

FISH POPULATIONS OF THE NEUSE RIVER IN THE AREA OF A LOW DAM IN THE UPPER COASTAL PLAIN

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Abstract: Fish populations in the Neuse River, North Carolina, were studied near a steam electric plant which included a low-head dam as part of the installation. The purpose of the study was to describe the fish population of a moderate-sized upper coastal plain river, and to provide insight in to the distribution of fishes relative to the dam. Fish were collected by gill netting, fyke netting, electrofishing, seining, and trawling to examine the various species and sizes of fishes present. Sampling was conducted over a 1-year period to include seasonal changes in the fish population. Fifty-two species of fish were collected including several estuarine forms, although the study area was located at approximately river mile 140. Several species of anadromous fishes were collected, but of these, only American shad were abundant. Little difference was observed in fish populations among sampling stations, and there is evidence that fish negotiate the dam either over the dam during high flow periods or via the fish ladder.

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A number of publications on Neuse River fishes have suggested that the presence of Quaker Neck Dam located near Goldsboro, North Carolina, restricts fish populations. These include a fisheries survey of the river basin (Bayless and Smith 1962), as well as works on anadromous fishes (Walberg 1953; Baker 1968; Pate 1971; Sholar 1976).

Most of these reports have been based on a sampling effort distributed over a large area; and consequently, few samples were collected in the vicinity of the dam. Also, reports based on fishermen interviews may reflect an overall trend rather than a cause-effect relationship regarding the dam and fish populations.

We designed a study to evaluate the fish population of the Neuse River in the vicinity of the H.F. Lee Steam Electric Plant, the installation utilizing water backed up by the Quaker Neck Dam at Goldsboro. During 1977, we sampled fish populations above and below the dam and in this report intend to update the Neuse River fisheries survey information and comment on the effect of the dam on fish populations.

METHODS AND MATERIALS

A variety of techniques were used in sampling due to the diversity in sizes and habits of fishes previously reported from the Neuse River (Bayless and Smith 1962). The reported presence of anadromous fish and the question of the effect of the dam on their distribution and spawning activity led to an intensive sampling effort during the spring months.

Fyke nets (3.7 cm mesh) and gill nets (experimental) were used in sampling large fishes, while electrofishing sampled both large and intermediate forms. Juvenile fishes and the smaller species were sampled with a 15.2 m bag seine (7 mm mesh) and by surface and bottom trawling.

The fyke nets used were approximately 5 m long and 1.3 m in diameter with throats on the second and fourth of seven hoops. Nets were fitted with 6.1 m wings and center lead. Nets were set at 4 sampling stations (Fig. 1) for 2 consecutive days each quarter (February, May, August, and November) and for 1 day each week during the intensive spring effort. All sets were made for approximately 24 hours. Catches were adjusted for actual fishing time and reported as number and weight per 24-hour set. Gill net sampling

