

FISH POPULATION ASSESSMENT AND INTERPRETATION FOR PRIVATE WATERS

Billy Higginbotham*

INTRODUCTION

Many lakeowners request detailed technical assistance and services to enhance the quality of their sport fishery. To accomplish this task, the fishery consultant must make assessments of the fish population, habitat and user group in order to formulate sound management recommendations.

This paper will specifically address assessment and interpretation of data concerning multi-species fish populations in private impoundments at least 30 surface acres in size. Much of this information applies to smaller impoundments, however, economics frequently limit surveys on these waters.

The purpose of fish population sampling is to collect enough information to formulate management recommendations. Therefore, fish sampling is merely a tool to gather assessment information; the interpretation of this information and resulting management recommendations that will positively impact the sport fishery are the real "meat" of a survey.

Electrofishing, shoreline seining and gill-netting are the three most common sampling

techniques utilized in Texas. No one of these three techniques is adequate to sample all species present; therefore, a combination of the three provides the best information to develop management plans. Problematic species will be detected, at least if present in problematic abundance.

The following discussion of each sampling technique will assist the consultant to achieve meaning assessment data and interpretation to formulate management recommendations.

Electrofishing

Electrofishing samples provide information on most shoreline-oriented species including largemouth bass, bluegill, redear sunfish and most other sunfish species. Both AC and DC electrofishing units are used successfully to sample fish populations.

The timing of electrofishing samples can be very important in terms of collecting meaningful information. Samples should always be collected at night since many species may avoid this gear in the daytime. In addition, several species, notably largemouth bass, orient toward shore at night, making them more susceptible to collection during this period.

The time of year that

electrofishing samples are collected may also affect sampling success. If the consultant plans to survey more than once annually, one electrofishing sample should be conducted during pre-spawn (March-April) and another in late summer/early fall (September-October). Multiple surveys per year are uncommon, therefore, the consultant is usually faced with a single opportunity to survey and collect enough information to formulate management recommendations. Electrofishing samples under these conditions will yield the best information when conducted in late spring (May-early June) or late summer/early fall (September-October).

Sample size (the number of fish collected and/or length of time spent electrofishing) is another important consideration for collecting meaningful information. One accepted method is to collect all fish shocked for the first 1/2 to 1 hour; this technique should adequately collect a sample of the shoreline fish community. If, however, a minimum of 15 8-inch largemouth bass and 30 3-inch or longer bluegill are not collected during the initial electrofishing sample, additional sampling effort should be utilized. These sample sizes for bass and bluegill are

*Professor and Extension Wildlife and Fisheries Specialist, Texas Cooperative Extension

necessary to employ key indices (PSD and Wr) for data interpretation that will be discussed later under "Interpretative Indices".

Shoreline Seining

Shoreline seining provides indications of young-of-the-year abundance of several key species, particularly largemouth bass and bluegill. This sampling technique supplements electrofishing data by providing information not easily collected otherwise. A 50-foot bag seine 4 feet deep with 1/4 inch mesh is the best choice for collecting samples, although some consultants prefer a 20-foot by 1/4 inch seine because of the limited seining area available in many impoundments.

At least three quadrant seine hauls in different areas should be collected during the survey. Collection of young-of-the-year will be most successful from June-September. A key for interpretation of samples collected by this method is provided in the "Interpretative Indices" section of this paper.

Gill-Netting

Gill-net sets identify the presence of pelagic species such as crappie, gizzard shad and

catfish. Occasionally, carp, buffalo, drum, etc. are present and can usually be collected by gill-netting.

As mentioned, the major sport species identified by gill-netting efforts are crappie and catfish. In many cases, properly maintained catch records can be indicative of these species relative abundance, replacing the need for gillnet sampling. However, if rough species are suspected to be problematic, or if gill-net data has never been collected, this sampling technique is recommended.

Gill-net sets are usually made perpendicular to the shoreline in water at least six feet deep. Experimental gill nets (150 feet x 6 feet) consisting of several panels of varying mesh size (usually 1 to 3 inch bar mesh) are used to sample different sizes of pelagic species. One to three overnight net sets are usually adequate to provide enough information on the relative abundance of pelagic species present.

Although no indices to specifically analyze gill-net samples are included in this paper, the consultant can rely on this technique to detect the presence or absence of certain species. Sport species such as crappie and catfish that are

collected can be further analyzed by employing a relative weight (Wr) index.

INDICES FOR DATA INTERPRETATION

Indices available for interpreting fish population data are too numerous to compile or discuss within the confines of this paper. As a result, only a few indices will be discussed that are (1) based on length and weight data and (2) apply to the collection techniques already mentioned.

Proportional Stock Density (PSD)

PSD was developed specifically for the interpretation of electrofishing data collected on largemouth bass and bluegill. The size structure of each species is divided into stock size (8 inches or larger for bass and 3 inches or larger for bluegill) and quality size (12 inches or larger for bass and 6 inches or larger for bluegill). By first comparing the stock and quality size structures for each individual species, then in relation to each other, inferences can be made for the formulation of management recommendations.

For a balanced bass population, the PSD should range between 40 and 60 percent:

$$\text{PSD (bass)} = \frac{\text{Number of bass 12 inches}}{\text{Number of bass 8 inches}} \times 100$$

For a balanced bluegill population, the PSD should range between 20 and 40 percent:

$$\text{PSD (bluegill)} = \frac{\text{Number of bluegill 6 inches}}{\text{Number of bluegill 3 inches}} \times 100$$

The tic-tac-toe diagram shown in Figure 1 indicates the relationship between bass-bluegill PSD. Corrective management recommendations are given for each of the nine compartments given.

Furthermore, recent investigations also recommend that 10-25% of the stock size bass collected also be at least 15 inches in length. For bluegill, 5-10 percent of the stock size sampled should also be at least 8 inches in length. Populations varying substantially outside these proposed ranges may be in need of corrective management.

