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A Duke Energy Company

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M. S. Tuckman
Executive Vice President
Nuclear Generation

February 8,2002

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555

Subject: Response to Requests for Additional Information in Support of the Staff Review of the Application to Renew the Facility Operating Licenses of McGuire Nuclear Station, Units 1 & 2 and Catawba Nuclear Station, Units 1 & 2

Docket Nos. 50-369, 50-370, 50-413 and 50-414

Dear Sir:
By letter dated June 13, 2001, Duke Energy Corporation (Duke) submitted an Application to Renew the Facility Operating Licenses of McGuire Nuclear Station and Catawba Nuclear Station (Application). The staff is reviewing the information provided in the Application and by letter dated December 12, 2001 identified areas where additional information is needed to complete its review of the Catawba Environmental Report contained within the Application. Duke responses to the requests for additional information are provided in Attachment 1 to this letter. Attachments 2, 3, and 4 provide additional information in support of the responses provided in Attachment 1. None of the responses in these attachments contain any commitments.

If there are any questions, please contact Bob Gill at (704) 382-3339.

Very truly yours,

M. S. Tuckman

M. S. Tuckman

Attachments

A085

Affidavit

M. S. Tuckman, being duly sworn, states that he is Executive Vice President, Nuclear Generation Department, Duke Energy Corporation; that he is authorized on the part of said Corporation to sign and file with the U. S. Nuclear Regulatory Commission the attached responses to staff requests for additional information relative to its review of the Application to Renew the Facility Operating Licenses of McGuire Nuclear Station and Catawba Nuclear Station, Docket Nos. 50-369, 50-370, 50-413 and 50-414 dated June 13, 2001, and that all the statements and matters set forth herein are true and correct to the best of his knowledge and belief. To the extent that these statements are not based on his personal knowledge, they are based on information provided by Duke employees and/or consultants. Such information has been reviewed in accordance with Duke Energy Corporation practice and is believed to be reliable.

M. S. Tuckman
M. S. Tuckman, Executive Vice President
Duke Energy Corporation

Subscribed and sworn to before me this 8TH day of February 2002.

Mary P. Nelms
Notary Public

My Commission Expires:

JAN 22, 2006

xc: (w/ Attachments)

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Attachment 1
Application to Renew the Operating Licenses of
McGuire Nuclear Station and Catawba Nuclear Station

Responses to NRC Requests for Additional Information
Concerning the Catawba Environmental Report
NRC Letter dated December 12, 2001

Application to Renew the Operating Licenses of
McGuire Nuclear Station and Catawba Nuclear Station

Responses to NRC Requests for Additional Information
Concerning the Catawba Environmental Report
NRC Letter dated December 12, 2001

Attachment 1

Response to Environmental RAI's

Attachment 1
Application to Renew the Operating Licenses of
McGuire Nuclear Station and Catawba Nuclear Station

Responses to NRC Requests for Additional Information
Concerning the Catawba Environmental Report
NRC Letter dated December 12, 2001

Environmental RAI 1
Provide a detailed written description of the aquatic ecology surveys conducted after the completion of the studies conducted for the 316(a) demonstration. The description should be written chronologically, with changes in the monitoring program described. At a minimum this should include:

- for fish species in Lake Wylie, a description of the methods used (such as gill netting, electro-fishing, purse seine), the timing of each survey, and locations surveyed; and

- similar information for surveys of benthic organisms, planktonic species, and other aquatic invertebrates is also requested.

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Response to Environmental RAI 1
There were no aquatic ecology surveys conducted for benthic organisms, planktonic species, and other aquatic invertebrates after the completion of the studies conducted for the 316(a) demonstration.

However, aquatic ecology surveys for fish species were performed after the completion of the 316(a) studies. The detailed description of the aquatic ecology surveys conducted for fish species is provided below.

Detailed Description of the Aquatic Ecology Surveys Conducted for Fish Species:
Subsequent to the submittal of the *Catawba Nuclear Station , Supplemental 316(a) Demonstration Data* dated January 1993, fisheries monitoring studies at the Catawba Nuclear Station (CNS) discharge, Location 215, and uplake reference, Location 216, were performed during 1991 and from 1993 through 1996. Since the post-1990 monitoring was not required, these data have not been summarized in a report.