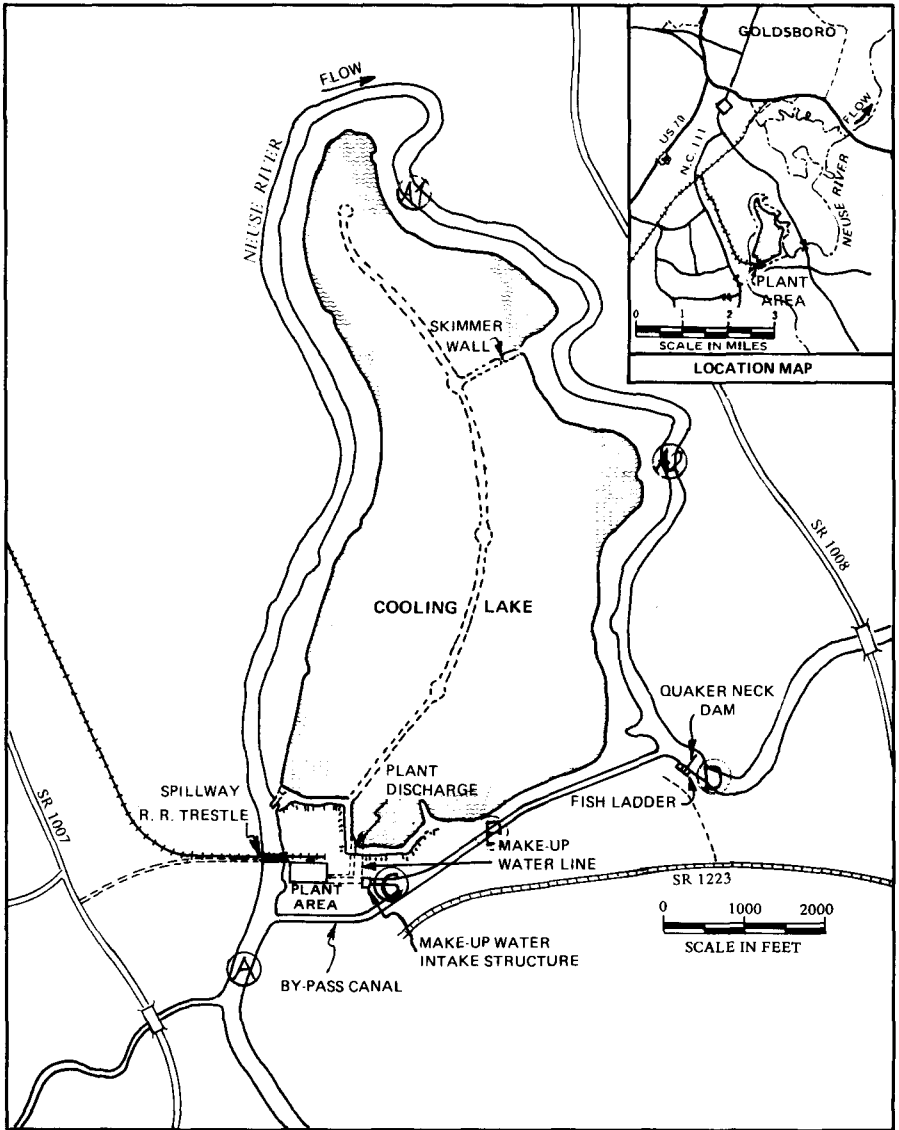


Figure 1 MAP OF NEUSE RIVER AND H. F. LEE STEAM ELECTRIC PLANT SITE ILLUSTRATING SAMPLING LOCATIONS

Fig. 1. Map of Neuse River and H.F. Lee Steam Electric Plant site illustrating sampling locations.

was conducted only during the spring intensive studies, primarily as an aid in sampling anadromous fishes. One large (7.6, 8.9, 10.2, and 11.4 cm stretch mesh) and one small (5.7 cm stretch mesh) net was set at Stations A and D at an approximate 45° angle to the current. As with fyke nets, sets were made for approximately 24 hours, catches adjusted for actual fishing time and catches reported per 24-hour set.

Electrofishing was conducted for .5 hours at Stations A,B,C, and D each quarter. A Smith Root Type IV electrofishing control unit and 3500-watt generator were used operating at the AC voltage necessary to produce a field of 1-3 amps. Fishes that were incapacitated were collected with dip nets and held in a tub of water until the end of the collection period. A second boat aided in collecting immobilized fish that drifted downstream. Catches are reported as number per hour of electrofishing.

Seining was attempted at Stations A,A-1,A-2,B, and D. Samples were collected during the first 3 weeks of June, but seining was replaced by trawling since obstructions and soft sediments made collection of comparable seine samples impossible.

We used an otter trawl with 5.2 m headrope and 6.4 m footrope. The trawl body had 1.3 cm bar mesh and the cod was equipped with a .6 cm (bar mesh) liner. The trawl was converted for surface trawling by adding extra floats to the headrope and a float to each door. Bottom and surface trawling was conducted at Stations A, A-1,A-2,B, and D. Tows were made against the current at approximately 1 m/sec for 0.1 hour when possible. Catches were adjusted for time fished and are reported as catch per standard .1-hour haul.

RESULTS AND DISCUSSION

Fifty-two species of fish were collected from the Neuse River during the study (Table 1). Fishes which could not be identified to species were placed in the 14 taxonomic groupings included in the table. Most of these were small individuals (early juvenile) which probably are species included in the list, but could not be positively identified below the family or generic level.