Bluegill PSD (%)	100	Characterized by stunted bass and large bluegill. Harvest more bass less than 12 inches to correct overcrowding. Increase harvest of six inch plus bluegills.	Increase harvest of large bluegills. If fishing pressure is heavy, release 12"-15" bass	Optimum situation for anglers (large bass and large bluegill). Normally only a temporary situation
	40	Bass reaching overcrowded condition. Increase harvest of bass less than 12 inches. Watch bluegill PSD	Balanced Release 12"-15" bass.	Normally a temporary situation
	20	Possible habitat problem - growth of both species may be limited due to heavy weed growth, muddy condition, etc.	Increase bluegill harvest. Bass population may be going toward overpopulation	Small bass may be out-competed for food by a stunted bluegill population - results in low bass recruitment, poor bluegill growth
		40	Bass PSD (%)	60

Figure 1. Proportional stock density interpretation for bass-bluegill populations

Relative Weight (Wr)

Relative Weight (Wr) is an index that compares the actual weight of a species with a standard weight (Ws) at the same length. The index can be calculated for fish collected by electrofishing or gill-netting, though samples should be collected in late summer or early fall for best results.

$$Wr = \frac{W \text{ (weight of a fish)}}{Ws \text{ (standard weight of fish)}} \times 100$$

A satisfactory range for Wr is 95-100. Wr for largemouth bass can be calculated from the same sample of bass analyzed using

PSD. Although, Wr has been applied primarily to largemouth bass, other species including bluegill, crappie and catfish can be analyzed with the enclosed standard weight tables (Appendix 1).

Wr for species consistently lower than the acceptable range of 95-100 may be in need of corrective management. Water quality, forage availability, and habitat are three factors that can affect the relative weight for a particular species.

Seining Interpretation

Shoreline seining as a method to determine the status of pond fish populations were

developed by H. S. Swingle at Auburn University. The smaller the impoundment, the more reliable seine analysis becomes for accurately assessing the fish population present.

The following key is a modification of this work and was developed by the Texas Chapter of the American Fisheries Society specifically for Texas waters. While this technique provides additional insight to the consultant, it should always be supplemented by electrofishing and (when appropriate) gill-netting in the larger impoundments addressed in this paper.

Table 1. Assessment of fish populations based on seining.

<u>Seine Contents</u>	<u>Status</u>	<u>Recommendations</u>
Young bass (less than 4 inches) present many recently hatched bluegills (less than 2 inches)	Population Balanced	Continue assessment using angler harvest records
Young bass (less than 4 inches) present no recently hatched bluegills	Bluegills absent or undesirable species competing with bluegills	Verify bluegill presence by angling
No young bass present many recently hatched bluegills (less than 2 inches)	Bluegills or bass crowded or bass not present in pond	Verify bass presence by angling.
No young bass present no recently hatched bluegills, undesirable species collected.	Overpopulation or absence of bluegills or undesirable fish species overpopulated.	Verify bass and/or bluegill presence by angling

CONCLUSION

In many instances, the fishery consultant has only one opportunity to formulate recommendations that will "chart the course" for the future management of a private impoundment. In order to provide the best recommendations, sampling efforts must be conducted at certain times using certain techniques to maximize the value of the data collected.

Corrective management recommendations require review and adjustment over time; therefore, blanket recommendations will seldom produce the long-term benefits of quality fishing. If possible, surveys conducted every two or three years will identify changes produced by corrective management recommendations and provide an opportunity for adjustments.

Unfortunately, most lakeowners are unwilling to follow-up with even occasional surveys. In these cases, angler catch records can easily be utilized to monitor changes in fish populations over time. Data collected by this technique can assist the consultant to determine the success of past recommendations when the lakeowner is unwilling to request future surveys.

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Appendix 1

Standard Weights for Sport Species

Appendix H. Standard weights (lb) for largemouth bass of different total lengths (inches).

Length	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
4	.0270	.0292	.0316	.0340	.0366	.0393	.0422	.0452	.0483	.0516
5	.0550	.0586	.0624	.0663	.0703	.0746	.0790	.0836	.0884	.0993
6	.0985	.1038	.1093	.1150	.1210	.1271	.1335	.1400	.1468	.1538
7	.1610	.1685	.1762	.1841	.1923	.2007	.2093	.2182	.2274	.2369
8	.2466	.2565	.2668	.2773	.2881	.2992	.3106	.3222	.3342	.3465
9	.35YO	.3719	.3851	.3986	.4125	.4267	.4411	.4560	.4712	.4867
10	.5025	.5187	.5353	.5522	.5695	.5872	.6052	.6236	.6424	.6616
11	.6811	.7011	.7215	.7422	.7634	.7850	.8069	.8294	.8522	.8754
12	.8991	.9233	.9478	.9728	.9983	1.024	1.051	1.077	1.105	1.133
13	1.161	1.190	1.219	1.248	1.279	1.309	1.341	1.372	1.404	1.437
14	1.470	1.504	1.539	1.573	1.609	1.645	1.681	1.718	1.756	1.794
15	1.833	1.872	1.912	1.952	1.993	2.035	2.077	2.120	2.163	2.207
16	2.252	2.297	2.343	2.389	2.436	2.484	2.532	2.581	2.631	2.681
17	2.732	2.784	2.836	2.889	2.943	2.997	3.052	3.108	3.164	3.221
18	3.279	3.337	3.397	3.457	3.517	3.579	3.641	3.703	3.767	3.831
19	3.896	3.962	4.029	4.096	4.164	4.233	4.303	4.373	4.444	4.516
20	4.589	4.663	4.737	4.813	4.889	4.966	5.043	5.122	5.201	5.281
21	5.362	5.444	5.527	5.611	5.695	5.781	5.867	5.954	6.042	6.131
22	6.221	6.311	6.403	6.495	6.589	6.683	6.778	6.874	6.972	7.070
23	7.169	7.268	7.369	7.471	7.574	7.678	7.783	7.888	7.995	8.103
24	8.211	8.321	8.432	8.543	8.656	8.770	8.884	9.000	9.117	9.235

Appendix 1. Standard weights (g) for largemouth bass of different total lengths (cm).