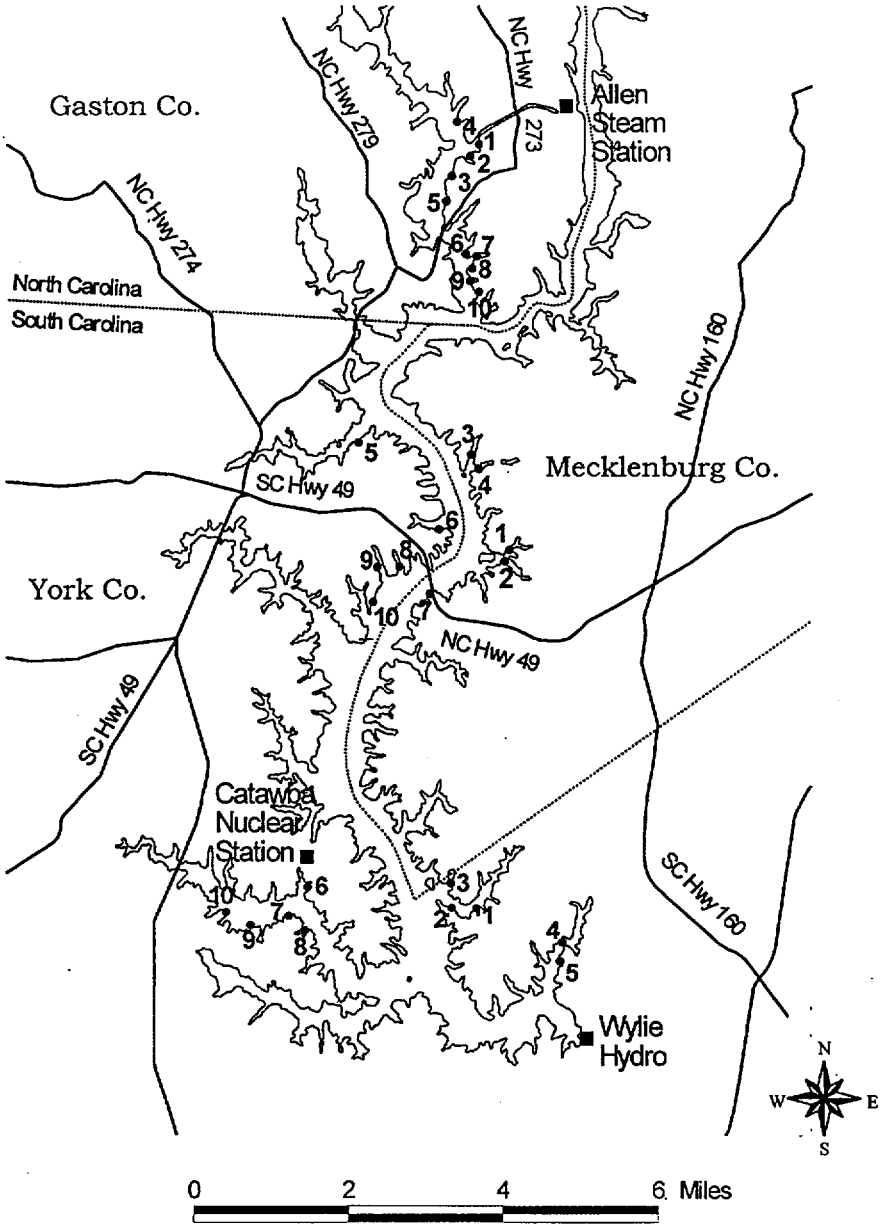
Additionally, littoral (shoreline electrofishing) and limnetic (hydroacoustics and purse seine) fish community assessments were conducted on Lake Wylie during 1993 through 1997 and in 2000, as part of a watershed sampling program for the Catawba River reservoirs in North and South Carolina. A portion of the littoral fish community data collected during 1993 through 1997 are summarized in the October 2000 Duke Power Report "The Catawba". The limnetic fish community data collected during 1993 through 1997 are summarized in the Duke Power report *Catawba River Forage Fish Densities, Population Estimates, and Species Composition: 1993 –1997.* The littoral and limnetic fish community data collected during 2000 have not been summarized in a report.

The *Catawba Nuclear Station , Supplemental 316(a) Demonstration Data* report summarized the results of Lake Wylie fisheries sampling through 1990.

Table 1 presents a chronological listing of fisheries sampling conducted on Lake Wylie since 1990. Table 1 also provides a description of changes in the monitoring programs.