Blueback herring, hogchokers, and threadfin shad have not been previously reported from this section of Neuse River. Blueback herring and hogchokers are abundant in the lower river, while threadfin shad have not been reported in the drainage, although they have been stocked at many localities in the state (Menhenick 1975). Carolina madtoms are listed by the North Carolina State Museum (Cooper 1977) as being of special concern due to their limited range and lack of life history information. Several Carolina madtoms were collected during the study including both adults and juveniles which suggested reproduction was occurring in the area. Tables 2 and 3 present catch rates of various species groups collected by electrofishing and fyke net sampling during the winter, spring, summer, and fall. The groupings used are indicated in Table 1.

Winter

Electrofishing catches during mid-February (Table 2) were largest numerically in the plant intake canal, Station C, where 252 of the 278 fish collected were swallowtail and satinfin shiners. The largest catch in terms of biomass was taken at Station A, upstream from the electric plant, and was composed primarily of longnose gar, largemouth bass, channel catfish, and brown bullheads. Bluegill also were important in the catch at Station A, ranking with largemouth bass as the numerically most abundant fish collected. The Station A electrofishing sample was also the most diverse of the winter electrofishing samples with 14 species of fishes collected. The winter electrofishing sample, collected below the dam (Station D), consisted primarily of shiners (satinfin, spottail, and swallowtail) which made up 170 of the 182 fish collected. Only 8 fish were taken at Station B; channel catfish, largemouth bass, and comely shiners.

The winter quarterly fyke net catches were small (Table 3), probably as a result of low water temperatures which generally decrease fish activity. Black crappie were taken in the intake canal, suckermouth redhorse taken in the bypass canal, and channel catfish and gizzard shad were taken in the river at Stations A and D.

Spring

Spring quarterly electrofishing samples were generally more diverse and contained more biomass than winter samples (Table 2). As during the winter, diversity was greatest

TABLE 1. Common and scientific names of fishes collected during 1977 from the Neuse River in the vicinity of the H.F. Lee Steam Electric Plant.

Common Name	Scientific Name	Groups
Longnose gar	<i>Lepisosteus osseus</i>	R
Bowfin	<i>Amia calva</i>	R
American eel	<i>Anguilla rostrata</i>	O
Blueback herring	<i>Alosa aestivalis</i>	A
Hickory shad	<i>Alosa mediocris</i>	A
Alewife	<i>Alosa pseudoharengus</i>	A
American shad	<i>Alosa sapidissima</i>	A
Gizzard shad	<i>Dorosoma cepedianum</i>	R
Threadfin shad	<i>Dorosoma petenense</i>	R
Eastern mudminnow	<i>Umbra pygmaea</i>	O
Redfin pickerel	<i>Esox americanus</i>	S
Chain pickerel	<i>Esox niger</i>	S
Carp	<i>Cyprinus carpio</i>	R
Silvery minnow	<i>Hybognathus nuchalis</i>	M
Bull chub	<i>Nocomis raneyi</i>	M
Golden shiner	<i>Notemigonus crysoleucas</i>	M
Comely shiner	<i>Notropis amoenus</i>	M
Satinfin shiner	<i>Notropis analostanus</i>	M
Spottail shiner	<i>Notropis hudsonius</i>	M
Swallowtail shiner	<i>Notropis proce</i>	M
Creek chubsucker	<i>Erimyzon oblongus</i>	R
Silver redhorse	<i>Moxostoma anisurum</i>	R
Shorthead redhorse	<i>Moxostoma macrolepidotum</i>	R
Suckermouth redhorse	<i>Moxostoma pappillosum</i>	R
White catfish	<i>Ictalurus catus</i>	C
Yellow bullhead	<i>Ictalurus natalis</i>	C
Brown bullhead	<i>Ictalurus nebulosus</i>	C
Channel catfish	<i>Ictalurus punctatus</i>	C
Carolina madtom	<i>Noturus furiosus</i>	C
Tadpole madtom	<i>Noturus gyrinus</i>	C
Margined madtom	<i>Noturus insignis</i>	C
Swamp fish	<i>Chologaster cornuta</i>	O
Pirate perch	<i>Aphredoderus sayanus</i>	O
Mosquitofish	<i>Gambusia affinis</i>	O
White perch	<i>Morone americana</i>	S
Striped bass	<i>Morone saxatilis</i>	A
Flier	<i>Centrarchus macropterus</i>	S
Redbreast sunfish	<i>Lepomis auritus</i>	S
Green sunfish	<i>Lepomis cyanellus</i>	S
Pumpinseed	<i>Lepomis gibbosus</i>	S
Warmouth	<i>Lepomis gulosus</i>	S
Bluegill	<i>Lepomis macrochirus</i>	S
Redear sunfish	<i>Lepomis microlophus</i>	S
Largemouth bass	<i>Micropterus salmoides</i>	S
White crappie	<i>Pomoxis annularis</i>	S
Black crappie	<i>Pomoxis nigromaculatus</i>	S
Tesselated darter	<i>Etheostoma olmstedii</i>	O
Glassy darter	<i>Etheostoma vitreum</i>	O
Yellow perch	<i>Perca flavescens</i>	O