<u>Length</u>	<u>0.0</u>	<u>0.1</u>	<u>0.2</u>	<u>0.3</u>	<u>0.4</u>	<u>0.5</u>	<u>0.6</u>	<u>0.7</u>	<u>0.8</u>	<u>0.9</u>
10	11.64	12.02	12.40	12.79	13.19	13.60	14.02	14.45	14.88	15.33
11	15.78	16.24	16.71	17.19	17.68	18.18	18.69	19.21	19.74	20.28
12	20.83	21.39	21.96	22.54	23.13	23.73	24.34	24.96	25.59	26.24
13	26.89	27.56	28.23	28.92	29.62	30.33	31.05	31.79	32.54	33.29
14	34.06	34.85	35.64	36.45	37.27	38.10	38.94	39.80	40.67	41.56
15	42.45	43.36	44.29	45.22	46.17	47.14	48.11	49.10	50.11	51.13
16	52.16	53.21	54.27	55.35	56.44	57.54	58.66	59.80	60.95	62.11
17	63.29	64.49	65.76	66.93	68.17	69.43	70.70	71.99	73.30	74.62
18	75.96	77.31	78.68	80.07	81.48	82.90	84.34	85.79	87.26	88.75
19	90.26	91.79	93.33	94.89	96.47	98.06	99.68	101.3	103.0	104.6
20	106.3	108.0	109.7	111.5	113.2	115.0	116.8	118.6	120.5	122.3
21	124.2	126.1	128.0	130.0	131.9	133.9	135.9	137.9	140.0	142.0
22	144.1	146.2	148.3	150.5	152.6	154.8	157.0	159.2	161.5	163.8
23	166.1	168.4	170.7	173.1	175.5	177.9	180.3	182.7	185.2	187.7
24	190.2	192.8	195.3	197.9	200.5	203.2	205.8	208.5	211.2	213.9
25	216.7	219.5	222.3	225.1	227.9	230.8	233.7	236.6	239.6	242.6
26	245.6	248.6	251.7	254.7	257.8	261.0	264.1	267.3	270.5	273.7
27	277.0	280.3	283.6	286.9	290.3	293.7	297.1	300.6	304.1	307.6
28	311.1	314.6	318.2	321.8	325.5	329.2	332.9	336.6	340.3	344.1
29	347.9	351.8	355.7	359.6	363.5	367.5	371.4	375.5	379.15	383.6
30	387.7	391.8	396.0	400.2	404.4	408.7	413.0	417.3	421.7	426.0
31	430.5	434.9	439.4	443.9	448.4	453.0	457.6	462.3	466.9	471.6
32	476.4	481.1	485.9	490.8	495.6	500.5	505.4	510.4	515.4	520.4
33	525.5	530.6	535.7	540.9	546.1	551.3	556.6	561.9	567.2	572.6
34	578.0	583.5	588.9	594.5	600.0	605.6	611.2	616.9	622.6	628.3
35	634.0	639.8	645.7	651.6	657.5	663.4	669.4	675.4	681.5	687.6
36	693.7	699.9	706.1	712.3	718.6	724.9	731.3	737.6	744.1	750.6
37	757.1	673.6	770.2	776.8	783.5	790.2	796.9	803.7	810.5	817.4
38	824.3	831.2	838.2	845.3	852.3	859.4	866.6	873.7	881.0	388.2
39	895.5	902.9	910.3	917.7	925.2	932.7	940.3	947.9	955.5	963.2
40	970.9	978.7	986.5	994.3	1002	1010	1018	1026	1034	1042

Appendix I. Continued.

Length	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
41	1050	1059	1067	1075	1084	1092	1100	1109	1117	1126
42	1134	1143	1152	1161	1169	1178	1187	1196	1205	1214
43	1223	1232	1241	1250	1260	1269	1278	1288	1297	1306
44	1316	1326	1335	1345	1355	1364	1374	1384	1394	1404
45	1414	1424	1434	1444	1454	1465	1475	1485	1496	1506
46	1517	1527	1538	1548	1559	1570	1581	1591	1602	1613
47	1624	1635	1646	1658	1669	1680	1691	1703	1714	1726
48	1737	1749	1760	1772	1784	1796	1807	1819	1831	1843
49	1855	1867	1880	1892	1904	1916	1929	1941	1954	1966
50	1979	1992	2004	2017	2030	2043	2056	2069	2082	2095
51	2108	21,21	2134	2148	2161	2175	2188	2202	2215	2229
52	2243	2256	2270	2284	2298	2312	2326	2340	2355	2369
53	2383	2398	2412	2427	2441	2456	2470	2485	2500	2515
54	2530	2545	2560	2575	2590	2605	2620	2636	2651	2667
55	2682	2698	2713	2729	2745	2761	2777	2793	2809	2825
56	2841	2857	2873	2890	2906	2923	2939	2956	2973	2989
57	3006	3023	3040	3057	3074	3091	3108	3125	3143	3160
58	3178	3195	3213	3230	3248	3266	3284	3302	3320	3338
59	3356	3374	3392	3410	3429	3447	3466	3484	3503	3522
60	3541	3559	3578	3597	3617	3636	3655	3674	3693	3713