Table 1 Description of Sampling – Years 1991 through 2000

Year	Description of Sampling	Description of Sampling Methods
1991	Post 316(a) Maintenance Monitoring Program for CNS: Boat-mounted electrofishing of 1000 m of shoreline during the winter and spring at Location 215 (CNS discharge) and spring at Location 216 (uplake reference area). These same locations (Locations 215 and 216) were used in the 316(a) studies.	Boat-mounted electrofishing gear was used to sample the littoral fish community of Lake Wylie. Sampling of 1000 m of shoreline was conducted during the winter and spring at Locations 215 and 216. Collected fishes were sorted and enumerated by species, measured for individual total length (mm) and returned to the water alive.
1992	No fisheries sampling was conducted during 1992.	N/A
1993 through 1996	Post 316(a) Maintenance Monitoring Program for CNS: Boat-mounted electrofishing of 1000 m of shoreline during the spring and fall at Locations 215 (CNS discharge) and 216 (uplake reference area).	Same methods as used in 1991 sampling.
1993 through 1997 and 2000	Littoral (shoreline electrofishing) and limnetic (hydroacoustics and purse seine) fish community assessments were conducted as part of a Catawba River watershed sampling program. The Littoral fish community assessments consisted of the following areas: Ten 300-m shoreline transects were electrofished during the spring in each of three areas of the reservoir: Big Allison Creek/lower main lake, vicinity of Buster Boyd Bridge (NC Highway 49 crossing) and South Fork Catawba River arm (total of 30 transects lakewide). See RAI 1 Figure 1 for sampling locations. The Limnetic fish community assessments consisted of fall hydroacoustics sampling of the entire reservoir for estimation of limnetic fish population. Concurrent purse seine sampling was conducted to determine species composition and size distribution of limnetic population.	See Attachment 2, Duke Power report *Catawba River Forage Fish Densities, Population Estimates, and Species Composition: 1993 – 1997*, for sampling methods.



RAI 1 - Figure1
Sampling locations for the watershed littoral fish community assessments conducted on Lake Wylie, NC/SC during 1993 through 1997 and in 2000.

Environmental RAI 2
Provide any documents summarizing the results of these surveys (referenced in #1, above) that have been published since the 316(a) report, supplement, and addendum, not including the October 2000 Duke Power Report "The Catawba" (which summarizes data through 1997).

If no published documents are available, provide tabular summaries of the results of the aquatic monitoring for fish, benthic, planktonic, and invertebrate species in Lake Wylie.

Response to Environmental RAI 2
As described in the response to RAI 1, there were no aquatic ecology surveys conducted for benthic organisms, planktonic species, and other aquatic invertebrates after the completion of the studies conducted for the 316(a) demonstration.

The documents summarizing the results of the aquatic ecology surveys conducted for fish species since the 316(a) report, supplement, and addendum, not including the October 2000 Duke Power Report "The Catawba," are summarized below.

1993 through 1997 and 2000 watershed limnetic fish community data:
Data collected from 1993 through 1997 is summarized in Attachment 2, Duke Power report *Catawba River Forage Fish Densities, Population Estimates, and Species Composition: 1993 –1997.* Data for 2000 have not been analyzed and are not available.

1993 through 1997 and 2000 watershed littoral fish community data:
Data collected from 1993 through 1997 data is summarized in the October 2000 Duke Power Report "The Catawba". Additional electrofishing data from 1993 through 1997 and 2000 in the vicinity of Locations 215 and 216 is summarized in Attachment 3.

1991 and 1993 through 1996 post 316(a) Maintenance Monitoring data:
No report was published. The referenced data is summarized in Attachment 3 and in Attachment 4.

Environmental RAI 3
Provide a summary of the results of the survey conducted on the downstream stretch of the Catawba river to determine the presence of the Carolina heelsplitter (*Lasmisgona decorata*), conducted by the USFWS and the SCDNR on October 26, 2001.

Response to Environmental RAI 3
On October 26, 2001, representatives of the US Fish and Wildlife Service, NC Department of Environment and Natural Resources, NC Department of Transportation, and ENTRIX participated in a field survey for the federally endangered Carolina Heelsplitter mussel (*Lasmigona decorata*) in four areas below the Lake Wylie Dam. Personnel searched the areas using snorkeling, viewing scopes, and examination of the substrate by hand. Live mussels and relic shells were collected, identified and counted.