Table 1. (cont.)

Shield darter	<i>Percina peltata</i>	O
Striped mullet	<i>Mugil cephalus</i>	O
Hogchoker	<i>Trinectes maculatus</i>	O
Crappie	<i>Poxomis</i>	S
Darter	<i>Etheostoma</i>	O
Banded sunfishes	<i>Enneacanthus</i>	O
Chubsucker	<i>Erimyzon</i>	R
Minnow family	<i>Cyprinidae</i>	M
Perch family	<i>Percidae</i>	O
Shad species	<i>Alosa</i>	A
Unidentified catfish	<i>Ictaluridae</i>	C
Unidentified herring	<i>Clupeidae</i>	A
Unidentified pickerel	<i>Esox</i>	S
Unidentified redhorse	<i>Moxostoma</i>	R
Unidentified shiner	<i>Notropis</i>	M
Unidentified sucker	<i>Catostomidae</i>	R
Unidentified sunfish	<i>Centrarchidae</i>	S

All fishes collected over 20 mm TL are included in the table. Some early juveniles could not be identified to the species level and are included in groupings at higher taxonomic levels.

Taxa Groups

A = Anadromous fish

M = Minnows

R = Rough fish

C = Catfish

S = Resident sport fish

O = Others

at the upstream station (A), but the difference in catches among transects was decreased. Channel catfish and silver redhorse were the most abundant fishes collected at Station A, redbreast sunfish and bluegill the most abundant in the bypass canal, and gizzard shad followed by bluegill and pumpkinseed the most abundant in the intake canal. Numbers of the various species collected below the dam ranged from 1 to 5 per hour of electrofishing with none particularly more abundant than the other.

Spring (late April) fyke net catches (Table 3) were appreciably larger than February catches. During the last week in April (considered as the spring quarterly sample), bluegill, brown bullhead, channel catfish, shorthead redhorse, and silver redhorse were taken in fyke nets at Station A and bluegill, gizzard shad, and white crappie were taken at Station C. Catches at Stations B and D were larger, consisting of eight and nine species, respectively. White catfish, silver redhorse, black crappie, channel catfish, and gizzard shad were taken at both stations and made up most of the catch. One striped bass was collected at Station D.

Spring Intensive

During the intensive spring sampling effort, hickory shad, American shad, gizzard shad, silver redhorse, shorthead redhorse, striped bass, white perch, channel catfish and longnose gar were taken in gill nets at the upstream river Station (A). Hickory shad were collected only on March 16 (Table 4); and since there were only 3 net sets made prior to this date, hickory shad may have been in the area earlier but were not collected. Subsequent extensive gillnetting did not collect any hickory shad indicating they probably moved back downriver soon after mid-March.

TABLE 2. Numbers and weights (g) of fishes collected per hour of electrofishing from the Neuse River in vicinity of the H.F. Lee Steam Electric Plant.

