SPECIES COMPOSITION, CATCH RATES, AND IMPACT OF A COMMERCIAL FISHERY ON STRIPED BASS IN WATTS BAR AND CHICKAMAUGA RESERVOIRS, TENNESSEE

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Abstract: Between March and October 1977, methods of local commercial fishermen were simulated to evaluate species composition, catch rates, and potential impact of the commercial fishery on striped bass (*Morone saxatilis*) in 2 Tennessee River mainstream impoundments. Estimated total commercial harvest rates during the sampling period were 26.6 kg/ha and 23.1 kg/ha in Watts Bar and Chickamauga Reservoirs. Because commercial fishing was concentrated in tailwater regions of both reservoirs, experimental catch rates and high estimated commercial harvest rates were probably not representative throughout each reservoir. Low catch rates of striped bass and other game fishes suggested that commercial netting had no negative influence on these species. It does appear, however, that the commercial fishery may be influencing rough fish species composition. Standing crops of buffalofish (*Ictiobus* spp.) have declined in recent years while carp (*Cyprinus carpio*) biomass has increased.

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Regulation of commercial fishing in inland waters is a controversial issue faced by fishery agencies and fishermen (Houser 1957; Warnick 1977). Although commercial fishing has been shown to affect abundance and composition of natural fish populations, its influence on successful establishment of non-native species is poorly understood.

Striped bass have been introduced into Watts Bar and Chickamauga Reservoirs, Tennessee, since 1964 and 1973, respectively. Although a sport fishery for striped bass now exists, catch rates have been low and there is speculation that a commercial net fishery, which has operated in both reservoirs since the early 1960's, may have adversely influenced the success of the introductions. Objectives of this study were to describe commercial catch composition and evaluate the effects of commercial netting on populations of striped bass in the reservoirs.

A considerable amount of published information indicates that striped bass are susceptible to a net fishery; and the large size attained by adults may be responsible for a greater susceptibility to commercial capture than would be expected for other sport fishes. Trent and Hassler (1968) described a linear relationship between gill net mesh size and mean length of male striped bass caught in commercial nets in the Roanoke River, North Carolina. Bishop (1970) found gill nets effective for sampling striped bass greater than 38 cm. Summerfelt and Mosier (1976) reported that an 8.9 cm trammel net was the most successful of several methods for capturing striped bass. Power (1962), Lyles (1965), and Koo (1970) reported that gill nets caught more striped bass than all other types of gear in the Atlantic fishery.

Although these studies suggest that commercial netting activities could capture striped bass, the few published studies of commercial fishing effects on striped bass populations are inconclusive. Bailey (1974) concluded that commercial netting had no significant effect on success of striped bass introductions in the southeastern U.S. but Johnston (1969) believed that commercial gill netting prevented expansion of the striped bass population in Lake Texoma.

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METHODS AND MATERIALS

Watts Bar and Chickamauga Reservoirs, which are Tennessee Valley Authority (TVA) mainstream impoundments of the Tennessee River, are used for flood control, recreation, hydroelectric power generation, and navigation. Watts Bar Dam was constructed in 1942 at river mile 530 in Tennessee (Fig. 1). At full pool elevation, the reservoir covers 15,400 ha and has a mean depth of 8.9 m. Its upstream boundaries are Melton Hill Dam on the Clinch River and Ft. Loudon Dam on the Tennessee River. Chickamauga Dam was constructed in 1940 at river mile 467 of the Tennessee River near Chattanooga, Tennessee (Fig. 2). At full pool elevation, the reservoir covers 13,800 ha and has a mean depth of 6.2 m. Its upstream boundary is Watts Bar Dam.

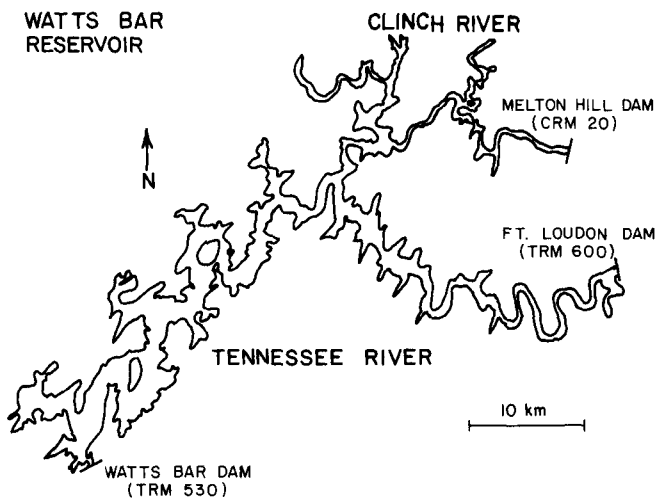

Fig. 1. Map of Watts Bar Reservoir, Tennessee. CRM = Clinch River mile, TRM = Tennessee River mile.