Seven species of mussels/species groups were collected, but no Carolina Heelsplitters were observed. The sample locations and the species collected (with the exception of the ubiquitous introduced Asiatic Clam- *Corbicula fluminea*) are listed below:

1. Catawba River immediately below Lake Wylie Dam:
   Strophitis undulatas- creeper
   Elliptio complanata- eastern elliptio
   Elliptio producta/angustata- Atlantic spike/Carolina lance
   Pyganodon cataracta- eastern floater
   Utterbackia imbecillis- paper pondshell
   Villosa delumbis- eastern Creekshell

2. Catawba River I-77 Bridge
   Elliptio complanata- eastern elliptio
   Elliptio producta/angustata- Atlantic spike/Carolina lance

3. Landsford Canal State Park - (Water was too turbid to perform survey)

4. Twelve Mile Creek at Highway US521 (near Hancock, SC)
   Elliptio complanata- eastern elliptio
   Villosa delumbis- eastern creekshell

Environmental RAI 4
Provide population by annular rings (10 mile increments out to 50 miles from the site) for 1990 and 2000 and projections out to 2030, if possible.

Response to Environmental RAI 4
Table 4-1 through Table 4-10 provide the population information for the area requested for the year 2000 and projections for years 2010, 2020, 2030, and 2040. The University of North Carolina at Charlotte Department of Geography and Earth Sciences was contracted to develop the projections for the years 2010, 2020, 2030 and 2040. The projections were based on the year 2000 census population information.

Table 4-1 Catawba Nuclear Station
Year 2000 Population Distribution 0 – 10 Miles

SECTOR	0-1 MILE	1-2 MILE	2-3 MILE	3-4 MILE	4-5 MILE	5-10 MILE
N	17	96	85	874	1,122	3,508
NNE	4	18	161	636	638	2,534
NE	13	67	128	301	361	11,508
ENE	11	70	118	285	676	7,143
E	30	48	523	465	969	4,992
ESE	11	47	1,745	827	165	10,410
SE	9	51	778	663	489	7,392
SSE	9	26	414	746	980	30,637
S	9	109	221	684	1,096	14,933
SSW	11	73	506	263	672	4,569
SW	6	27	210	386	253	2,822
WSW	14	16	25	98	397	4,340
W	21	57	115	334	555	3,013
WNW	18	113	202	193	592	4,582
NW	12	78	220	247	301	1,799
NNW	11	64	168	166	162	3,197
TOTAL	206	960	5,619	7,168	9,428	117,379

Table 4-2 Catawba Nuclear Station
Year 2010 Projected Population Distribution 0 – 10 Miles

SECTOR	0-1 MILE	1-2 MILE	2-3 MILE	3-4 MILE	4-5 MILE	5-10 MILE
N	23	130	112	932	1,545	4,497
NNE	7	28	161	773	724	3,374
NE	15	103	137	461	578	18,613
ENE	14	80	111	316	1,149	12,875
E	38	62	922	750	1,582	6,100
ESE	11	47	2,090	998	178	13,266
SE	13	67	974	677	543	10,574
SSE	14	27	481	792	1,133	33,099
S	15	142	273	1,010	1,336	18,197
SSW	21	111	673	316	871	6,112
SW	10	41	206	392	330	4,046
WSW	18	20	27	152	559	5,609
W	24	75	185	587	802	4,306
WNW	21	154	296	243	875	5,375
NW	15	92	306	374	350	2,306
NNW	14	56	190	199	212	3,787
TOTAL	273	1,235	7,144	8,972	12,767	152,136

Table 4-3 Catawba Nuclear Station
Year 2020 Projected Population Distribution 0 – 10 Miles

SECTOR	0-1 MILE	1-2 MILE	2-3 MILE	3-4 MILE	4-5 MILE	5-10 MILE
N	29	164	140	991	1,976	5,499
NNE	10	38	179	912	820	4,272
NE	17	140	154	633	799	25,743
ENE	17	90	104	347	1,630	18,821
E	46	77	1,333	1,038	2,195	7,594
ESE	13	48	2,435	1,171	201	16,436
SE	17	83	1,172	694	597	14,523
SSE	19	31	548	843	1,299	36,290
S	21	178	333	1,338	1,601	22,159
SSW	31	149	840	369	1,070	7,732
SW	14	56	202	398	434	5,304
WSW	22	24	29	206	727	7,000
W	27	93	255	840	1,071	5,625
WNW	24	197	390	295	1,163	6,320
NW	18	109	392	501	442	2,912
NNW	17	51	212	236	264	4,430
TOTAL	342	1,528	8,718	10,812	16,289	190,660

Table 4-4 Catawba Nuclear Station
Year 2030 Projected Population Distribution 0 – 10 Miles