BLUEGILL STANDARD WETGHTS (From Anderson 1980) $\log W_s = 5.374 + 3.316 \log L$

Length (mm)	Weight (gms)	Length (mm)	Weight (gms)	Length (mm)	Weight (gms)
25	0.18	80	8.64	135	49.00
26	0.21	81	9.01	136	50.21
27	0.24	82	9.38	137	51.45
28	0.27	83	9.76	138	52.70
29	0.30	84	10.16	139	53.98
30	0.33	85	10.57	140	55.28
31	0.37	86	10.98	141	56.60
32	0.41	87	11.41	142	57.94
33	0.46	88	11.86	143	59.31
34	0.51	89	12.31	144	60.69
35	0.56	90	12.77	145	62.10
36	0.61	91	13.25	146	63.53
37	0.67	92	13.74	147	64.99
38	0.73	93	14.24	148	66.46
39	0.80	94	14.75	149	67.97
40	0.87	95	15.28	150	69.49
41	0.94	96	15.82	151	71.04
42	1.02	97	16.37	152	72.61
43	1.10	98	16.94	153	74.21
44	1.19	99	17.52	154	75.83
45	1.28	100	18.11	155	77.47
46	1.38	101	18.72	156	79.14
47	1.48	102	19.34	157	80.84
48	1.59	103	19.98	158	82.56
49	1.70	104	20.63	159	84.30
50	1.82	105	21.29	160	86.07
51	1.94	106	21.97	161	87.87
52	2.07	107	22.67	162	89.69
53	2.21	108	23.38	163	91.54
54	2.35	109	24.10	164	93.42
55	2.49	110	24.85	165	95.32
56	2.65	111	25.60	166	97.25
57	2.81	112	26.38	167	99.20
58	2.98	113	27.16	168	101.19
59	3.15	114	27.97	169	103.20
60	3.33	115	28.79	170	105.24
61	3.52	116	29.63	171	107.30
62	3.71	117	30.49	172	109.40
63	3.91	118	31.36	173	111.52
64	4.12	119	32.25	174	113.67
65	4.34	120	33.16	175	115.85
66	4.57	121	34.08	176	118.06
67	4.80	122	35.02	177	120.30
68	5.04	123	35.99	178	122.57
69	5.29	124	36.96	179	124.87
70	5.55	125	37.96	180	127.20
71	5.82	126	38.98	181	129.56
72	6.09	127	40.01	182	131.95
73	6.38	128	41.07	183	134.37
74	6.67	129	42.14	184	136.82
75	6.98	130	43.24	185	139.30
76	7.29	131	44.35	186	141.81
77	7.61	132	45.48	187	144.35
78	7.95	133	46.63	188	146.93
79	8.29	134	47.81	189	149.54

BLUEBILL .. STANDARD WEIGHTS (continued)

Length (mm)	Weight (gms)	Length (mm)	Weight (gms)	Length (mm)	Weight (gms)
190	152.18	229	282.63	268	476.10
191	154.85	230	286.74	269	482.01
192	157.55	231	290.90	270	487.98
193	160.29	232	295.09	271	494.00
194	163.06	233	299.33	272	500.07
195	165.87	234	303.61	273	506.19
196	168.70	235	307.94	274	512.37
197	171.57	236	312.30	275	518.59
198	174.48	237	316.71	276	524.87
199	177.42	238	321.17	277	531.21
200	180.39	239	325.66	278	537.59
201	183.40	240	330.20	279	544.03
202	186.44	241	334.79	280	550.52
203	189.52	242	339.42	281	557.07
204	192.63	243	344.09	282	563.67
205	195.78	244	348.81	283	570.33
206	198.97	245	353.57	284	577.04
207	202.19	246	358.38	285	583.80
208	205.45	247	363.23	286	590.62
209	208.74	248	368.13	287	597.50
210	212.07	249	373.08	288	604.43
211	215.44	250	378.07	289	612.42
212	218.84	251	383.11	290	618.46
213	222.28	252	388.19	291	625.56
214	225.76	253	393.32	292	632.72
215	229.28	254	398.50	293	639.93
216	232.84	255	403.73	294	647.20
217	236.43	256	409.00	295	654.53
218	240.06	257	414.32	296	661.92
219	243.73	258	419.69	297	689.36
220	247.44	259	425.11	298	676.86
221	251.19	260	430.58	299	684.42
222	254.98	261	436.09	300	692.04
223	258.81	262	441.66	301	699.72
224	262.68	263	447.27	302	707.46
225	266.59	264	452.94	303	715.26
226	270.54	265	458.65	304	723.12
227	274.52	266	464.42	305	731.04
228	278.56	267	470.23		

Black Crappie - Standard Weights (From Anderson 1980) $\log W_s = -4.914 + 3.052 \log L$

Length (mm)	Weight (gms)	Length (mm)	Weight (gms)	Length (mm)	Weight (gms)
25	0.23	75	6.44	125	30.60
26	0.25	76	6.70	126	31.36
27	0.28	77	6.98	127	32.12
28	0.32	78	7.26	128	32.90
29	0.35	79	7.54	129	33.69
30	0.39	80	7.84	130	34.49
31	0.43	81	8.14	131	35.31
32	0.48	82	8.45	132	36.14
33	0.53	83	8.77	133	36.98
34	0.58	84	9.10	134	37.84
35	0.63	85	9.43	135	38.71
36	0.69	86	9.77	136	39.59
37	0.74	87	10.13	137	40.48
38	0.81	88	10.48	138	41.39
39	0.87	89	10.85	139	42.31
40	0.95	90	11.23	140	43.25
41	1.02	91	11.61	141	44.20
42	1.10	92	12.01	142	45.16
43	1.18	93	12.41	143	46.14
44	1.26	94	12.82	144	47.13
45	1.35	95	13.24	145	48.14
46	1.45	96	13.67	146	49.16
47	1.55	97	14.11	147	50.19
48	1.65	98	14.56	148	51.24
49	1.76	99	15.02	149	52.31
50	1.87	100	15.49	150	53.39
51	1.98	101	15.97	151	54.48
52	2.10	102	16.45	152	55.59
53	2.23	103	16.95	153	56.71
54	2.36	104	17.46	154	57.85
55	2.50	105	17.98	155	59.01
56	2.64	106	18.50	156	60.18
57	2.79	107	19.04	157	61.36
58	2.94	108	19.59	158	62.56
59	3.09	109	20.15	159	63.78
60	3.26	110	20.72	160	65.01
61	3.43	111	21.30	161	66.26
62	3.60	112	21.89	162	67.52
63	3.78	113	22.49	163	68.80
64	3.97	114	23.10	164	70.10
65	4.16	115	23.73	165	71.41
66	4.36	116	24.36	166	72.74
67	4.56	117	25.01	167	74.09
68	4.77	118	25.67	168	75.45
69	4.99	119	26.34	169	76.83
70	5.21	120	27.02	170	78.22
71	5.45	121	27.71	171	79.64
72	5.68	122	28.42	172	81.06
73	5.93	123	29.13	173	82.51
74	6.18	124	29.86	174	83.98