Upstream portions of both reservoirs are riverlike with fluctuating water levels and variable flow rates due to hydroelectric power generation. Discharges tended to be highest during winter and lowest in late summer and early fall. Generation and resultant currents were usually highest during the day and lowest at night because electrical generation varied with power demand. Generation commonly ceased between 2200 and 2400 hours, and zero generation lasted 2 to 10 hours. Shorter periods of zero generation occurred in winter and spring than during summer or early fall. Retention periods of the mainstream impoundments of the Tennessee River are 10 to 14 days (Churchill 1967); thus, large volumes of water that pass through the dams create currents throughout the downstream portions of both reservoirs.

Important game fishes present in both reservoirs are largemouth bass (*Micropterus salmoides*), smallmouth bass (*M. dolomieui*), crappie (*Pomoxis* spp.), bluegill (*Lepomis macrochirus*), white bass (*Morone chrysops*) and striped bss. Predominant forage fishes

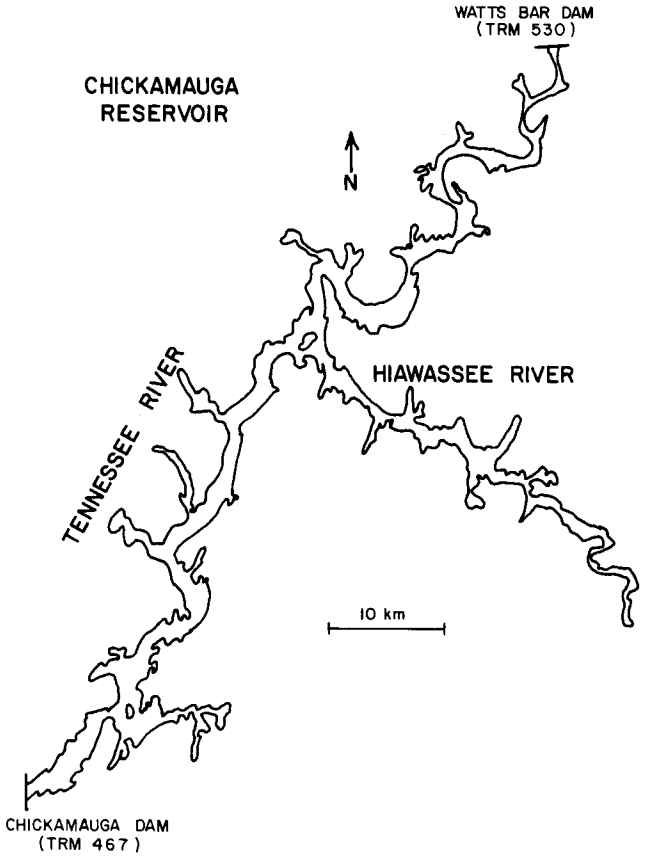

Fig. 2. Map of Chickamauga Reservoir, Tennessee. TRM = Tennessee River mile.

are threadfin shad (*Dorosoma petenense*) and gizzard shad (*D. cepedianum*). Commercially important species are smallmouth buffalo (*Ictiobus bubalus*), paddlefish (*Polyodon spathula*), carp (*Cyprinus carpio*) and freshwater drum (*Aplodinotus grunniens*). Tennessee state law defines catfish (Ictaluridae) as rough fish; however, channel catfish (*Ictalurus punctatus*), flathead catfish (*Pylodictus olivaris*), and, to a lesser extent, blue catfish (*I. furcatus*) are important in both the sport and commercial fisheries.

Species composition, catch rates, and effects of commercial netting on striped bss were evaluated by using trammel nets similar to those employed by local commercial fishermen. Nets had 8.3 cm webbing (bar measure) and 40.6 cm walls, and were 91 m long by 2.4 m deep. From March to October 1977, experimental methods duplicated those of local commercial fishermen as closely as possible, including types of gear used, fishing locations, and duration of fishing periods.