SECTOR	0-1 MILE	1-2 MILE	2-3 MILE	3-4 MILE	4-5 MILE	5-10 MILE
N	35	198	170	1,101	2,408	6,551
NNE	13	48	216	1,056	921	5,182
NE	19	177	171	805	1,031	32,915
ENE	20	101	97	378	2,111	24,783
E	54	93	1,749	1,330	2,811	9,294
ESE	15	49	2,782	1,351	230	19,815
SE	21	99	1,370	736	652	18,504
SSE	24	35	621	894	1,471	40,148
S	27	214	399	1,671	1,866	26,549
SSW	41	187	1,007	422	1,274	9,417
SW	18	72	201	404	538	6,571
WSW	26	30	31	260	898	8,504
W	30	111	325	1,093	1,360	6,972
WNW	27	240	484	347	1,451	7,327
NW	21	126	478	628	534	3,555
NNW	20	47	234	274	321	5,159
TOTAL	411	1,827	10,335	12,750	19,877	231,246

Table 4-5 Catawba Nuclear Station
Year 2040 Projected Population Distribution 0 – 10 Miles

SECTOR	0-1 MILE	1-2 MILE	2-3 MILE	3-4 MILE	4-5 MILE	5-10 MILE
N	41	232	201	1,224	2,841	7,671
NNE	16	58	260	1,201	1,029	6,098
NE	21	214	188	977	1,263	40,180
ENE	23	115	90	409	2,592	30,755
E	62	110	2,171	1,622	3,428	11,116
ESE	17	50	3,153	1,531	259	23,321
SE	25	115	1,568	793	713	22,502
SSE	29	39	714	945	1,644	44,544
S	33	250	465	2,008	2,131	31,378
SSW	51	225	1,174	475	1,481	11,130
SW	22	89	206	410	642	7,841
WSW	30	36	33	317	1,077	10,034
W	33	129	395	1,346	1,649	8,330
WNW	30	283	578	399	1,739	8,385
NW	24	143	564	755	626	4,211
NNW	23	43	256	313	379	5,897
TOTAL	480	2,131	12,016	14,725	23,493	273,393

Table 4-6 Catawba Nuclear Station
Year 2000 Population Distribution 0 – 50 Miles

SECTOR	0-10 MILE	10-20 MILE	20-30 MILE	30-40 MILE	40-50 MILE	TOTAL
N	5,702	43,427	23,065	28,368	46,692	147,254
NNE	3,991	35,407	42,232	56,392	28,515	166,537
NE	12,378	127,949	130,786	96,881	52,611	420,605
ENE	8,303	147,588	116,057	20,124	18,317	310,389
E	7,027	75,347	51,153	26,587	9,127	169,241
ESE	13,205	10,577	16,860	12,113	10,726	63,481
SE	9,382	7,349	19,247	14,455	10,594	61,027
SSE	32,812	11,266	11,637	12,076	2,971	70,762
S	17,052	7,231	3,187	1,931	10,265	39,666
SSW	6,094	3,162	16,858	1,212	1,759	29,085
SW	3,704	3,307	2,702	12,341	5,837	27,891
WSW	4,890	7,842	1,827	10,728	13,295	38,582
W	4,095	4,380	6,914	32,500	78,377	126,266
WNW	5,700	6,064	20,886	28,923	31,040	92,613
NW	2,657	18,804	36,309	22,818	8,850	89,438
NNW	3,768	76,774	24,572	28,968	54,546	188,628
TOTAL	140,760	586,474	524,292	406,417	383,522	2,041,465

Table 4-7 Catawba Nuclear Station
Year 2010 Projected Population Distribution 0 – 50 Miles

SECTOR	0-10 MILE	10-20 MILE	20-30 MILE	30-40 MILE	40-50 MILE	TOTAL
N	7,239	48,498	27,212	36,262	57,506	176,717
NNE	5,067	43,287	66,719	82,204	37,614	234,891
NE	19,907	136,766	190,222	123,991	61,815	532,701
ENE	14,545	169,329	148,836	25,282	21,616	379,608
E	9,454	115,457	73,711	33,424	10,610	242,656
ESE	16,590	14,582	21,829	14,755	13,455	81,211
SE	12,848	9,412	21,782	16,827	12,805	73,674
SSE	35,546	13,353	13,513	13,496	3,848	79,756
S	20,973	8,286	4,043	2,063	10,851	46,216
SSW	8,104	3,825	17,764	1,250	1,841	32,784
SW	5,025	4,026	2,775	11,560	6,147	29,533
WSW	6,385	8,751	2,254	12,147	15,487	45,024
W	5,979	5,544	8,552	37,124	87,241	144,440
WNW	6,964	7,180	25,438	33,781	33,978	107,341
NW	3,443	21,678	41,391	25,448	10,453	102,413
NNW	4,458	84,155	28,202	34,926	63,935	215,676
TOTAL	182,527	694,129	694,243	504,540	449,202	2,524,641

