Examination of Daily Angler Log Data from a Reservoir where a No-harvest Regulation Was in Effect

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Abstract: Daily angler logs were used to obtain lengths of 696 angler-caught largemouth bass *(Micropterus salmoides)* during January–May 1993 from Farm 13 Reservoir, Florida (2,600 ha), where a no-harvest rule was in effect. Sixty-three percent of these fish were caught by 2 fishing guides (and their clients) and 37% were caught by 19 other parties of anglers that fished without a guide. Angler-caught largemouth bass ranged from 254 to 648 mm total length (TL) with modal peaks at 381- and 457-mm length groups. By extrapolating angler log data into the catch estimate from an ongoing creel survey, we estimated 96 trophy largemouth bass (>635 mm) were caught by anglers from December 1992 through May 1993. Seventy percent of the largemouth bass were caught with live bait (golden shiners, *Notemigonus chrysoleucas*). Anglers fishing with golden shiners tended to catch larger bass than anglers using artificial lures. The mean length of bass (429 mm) caught with golden shiners was significantly larger ($P < 0.05$) than the mean length of bass (376 mm) caught with artificial lures. Mean length and length distributions of angler-caught bass varied significantly between the 2 fishing guides, and between 1 guide and anglers that fished without a guide. However, when the data collected by the 2 guides were combined, differences were not observed between the size of bass caught by anglers that fished with or without a guide. Anglers caught a significantly ($P < 0.01$) smaller percentage of largemouth bass <330 mm and ≥584 mm TL compared to those captured by electrofishing. The angler daily log program provided a reliable method for collecting data on lengths of largemouth bass caught by anglers where a no-harvest rule was in effect.

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Although angler diaries and log books rely on angler reported data, fisheries biologists continue to use these methods because they are inexpensive and simple to administer (Pollock et al. 1994). In some situations, they are also the only practical method to collect certain types of angler information. For example, angler diaries were used to monitor fisheries on Lake Erie, where large geographic area and limited monetary resources precluded use of conventional creel survey methods (Sztramko et al. 1991). An angler diary program was also successful on Great Bear Lake, Northwest Territories, which is located in a remote area (Anderson and Thompson 1991).

Eisenhauer et al. (1993) documented high catch rates (0.79–1.60 bass/hour) by largemouth bass anglers that fished Farm 13 Reservoir, Florida, during 1990–1992, and a dramatic increase in angler effort for bass. This increase in angler effort likely resulted from both high angler success and construction of a boat ramp that allowed easier access to the reservoir. By fall 1992, angler complaints that a decline had occurred in the number of trophy bass being caught in Farm 13 Reservoir prompted biologists to collect information on the size of largemouth bass being caught by anglers. An access-point angler creel survey was being conducted on Farm 13 Reservoir during December 1992–May 1993 to estimate angler catch, harvest, effort, and success for all sport fish. However, the size of largemouth bass being caught by anglers was not being measured through conventional creel survey methods due to a no-harvest regulation on largemouth bass. An angler daily log program was initiated in January and continued until May 1993 to obtain information on the size distribution of largemouth bass being caught in the reservoir.

The objectives of this study were to use daily angler logs to determine 1) the size distribution of largemouth bass caught by anglers, 2) the number of trophy bass (>635 mm TL) caught by anglers and 3) whether differences existed in the size distribution of bass caught between angler groups, angler groups and electrofishing, and bait types.

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Methods

The St. Johns Water Management Area (2,600 ha; Indian River County) is a shallow reservoir (2.6-m mean depth) that was created in 1987 by flooding 2 tracts of farm land that were historically marsh areas in the St. Johns River watershed. The reservoir will be referred to as Farm 13 Reservoir in this paper. A no-harvest regulation for largemouth bass was implemented in January 1990 by the Florida Game and Fresh Water Fish Commission (FGFWFC).

An angler daily log program was used to obtain lengths and weights of angler-caught largemouth bass on Farm 13 Reservoir from January through May 1993. Informational handouts, waterproof data sheets, scales, and measuring boards were made available at the only 2 local bait shops. Several additional anglers that showed interest in the program were recruited by project biologists. Anglers were instructed

to record the total length and weight of each largemouth bass caught, and whether each was caught with artificial lures or live bait (golden shiners). Accuracy was stressed as being critical to the results of this study. Anglers were requested to measure each bass to the nearest 12.7 mm TL and weigh it to the nearest 28 g. Instructions and a picture on each data sheet illustrated the proper way to measure the total length of a bass. Additional information requested on data sheets included date, angler's name, angler's telephone number, number of anglers fishing, total number of bass caught, and the type of scale used to weigh their fish.

