Monitoring the Effects of Introduced Flathead Catfish on Sport Fish Populations in the Altamaha River, Georgia

Matthew E. Thomas, *Georgia Department of Natural Resources, Fisheries Management Section, P.O. Box 2089, 108 Darling Ave., Waycross, GA 31502-2089*

Abstract: A standardized stream monitoring program conducted on the Altamaha River, Georgia, from 1988 to 1992 was successful in detecting substantial changes in sport fish populations. Flathead catfish (*Pylodictus olivaris*) electrofishing catch rates generally increased from 1988 to 1992 reaching a peak CPUE of 90 fish per hour in 1990. CPUE of flathead catfish was significantly different ($P < 0.05$) between years and sites. Percent composition of flathead catfish in ictalurid samples doubled over the 5-year study period. A concurrent decrease in native bullhead populations was observed in annual creel and electrofishing surveys. Redbreast sunfish catch rates precipitously declined in both electrofishing samples and creel surveys taken from 1988 to 1992. Differences in mean CPUE of redbreast sunfish were significant ($P <$ 0.05). Annual monitoring results suggest that the invasion and subsequent rapid expansion of flathead catfish in the Altamaha River has affected native sport fish populations.

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The Altamaha River represents the largest inland fishery in southeast Georgia, supporting upwards of 60,000 sport fishing trips annually (Hottel et al. 1983). During the early 1980s, Altamaha anglers began reporting sporadic catches of flathead catfish (*Pylodictis olivaris*). Michaels and Williamson (1982) captured 2 flathead catfish in the Altamaha River during extensive ictalurid sampling. These few accounts indicated that the flathead catfish had expanded some 180 river kilometers downstream from an unauthorized stocking which took place on the Ocmulgee River in 1973 (Evans 1991). Fishery managers were apprehensive as to the possibility of a nonnative species (Glodek 1980) establishing in the Altamaha River. Concerns were also expressed that the piscivorous nature of the flathead catfish (Hackney 1965, Minckley and Deacon 1959, Guier et al. 1981, Davis 1985) could alter the resident sport fish community.

Date depicting the status of sport fish populations in the Altamaha River system were limited. Previous studies conducted by Coomer and Holder (1980) and Hottel et al. (1983) provided good baseline data, but their descriptive and transitory design allowed for little discernment of sport fish population trends. Quinn (1987) suggested that extensive and regular fish population sampling would be needed before and after flathead catfish establishment in order to fully assess perceived impacts.

In an effort to monitor the expansion of flathead catfish and keep abreast of changes in the sport fish community, a standardized stream monitoring program was initiated on the Altamaha River in 1987. The primary objective of the program was to provide biologists with a database capable of monitoring trends in sport fish populations over time. It was felt that the data generated from such a survey would also serve to justify future research and management needs, in an era of ever increasing scrutiny. This paper addresses substantial changes in Altamaha River sport fish populations detected through standardized monitoring.

Methods

Ten sampling locations were used during this survey. The river was equally divided into 5 river sections or regions from which 2 sampling stations were randomly chosen. This ensured that pooled samples would represent the entire study area and guarded against station clustering. Each station was electrofished for approximately 1 hour following the outside bends of the river and moving in an upstream direction. Centrarchid samples were collected annually during the fall and were completed within a 2-week time frame. Year to year variation in electrofishing indices are generally less for fall centrarchid samples than for spring samples (Probst 1991). Centrarchids were collected with a boat-mounted electrofishing unit using 2 hoops with droppers as the anode and the boat as the cathode. Five thousand-watt generators equipped with Smith Root™ Type VI power boosters were used in the pulsed DC mode. All centrarchids captured were weighed, measured (TL), and released.

Ictalurids were collected during the summer of each year under low flow conditions. The same stations used to collect centrarchids were used to collect ictalurids. Catfish were collected using a boat mounted Electrofisher Pulser Model 3-A as described by Quinn (1986). A chase boat was utilized due to the large effective field.