Table 4-8 Catawba Nuclear Station
Year 2020 Projected Population Distribution 0 – 50 Miles

SECTOR	0-10 MILE	10-20 MILE	20-30 MILE	30-40 MILE	40-50 MILE	TOTAL
N	8,799	55,032	31,850	44,621	69,656	209,958
NNE	6,231	52,347	92,170	109,052	47,438	307,238
NE	27,486	149,286	251,355	152,935	72,337	653,399
ENE	21,009	193,135	183,068	30,655	25,274	453,141
E	12,283	155,881	97,285	40,987	12,326	318,762
ESE	20,304	18,738	27,270	17,617	16,696	100,625
SE	17,086	11,591	25,370	19,519	15,584	89,150
SSE	39,030	15,719	15,699	15,257	4,817	90,522
S	25,630	9,624	4,970	2,300	12,037	54,561
SSW	10,191	4,590	19,501	1,417	2,010	37,709
SW	6,408	4,790	3,004	11,411	6,714	32,327
WSW	8,008	9,831	2,720	14,150	18,167	52,876
W	7,911	6,829	10,334	43,149	99,804	168,027
WNW	8,389	8,429	30,421	39,155	37,879	124,273
NW	4,374	25,359	47,871	28,708	12,240	118,552
NNW	5,210	93,818	32,385	41,495	75,039	247,947
TOTAL	228,349	814,999	875,273	612,428	528,018	3,059,067

Table 4-9 Catawba Nuclear Station
Year 2030 Projected Population Distribution 0 – 50 Miles

SECTOR	0-10 MILE	10-20 MILE	20-30 MILE	30-40 MILE	40-50 MILE	TOTAL
N	10,463	62,276	36,718	53,241	82,379	245,077
NNE	7,436	61,834	117,885	136,419	57,585	381,159
NE	35,118	164,395	313,313	183,279	83,736	779,841
ENE	27,490	218,499	218,053	36,242	29,190	529,474
E	15,331	196,845	121,322	48,836	14,172	396,506
ESE	24,242	22,917	32,872	20,550	20,208	120,789
SE	21,382	13,847	29,565	22,442	18,630	105,866
SSE	43,193	18,260	18,107	17,205	5,858	102,623
S	30,726	11,134	5,987	2,557	13,510	63,914
SSW	12,348	5,419	21,748	1,619	2,231	43,365
SW	7,804	5,583	3,385	11,614	7,460	35,846
WSW	9,749	11,110	3,194	16,407	21,178	61,638
W	9,891	8,219	12,194	49,920	114,637	194,861
WNW	9,876	9,761	35,578	44,907	42,508	142,630
NW	5,342	29,511	55,070	32,475	14,132	136,530
NNW	6,055	105,078	36,925	48,608	87,221	283,887
TOTAL	276,446	944,688	1,061,916	726,321	614,635	3,624,006

Table 4-10 Catawba Nuclear Station
Year 2040 Projected Population Distribution 0 – 50 Miles

SECTOR	0-10 MILE	10-20 MILE	20-30 MILE	30-40 MILE	40-50 MILE	TOTAL
N	12,210	70,092	41,786	62,015	95,510	281,613
NNE	8,662	71,707	143,832	164,162	67,998	456,361
NE	42,843	181,168	375,921	214,606	95,774	910,312
ENE	33,984	245,227	253,630	41,970	33,303	608,114
E	18,509	238,123	145,682	56,854	16,160	475,328
ESE	28,331	27,138	38,546	23,533	23,855	141,403
SE	25,716	16,128	34,000	25,524	21,817	123,185
SSE	47,915	21,107	20,664	19,294	6,912	115,892
S	36,265	12,766	7,040	2,828	15,182	74,081
SSW	14,536	6,291	24,219	1,833	2,491	49,370
SW	9,210	6,399	3,807	12,228	8,328	39,972
WSW	11,527	12,525	3,677	18,787	24,329	70,845
W	11,882	9,625	14,117	57,040	131,100	223,764
WNW	11,414	11,134	40,899	51,046	47,486	161,979
NW	6,323	33,977	62,793	36,633	16,126	155,852
NNW	6,911	117,384	41,694	55,975	100,045	322,009
TOTAL	326,238	1,080,791	1,252,307	844,328	706,416	4,210,080