An access-point angler creel survey was conducted at the only boat ramp on Farm 13 Reservoir from December 1992 to May 1993. Nonuniform probabilities had been used to determine creel interview times and sampling dates. A total of 59 days were creeled during the period. The creel survey was designed to estimate angler catch, harvest, effort, and success for individual species or groups of sport fish. To estimate the number of trophy largemouth bass (>635 mm TL; Anderson and Neuman 1996) caught in Farm 13 Reservoir, we determined the percentage of largemouth bass >635 mm TL in the angler log data, and extrapolated this number into the estimated catch for largemouth bass anglers from the creel survey. The SE of the catch was used to calculate 95% CL (95% CL = ±1.96 X SE).

Since 2 fishing guides provided the majority of our samples, the data set was divided into 3 angler groups to compare the mean size and the size distribution of largemouth bass caught by 2 different fishing guides and their clients, and a combined group of anglers that fished without a guide. These 3 groups are referred to as guide #1, guide #2, and anglers. Data collected by the 2 guides were also combined to compare the mean size and size distribution of largemouth bass caught by all anglers that fished with a guide and anglers that fished without a guide. The mean lengths and length distributions of largemouth bass caught with artificial lures and live bait (golden shiners) were also compared.

A comparison was also made between size distributions of largemouth bass caught by angler groups in the angler log program and day-time electrofishing samples ($N = 586$) that were collected on Farm 13 Reservoir from January through April 1993. Largemouth bass <254 mm TL were excluded from the electrofishing samples to make comparisons to the angler data.

The Kolmogorov-Smirnoff test was used to statistically compare differences in size distributions between 1) angler groups, 2) angler groups and electrofishing samples and 3) bait types. Due to the sensitivity of the test, a probability of $P < 0.01$ was used as the level of significance. A 1-way analysis of variance was used to test for differences between mean lengths of largemouth bass caught by the different angler groups and bait types. A probability of $P < 0.05$ was used to determine significance for this test.

Results and Discussion

Information was recorded for 696 largemouth bass caught by anglers on Farm 13 Reservoir daily angler logs. Sixty-three percent of the fish were caught by the 2

Table 1. Number of largemouth bass caught by 3 angler groups (anglers, guide #1, and guide #2) while fishing Farm 13 Reservoir, Florida, January–May 1993.

	Bait type reported by anglers			
Angler group	Live bait	Artificial lures	Bait not designated	Total
Anglers	188	52	15	255
Guide #1	264	1	0	265
Guide #2	33	142	1	176
Guides #1 and #2	297	143	1	441
Total	485	195	16	696

fishing guides and their clients and 37% were caught by 19 other parties of anglers that fished without a guide (Table 1). Data were recorded during 50 fishing trips by anglers.

Largemouth bass weights were not used in this study because many volunteer anglers did not take the scales provided by the FGFWFC at the 2 bait shops to the reservoir when they went fishing. A variety of scales were used by anglers and none of the personally-owned scales had been tested for accuracy. Had our objective been to only determine lengths of largemouth bass caught in the fishery, our creel clerk could have provided anglers with instructions, data cards, and a ruler during the access-point creel survey. A drop box could have been provided at the boat ramp for anglers to return data cards at the completion of their fishing trip. Using a creel clerk to disseminate cards and rulers could have supplemented data that we collected through the bait shops.

On-site weight certification facilities on reservoirs have also been used to collect length and weight information on trophy largemouth bass where no-harvest regulations were in effect (Ott and Webb 1996). This type of facility was not practical for Farm 13 Reservoir due to its remote location, but might be considered for future studies where applicable.

Angler-caught largemouth bass ranged from 254 to 648 mm TL with modal peaks at 381- and 457-mm length groups in the angler log program (Fig. 1). Seventy-two percent ($N = 498$) were preferred-size (>38 cm) and 12% ($N = 85$) were memorable-size (>50 cm) largemouth bass, based on criteria by Anderson and Neuman (1996).

One trophy-size largemouth bass (>635 mm TL) was caught by an angler in our angler log program. By extrapolating the percentage of trophy bass (0.14%) from the angler log data into the estimated catch of 68,313 largemouth bass (SE = 9,175) from the creel survey, we estimated that 96 trophy bass (95% CL ± 25) were caught from Farm 13 Reservoir from December 1992 through May 1993. Extrapolating angler log data from only 1 trophy bass in our data set has a lot of potential for error, but this mathematical exercise illustrates how angler log data might be used to complement data from conventional creel survey methods if an adequate sample size could be collected. While little confidence can be placed in our estimate of the number of trophy