During the spring of 1977, commercial netting practices were dependent on water currents produced by electrical generation at the upstream dams of each reservoir. Commercial fishermen set nets only at night when the expected period of zero generation

was longer than 3 hours. Nets were set when water currents subsided, and fishermen attempted to lift all nets before generation resumed. Nets caught in the currents were often damaged or lost.

The number of nets set each night depended on anticipated catch and duration of fishing. Three to 12 nets were used by individual fishermen, and 1 to 6 fishermen worked an area on a particular night. Occasionally, as many as 5 nets were tied together when fishing in productive areas or when locating concentrations of fish.

From June through September 1977, netting was concentrated in coves and backwater areas. This shift from upstream areas fished during the spring reduced the dependence of fishing on power generation schedules and allowed nets to be set for longer periods. Nets were set shortly after dark and lifted at dawn. The number of nets per fishermen also increased to 12 to 14 per night, and as many as 25 nets were used on some occasions. Commercial netting methods in October 1977 were similar to those used in the spring. In November and December 1977, continuous electrical generation, high reservoir inflow, and open flood gates prevented experimental or extensive commercial netting in both reservoirs.

Fish from each net were sorted by species, total lengths and weights were measured, times fished for each net were recorded, and data were standardized for further analysis by computing catch rates in numbers or kilograms per hour. Analyses assumed that hourly catch rates were not affected by the number of hours fished per net. When multiple nets were used, data were summarized from each distinct 91 m section.

Monthly catch rates for each species and for all species combined in each reservoir were computed by dividing the monthly catch by the total number of hours fished. Monthly catch rates were also computed for the following groups: (1) buffalofish, (2) catfish (3) other commercial species, (4) striped bass and (5) other game fish (Table 1).

RESULTS

Between March and October 1977, 1221 fish weighing 3248.2 kg were caught during 845.6 net-hours of fishing in Watts Bar Reservoir. Smallmouth buffalo, black buffalo, and carp were most important on both a numerical and weight basis (Table 2). Buffalofish collectively accounted for 84.8% of the number and 84.9% of the weight of all fish collected. Only 1 striped bss and 7 other game fish were taken in Watts Bar Reservoir.

From April through October 1977, 758 fish weighing 2082.0 kg were caught during 526.9 net-hours of fishing in Chickamauga Reservoir. Species dominance of the catch was different from that in Watts Bar Reservoir. Freshwater drum, smallmouth buffalo, and carp were, respectively, most abundant on both a numerical and weight basis (Table 2). Buffalofish collectively accounted for only 37.3% of the total weight. Seven striped bass and 7 other game fishes comprised 1.2% and 0.4%, respectively, of the total weight caught.

The highest total monthly catches occurred in March and May for Watts Bar and Chickamauga Reservoirs, respectively, when buffalofish, carp, and freshwater drum were concentrated in tailwater areas (Tables 3 and 4). Springtime peaks in catch rates have also been observed in other commercial fisheries (Bryan and Tarzwell 1941; Parrack et al. 1970). During September and October 1977, experimental catch rates in Watts Bar Reservoir increased above summer levels (Table 3), but catches in Chickamauga Reservoir were lower than those observed during June, July, and August (Table 4).

Maximum catches occurred earlier in Watts Bar Reservoir because generation schedules at Ft. Loudoun Dam were conducive to fishing in spawning concentrations of buffalofish. Spawning concentrations may also have been present in the Watts Bar Dam tailwater region of Chickamauga Reservoir during March and April, but generation schedules did not permit intensive commercial fishing there until May. Although experimental catches during the spring months may not accurately reflect differences in

Table 1. Species groups and species caught in Watts Bar and Chickamauga Reservoirs, Tennessee, March to October 1977.

Group *Common Name*	*Species*
Buffalofish	
Smallmouth Buffalo	*Ictiobus bubalus*
Black Buffalo	*Ictiobus niger*
Bigmouth Buffalo	*Ictiobus cyprinellus*
Catfish	
Flathead Catfish	Pylodictis olivaris
Channel Catfish	*Ictalurus punctatus*
Blue Catfish	*Ictalurus furcatus*
Other Commercial Species	
Carp	*Cyprinus carpio*
Freshwater Drum	*Aplodinotus grunniens*
Paddlefish	*Polyodon spathula*
Longnose Gar	*Lepisosteus osseus*
Blue Sucker	*Cycleptus elongatus*
Quillback Carpsucker	*Carpiodes cyprinus*
Golden Redhorse	*Moxostoma erythrurum*
Striped Bass	
Striped Bass	*Morone saxatilis*
Other Game Fish	
Largemouth Bass	*Micropterus salmoides*
Smallmouth Bass	*Micropterus dolomieui*
Sauger	*Stizostedion canadense*
Walleye	*Stizostedion vitreum*
White Bass	*Morone chrysops*
Redear Sunfish	*Lepomis microplophus*

fish abundance between tailwater regions, catch rates and species composition are probably representative of the commercial fishery because generation schedules and flow rates would have had an equal influence on commercial and experimental fishing practices.