Application to Renew the Operating Licenses of
McGuire Nuclear Station and Catawba Nuclear Station

Responses to NRC Requests for Additional Information
Concerning the Catawba Environmental Report
NRC Letter dated December 12, 2001

Attachment 2

Catawba River Forage Fish Densities, Population Estimates, and Species Composition: 1993 - 1997

Attachment 2
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Catawba River Forage Fish Densities, Population Estimates, and Species Composition: 1993 - 1997

Duke Power Company
Group Environment, Health and Safety
Scientific Services Section

INTRODUCTION

Gizzard shad (*Dorosoma cepedianum*) and threadfin shad (*Dorosoma petenense*) are widely distributed clupeids that have tremendous value as forage fish in southern reservoirs (Noble 1981). Investigations of clupeid population size may provide information associated with seasonal changes in clupeid abundance, entrainment and impingement at water withdrawal facilities, effectiveness as forage for predatory fish, and plankton dynamics. This information is of tremendous value to Duke Power Company, North Carolina Wildlife Resources Commission, and South Carolina Department of Natural Resources; thus this study was initiated. This study employed hydroacoustic techniques and purse seining to estimate the density, population size, and taxa composition of forage fish in nine Catawba River reservoirs from 1993 to 1997.

METHODS

Study Locations - Nine Catawba River reservoirs (James, Rhodhiss, Hickory, Lookout, Norman, Mountain Island, Wylie, Fishing Creek, and Wateree) in North and South Carolina were sampled annually from 1993 through 1997 during late summer to early fall. The entire river system will be sampled again in 2000 and every three years thereafter (Lake Norman was sampled in 1998 and Lakes Norman, Mt. Island, and Wylie were sampled in 1999). Sampling typically consisted of a mid-channel transect running from the forebay of the dam to the influent; significant side channels (creeks) were also sampled. All lakes were treated as a single zone for the generation of an average forage fish density with the exception of Lakes Norman and Wylie. The large size, spatial heterogeneity, multiple power generation facilities, and significant inflow (Wylie) necessitated the division of Lakes Norman and Wylie into six and four zones, respectively (Figure 1, Siler et al. 1986, McInerny and Degan 1991). Lake surface areas (hectares) were calculated by Geographic Information System analysis of United States Geological Survey 1:100,000 digital line graphs.

Hydroacoustic Data Collection and Analysis - The collection and processing of hydroacoustic data for this study coincided with an era of great technological advance in

portable computers and hydroacoustic equipment. Accordingly, a specific data collection system was rarely used for more than two years, so collection methods and analyses will be discussed by year(s). All mobile hydroacoustic surveys were conducted at night. All transducer systems were calibrated using US Navy standards at the BioSonics Laboratory, Seattle, Washington, and standardized with a tungsten carbide reference sphere as a standard target prior to sampling.

Hydroacoustic sampling in 1993 and 1994 was conducted with 200-kHz 6x15° nominal dual-beam, bow-mounted analog transducer with two echo signal processors to simultaneously capture dual-beam target strength and echo integration information. Echo integration processing parameters were set to collect data from 2 m below the surface to 1 m above the bottom. The mean back-scattering cross section was calculated by dual-beam analysis. The mean back-scattered cross section for each reservoir was used to scale the total back-scattered voltage (echo integration) for each 1-meter depth strata and ¼-km interval to arrive at fish densities (number/hectare).

Hydroacoustic sampling in 1995 employed the same equipment as in 1993-1994 in combination with a 200-kHz digital transducer system and a 6° single-beam transducer aboard a second boat. On larger reservoirs one-half of the data was collected with each system; on smaller reservoirs a single system was used. The digital transducer collected data from 2 m below the water surface to the bottom. The mean back-scattering cross section was calculated with an expectation, maximization, and smoothing algorithm (EMS) developed by John Hedgepeth, Biosonics, Inc. Echo integration methodology was similar to that used previously.

Hydroacoustic surveys in 1996 and 1997 employed a multiplexing 200-kHz digital transducer system. This multiplexing system consisted of side-scan 6° single-beam (ensonifying the top 2 m of the water column) and down-looking 6x15° dual-beam (ensonifying from 2 m to bottom) transducers to detect surface-oriented and deeper fish, respectively. Dual-beam analysis was used to determine acoustic size of single fish targets (EMS techniques were used on the side-scan data) and echo integration was used to measure relative fish density. Surface fish densities (from 0 to 2 m deep) were added

to deeper fish densities (2 m to bottom) to arrive at total fish densities for each ¼-km interval.