	STATION							
	A		B		C		D	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Winter Quarter								
Anadromous								
Catfish	12	6,886	4	1,670			4	1,464
Minnow	10	5	2	13	256	93	170	156
Other	2	6			2	24	6	52
Resident sport	28	7,260	2	1,330	14	3,032	2	1
Rough fish	<u>10</u>	<u>8,489</u>			<u>8</u>	<u>9,260</u>		
Total	62	22,646	8	3,013	280	12,625	182	1,673
Spring Quarter								
Adadromous								
Catfish	19	14,684	2	840			3	475
Minnow	4	20	4	6			4	9
Other	3	186	2	6			3	390
Resident sport	14	1,896	30	3,398	34	2,918	7	1,010
Rough fish	<u>22</u>	<u>23,021</u>	<u>20</u>	<u>13,068</u>	<u>34</u>	<u>31,986</u>	<u>10</u>	<u>3,595</u>
Total	62	39,807	58	17,318	68	34,904	33	7,793
Summer Quarter								
Anadromous								
Catfish	12	2,115	6	1,820	6	426	6	30
Minnow	20	56	30	65	72	160	104	261
Other	6	188	10	116	66	21	4	48
Resident sport	48	5,399	70	1,576	42	673	42	5,272
Rough fish	<u>20</u>	<u>16,648</u>	<u>6</u>	<u>3,078</u>	<u>12</u>	<u>868</u>	<u>26</u>	<u>15,997</u>
Total	106	24,406	122	6,655	198	2,148	186	21,618
Fall Quarter								
Anadromous								
Catfish	4	2,114					4	3,988
Minnow	40	100	48	48	82	318	40	71
Other	4	606	4	6	4	35	2	6
Resident sport	112	4,547	54	1,044	124	2,747	174	3,624
Rough fish	<u>10</u>	<u>20,312</u>	<u>8</u>	<u>7,698</u>	<u>24</u>	<u>5,048</u>	<u>4</u>	<u>2,442</u>
Total	170	27,679	114	8,796	234	8,148	224	10,131

Gizzard shad catches during the spring intensive sampling period at the upstream river station (Station A) were greatest during May, although individuals were taken sporadically throughout the spring. Three species of redhorse suckers were collected during the sampling program. The most numerous of these was the silver redhorse which was most abundant at Station A from mid-April to mid-May. Shorthead redhorse were collected somewhat less frequently and were taken earlier in the spring, late February through early April. Suckermouth redhorse were taken occasionally throughout the sampling period. Striped bass and white perch both exhibit spring spawning migrations; striper being anadromous and white perch moving upstream from the lower river. During the intensive sampling program at Station A, white perch were taken from late March through late April and 1 striped bass was taken April 12. Other species abundant at Station A during the intensive sampling program were channel catfish and longnose

TABLE 3. Number of fishes caught in fyke nets at each sampling location (per standard set) in the Neuse River in the vicinity of the H.F. Lee Steam Electric Plant.

	February			March			April					May					August		November	December							
	¹ 17	¹ 18	¹ 29	10	16	22	30	04	08	12	16	20	24	28	02	06	10	14	18	22	26	² 24	² 25	³ 30	³ 1		
STATION A																											
Anadromous							1			1														1			
Catfish	11		2			15	6	2	1	3	3	3	1	1	1	5	38	3	5		26	4				1	
Minnow																											
Other																											
Resident sport							3	2			5	2	2	1	1			5				2	1			1	
Rough fish	$\frac{1}{2}$	0	$\frac{2}{4}$	$\frac{6}{6}$	$\frac{2}{2}$	$\frac{3}{18}$	$\frac{1}{10}$	$\frac{4}{6}$	$\frac{4}{5}$	$\frac{3}{12}$	$\frac{7}{9}$	$\frac{1}{6}$	$\frac{1}{4}$	$\frac{3}{5}$	$\frac{2}{2}$	0	$\frac{2}{3}$	$\frac{1}{6}$	$\frac{1}{44}$	$\frac{5}{8}$	$\frac{2}{7}$	$\frac{2}{30}$	$\frac{1}{6}$	0		$\frac{1}{2}$	
Total																											
STATION B																											
Anadromous																											
Catfish										1	1	1	8		23	9	1		11	6		8					
Minnow																											
Other																											
Resident sport													4	1			13	5	1	6	4		1	3			
Rough fish	$\frac{1}{1}$	0	NS*	0	0	0	0	0	0	1	2	$\frac{1}{3}$	$\frac{2}{13}$	$\frac{1}{3}$	$\frac{1}{24}$	$\frac{2}{24}$	$\frac{1}{8}$	$\frac{1}{21}$	$\frac{4}{22}$	$\frac{12}{22}$	$\frac{2}{2}$	$\frac{1}{10}$	$\frac{5}{8}$		$\frac{1}{1}$	0	
Total																											
STATION C																											
Anadromous																											
Catfish							1			1	1	1			1	1	1										
Minnow																											
Other																											
Resident sport	1	1					4	3	2	15	3	2	2	2	5	2	2	1	1	1	1					1	
Rough fish	$\frac{1}{1}$	$\frac{1}{1}$	0	0	$\frac{1}{1}$	0	$\frac{5}{5}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{15}{15}$	$\frac{4}{8}$	$\frac{14}{17}$	$\frac{2}{4}$	$\frac{2}{2}$	$\frac{5}{6}$	$\frac{2}{11}$	$\frac{1}{4}$	$\frac{2}{2}$	$\frac{1}{2}$	0	1	$\frac{1}{2}$	0		$\frac{1}{2}$	0	
Total																											
STATION D																											
Anadromous																											
Catfish	1		2				1	2		15	7	1	10		1	2			1	30	12	3			1	3	
Minnow																											
Other																											
Resident sport											2		1		2	1	6	1	2	1		4	3				
Rough fish	$\frac{1}{1}$	0	$\frac{2}{2}$	0	0	$\frac{5}{5}$	1	$\frac{3}{5}$	$\frac{1}{15}$	$\frac{1}{14}$	$\frac{5}{7}$	$\frac{6}{16}$	$\frac{3}{4}$	$\frac{2}{4}$	$\frac{2}{10}$	$\frac{8}{8}$	$\frac{6}{8}$	$\frac{7}{27}$	$\frac{17}{19}$	$\frac{2}{32}$	$\frac{3}{19}$	$\frac{4}{10}$		$\frac{1}{1}$	$\frac{3}{3}$		
Total																											