For March through October in Watts Bar Reservoir and April through October in Chickamauga, overall hourly catch rates for all species combined were nearly identical (Tables 3 and 4). Except for the unusually high March and October catches of buffalofish in Watts Bar Reservoir, monthly total catch rates were generally higher in Chickamauga Reservoir. Buffalofish catch rates for April through September were similar between reservoirs, but catches of catfish and other commercial species were consistently higher in Chickamauga Reservoir.

Objectives of this study required experimental effort to duplicate commercial techniques; thus, spatial variability in catch rates could not be precisely evaluated because commercial fishermen concentrated their efforts in areas where fish were known or believed to be abundant. Consequently, catch rates reported herein are probably higher than catches that would have occurred if nets had been set randomly throughout each lake. Commercial practices indicate that economically important species, such as buffalofish and catfish, concentrated in upstream river-like areas during fall, winter, and spring and in shallow, backwater areas during the summer.

Table 2. Numbers and weights (kg) of fishes caught in 8.3-cm trammel nets during 845.6 net-hours in Watts Bar Reservoir and 526.9 net-hours in Chickamauga Reservoir, Tennessee.

Species Group	*Watts Bar Res.*		*Chickamauga Res.*	
Common Name	*Number*	*Weight*	*Number*	*Weight*
Buffalofish				
Smallmouth buffalo	989	2392.7	220	537.0
Black buffalo	134	354.6	75	216.1
Bigmouth buffalo	4	14.1	6	22.7
Group total	1036	2761.4	301	775.8
Catfish				
Flathead catfish	11	23.6	43	161.1
Channel catfish	9	24.4	10	12.3
Blue catfish	3	7.5	11	26.9
Group total	23	55.3	64	200.3
Other Commercial Species				
Carp	95	235.8	117	349.2
Freshwater drum	38	102.1	241	639.0
Others	21	80.8	21	85.3
Group total	154	418.7	379	1073.5
Striped bass	1	5.7	7	24.1
Other Game Fish	7	7.1	7	8.3
Total	1221	3248.2	758	2082.0

Table 3. Catch rates in 8.3-cm trammel nets, expressed as number (N) and weight (kg) per hour, for selected species groups in Watts Bar Reservoir, Tennessee, 1977.

			Buffalofish		*Catfish*		*Other Comm.*[a]		*Striped Bass*		*Other Game*[b]		*All Species*	
Month	*Number Nets Set*	*Total Hours Set*	*N*	*kg*	*N*	*kg*	*N*	*kg*	*N*	*kg*	*N*	*kg*	*N*	*kg*
Mar	10	27.8	11.54	37.38	0.04	0.07	0.00	0.00	0.00	0.00	0.04	0.05	11.62	37.50
Apr	22	129.4	0.60	1.41	0.06	0.16	0.12	0.32	0.00	0.00	0.01	TR[c]	0.79	1.89
May	3	4.5	1.11	2.19	0.00	0.00	0.44	1.06	0.00	0.00	0.00	0.00	1.55	3.25
June	17	151.6	0.19	0.52	0.01	0.02	0.30	0.82	0.00	0.00	0.02	0.02	0.52	1.38
July	9	76.7	0.10	0.42	0.00	0.00	0.10	0.32	0.00	0.00	0.00	0.00	0.20	0.74
Aug	20	190.7	0.22	0.73	0.03	0.10	0.15	0.48	0.00	0.00	0.00	0.00	0.40	1.31
Sept	18	130.4	0.66	1.45	0.01	0.02	0.10	0.24	0.00	0.00	0.01	TR	0.78	1.71
Oct	37	134.5	3.49	8.10	0.04	0.06	0.42	0.94	0.01	0.04	0.02	0.03	3.98	9.17
All months	135	845.6	1.23	3.26	0.03	0.07	0.20	0.53	TR	0.01	0.01	0.01	1.47	3.87

[a]Other commercial species include: carp, freshwater drum, longnose gar, quillback carpsuckers and paddlefish.