Indices generated from electrofishing data included length frequency distributions, proportional stock density (PSD), and relative stock density (RSD) (Anderson and Gutreuter 1983), relative weight (Wr) (Wege and Anderson 1978), relative composition, mean length, and weight. Analysis of variance was used to compare CPUE values between years and sites. $P \leq 0.05$ was considered significant for all analyses. Standardization of river stations did not occur until 1988; therefore, comparisons are limited to years 1988 through 1992.

A non-uniform access creel survey was conducted on the Altamaha River annually between 1987–1992 to supplement electrofishing data. Estimates of total harvest, overall success rate, fished-for success rate, and fishing pressure were generated from creel data.

Results

Approximately 11,780 game fish were collected and 5,000 anglers were interviewed on the Altamaha River during this survey. A total of 3,043 flathead catfish were collected between 1988 and 1992. Electrofishing catch rates for flathead catfish generally increased throughout the survey period, increasing from 20.7 fish/hour in 1988 to 84.0 fish/hour in 1992 (Fig. 1). Significant differences ($P < 0.05$) existed in CPUE between years and between sites. Weight per hour was 10 times greater in 1992 (212 kg/hour) than in 1988 (20 kg/hour) and increased yearly over the 5 years. The percent contribution of flathead catfish in ictalurid samples also increased yearly, going from 32% in 1988 to 83% in 1992. Mean total length of captured fish was 334 mm in 1988 and increased steadily to 515 mm in 1992. PSD_{510} and RSD_{710} (Quinn 1989) ranged from 49.0–64.0 and 11.6–18.2, respectively. There was no discernable increase in the number of flathead catfish in the creel survey from 1987 to 1992.

Few bullheads ($N = 5$) were collected during sampling efforts conducted from 1988–1992. The highest CPUE value (0.3 fish/hour) was recorded in 1990 (Fig. 2). During the last 2 sampling years—1991 and 1992—no bullheads were collected. In 1987, an estimated 15,500 bullheads were harvested by anglers from the Altamaha River, which represented 34% of the total ictalurid harvest (Probst 1991). By 1991 and 1992, few bullheads were entering the creel, and their contribution to the ictalurid harvest had fallen to approximately 2%.

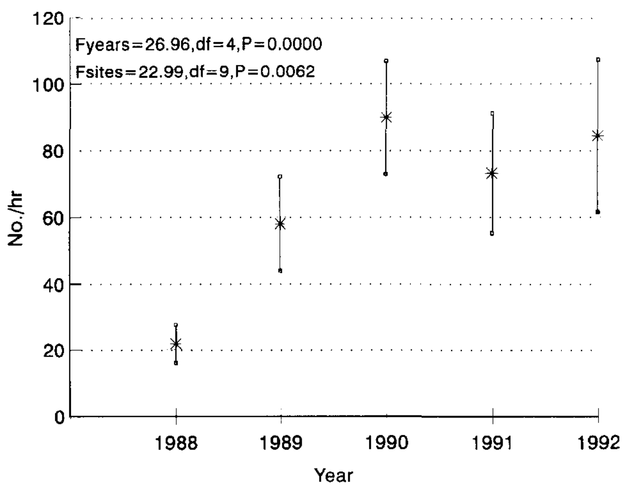
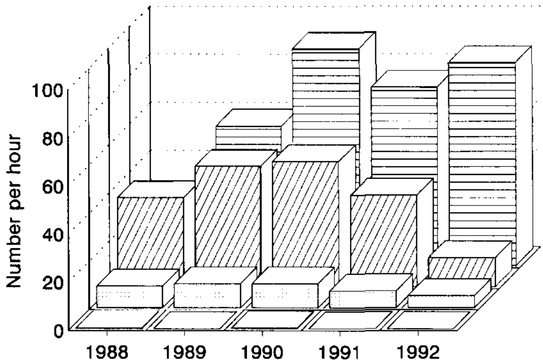


Figure 1. Mean catch per unit effort (*N*/hour) of flathead catfish with 95% confidence intervals from the Altamaha River, Georgia (1988–1992).