Black Crappie - Standard Weights (continued)

Length (mm)	Weight (gms)	Length (mm)	Weight (gms)	Length (mm)	Weight (gms)
175	85.46	225	184.00	275	339.50
176	86.96	226	186.53	276	343.28
177	88.47	227	189.06	277	347.09
178	90.01	228	191.61	278	350.93
179	91.56	229	194.19	279	354.80
180	93.13	230	196.79	280	358.70
181	94.72	231	199.41	281	362.62
182	96.32	232	202.05	282	366.57
183	97.95	233	204.72	283	370.55
184	99.59	234	207.42	284	374.57
185	101.25	235	210.14	285	378.61
186	102.93	236	212.88	286	382.67
187	104.63	237	215.64	287	386.77
188	106.35	238	218.43	288	390.90
189	108.08	239	221.24	289	395.06
190	109.84	240	224.08	290	399.24
191	111.61	241	226.94	291	403.46
192	113.41	242	229.83	292	407.71
193	115.22	243	232.74	293	411.98
194	117.05	244	235.68	294	416.29
195	118.90	245	238.64	295	420.63
196	120.77	246	241.62	296	424.99
197	122.66	247	244.63	297	429.39
198	124.57	248	247.67	298	433.82
199	126.50	249	250.73	299	438.28
200	128.45	250	253.81	300	442.77
201	130.42	251	256.92	301	447.29
202	132.41	252	260.06	302	451.84
203	134.42	253	263.22	303	456.42
204	136.46	254	266.41	304	461.03
205	138.51	255	269.63	305	465.68
206	140.58	256	272.87	306	470.35
207	142.67	257	276.13	307	475.06
208	144.79	258	279.42	308	479.80
209	146.92	259	282.74	309	484.57
210	149.08	260	286.09	310	489.37
211	151.26	261	289.46	311	494.20
212	153.45	262	292.86	312	499.07
213	155.67	263	296.28	313	503.97
214	157.91	264	299.73	314	508.90
215	160.18	265	303.21	315	513.86
216	162.46	266	306.72	316	518.85
217	164.77	267	310.25	317	523.88
218	167.10	268	313.81	318	528.94
219	169.45	269	317.40	319	534.03
210	171.82	270	321.01	320	539.16
221	174.21	271	324.66	321	544.32
222	176.63	272	328.33	322	549.51
223	179.07	273	332.02	323	554.74
224	181.53	274	335.75	324	559.99

Black Crappie . Standard Weights (continued)

<u>Length (mm)</u>	<u>Weight (gms)</u>	<u>Length</u>	<u>Weight (gms)</u>	<u>Length (mm)</u>	<u>Weight (gms)</u>
325	565.29	353	727.46	380	910.96
326	570.61	354	733.77	381	918.30
327	575.97	355	740.11	382	925.67
328	581.36	356	746.49	383	933.09
329	586.79	357	752.91	384	940.54
330	592.25	358	759.37	385	948.04
331	597.74	359	765.86	386	955.57
332	603.27	360	772.39	387	963.15
333	608.84	361	778.95	388	970.77
334	614.43	362	785.56	389	978.42
335	620.06	363	792.20	390	986.12
336	625.73	364	798.88	391	993.86
337	631.43	365	805.60	392	1001.53
338	637.17	366	812.35	393	1009.45
339	642.94	367	819.15	394	1017.31
340	648.74	368	825.98	395	1025.21
341	654.59	369	832.85	396	1033.16
342	660.46	370	839.75	397	1041.14
343	666.37	371	846.70	398	1049.16
344	672.32	372	853.68	399	1057.23
345	678.30	373	860.71	400	1065.34
346	684.32	374	867.77	401	1073.49
347	690.38	375	874.87	402	1081.68
348	696.47	376	882.01	403	1089.91
349	702.59	377	889.19	404	1098.19
350	708.75	378	896.41	405	1106.50
351	714.95	379	903.66	406	1114.86
352	721.19				

White Crappie - Standard Weights (From Anderson 1980) $\log W_s = -5.102 + 3.112 \log T$