*NS = No samples taken.

¹Winter Quarterly

²Summer Quarterly

³Fall Quarterly

gar. Channel catfish were taken most frequently in fyke nets and were abundant during late March and during May. Longnose gar were collected most frequently during May.

Downstream from the dam (Station D), 1 hickory shad was collected on March 16, the same date hickory shad were taken at Station A. Most American shad were taken from April 12 to May 22; however, 2 were collected on March 10. One alewife and 1 blueback herring were collected at Station D indicating that a few individuals of these species migrate this distance upstream. The presence of only 2 river herring in catches from 38 net days fished during the spawning season indicates that the number reaching this section of river is very small. Ten striped bass were collected from Station D from March 30 through May 18. All of these fish were males in spawning condition, and the total lack of females in the collections suggests that little or no spawning occurs in the area. Channel catfish were taken frequently in Station D catches. As at Station A, most were taken in fyke nets during May. Gizzard shad were abundant from mid-April through the period of intensive sampling. Longnose gar, like channel catfish, were taken most frequently during May. Silver redhorse were taken in Station D gill nets occasionally, but were a large component of the fyke net catches, particularly during April.

Summer

Summer electrofishing catches were 2-6 times larger numerically than were spring catches at all stations. Most of this increase is due to recruitment of young of the year into

TABLE 4. Numbers of fishes caught in gill nets (per standard set) from the Neuse River in the vicinity of the H.F. Lee Steam Electric Plant.

	March					April								May							
	01	10	16	11	30	04	08	12	16	20	24	28	02	06	10	14	18	22	26		
STATION A																					
<u>Large Net</u>																					
Anadromous				1																	
Catfish									2									1			
Minnow																					
Other																					
Resident sport																		1			
Rough fish																					
Total	0	NS*	1	0	0	0	0	2	5	2	1	4	1	1	10	4	11	21	0		
<u>Small Net</u>																					
Anadromous				1											1				3		
Catfish									1										1		
Minnow																			1		
Other																					
Resident sport					1										1	1		1	3		
Rough fish										1	0	0	1	2	1	1	10	3			
Total	0	0	1	1	1	0	0	1	0	1	0	0	2	4	1	1	10	1	0		
STATION D																					
<u>Large Net</u>																					
Anadromous			2	1							3	6		1							
Catfish												1		1	8		2	2	1		
Minnow																		1	1		
Other																					
Resident sport																					
Rough fish					1					1	2	4		2	16	6	2	7	6		
Total	0	2	1	0	1	0	0	0	1	5	11	0	4	24	6	4	10	8	0		
<u>Small Net</u>																					
Anadromous						1		1		1											
Catfish							1			1											
Minnow																					
Other																					
Resident sport															1			1	1	1	
Rough fish											1	1	1	1	1	1	1	8	1	1	
Total	0	0	0	0	0	1	1	1	0	2	1	1	2	1	1	1	1	9	2	2	

*NS = No sample taken.

the catchable population as evidenced by the smaller average weights. Catches among stations were somewhat more similar during the summer than during other electrofishing sampling periods with the large variation in biomass due to the size of silver redhorse, largemouth bass, and channel catfish collected at each station. The reduced size of fishes inhabiting Station C was expected since summer low water conditions reduced much of the intake canal to a depth of less than 0.3 m.