		1988	1989	1990	1991	1992
Flathead Catfish		21	58	90	74	84
Channel Catfish		37	50	52	38	12
White Catfish		9	10	10	7	5
Bullheads		0.24	0	0.3	0	0

Figure 2. Average catch per unit effort (*N*/hour) of ictalurids from the Altamaha River, Georgia (1988–1992).

Redbreast sunfish were the most abundant centrarchid species collected in fall samples from 1988 to 1992 ($N = 3{,}386$). However, CPUE values precipitously declined from 1988 (105 fish/hour) to 1992 (32 fish/hour) (Fig. 3). A significant difference ($P < 0.05$) was detected in CPUE between years but not between sites. Relative species composition also declined steadily from 59% in 1988 to 35% in 1992 (Table 1). Corresponding to the decline in CPUE was a general increase in PSD and RSD values. In fact, PSD_{110} and RSD_{130} values more than doubled during the 5-year survey. Inverse relationships between redbreast CPUE and PSD-RSD were significant (Probst 1991). Based on creel survey estimates, overall success rate for redbreast declined from 0.594 fish/hour in 1987 to 0.256 fish/hour in 1992. Likewise, fished-for catch rates declined from 3.715 fish/hour in 1987 to 1.257 fish/hour in 1992.

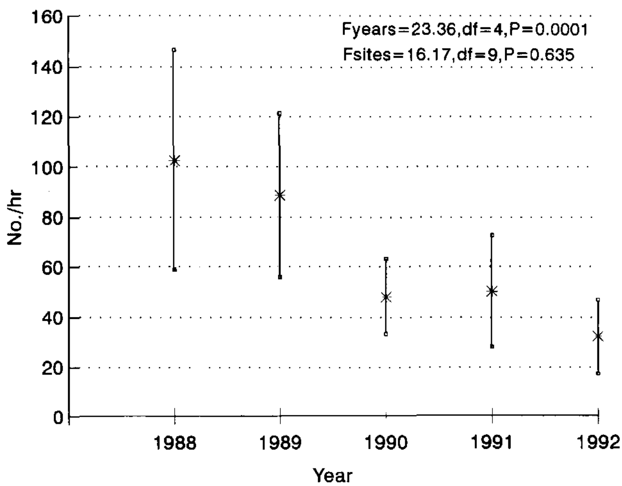


Figure 3. Mean catch per unit effort (*N*/hour) of redbreast sunfish with 95% confidence intervals from the Altamaha River, Georgia (1988–1992).

Table 1. Relative composition, proportional stock density (PSD), relative stock density (RSD), overall success, and fished-for success of redbreast sunfish from the Altamaha River, Georgia (1987–1992).

	Electrofishing			Creel	
Year	Relative composition (%)	PSD_{110}	RSD_{130}	Overall success (*N*/hour)	Fished-for success (*N*/hour)
1987				0.594	3.715
1988	59	31	16	0.447	1.880
1989	57	48	25	0.516	2.276
1990	43	52	31	0.425	1.350
1991	45	69	39	0.211	1.176
1992	35	68	48	0.256	1.257

Discussion

In an era of reduced research budgets, constraints on available manpower, and the persistent need for pertinent information, river resource managers seek viable methodologies to ascertain fish population status. Standardized stream monitoring efforts detected substantial changes in Altamaha River sport fish populations, and were successful in generating research and management focal points.

Based on results from this survey, flathead catfish have gone from relative obscurity in the early 1980s to the most dominant predator present in mainstream habitat. Flathead catfish electrofishing catch rates averaged 212 kg per hour in 1992. Investigations conducted by Michaels and Williamson (1982) and Hottell et al. (1983) found very few flathead catfish present in the Altamaha River between 1979 and 1982. Moreover, expansion has been speedy and complete, with CPUE values in lower river stations equal to upper river stations. The elapsed time from sparse existence to predominant status took approximately 10 years. A similar time span was noted by Guier et al. (1981) in the Cape Fear River, North Carolina, where only 10 years were required for introduced flathead catfish to expand into a significant fishery.