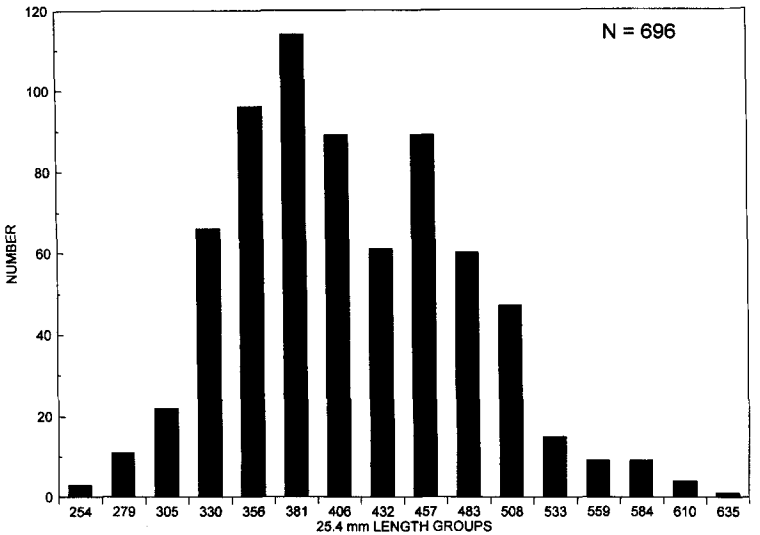

Figure 1. Length-frequency of largemouth bass caught by anglers while fishing Farm 13 Reservoir, Florida, January–May 1993.

bass caught in Farm 13 Reservoir, we concluded that only a small percentage (<1%) of the largemouth bass caught by anglers were trophy size.

Anglers designated which bait type they used for 680 of the 696 largemouth bass caught in the angler log program (Table 1). Seventy percent of the largemouth bass were caught with live bait, 28% were caught with artificial lures, and 2% were caught with undetermined bait type. Although our creel clerks did not collect data during the creel survey on bait types used by anglers, discussions with anglers, guides, bait shop owners, and outdoor writers over a 3-year period substantiated that many bass anglers used golden shiners for bait when fishing Farm 13 Reservoir. The size distribution of largemouth bass caught with live bait and artificial lures in the angler log program were different, with a significantly ($P < 0.01$) higher percentage of larger bass caught with live bait (Fig. 2). Only 15% of the largemouth bass caught with artificial lures were >457 mm, but 41% of the bass caught with golden shiners were >457 mm. The mean total length of bass (429 mm) caught with golden shiners was significantly ($P < 0.05$) larger than the mean total length of bass (376 mm) caught with artificial lures.

The mean lengths and length distributions of angler-caught largemouth bass varied between fishing guides and between 1 guide and anglers that fished without a guide (Tables 2, 3). The mean length of largemouth bass caught by guide #2 (386 mm) was significantly ($P < 0.05$) smaller than the mean lengths of largemouth bass caught by anglers (417 mm) and guide #1 (427 mm). The length-frequency distribution of

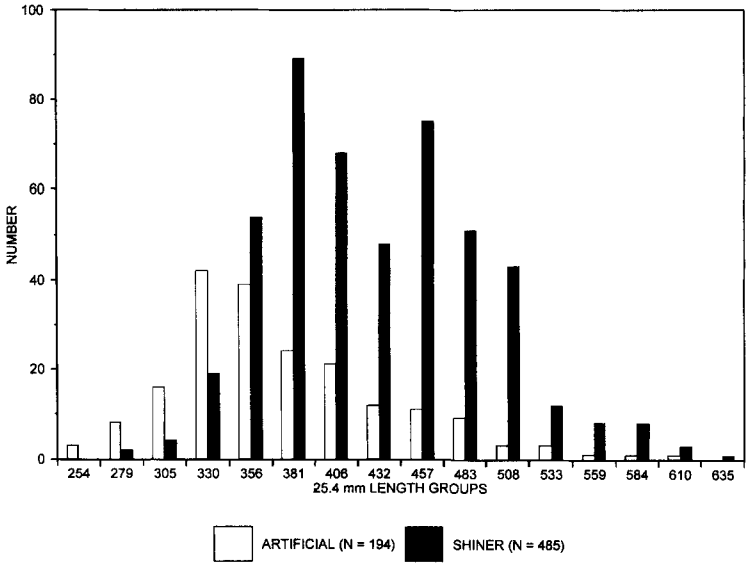

Figure 2. Length-frequency of largemouth bass caught by anglers with artificial lures (artificial) and live bait (shiner) while fishing Farm 13 Reservoir, Florida, January–May 1993.

bass caught by guide #2 was also significantly ($P < 0.01$) different than those of the other 2 groups, with a greater percentage of smaller bass caught. Mean lengths and length distributions were not significantly different between guide #1 and anglers. Differences were not observed between anglers that fished with or without a guide when the data collected by the 2 guides were combined.

