0.00	0.00					
42	white bass	0.05	0.29	213293	53323	23699	13331	8532
43	white crappie	0.59	0.88	13537	3384	1504	846	541
44	yellow bass	0.00	0.00					
45	yellow bullhead	0.09	0.31	75552	18888	8395	4722	3022
46	yellow perch	0.70	0.85	8905	2226	989	557	356
	ALL SPECIES	**6.74**	**0.55**	**41**	**10**	**5**	**3**	**2**

TABLE 19. NUMBER OF SHOCKING FISH NEEDED TO DETECT A GIVEN PERCENT CHANGE IN MEAN TOTAL LENGTH FOR SELECTED TAXA, PETTIBONE LAGOON, 2005-2010, ALL SEASONS.

TAXON	MEAN LENGTH	N, 5% CHANGE	N, 10% CHANGE	N, 15% CHANGE	N, 20% CHANGE	N, 25% CHANGE
black crappie	7.00	751	188	83	47	30
bluegill	3.79	1102	275	122	69	44
bowfin	21.48	225	56	25	14	9
brook silverside	2.52	276	69	31	17	11
common carp	21.32	362	90	40	23	14
emerald shiner	2.46	296	74	33	18	12
gizzard shad	4.73	2183	546	243	136	87
green sunfish	3.31	1139	285	127	71	46
largemouth bass	7.39	1733	433	193	108	69
minnows & cyprinidae carps unsp.	2.18	343	86	38	21	14
northern pike	25.34	350	87	39	22	14
shorthead redhorse	16.72	36	9	4	2	1
spotted sucker	14.35	191	48	21	12	8
walleye	16.7	384	96	43	24	15
warmouth	4.36	524	131	58	33	21
white crappie	8.65	745	186	83	47	30
yellow perch	5.89	630	158	70	39	25

TABLE 20. MEAN OF THE NATURAL LOG TRANSFORMED CPUE COMPARISON BETWEEN 2005-2010 PETTIBONE AND 2009 LAWRENCE/TARGET LAKE UNIT.

	PETTIBONE			LAWRENCE/TARGET			
TAXON	MEANLOGCPH	STDLOGCPH	N	MEANLOGCPH	STDLOGCPH	N	SIGNIF. DIFFERENT
black crappie	2.40	1.39	35	1.65	1.23	38	Y
bluegill	5.63	0.94	35	3.03	1.77	38	Y
bowfin	0.20	0.51	35	1.16	1.46	38	Y
common carp	1.01	1.08	35	0.49	1.08	38	Y
green sunfish	5.63	0.94	35	3.03	1.76	38	Y
largemouth bass	5.34	0.59	35	3.96	1.35	38	Y
northern pike	0.23	0.53	35	0.90	1.10	38	Y
pumpkinseed	0.29	0.52	35	0.27	0.71	38	N
warmouth	0.61	0.83	35	0.34	0.82	38	N
white crappie	0.59	0.88	35	0.08	0.52	38	Y
yellow perch	0.70	0.85	35	3.35	1.81	38	Y
ALL SPECIES ABOVE	**6.37**	**0.50**	**35**	**5.23**	**1.00**	**38**	**Y**

TABLE 21. COMPARISON OF TOTAL LENGTH BY SPECIES BETWEEN FALL 2005-2010 PETTIBONE AND FALL 2007-2010 LAKE ASSESSMENT, ALL UNITS, ELECTRO SHOCKING, ALL SIZES.

	PETTIBONE			LAKE UNITS			SIGNIF.
SPECIES	MEAN LENGTH	STD	N	MEAN LENGTH	STD	N	DIFFERENT
black crappie	6.40	2.86	392	7.64	2.91	558	Y
bluegill	3.53	1.62	5211	4.22	1.73	8554	Y
largemouth bass	6.84	3.77	3745	8.32	4.37	8794	Y
white crappie	8.20	3.35	39	9.94	2.21	147	Y
yellow perch	5.61	1.55	28	5.27	1.97	1690	N