Evaluation of a Length-categorization System for Flathead Catfish

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Abstract: Increased management of wild catfish stocks is imminent due to their growing popularity with anglers and commercial exploitation. Length-categorization systems, like those used for largemouth bass (*Micropterus salmoides*), would improve catfish stock assessment and facilitate comparison of results among years, gears, samples, and populations. Flathead catfish (*Pylodictis olivaris*) from the Flint River, Georgia, collected by electrofishing and those caught by fishermen were assessed with Proportional Stock Density (PSD) and Relative Stock Density (RSD) indices. Population PSD was 72, suggesting a high quality fishery. Fishermen selected fish in the RSD Quality-Preferred and Preferred-Memorable length categories. Minimum length for size categories may be too low, and I submit alternate thresholds. Use of a standardized system is recommended for reporting results of catfish studies.

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Catfish are among the most popular sportfish groups in many parts of the country, as indicated by opinion surveys and creel summaries (S. P. Quinn, unpubl. data). Nationwide, catfish (including bullheads) are the second most fished-for group (U.S. Dep. of Int. 1988). Stocking of channel catfish (*Ictalurus punctatus*) has been an important part of farm pond management since the 1950s (Swingle 1970), and supplemental stocking of that species in small public impoundments has been a valuable management strategy (Powell 1975, Eder and McDannold 1987). However, relatively little management of wild catfish stocks, particularly flathead catfish populations, has been attempted.

Commercial fisheries have minimum sizes in some states; some recreational fisheries have bag limits, but most states do not regulate catfish fisheries by bag limit, size limit, or season. Examination of life history data, including fecundity, growth, and mortality (Carlander 1969) suggests that theoretically, catfish species should be as vulnerable to overharvest as species for which regulations are much more stringent (black basses, walleyes, salmonids, esocids). Standard length categories would enable samples of catfish to be compared among years, gears, and

populations to improve stock assessment and advance catfish management. To date, no published accounts of catfish Proportional Stock Density (PSD) exist.

The large sample of flathead catfish collected by Quinn (1986) and the sample of catfish of known size reported by anglers (Quinn 1988*a*) provided an opportunity to use documented length-categorization systems and test their value for stock assessment of flathead catfish.

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Methods

From May through November 1985, flathead catfish were collected from the 50-km stretch of the Flint River, Georgia, between the Albany Dam and the city of Newton. River width is 60–90 m. Substrate is primarily Ocala limestone outcroppings and rubble with silt and sand deposits. The river is characterized by shoals alternating with longer stretches of deeper (5–10 m), slower moving water. During the study period, mean conductivity was 104 μmhos/cm and mean monthly discharge at Albany was 74 m^3/sec.

Flathead catfish were collected with a boat-mounted, pulsed-DC electrofishing unit as described by Quinn (1986). Peak efficiency was at 20 Hertz frequency, 0.4–0.5 milliseconds pulse width, 250–350 volts and 3 amps. Flathead catfish ≥305 mm were tagged with numbered plastic anchor tags (Floy FD68B) in accordance with Surber's (1959) designation of 305 mm as the threshold of harvestable size for flathead catfish. Tags were inserted through the operculum as described by Summerfelt and Turner (1972). Tags were imprinted with the words, "GA. D.N.R." and the tag number.

Presence of tagged fish in the Flint River was announced through notices in the local newspaper, radio messages, and posters at bait-and-tackle stores and boat ramps. A $5.00 reward was offered for returned tags. Postage-paid envelopes for that purpose were available at bait-and-tackle stores, from conservation officers, fisheries field staff, and DNR offices. I used the length-categorization system proposed for flathead catfish by Anderson (1980) and expanded upon by Gabelhouse (1984*a*) to categorize the stock and compare it to the reported catch. Proportional Stock Density (PSD) was calculated with 305 mm as the threshold for stock size because flathead catfish from 280–304 mm were not tagged.

Results

A total of 3,266 flathead catfish was collected from the study area between 21 May and 20 November 1985. A total of 1,650 fish was ≥305 mm, and 1,191 were ≥410 mm (quality size), producing a PSD of 72 (Table 1). PSD for the catch by

Table 1. Length categorization of flathead catfish collected by electrofishing and those caught by fishermen from the Flint River, Georgia, calculated by the traditional and incremental approaches of Gabelhouse (1984*a*).