Differences in the sizes of bass caught by the 3 angler groups were influenced by their method of fishing. Largemouth bass caught by anglers using live bait were significantly larger than bass caught with artificial lures. Over 99% of the largemouth bass caught by guide #1 were caught with live bait, compared to 74% for anglers and 19% for guide #2. Consequently, guide #1 caught a higher percentage of larger bass

Table 2. Mean total lengths (TL) and SD for largemouth bass caught by 3 angler groups (anglers, guide #1, and guide #2) while fishing Farm 13 Reservoir, Florida, January–May 1993.

Angler group	*N*	Mean TL (mm)	SD (mm)
Anglers	255	417 AB[a]	73
Guide #1	265	427 A	61
Guide #2	176	386	63
Guide #1 & #2	414	410 B	65

a. Means followed by the same letter are nor significantly different ($P > 0.05$). Comparisons were not made between the data from the combined group of guides and their individual data sets.

Table 3. Length-frequency of largemouth bass caught by anglers in an angler log program (Jan–May 1993) and captured by electrofishing (Jan–Apr 1993) on Farm 13 Reservoir, Florida.

Length group (mm TL)	Angler group				
	Guide #1	Guide #2	Guides #1 & #2	Anglers	Electrofishing
254–278	0	1	1	2	8
279–304	1	5	6	5	42
305–329	1	12	13	9	40
330–355	13	30	43	23	56
356–380	30	35	65	31	66
381–405	55	22	77	37	75
406–431	34	24	58	31	72
432–456	21	13	34	27	46
457–482	48	11	59	30	61
483–507	25	15	40	20	44
508–532	25	3	28	19	18
533–558	3	4	7	8	14
559–583	3	0	3	6	7
584–609	5	0	5	4	20
610–634	0	1	1	3	12
635–660	1	0	1	0	5
Total	265	176	441	255	586

(>457 mm) than the other 2 groups, while guide #2 caught the highest percentage of smaller fish (<305 mm).

The length-frequency distribution of largemouth bass collected by electrofishing was significantly different ($P < 0.01$) than length-frequency distributions of bass caught by all anglers in the angler diary program and by bass caught by anglers fishing with each of the 2 guides (Table 3). However, no significant difference ($P > 0.01$) in length frequencies of bass caught by anglers fishing without a guide and those captured by electrofishing data was determined. The most obvious disparities were observed at the tails of the distributions when comparing electrofishing and angler data. The percentage of bass <330 mm TL in electrofishing samples (15.4%) was approximately 3 times the percentage in the angler log samples (5.2%). Considering that all bass caught by anglers were ≥254 mm TL, anglers obviously selected against smaller fish. The percentage of bass ≥584 mm TL in electrofishing samples (6.3%) was also 3 times the percentage in the angler log sample (2.1%). Even though fishing with golden shiners tended to select for larger bass (>457 mm TL), electrofishing collected a greater percentage of largemouth bass ≥584 mm TL. Simpson (1978) reported that electrofishing was selective for larger fish and may overestimate their abundance.

With the 2 exceptions for bass <330 mm and ≥584 TL, the proportion of fish in various size classes was similar in electrofishing and angling samples. Green et al. (1984) reported that anglers in New York caught a higher percentage of mid-size bass (205–356 mm) relative to numbers observed in electrofishing samples. However, when only comparing bass ≥200 mm, Santucci and Wahl (1991) found length-

frequency distributions among angler catches, electrofishing samples and lake drainings were similar in Ridge Lake, Illinois. Ebbers (1987) also observed that the length-frequency distributions of largemouth bass captured by electrofishing and diary anglers were similar in Lake Minnetonka, Minnesota. Even though angler log data on Farm 13 Reservoir under-represented small (<330 mm TL) bass, it provided an estimate of what anglers were catching. Chambers (1993) found angler diaries useful to determine the size distribution of angler-caught flathead catfish *(Pylodictis olivaris)* in the Yadkin-Pee Dee River, North Carolina.

In summary, an angler daily log program provided a method for collecting data on lengths of largemouth bass caught by anglers on a reservoir where a no-harvest regulation was in effect. Results complemented angler catch data that were obtained using a standard creel survey. We suggest that caution be used, however, when expanding data from angler daily logs into estimates from a creel survey. Weights of largemouth bass were not used since anglers frequently used their own scales, but investigators should require the use of validated scales only in future studies that use volunteer anglers. Guides were very useful in obtaining data on lengths of angler-caught bass. Mean sizes and size distributions varied between individual fishing guides, and between 1 guide and anglers that fished without a guide. Differences were also observed in the size of largemouth bass caught with live bait and artificial lures. Therefore, some method should be established in future studies to insure that anglers in a daily log program are representative of the total angling population. This could be done by interviewing anglers fishing a reservoir and partitioning data by a representative number of guides and anglers that fished without a guide, and by a representative number of anglers fishing with live bait and those fishing with artificial lures.

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