[b]Other game species include: largemouth and smallmouth bass, sauger, walleye, white bass and redear sunfish.

[c]TR indicates catch less than 0.0005 kg hr but greater than zero.

Table 4. Catch rates in 8.3-cm trammel nets, expressed as numbers (N) and weight (kg) per hour, for selected species groups in Chickamauga Reservoir, Tennessee, 1977.

Month	Number Nets Set	Total Hours Set	Buffalofish N	Buffalofish kg	Catfish N	Catfish kg	Other Comm.[a] N	Other Comm.[a] kg	Striped Bass N	Striped Bass kg	Other Game[b] N	Other Game[b] kg	All Species N	All Species kg
Apr	5	21.3	0.66	2.11	0.09	0.12	0.24	0.86	0.00	0.00	0.00	0.00	0.99	3.09
May	11	58.8	0.63	1.67	0.10	0.22	2.34	7.24	0.10	0.36	0.03	0.06	3.20	9.55
June	17	60.5	0.94	2.00	0.13	0.45	1.29	2.73	0.00	0.00	0.02	0.01	2.38	5.19
July	12	57.2	0.68	1.78	0.12	0.31	0.86	2.47	0.00	0.00	0.02	0.01	1.68	4.57
Aug	15	126.6	0.51	1.45	0.10	0.21	0.56	1.66	0.01	0.03	0.02	0.03	1.20	3.38
Sept	20	153.7	0.50	1.28	0.16	0.55	0.12	0.44	0.00	0.00	0.01	TR[c]	0.79	2.27
Oct	18	49.0	0.24	0.61	0.08	0.62	1.01	0.89	0.00	0.00	0.00	1.33	2.12	
All months	09	526.9	0.57	1.47	0.12	0.38	.77	2.03	0.01	0.05	0.01	0.02	1.49	3.95

[a]Other commercial species include: carp, freshwater drum, longnose gar, quillback carpsuckers and paddlefish.

[b]Other game species include: largemouth and smallmouth bass, sauger, walleye, white bass and redear sunfish.

[c]TR indicates a catch less than 0.0005 kg hr but greater than zero.

Some information was available to compare catch rates between nets set in legal and illegal areas in the immediate downstream vicinities of Watts Bar and Ft. Loudoun Dams. Areas within 910 m of the dams are closed to commercial fishing by Tennessee state law, but commercial fishermen were occasionally observed setting nets within the restricted zones. During May, August, and October, trammel nets that were set in illegal areas caught more fish (Table 5). In Chickamauga Reservoir during May, the catch of all fish in the illegal areas was 5.2 times greater in number and 5.0 times greater in weight than in legal areas. All game fish caught in Chickamauga Reservoir during August came from illegal areas. In October total catch rates in legal and illegal areas of Chickamauga Reservoir were nearly equal, but no striped bass or other game fish were caught in either area. All striped bass caught throughout this study in Chickamauga Reservoir were taken from trammel nets set in illegal areas. In Watts Bar Reservoir, experimental netting in illegal waters was conducted only during October, and the total catch rate in the illegal area was 10.0 and 8.1 times greater by number and weight, respectively, than in legal waters. The single striped bass and all other game fish caught in October came from the illegal area below Ft. Loudoun Dam.

DISCUSSION

Evaluation of commercial impact on fish populations in Watts Bar and Chickamauga Reservoirs is hampered due to absence of data that estimate total commercial netting intensity. Personal observations and communications with commercial fishermen indicated that there were approximately 15 to 20 full-time fishermen who fished both reservoirs. Each fisherman used about 10 trammel nets and fished about 5 nights per week. Although a large number of part-time fishermen also operated on these reservoirs, it was virtually impossible to estimate their fishing effort. Further analyses and discussion will refer only to effort and catches judged to be representative of full-time fishermen. Based on the assumed number of commercial fishermen (20) and their average effort, approximately 500 trammel nets were set per week in each reservoir.

Table 5. Catch rates in 8.3-cm trammel nets, expressed as numbers and weights (kg) per hour, in legal and illegal areas of Watts Bar and Chickamauga Reservoirs, Tennessee, 1977.