Summer fyke-net catches were similar to spring catches. Channel catfish and silver redhorse were the most abundant fishes taken at Stations A and B, while channel catfish, bluegill, and longnose gar made up most of the catch at Station D. One black crappie and 1 silver redhorse were taken in the Station C fyke net during the summer. The presence of the striped bass at the upstream river station (A) fyke net indicated that at least some individuals of this species remain in the river through the summer.

Although seining was replaced by trawling because of the sampling difficulties, some observations can be made from the data collected (Table 5). Satinfish shiners were the largest component of the upstream river station (A) catches during both sampling weeks. American shad juveniles were collected during the first week of sampling, and juvenile shad, not identifiable below the generic level (*Alosa*), were collected during the second week. Other juveniles collected include bluegill, chain pickerel, channel catfish, gizzard shad, largemouth bass, pumpkinseed, redbreast sunfish, shorthead redhorse, silver redhorse, and unidentified redhorse (probably silver or shorthead). American shad juveniles were collected at Stations A-2 and D in addition to Station A, and one alewife juvenile was collected at Station A-1. Also of interest in the seine sampling was the collection of striped mullet juveniles on two separate occasions downstream from the dam (Station D).

TABLE 5. Fishes collected by seining (number per standard haul) from the Neuse River in the vicinity of the H.F. Lee Steam Electric Plant.

Station:	A		A-1		A-2		B	D		
	6/6 n=2	6/13 n=2	6/6 n=1	6/13 n=1	6/6 n=1	6/13 n=1	6/13 n=1	6/1 n=2	6/6 n=2	6/13 n=2
Date:										
No. of Hauls:										
Andromous	.5	2.5		2		1				2.5
Catfish	.5									
Minnow	13	39	6	17	2	2	6	4.5	11	20
Other	1	1	1	2	1	1		3.5	.5	2
Resident sport	7	10.5	5	5	7	2	8	3.5	6.5	3
Rough fish	5	1		5		1		.5	4.5	1
Total	27	54	12	31	10	7	14	12	22.5	28.5

Spottail shiners and satinfish shiners were the largest components of surface trawl catches (Table 6). Comely shiners were taken in all samples collected, but numbers were somewhat lower. Of the anadromous fishes, 1 alewife was collected while American shad were taken in 6 of the 8 weeks of sampling. The abundance of American shad appeared to decrease through the summer as would be expected. Low catch rates and variations in catch rates for most other species probably reflect the selectivity of the surface trawl.

Of the anadromous fishes, most American shad were taken at Station A-2, followed by Stations D and A-1. One alewife was taken at Station B. Clupeids (herring), which could not be identified below the family level, were taken at all stations sampled except Station D and may represent any of the clupeid species utilizing the area.

Tessellated darter, spottail shiner, and bluegill were the most abundant species collected by bottom trawling during the summer (Table 7). Spottail shiners and tessellated darters decreased in abundance through the season while bluegill increased. The decrease in catches seen during the last weeks of sampling was probably due to decreased trawl efficiency with the higher water levels experienced during that period. Like bluegill, the catches of largemouth bass, black crappie, channel catfish, and white catfish increased from early summer to mid-summer, then decreased. Catches, however, were much smaller than those of bluegill. American shad were taken during the first 3 weeks of sampling, and alewife were taken on July 19 and August 1. Hogchoker were collected on 2

TABLE 6. Fishes collected by surface trawling in the Neuse River in the vicinity of the H.F. Lee Steam Electric Plant. Numbers represent mean number caught per .1-hour tow.