Size category	Length range (mm)	Catch (N = 184)	Electrofishing sample (N = 1,650)
Traditional			
PSD	≥410	92	72
RSD-P	≥610	33	21
RSD-M	≥710	10	9
RSD-T	≥910	2	1
Incremental			
RSD S-Q	305-409	8	26
RSD Q-P	410-609	60	50
RSD P-M	610-709	22	13
RSD M-T	710-909	9	9
RSD T	≥910	2	1

fishermen was 92. Anglers returned 87% of all tags; trot-line and bush-hook fishermen accounted for the rest (Quinn 1988*a*).

I calculated Relative Stock Densities (RSD's) using 2 methods. The first method, termed the "traditional approach" by Gabelhouse (1984*a*) involved calculation of the number of preferred (≥610 mm), memorable (≥710 mm), and trophy (≥910 mm) flathead catfish in the samples as percentages of the total number of stock-size fish. Traditional RSD's for the preferred, memorable, and trophy categories, derived from tag returns by fishermen, were higher than corresponding RSD's for the electrofishing sample, although differences in the latter 2 categories were minimal (Table 1).

I also calculated RSD's using the "incremental approach" (Gabelhouse 1984*a*), which is based on the percentage of fish within each length category, rather than the percentage of fish above the minimum length for each category. Incremental RSD categories for the catch were higher than for the electrofishing sample for 3 of 5 categories (Table 1).

Discussion

Length categorization of the electrofishing sample indicated a flathead catfish population with abundant fish at or above quality size of interest to anglers. Wege and Anderson (1978) recommended a PSD range of 40–60 for largemouth bass and Anderson and Weithman (1978) recommended 30–60 as an optimal range for predatory coolwater species. Flathead catfish PSD's, 72 in the electrofishing sample and 92 for the catch (Table 1), were above this range. Because catfish grew between the time they were tagged, when they were measured, and time of capture by fishermen, RSD values for the catch may be negatively biased for some length categories. This length-categorization system assumes steady recruitment, growth,

and mortality. Effects of different life history strategies on PSD values have not been described, but flathead catfish do not appear to deviate greatly from typical population structures of other exploited predators.

Carline et al. (1984) and Serns (1985) recommended using age-growth data in conjunction with PSD for evaluating fish populations. The flathead catfish population below Albany Dam was recently established and has been expanding. Average growth rate of Flint River flathead catfish (Quinn 1988*b*) indicated fish would enter the RSD S-Q size category in their second year, RSD Quality-Preferred (RSD Q-P) in their third year, RSD Preferred-Memorable (RSD P-M) in the fourth year, RSD Memorable-Trophy (RSD M-T) in their fifth year, and RSD-Trophy (RSD-T) in their seventh year. Growth was faster than most populations nationwide (Quinn 1988*b*). A relatively low expoitation rate (12%–16%, Quinn 1988*a*) and steady recruitment have resulted in high PSD and RSD values. Carline et al. (1984) found the relationship between largemouth bass survival and PSD to be nearly linear. In computer simulations, PSD increased with increasing growth rate and survival (Carline et al. 1984). Serns (1985) noted no relationship between walleye growth rate and PSD, although fluctuations in growth were minor. Gabelhouse (1984*b*) found significant relationships between PSD and annual growth increments of crappie (*Pomoxis* spp.) in small midwestern impoundments.

RSD S-Q for the catch of flathead catfish from the Flint River by fishermen was much lower than for the electrofishing sample, but RSD Q-P and RSD P-M for the catch were considerably higher than for the electrofishing sample (Table 1). Carline et al. (1984) noted seasonal variations in vulnerability of largemouth bass to electrofishing, which biased PSD calculations. In this study, the electrofishing system used to collect flathead catfish was rather non-selective for size, for fish >150 mm (Quinn 1986). Electrofishing was ineffective for fish of any size when water temperature was below 15° C (Quinn 1986). Gabelhouse and Willis (1986) noted that RSD's calculated for largemouth bass caught by 4 different groups of anglers varied due to fishing techniques and preferences. Correlations between electrofishing RSD's and those calculated for the angling catch varied according to size category, angler group, reservoir, length-limit regulation, and fish population structure. In this study, angler selectivity for large flathead catfish resulted in incomplete recruitment of RSD S-Q catfish to Flint River fisheries. Fishermen selected large catfish by their choice of fishing area and use of large live baits (Quinn 1988*a*). This selectivity resulted in high RSD's for all categories except RSD S-Q.