	Striped Bass		*Other Game*[a]		*All Fish*	
	Number	*Weight*	*Number*	*Weight*	*Number*	*Weight*
			Chickamauga Reservoir			
May						
Legal	0	0	0.02	0.05	1.69	5.31
Illegal	0.49	1.69	0.08	0.08	8.91	26.58
August						
Legal	0	0	0	0	1.07	3.00
Illegal	0.15	0.49	0.29	0.59	3.51	9.83
October						
Legal	0	0	0	0	0.71	2.11
Illegal	0	0	0	0	1.08	2.80
			Watts Bar Reservoir			
October						
Legal	0	0	0	0	1.14	3.15
Illegal	0.03	0.16	0.06	0.11	11.39	25.51

[a]Other game species include: largemouth and smallmouth bass, sauger, walleye, white bass, and redear sunfish.

Between March and October 1977 (34 weeks), 135 experimental trammel nets were set in Watts Bar Reservoir. Total commercial catch during this period was estimated by multiplying the average experimental catch per net (3248.2 kg/135 nets) by the estimated commercial effort (34 weeks x 500 nets/week). On this basis, approximately 402,000 kg or 26.6 kg/ha of fish were commercially harvested in Watts Bar Reservoir between March and October 1977. This method of computation assumes that the average number of hours fished per net was similar for experimental and commercial netting.

Between April and October 1977 (30 weeks), 98 trammel nets were set in Chickamauga Reservoir. Total commercial catch, estimated by multiplying the overall experimental catch per net (2082.0 kg/98 nets) by the estimated commercial effort (30 weeks x 500 nets/week), was approximately 318,000 kg or 23.09 kg/ha.

These estimated harvest rates are much higher than those reported from most reservoirs that have sustained commercial fisheries. Leidy and Jenkins (1977) reported an average total commercial harvest of 13.0 kg/ha per year in 12 Tennessee River valley impoundments. Buffalofish, catfish, and carp contributed 8.5, 3.2, and 1.3 kg/ha per year, respectively. Parrack (1970) reported that the average annual commercial harvest in four Oklahoma reservoirs was about 6.0 kg/ha. Annual commercial harvest from Norris Reservoir, Tennessee, was about 1.6 kg/ha over a 3 year period, but netting was conducted only during winter months (Carroll et al. 1963). Over a 13 year period in 31 reservoirs and 5 rivers in Oklahoma, the average annual commercial harvest was about 3 kg/ha (Mensinger 1971). Laflin and Renaker (1969), however, reported that the commercial harvest in Herrington Lake, Kentucky, ws 57 kg/ha in 165 days of netting.

Because experimental netting between March and October 1977 represented only about 0.7 - 0.8% of the estimated commercial effort in each reservoir, and because sport fish comprised a small percentage of the experimental catch, predictions of commercial

harvest of sport fish are subject to considerable error. In Watts Bar Reservoir, only one striped bass (0.18% of the total weight caught) was caught, indicating a low or negligible commercial influence. Seven other game fish that represented only 0.22% by weight of the total experimental catch were also sampled. Assuming that these percentages are representative of the commercial catch, about 0.05 kg/ha of striped bass and 0.06 kg/ha of other game fish were harvested. In Chickamauga Reservoir, striped bass and other game fish represented, respectively, 1.16% and 0.40% by weight of the experimental catch. These percentages of the estimated commercial catch gave harvest estimates of 0.27 kg/ha for striped bass and 0.09 kg/ha for other sport fish. Based on the average weight of striped bass caught in experimental trammel nets (3.44 kg), the commercial harvest was approximately 0.08 striped bass/ha in Chickamauga Reservoir.

The impact of commercial fishing on fish populations in both reservoirs was evaluated by comparing calculated catch rates with standing crop estimates from cove rotenone surveys conducted by the TVA during 1963, 1973, and 1977 in Watts Bar Reservoir and during 1970, 1973, and 1977 in Chickamauga Reservoir (TVA 1964, 1971, 1973, 1974, unpublished data for 1977). Standing crop estimates in Tables 6 are averages obtained from several coves within each reservoir. In Watts Bar Reservoir, the 1963 and 1973 data were based upon 20 and 10 coves, respectively, sampled during July or August; and the 1977 data are from six coves sampled during May, July, or October. In Chickamauga Reservoir, 12 coves were sampled during July or August in 1970, 4 coves were sampled in September 1973, and 5 coves were sampled in August or September, 1977.