Concurrent with the rapid expansion of flathead catfish has been the decline of bullhead populations. In the early 1970s, bullheads comprised approximately 45% of the catfish present in the lower Altamaha River (L. Kirkland and C. Hall, unpubl. rep. 1972). Hottel et al. (1983) estimated annual harvest of bullheads to be 38,342 from the Altamaha River. In 1987, estimates of bullhead harvest had fallen to 15,500 annually, and in 1989 no bullheads were observed in the creel (Probst 1991). Michaels and Williamson (1982) achieved bullhead catch rates of 16.1 fish/hour using a telephone type electrofishing unit in the Altamaha River. Quinn (1986) stated that the Mod-3A catfish shocking apparatus was species selective toward flathead catfish. However, Evans (1991) used the Mod-3A electrofisher to capture flat and snail bullheads at a rate of nearly 70 per hour above a barrier which negated flathead invasion. Below the dam and in the presence of flathead catfish, only 1 bullhead was collected in Mod-3A samples (Evans 1991). Thus, the inability to collect bullheads in recent study years is attributed to a gross decline in bullhead populations, and not equipment inadequacies. Mickey and Simpson (1988) also reported the inability to collect bullheads below dams in the Upper Yadkin and South Yadkin rivers, North Carolina, where flatheads were present, yet collected bullheads above the dams which limited flathead catfish expansion. Both studies conducted by Evans (1991) and by Mickey and Simpson (1988) attributed the absence of bullheads to flathead catfish. Guier et al. (1981) also provided strong evidence that flathead catfish introductions into the Cape Fear River, North Carolina, impacted native bullhead populations.

Redbreast sunfish are a major component of the Altamaha River sport fisheries. In fact, more redbreast sunfish were harvested each year than any other species from 1980 to 1990 (Hotell et al. 1983, Probst 1991). Annual monitoring results combined with creel estimates have shown a substantial decline in redbreast sunfish abundance. Creel estimates generated in 1991 and 1992 showed that redbreast sunfish were no longer the most harvested fish by number in the Altamaha River. Overharvest does not seem to be the problem due to the inverse relationship between CPUE and PSD and RSD (Probst 1991). In addition, Hess (1991) found that very few Georgia sunfish anglers (0.1%) actually creel a limit of fish ($N = 50$). CPUE of redbreast sunfish <70 mm has remained relatively constant over a 4-year period, indicating no major reproduction failures. However, CPUE of redbreast sunfish 70–100 mm declined >90% during the study period.

The decline of redbreast sunfish is probably due to the substantial increase in flathead catfish abundance. Several reports describe flathead catfish as opportunistic feeders (Minckley and Deacon 1959, Turner and Summerfelt 1970, Quinn 1987) that apparently choose their prey based on abundance and ease of capture. Eradication of the bullhead forage base could have caused a shift in the flathead catfish diet. Edmonson (1974) reported that sunfish were the dominant forage consumed by flathead catfish in Bluestone Reservoir, West Virginia. Guier et al. (1981) found that members of 2 families, Ictaluridae and Centrarchidae, were most frequently represented in flathead catfish stomachs in the Cape Fear River, North Carolina. More substantiating is the documented decline of redbreast sunfish in the Ocmulgee River below Juliette Dam, were they are found in association with flathead catfish (Evans 1991).

As recent as 1987, redbreast sunfish and bullheads contributed 45% by number and 38% by weight to the Altamaha sport fishery. Presently, bullheads seldom enter the creel and the contribution of redbreast sunfish is approximately half its 1987 value. Although flathead catfish abundance continues to increase, they remain a minor component of the sport fishery. Documented declines in native sport fish populations are considered major. Monitoring efforts will continue in an effort to understand the full impacts of flathead catfish introduction into the Altamaha River system.

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