Sampling Flathead Catfish in Small Streams

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Abstract: Small diameter hoop nets were compared with low frequency, pulsed DC electrofishing for assessing flathead catfish (*Pylodictis olivaris*) stocks in the Noxubee River, a small stream in east-central Mississippi. Small diameter hoop nets fished during summer low flow regimes were appropriate for collecting stock size fish (≥280 mm, total length) while electrofishing was a better tool for assessing smaller flathead catfish. No significant difference ($P > 0.05$) was found between the 2 sample techniques with regard to kg/man-day or fish/man-day. Small diameter hoop nets were determined to be the most appropriate gear for sampling flathead catfish resources in streams where the use of boats is restricted by poor access.

Proc. Annu. Conf. Southeast. Assoc. Fish and Wildl. Agencies 43:133–137

The flathead catfish (*Pylodictis olivaris*) is a principal fishery resource in Mississippi streams (Garavelli 1985; Jackson and Jackson 1989*a*). Many of these streams are small (second or third order), remote, and turbid and contain considerable debris accumulations which commonly block the entire stream channel. Effectively assessing flathead catfish stocks in these systems can be logistically challenging.

In Mississippi, recreational hand fishing is a common technique for harvesting flathead catfish in small streams. Many recreational fishermen plant specially constructed boxes in strategic locations, give the boxes time to attract fish, and then "fish" the boxes periodically throughout the spawning season. However, little data exists on flathead catfish in these systems, or on the impact of hand fishing on these populations.

Large diameter hoop nets (≃1.0 m) (Jackson and Jackson 1989*b*) and low frequency electrofishing units (Quinn 1986) have been reported to be effective for sampling flathead catfish in larger streams. However, both of these sampling methods normally require the use of boats, which in turn require reasonable access to the

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stream. Sampling smaller, more remote systems from boats is typically not feasible. Although backpack electrofishing units are available, sampling with these units may be difficult and dangerous in streams having turbid water, soft, shifting substrates, heterogeneous bottom contours and underwater obstructions.

Small diameter hoop nets appear to be a sampling method amenable to working in such systems. Because they are lightweight and highly portable, several of these nets can be transported on a backpack into remote locations. Our objective was to determine if small diameter hoop nets and electrofishing provide comparable data for population assessments of flathead catfish in small streams.

Appreciation is extended to L. R. D'Abramo, L. E. Miranda, R. E. Reagan and H. R. Robinette for reviews of drafts of this manuscript. Support for this study was provided by the U.S. Fish and Wildlife Service, Noxubee National Wildlife Refuge, the Latin American Scholarship Program of American Universities, and the Mississippi Agricultural and Forestry Experiment Station. This paper was approved for publication as journal article No. PS–7251 of the Mississippi Agricultural and Forestry Experiment Station, Mississippi State University.

Methods

Flathead catfish were sampled in a 39-km section of the Noxubee River, Oktibbeha and Noxubee counties, Mississippi, from May through September 1988. Under low flow conditions the stream was generally <1.5 m deep and 7–10 m wide. Overland access to many of the stream reaches was restricted and boat travel was severely inhibited by log obstructions within the stream.

Electrofishing was conducted in 34 arbitrarily selected stream reaches with a battery powered, portable unit (Custom Electronic Design, P.O. Box 763, Dawson, GA 31742) set to produce low frequency, pulsed DC current (20 Hz, 210 V, 5 amps). Two anodes constructed of 1.0-cm diameter steel coaxial cable 1.0 m long were used. Water conductivity ranged from 40 to 120 micromhos. In each stream reach, flathead catfish were collected with a single boat moving slowly downstream in a figure-s pattern, covering the maximum distance that logs and other obstacles in the stream permitted during a 10-minute period. Normally, 6–8 samples could be taken during one day by a 2-person crew.

For hoop net sampling, the river was divided into 65 stream reaches with each reach encompassing a distance of approximately 0.61 km. On each of 20 sample dates (evenly distributed throughout the study period), 15 randomly selected stream reaches were chosen. In each of the selected stream reaches, 1 hoop net was set for a 48-hour period. Hoop nets were 150-cm long with 3 hoops having 49-cm diameters, 2 throats and 2.5-cm bar mesh constructed of treated cotton netting. Nets were positioned in the stream parallel to the stream bank, mouths oriented downstream, and attached to a submerged log. One person could check and reset all 15 nets during a single day. However, data collected on any given date was considered the result of 2 man-days of effort (i.e., 1 day to set; 1 day to retrieve).

All flathead catfish collected by the 2 gears were weighed (g), measured (TL, mm), and released into the stream reach from which they had been captured. Fish ≥120 mm were tagged through a gill operculum with a single, numbered, brightly colored t-bar Floy anchor tag. One pectoral fin was clipped on fish <120 mm.