Length (mm)	Weight (gms)	Length (mm)	Weight (gms)	Length (mm)	Weight (gms)
25	0.18	75	5.41	125	26.52
26	0.20	76	5.64	126	27.19
27	0.23	77	5.81	127	27.86
28	0.25	78	6.11	128	28.55
29	0.28	79	6.36	129	29.25
30	0.31	80	6.61	130	29.96
31	0.35	81	6.87	131	30.69
32	0.38	82	7.14	132	31.42
33	0.42	83	7.42	133	32.17
34	0.46	84	7.70	134	32.93
35	0.50	85	7.99	135	33.70
36	0.55	86	8.28	136	34.48
37	0.60	87	8.59	137	35.28
38	0.65	88	8.90	138	36.08
39	0.71	89	9.22	139	36.90
40	0.76	90	9.54	140	37.74
41	0.83	91	9.87	141	38.58
42	0.89	92	10.22	142	39.44
43	0.96	93	10.57	143	40.31
44	1.03	94	10.92	144	41.19
45	1.10	95	11.29	145	42.09
46	1.18	96	11.66	146	43.00
47	1.26	97	12.05	147	43.92
48	1.35	98	12.44	148	44.86
49	1.44	99	12.84	149	45.81
50	1.53	100	13.24	150	46.77
51	1.63	101	13.66	151	47.75
52	1.73	102	14.09	152	48.74
53	1.84	103	14.52	153	49.75
54	1.95	104	14.96	154	50.77
55	2.06	105	15.41	155	51.80
56	2.18	106	15.88	156	52.84
57	2.30	107	16.35	157	53.91
58	2.43	108	16.83	158	54.98
59	2.56	109	17.32	159	56.07
60	2.70	110	17.82	160	57.18
61	2.84	111	18.33	161	58.30
62	2.99	112	18.84	162	59.43
63	3.14	113	19.37	163	60.58
64	3.30	114	19.91	164	61.74
65	3.47	115	20.46	165	62.92
66	3.63	116	21.02	166	64.12
67	3.81	117	21.59	167	65.33
68	3.99	118	22.17	168	66.55
69	4.17	119	22.76	169	67.79
70	4.36	120	23.36	170	69.05
71	4.56	121	23.97	171	70.32
72	4.76	122	24.59	172	71.61
73	4.97	123	25.22	173	72.91
74	5.19	124	25.87	174	74.23

White Crappie - Standard Weights (continued)

Length (mm)	Weight (gms)	Length (mm)	Weight (gms)	Length (mm)	Weight (gms.)
175	75.57	225	165.19	275	308.46
176	76.92	226	167.49	276	311.97
177	78.29	227	169.81	277	315.50
178	79.67	228	172.14	278	319.06
179	81.07	229	174.51	279	322.64
180	82.49	230	176.89	280	326.25
181	83.93	231	179.29	281	329.89
182	85.38	232	181.72	282	333.56
183	86.85	233	184.17	283	337.26
184	88.33	234	186.64	284	340.98
185	89.83	235	189.13	285	344.73
186	91.35	236	191.65	286	348.51
187	92.89	237	194.19	287	352.31
188	94.45	238	196.75	288	356.15
189	96.02	239	199.33	289	360.01
190	97.61	240	201.94	290	363.90
191	99.21	241	204.57	291	367.82
192	100.84	242	207.22	292	371.77
193	102.48	243	209.90	293	375.74
194	104.15	244	212.60	294	379.75
195	105.82	245	215.32	295	383.78
196	107.52	246	218.07	296	387.85
197	109.24	247	220.84	297	391.94
198	110.27	248	223.63	298	396.06
199	112.73	249	226.45	299	400.21
200	114.50	250	229.29	300	404.39
201	116.29	251	232.16	301	408.60
202	118.10	252	235.05	302	412.84
203	115.93	253	237.96	303	417.11
204	121.78	254	240.90	304	421.41
205	123.65	255	243.87	305	425.74
206	125.53	256	246.86	306	430.10
207	127.44	257	249.87	307	434.48
208	129.36	258	252.91	308	438.90
209	131.31	259	255.97	309	443.35
210	133.27	260	259.06	310	447.83
211	135.26	261	262.17	311	452.35
212	137.26	262	265.31	312	456.89
213	139.29	263	268.47	313	461.46
214	141.33	264	271.66	314	466.06
215	143.40	265	274.88	315	470.70
216	145.49	266	278.12	316	475.36
217	147.59	267	281.39	317	480.06
218	149.72	268	284.68	318	484.79
219	151.87	269	288.00	319	489.55
220	154.03	270	291.34	320	494.34
221	156.22	271	294.71	321	499.16
222	158.43	272	298.11	322	504.02
223	160.67	273	301.54	323	508.91
224	162.92	274	304.99	324	513.83

White Crappie - Standard Weights (continued)

Length (mm)	Weight (gms)	Length (mm)	Weight (gms)	Length (mm)	Weight (gms)
325	518.78	353	670.93	380	843.89
326	523.76	354	676.96	381	850.82
327	528.78	355	682.83	382	857.79
328	533.83	356	688.83	383	864.80
329	538.91	357	694.87	384	871.84
330	544.02	358	700.95	385	878.93
331	549.17	359	707.06	386	886.05
332	554.35	360	713.20	387	893.22
333	559.56	361	719.39	388	900.42
334	564.81	362	725.61	389	907.66
335	570.08	363	731.86	390	914.94
336	575.40	364	738.15	391	922.26
337	580.74	365	744.48	392	929.62
338	586.12	366	750.85	393	937.02
339	591.54	367	757.25	394	944.46
340	596.98	368	763.69	395	951.94
341	602.46	369	770.17	396	959.46
342	607.98	370	776.68	397	967.02
343	613.53	371	783.23	398	974.62
344	619.11	372	789.83	399	982.26
345	624.73	373	796.45	400	989.94
346	630.38	374	803.11	401	997.67
347	636.07	375	809.81	402	1005.43
348	641.79	376	816.55	403	1013.23
349	647.55	377	823.33	404	1021.08
350	653.34	378	830.15	405	1028.96
351	659.17	379	837.00	406	1036.89
352	665.03				

CHANNEL CATFISH. STANDARD WEIGHTS (From Anderson 1980) $\log W_s = -5.649 + 3.243 \log L$