Estimated commercial harvests of rough fish during the experimental sampling periods represented 35% and 24% of the 1977 rough fish standing crops in Watts Bar and Chickamauga Reservoirs, respectively. Catches of game fish other than striped bass were only 0.1 - 0.2% of the 1977 game fish standing crops, but because no striped bass were collected in the cove rotenone samples, the relationship between estimated commercial harvest and standing crop of this species could not be evaluated.

Estimates of buffalofish harvest exceeded the 1977 standing crops in Watts Bar Reservoir and they were greater than 50% of the 1977 standing crops in Chickamauga Reservoir (Table 6). This resulted because commercial fishing was usually conducted in tailwater regions where buffalofish concentrated in the spring and fall. Standing crops of buffalofish in these areas would be considerably higher than those reflected by the cove rotenone samples. Thus, the calculated commercial harvest rates in Table 6 probably overestimate commercial impact throughout the reservoir and underestimate the impact in the tailwater regions.

Changes in standing crop of smallmouth buffalo and carp suggest that commercial netting may be influencing species composition. In the 1977 standing crop estimates for Watts Bar Reservoir, smallmouth buffalo decreased to about 14% and carp increased to about 154% of the 1963 estimates (Table 6). In Chickamauga Reservoir, the 1977 standing crops of smallmouth buffalo and carp were about 22% and 477%, respectively, of the 1970 estimates. Total rough fish standing crop estimates were similar between the first 2 rotenone estimates within each reservoir, but the 1977 estimates were lower due to declines in buffalofish biomass (Table 6). These relationships suggest that commercial netting may be selectively reducing smallmouth buffalo biomass and that carp biomass has increased in response. Jester (1971, 1972, 1973, 1974) observed that populations of carp and river carpsucker (*Carpiodes carpio*) increased when smallmouth buffalo were selectively harvested by commercial netting in Elephant Butte Lake, New Mexico.

As reported in other studies, the commercial fishery in Watts Bar and Chickamauga Reservoirs is selective for rough fish. Capture of game fish was infrequent, and increases of game fish biomass between standing crop estimates in both reservoirs suggest that commercial netting had no negative influence on these species.

Table 6. Estimated standing crops (kg/ha) and commercial harvest rates (kg/ha) for sport, forage, and commercially important species. Harvest estimates for Watts Bar Reservoir are for March through October, 1977, and estimates in Chickamauga Reservoir are for April through October, 1977.

	Watts Bar Reservoir				*Chickamauga Reservoir*			
	Standing Crop				*Standing Crop*			
	1963	*1973*	*1977*	*Estimated Harvest*	*1970*	*1973*	*1977*	*Estimated Harvest*
Game Fish								
Striped bass	---	---	---	0.05	---	---	---	0.27
Other game[a]	18.8	37.6	31.6	0.06	24.5	40.5	75.3	0.09
Rough Fish								
Smallmouth buffalo	66.3	34.4	9.5	19.56	48.3	41.9	10.8	5.96
Other buffalofish[b]	4.0	11.6	1.0	3.01	18.2	0	0	2.64
Total buffalofish	70.3	46.0	10.5	22.57	66.5	41.9	10.8	8.60
Carp	21.3	50.4	32.9	1.93	6.5	40.7	31.0	3.87
Freshwater drum	25.5	27.9	16.8	0.83	27.9	30.9	25.0	7.09
Other rough fish[c]	14.6	13.4	14.9	1.14	11.1	22.3	26.9	3.17
Total rough fish	131.7	137.7	75.1	26.47	112.0	135.8	93.7	22.73
Forage Fish	60.6	137.7	119.5	---	67.3	112.7	176.4	---
All Species	211.1	313.0	225.7	26.58	204.0	289.0	345.0	23.09

[a]Other game species include: largemouth and smallmouth bass, sauger, walleye, white bass, and redear sunfish.

[b]Other buffalofish include: bigmouth buffalo and black buffalo.

[c]Other rough fish include: paddlefish, longnose gar, blue sucker, quillback carpsucker, golden redhorse, and flathead, blue, and channel catfish.

Overall impact of commercial fishing on striped bass population could not be completely evaluated because standing crop estimates were not available. Although experimental data indicate that striped bass catch rates were low in legal fishing areas, higher catch rates from nets set within illegal areas below Watts Bar Dam indicate a potential for depletion. If commercial fishermen expended a greater proportion of fishing effort in illegal areas than was indicated by the experimental samples, then the actual commercial harvest of striped bass could have been considerably higher than the estimates made herein.

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