	SAMPLE STATION				
	<u>A</u> No. of Hauls= <u>7</u>	<u>A-1</u> <u>=8</u>	<u>A-2</u> <u>=7</u>	<u>B</u> <u>=7</u>	<u>D</u> <u>=7</u>
Anadromous	.2	.5	2.9	.4	.7
Catfish	.2	.1			1.6
Minnow	1.9	3.1	13.5	18.8	17.5
Other	1.9		.6	.1	1.1
Resident sport	1.9	.2	.6	5.3	1.7
Rough fish	.6	.4	.5	.4	.3
Total	6.7	4.3	18.1	25	22.9

TABLE 7. Fishes collected by bottom trawling in the Neuse River in the vicinity of the H.F. Lee Steam Electric Plant. Numbers represent mean number caught per .1-hour tow.

	SAMPLE STATION				
	<u>A</u> No. of Hauls= <u>9</u>	<u>A-1</u> <u>=10</u>	<u>A-2</u> <u>=10</u>	<u>B</u> <u>=10</u>	<u>D</u> <u>=8</u>
Anadromous		.7	1.2	1.8	1.1
Catfish	2.3	11	12.6	2.7	3.2
Minnow	3.2	44.3	11.5	26.9	38.8
Other	4.6	42.3	34.6	3.1	14.3
Resident sport	10.4	23.7	33.9	80.8	4.2
Rough fish	1.7	5.2	2.3	5.2	3.1
Total	22.2	127.2	96.1	120.5	64.7

sampling dates during August. Shorthead and silver redhorse were taken in low numbers through the sampling period but seemed to decrease somewhat in late August and September.

American shad were collected in bottom trawls at Stations A-1, A-2, and B, while alewives were collected only at Station A-1. These data, when combined with surface trawl and seine data, indicate all areas sampled are utilized by American shad juveniles, while alewives are less abundant.

Fall

Fall quarterly electrofishing catches were generally similar to summer catches. The continued recruitment of young of the year decreased the average weight of several species, particularly the sunfishes. No anadromous species were collected during the fall sample period probably indicating their movement out of the area. The biomass of fish taken at Station C had increased somewhat from the summer collections, probably as a result of the increased water depth enabling larger fish to occupy the area.

Fall fyke-net catches were small consisting of a carp and a white catfish at Station A, 4 channel catfish at Station D, a gizzard shad and a white crappie at Station C, and 1 silver redhorse at Station B. These low catch rates were expected since decreasing fall water temperatures were expected to decrease fish activity.

Quaker Neck Dam and Fish Populations

The quaker neck dam appears to have little effect on Neuse River fish populations. Sampling above and below the dam indicated abundance of resident species was similar and influenced primarily by habitat. Tagged fish moved in both directions across the dam or through the fish ladder (CP&L 1978). Of the anadromous fishes collected, hickory shad were collected on a single date both above and below the dam. Numbers evidently were low; only 1 specimen was collected from each locality suggesting few hickory shad are presently moving this distance upriver.

Adult American shad were collected both above and below the dam. More adults were collected below (Station D) than from above the dam; however, more eggs and larvae were taken above the dam (CP&L, 1978). Juvenile American shad collected by trawling and seining were taken in similar numbers above and below the dam. One alewife and one blueback herring were taken below the dam in gill nets. The presence of only two river herring catches from 38 net days fished during the spawning season indicates that the number reaching this section of river is very small. One juvenile alewife was collected by trawling above the dam indicating some alewife move above the dam prior to spawning. Striped bass adults were collected both above and below the dam during the spring with numbers larger below the dam. All fish collected were males, and the lack of females in the collection suggests that little or no spawning occurs in the area.

Other observations of note are the collection of hogchoker above the dam and reports of fishermen "snatching" American shad out of the fish ladder. Hogchoker are normally found in lower reaches of rivers and estuaries and collecting them above the dam suggest the fish negotiated the dam in moving upstream from the estuary. The snatching of American shad from the fish ladder indicates an abundance of shad using the ladder.

SUMMARY AND CONCLUSION

The fish population in the Neuse River is typical of coastal plain rivers with 52 species collected. The collection of blueback herring and hogchoker apparently are new records for this section of river and the threadfin shad collected is a new record for the drainage. Several Carolina madtoms, a species classified as of special concern in North Carolina, were collected during the study. Some of these were young-of-the-year indicating reproduction was occurring.

Considerable spawning of American shad and redhorse suckers occurred during the spring, and sunfish and minnows spawned extensively in this section of the river during the summer.

Both adult and juvenile fish collections indicated that the Quaker Neck Dam had little effect on distribution, movement, or reproduction of fishes, at least during the 1977 study year.

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