Length(mm)	Weight(gms)	Length(mm)	Weight (gms)	Length(mm)	Weight (mm)
25	0.08	80	3.33	135	18.18
26	0.09	81	3.47	136	18.62
27	0.10	82	3.61	137	19.07
28	0.11	83	3.75	138	19.53
29	0.12	84	3.90	139	19.99
30	0.14	85	4.06	140	20.46
31	0.15	86	4.21	141	20.94
32	0.17	87	4.37	142	21.42
33	0.19	88	4.54 ^a	143	21.92
34	0.21	89	4.71	144	22.42
35	0.23	90	4.88	145	22.93
36	0.25	91	5.06	146	23.44
37	0.27	92	5.24	147	23.97
38	0.30	93	5.43	148	24.50
39	0.32	94	5.62	149	25.04
40	0.35	95	5.82	150	25.59
41	0.38	96	6.02	151	26.15
42	0.41	97	6.22	152	26.71
43	0.44	98	6.43	153	27.29
44	0.48	99	6.65	154	27.87
45	0.52	100	6.87	155	28.46
46	0.55	101	7.10	156	29.06
47	0.59	102	7.33	157	29.67
48	0.64	103	7.56	158	30.29
49	0.68	104	7.80	159	30.91
50	0.73	105	8.05	160	31.55
51	0.77	106	8.30	161	32.19
52	0.82	107	8.56	162	32.84
53	0.88	108	8.82	163	33.51
54	0.93	109	9.09	164	34.18
55	0.99	110	9.36	165	34.86
56	1.05	111	9.64	166	35.55
57	1.11	112	9.92	167	36.25
58	1.17	113	10.21	168	36.96
59	1.24	114	10.51	169	37.67
60	1.31	115	10.31	170	38.40
61	1.38	116	11.12	171	39.14
62	1.46	117	11.43	172	39.89
63	1.54	118	11.75	173	40.64
64	1.62	119	12.08	174	41.41
65	1.70	120	12.41	175	42.19
66	1.79	121	12.75	176	42.97
67	1.87	122	13.09	177	43.77
68	1.97	123	13.45	178	44.58
69	2.06	124	13.80	179	45.39
70	2.16	125	14.17	180	46.22
71	2.26	126	14.54	181	47.06
72	2.37	127	14.92	182	47.91
73	2.48	128	15.03	183	48.77
74	2.59	129	15.69	184	49.64
75	2.70	130	16.09	185	50.52
76	2.82	131	16.49	186	51.41
77	2.94	132	16.91	187	52.31
78	3.07	133	17.32	188	53.22
79	3.20	134	17.75	189	54.15

Channel Catfish Standard Weights(Continued)

Length(mm)	Weight(gms)	Length (mm)	Weight(gms)	Length(mm)	Weight (gms)
190	55.08	241	119.09	292	221.04
191	56.03	242	120.70	293	224.41
192	56.98	243	122.33	294	226.91
193	57.95	244	123.97	295	229.42
194	58.93	245	125.62	296	231.95
195	59.92	246	127.29	297	234.50
196	60.92	247	128.98	298	237.07
197	61.94	248	130.68	299	239.66
198	62.96	249	132.40	300	242.27
199	64.00	250	134.13	301	244.90
200	65.05	251	135.88	302	247.55
201	66.11	252	137.64	303	250.22
202	67.18	253	139.42	304	252.91
203	68.27	254	141.21	305	255.61
204	69.36	255	143.02	306	258.34
205	70.47	256	144.85	307	261.09
206	71.59	257	146.69	308	263.86
207	72.73	298	148.55	309	266.65
208	73.87	259	150.43	310	269.45
209	75.03	260	152.32	311	272.28
210	76.20	261	154.23	312	275.13
211	77.38	262	156.15	313	278.00
21P	78.58	263	158.09	314	280.89
213	79.79	264	160.05	315	283.81
214	81.01	263	162.03	316	286.74
215	82.24	266	164.02	317	289.69
216	83.40	267	166.03	318	292.67
217	84.75	268	168.05	319	295.66
218	86.02	269	170.09	320	298.68
219	87.31	270	172.15	321	301.71
220	88.61	271	174.23	322	304.77
221	89.92	272	176.32	323	307.85
222	91.25	273	178.43	324	310.95
223	92.59	274	180.56	325	314.08
224	93.94	275	182.71	326	317.22
225	95.31	276	184.87	327	320.39
226	96.69	277	187.05	328	323.58
227	98.08	278	189.25	329	326.79
228	99.49	279	191.47	330	330.02
229	100.91	280	193.70	331	333.27
230	102.35	281	195.95	332	336.55
231	103.80	282	198.22	333	339.85
232	105.26	283	200.51	334	343.17
233	106.74	284	202.82	335	346.51
234	108.23	285	205.15	336	349.88
235	109.74	286	207.49	337	353.27
236	111.26	287	209.85	338	356.68
237	112.80	288	212.23	339	360.11
238	114.35	289	214.63	340	363.57
239	115.92	290	217.05	341	367.05
240	117.50	291	219.49	342	370.55

CHANNEL CATFISH – Standard Weights (Continued)

Length (mm)	Weight (gms)	Length (mm)	Weight (gms)	Length (mm)	Weight (gms)
343	374.08	399	610.88	454	928.61
344	377.62	400	615.86	455	935.26
345	381.20	401	620.87	456	941.91
346	384.79	402	625.90	457	948.65
347	388.41	403	630.96	458	955.40
348	392.05	404	636.06	459	962.18
349	395.72	405	641.18	460	969.00
350	399.40	406	646.32	461	975.85
351	403.12	407	654.50	462	982.73
352	406.85	408	656.71	463	989.64
353	410.61	409	661.94	464	996.59
354	414.40	410	667.20	465	1003.58
355	418.21	411	672.49	466	1010.59
356	422.04	412	677.82	467	1017.64
357	425.90	413	683.17	468	1024.72
358	429.78	414	688.54	469	1031.81
359	433.68	415	693.95	470	1038.99
360	437.61	416	699.39	471	1046.18
361	441.57	417	704.86	472	1053.40
362	445.55	418	710.35	473	1060.66
363	449.55	419	715.88	474	1067.95
364	453.58	420	721.44	475	1075.27
365	457.63	421	727.02	476	1082.63
366	461.71	422	732.64	477	1090.02
367	465.81	423	738.28	478	1097.45
368	469.94	424	743.96	479	1104.91
369	474.10	425	749.66	480	1112.41
370	478.28	426	755.40	481	1119.94
371	482.48	427	761.16	482	1127.51
372	486.71	428	766.96	483	1135.12
373	490.97	429	772.79	484	1142.76
374	495.25	430	778.64	485	1150.43
375	499.56	431	784.53	486	1158.14
376	503.89	432	790.45	487	1165.89
377	508.25	433	796.40	488	1173.67
378	512.63	434	802.38	489	1181.49
379	517.04	435	808.39	490	1189.34
380	521.48	436	814.43	491	1167.23
381	525.94	437	820.51	492	1205.15
382	530.43	438	826.61	493	1213.12
383	534.95	439	832.75	494	1221.11
384	539.49	440	838.91	495	1229.15
385	544.06	441	845.11	496	1237.22
386	548.66	442	851.34	497	1245.33
387	553.28	443	857.60	498	1253.47
388	557.93	444	863.9	499	1261.65
389	562.61	445	870.22	500	1269.87
390	567.31	446	876.58	501	1278.13
391	572.04	447	882.97	502	1286.42
392	576.80	448	889.39	503	1294.75
393	581.59	449	895.85	504	1303.11
394	586.40	450	902.34	505	1311.52
395	591.24	451	908.85	506	1319.96
396	596.11	452	915.41	507	1328.44
397	601.00	453	921.99	508	1336.95
398	605.93				