Another factor that contributed to rather high RSD values with the traditional and incremental length categorizations was the use of a rather small "world record" flathead catfish (36.093 kg and 1,118 mm) by Anderson (1980) and Gabelhouse (1984*a*). The present all-tackle record weighed 44.453 kg and measured 1,372 mm in total length (B. Kutz, Natl. Fresh Water Fish. Hall Fame, pers. commun.) It is recognized by both major record-keeping organizations (National Fresh Water Fishing Hall of Fame and International Game Fish Association). Flathead catfish of this size have long been recognized (Eddy and Surber 1947, Pflieger 1975). The earlier "world" record was lighter than many state records and was also unusually short for its weight. Its condition

factor (K of Carlander (1969)) was 2.58; K of the present record was 1.72. Discrepencies among catfish records may be due in part to the traditional lack of interest of catfish fishermen in setting records (Stevens 1959). Using the present record, size ranges for stock, quality, preferred, memorable, and trophy, based on percentages of record size listed by Gabelhouse (1984*a*), would be 274–357, 494–563, 617–755, 809–878, and 1,015–1,098 mm, respectively. Only the stock and preferred minimum lengths listed by Anderson (1980) and Gabelhouse (1984*a*) are close to these lengths. In general, higher thresholds reduce RSD's.

Anderson (1980) defined stock length as a size at or near which fish often reach maturity. Because male and female flathead catfish typically mature at sizes at least 100 mm longer than 280 mm (Carlander 1969, Turner and Summerfelt 1971), initial choice of stock size was too low.

Size ranges for length categories are not particularly important when the purpose is standardization of result reporting to allow easy comparison among data sets, unless minimum lengths are so low that PSD approaches 100. Gabelhouse (1984*a*) suggested that his length-categorization system eliminated problems encountered in comparing data sets when researchers selected their own length categories for description of results, and that it allowed quantitative comparison of length data that was not possible with length-frequency histograms. These advantages were noted in this study. Increased precision of the incremental approach was particularly useful for comparing samples. Quinn (1987*a*) noted difficulty in comparing results of food habits studies in which researchers had divided predators into their own size categories. Adherence to standard categories would reduce such problems.

If researchers establish PSD or RSD ranges as management goals for flathead catfish populations as has been done for black basses, bluegill, and coolwater fishes, minimum lengths for categories should probably be altered in light of angler preferences, and growth and maturity characteristics of the species. Therefore, I submit the following threshold sizes for assessment of flathead catfish stocks with traditional or incremental RSD analyses: stock - 350 mm, quality - 510 mm, preferred - 710 mm, memorable - 865 mm, and trophy - 1,020 mm. These lengths correspond closely to 14, 20, 28, 34, and 40 in.

Reevaluation of the fishing catch and electrofishing sample of flathead catfish from the Flint River with these thresholds reduced all traditional RSD categories by 18% to 80% (Table 2). RSD S-Q of the electrofishing sample was higher when calculated with the higher threshold sizes. RSD Q-P declined. RSD M-T of the catch and electrofishing sample declined dramatically from 9 and 9 to 2 and 1, respectively (Table 2), due to decreased abundance of larger fish. Gabelhouse (1984*a*) defined "memorable" as a size most anglers remember catching. While problems of angler recall have been noted (Duttweiler 1976, Harris and Bergersen 1985), it is likely that a fish of a size equalled by only 1 in 50 catches would be more memorable than 1 caught once in 11 catches, as would occur with a RSD M-T of 9. "Trophy" size was a size considered worthy of acknowledgement (Gabelhouse 1984*a*). Many state agencies administer angler recognition programs to recognize significant catches (Quinn 1987*b*). Minimum eligible weights for flathead catfish in state programs

Table 2. Length categorization of flathead catfish collected by electrofishing and those caught by fishermen from the Flint River, Georgia, calculated by the traditional and incremental approaches of Gabelhouse (1984*a*) with threshold sizes proposed in this paper.

Size category	Length range (mm)	Catch (N = 181)	Electrofishing sample (N = 1,428)
Traditional			
PSD	≥510	75	57
RSD-P	≥710	10	11
RSD-M	≥865	2	2
RSD-T	≥1,020	1	0
Incremental			
RSD S-Q	350-509	25	43
RSD Q-P	510-709	65	46
RSD P-M	710-864	9	9
RSD M-T	865-1,019	1	2
RSD T	≥1,020	1	0

range widely from 4.54 to 22.70 kg. A flathead catfish of 1,020 mm might weigh from 12 to 16 kg, depending on the length-weight relationship of the population and individual condition.

I urge investigators to test the categories I propose and those described earlier on flathead catfish populations in different habitats and geographic locations. Comparison and communication of results should improve assessment and management of wild catfish stocks.

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