Pectoral spines of flathead catfish selected for age determination were disarticulated with pliers, cleaned, dried and stored in labeled envelopes. Spines were sectioned (0.5 mm) at the distal end of the basal process with a low speed jeweler's saw as described by Turner (1980). Sections were then mounted on glass microscope slides and projected at 40X with a Bausch and Lomb Tri-Simplex microprojector. Fish were aged with annuli counts as proposed by Sneed (1951) and Marzolf (1955). Total spine radius was measured for back calculation of lengths at previous ages by the Lee Method (Everhart and Youngs 1981).

For each gear, fish were pooled into 50-mm groups for development of length-frequency histograms. Additionally, fish were categorized as being greater than or less than stock size (280 mm; Gablehouse 1984) for determination of gear selectivity. Catch per unit of effort (CPUE) was calculated as kg/man-day and number of fish/man-day in order to determine the relative harvest rates of each gear.

Length-frequency distributions associated with each of the gears were compared with a Kolmogorov-Smirnov 2-group test. Chi-square analysis was used to compare the relative abundances of fishes greater than and less than stock size collected with each gear. CPUE for the 2 gears were compared with *t*-tests using $\log_{10}$-transformed data to normalize distributions. Significance levels were assessed at the $P \leq 0.05$ level.

Results and Discussion

Harvestable-sized flathead catfish may not be especially numerous in small streams. They are solitary fish, and a single unit of cover will usually yield only 1, or at most 2 or 3 adults (Pflieger 1975). During our study small diameter hoop nets and electrofishing yielded a total of only 43 and 29 flathead catfish, respectively. Six marked fish were recaptured. Mean length of flathead catfish captured with hoop nets was 468 mm (range 211–930 mm), while for electrofishing the mean length was 330 mm (range 33–667 mm). Mean weight of fish collected with hoop nets was 1.28 kg (SD = 0.83 kg) while for electrofishing mean weight of fish collected was 0.70 kg (SD = 0.63 kg).

Length-frequency distributions for fish collected by hoop nets (Fig. 1) differed significantly from those collected by electrofishing with hoop nets catching proportionally more stock size fish (≥280 mm) than electrofishing. Length-frequency distributions and back calculated lengths at ages (Table 1) indicate that hoop nets were less effective than electrofishing for collecting young-of-the-year (YOY) flathead catfish, and more selective for age-IV and older individuals.

No significant difference was found between electrofishing and hoop nets with regard to CPUE (kg/man-day; fish/man-day) (Table 2). Using a sample size formula modified after Steel and Torrie (1980) and an acceptable error of 50% about means, we determined that generating reliable estimates of CPUE would require 20 man-

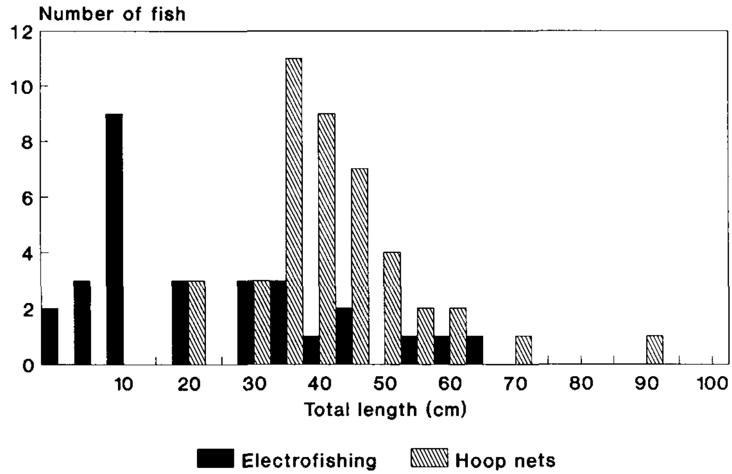

Figure 1. Length frequency of flathead catfish collected with small diameter hoop nets and low frequency electrofishing from the Noxubee River, Mississippi, 1988.

Table 1. Backcalculated total length (mm) and annual length increments for flathead catfish collected from the Noxubee River, 1988.

		Annulus					
Year Class	*N*	I	II	III	IV	V	VI
1987	2	130.39					
1986	1	116.26	168.07				
1985	3	102.13	215.17	328.21			
1984	2	130.39	205.75	252.85	332.91		
1983	1	120.97	186.91	238.72	351.76	469.51	
1982	2	125.68	205.75	276.40	365.89	488.35	497.72
$\bar{x}$		120.97	196.33	274.05	350.19	478.93	497.72
Annual length increment		120.97	75.36	77.72	76.14	128.74	18.84

Table 2. Catch per unit of effort for flathead catfish in the Noxubee River using small diameter hoop nets and low frequency electrofishing, 1988.

Gear	*N* (days)	Kg/man-day	SD	*N*/man-day	SD
Low frequency electrofishing	5	1.44	1.21	2.90	2.70
Small diameter hoop nets	20	1.29	1.56	1.08	1.08

days for hoop nets (15 nets/set) and 18 man-days for electrofishing (60–80 minutes/ day).

We conclude that small diameter hoop nets are an effective means for sampling the exploitable component of flathead catfish stocks in smaller streams. However, when data on reproductive success and/or recruitment of flathead catfish is needed, electrofishing is a better population assessment technique.

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