Channel Catfish. Standard Weights (Continued)

Length(mm)	Weight(gms)	Length(mm)	Weight(gms)	Length(mm)	Weight(gms)
509	1345.51	561	1844.53	613	2458.86
510	1354.10	562	1855.22	614	2471.90
511	1362.73	563	1865.94	615	2484.97
512	1371.89	564	1876.71	616	2498.10
513	1380.10	565	1887.53	617	2511.28
514	1388.84	566	1898.38	618	2524.50
515	1397.63	567	1909.28	619	2537.77
516	1406.45	568	1920.22	620	2551.09
517	1415.30	569	1931.21	621	2564.46
518	1424.20	570	1942.24	622	2577.88
519	1433.14	571	1953.31	623	2591.34
520	1442.11	572	1964.42	624	2604.86
521	1451.1P	573	1975.58	625	2618.42
522	1460.18	574	1986.79	626	2632.03
523	1469.27	575	1998.03	627	2645.69
524	1478.40	576	2009.32	628	2659.40
525	1487.57	577	2020.66	629	2673.15
526	1496.78	578	2032.04	630	2686.96
527	1506.02	579	2043.46	631	2700.82
528	1515.31	580	2054.93	632	2714.72
529	1524.64	581	2066.44	633	2728.68
530	1534.00	582	2078.00	634	2742.68
531	1543.41	583	2089.60	635	2756.74
532	1552.86	584	2101.25	636	2770.84
533	1562.34	585	2112.94	637	2784.99
534	1571.87	586	2124.67	638	2799.20
535	1581.43	587	2136.45	639	2813.45
536	1591.04	588	2148.28	640	2827.15
537	1600.69	589	2160.15	641	2842.11
538	1610.37	590	2172.07	642	2856.51
539	1620.10	591	2184.03	643	2870.97
540	1629.87	592	2196.04	644	2885.47
541	1639.68	593	2208.09	645	2900.03
542	1649.53	594	2220.19	646	2914.63
543	1659.42	595	2232.33	647	2929.29
544	1669.35	596	2244.52	648	2944.00
545	1679.32	597	2256.76	649	2958.76
546	1689.33	598	2269.04	650	2973.57
547	1699.39	599	2281.37	651	2988.43
548	1709.49	600	2293.74	652	3003.34
549	1719.62	601	2306.16	653	3018.31
550	1729.80	602	2318.63	654	3033.32
551	1740.02	603	2331.14	655	3048.39
552	1750.28	604	2343.70	656	3063.51
553	1760.59	605	2356.31	657	3078.68
554	1770.93	606	2368.97	658	3093.90
555	1781.32	607	2381.67	659	3109.18
556	1791.75	608	2394.41	660	3124.50
557	1802.22	609	2407.21	661	3139.88
558	1812.74	610	2420.05	662	3155.31
559	1823.29	611	2432.94	663	3170.80
560	1833.89	612	2445.88	664	3186.33

Channel Catfish - Standard weights (Continued)

Length(mm)	Weight (gms)	Length (mm)	Weight(gms)
665	3201.92	715	4050.55
666	3217.56	716	4068.96
667	3233.26	717	4087.41
668	3249.00	718	4105.93
669	3264.80	719	4124.50
670	3280.60	720	4143.14
671	3206.56	721	4161.83
672	3312.52	722	4180.58
673	3328.53	723	4199.38
674	3344.60	724	4218.25
675	3360.72	725	4237.17
676	3376.89	726	4256.16
677	3393.12	727	4275.20
678	3409.40	728	4294.30
679	3425.73	729	4313.46
680	3442.12	730	4332.67
681	3458.57	731	4351.95
682	3475.06	732	4371.29
683	3491.61	733	4300.68
684	3508.22	734	4410.14
685	3524.88	735	4429.65
686	3541.60	736	4449.23
687	3558.37	737	4468.86
688	3575.19	738	4488.56
689	3592.07	739	4508.31
690	3609.01	740	4528.13
691	3626.01	741	4548.00
692	3643.04	742	4567.93
693	3660.14	743	4587.93
694	3677.30	744	4607.98
695	3694.51	745	4628.10
696	3711.78	746	4648.28
697	3729.10	747	4668.51
698	3746.48	748	4688.81
699	3763.91	749	4709.17
700	3781.40	750	4729.59
701	3798.95	751	4750.07
702	3816.55	752	4770.62
703	3834.21	753	4791.22
704	3851.93	754	4811.89
705	3869.70	755	4832.61
706	3887.53	756	4853.40
707	3905.41	757	4874.25
708	3923.36	758	4895.16
709	3941.36	759	4916.14
710	3959.41	760	4937.17
711	3977.53	761	4958.27
712	3995.70	762	4979.43
713	4013.93		
714	4032.21		