Hydroacoustic data collected in 1993 through 1995 did not account for forage fish near the surface and were not comparable to multiplexed data collected in 1996 and 1997. Analysis of 1997 Catawba River hydroacoustic data demonstrated a one-to-one relationship between fish density in the 2 to 3 m depth strata and the top two meters of the water column. This relationship was applied to the 1993 through 1995 data to correct fish densities to include estimated fish near the surface. All data reported herein account for forage fish near the surface, whether measured or estimated.

Purse Seine Sampling - Forage fish species composition and length frequencies were sampled with a 4.8-mm (3/16 in) mesh purse seine measuring 118 x 9 m (400 x 30 ft). Purse seine samples were generally collected from two locations (three in Lake Norman) during late summer to early fall in reservoirs with maximum depths exceeding 9 m. Fishing Creek reservoir was too shallow to sample without damage to the net.

Non-forage fish (e.g., catfish, crappie, white bass, bluegill, etc.) were sorted, measured (TL, mm), and released; the remaining volume or weight of forage fish was measured. A subsample of forage fish (usually at least 200 individuals) was measured and preserved for laboratory analyses. Forage fish were processed by determining taxa composition and size distribution (TL, mm). The number of forage fish in the entire purse seine haul was estimated by expanding the number of fish in the subsample, based on the ratio of the subsample to the entire forage fish haul.

RESULTS AND DISCUSSION

Catawba River - Estimated forage fish densities in nine Catawba River reservoirs from 1993 to 1997 ranged from 870 to 322,324 (Table 1, Figure 2). For comparative purposes, a single density (based on the sum of population estimates for individual zones divided by the total lake surface area) was calculated for Lakes Norman and Wylie (Lakes Norman and Wylie will subsequently be discussed in more detail due to their spatial heterogeneity and division into sampling zones). Forage fish densities exhibit high variability from year to year on all reservoirs except James. The estimated number of forage fish in nine Catawba River reservoirs from 1993 to 1997 ranged from 994,407 to 1,540,837,649 (Table 1, Figure 3).

Purse seine sampling for forage fish species composition yielded variable percentages of gizzard and threadfin shad in Catawba River reservoirs from 1993 to 1997 (Table 2). For example, Lake James gizzard shad comprised 0.12 and 100.00 % of the forage fish in 1993 and 1994, respectively. The percentage of gizzard shad remained extremely high in Lake James through 1996 and then dipped to approximately 81% in 1997. Similar results were also observed in Lakes Rhodhiss, Hickory, and Lookout Shoals although the decline in percentages of gizzard shad in Lakes Hickory and Lookout Shoals in 1997 was very extreme. Even Lake Wateree, the most southerly of the Catawba River reservoirs, demonstrated this same gizzard shad trend, although to a lesser degree. Variable species composition was most likely due to winter climatic conditions influencing water temperatures on reservoirs that receive no heated effluents. Threadfin shad succumb to cold stress at water temperatures of 9 °C and below (Strawn 1965, Griffith 1978). Lakes Norman, Mt. Island, and Wylie receive heated effluents that provide winter refugia for the overwinter survival of threadfin shad populations. The percentage of threadfin shad in these three reservoirs has typically remained quite high from 1993 to 1997.

Forage fish length frequency distributions (in 5-mm size classes) for each reservoir from 1993 to 1997 are presented in Appendix 1.

Lake Norman - Purse seine sampling identified threadfin shad as the dominant forage fish from 1993 to 1997 on Lake Norman (Table 2). Threadfin shad comprised from 99.94 to 100.00 % of the forage fish in the purse seine hauls.

Threadfin shad densities (number / hectare) in the six zones of Lake Norman were variable and ranged from 1,102 to 99,845 during 1993 to 1997 (Table 3). Within a given year threadfin shad densities were generally higher uplake than downlake, though several large creeks and the limited amount of 'sampleable' habitat in Zone 6 (the most uplake zone) sometimes complicated this trend. Higher densities of forage fish in uplake regions have been demonstrated previously on Lake Norman (Siler et al. 1986) and in Missouri reservoirs (Michaletz and Gale 1999). Average forage fish densities for nine Catawba River reservoirs indicate that Lake Norman densities typically exceed those for Lookout Shoals and Mt. Island reservoirs (the immediate upstream and downstream reservoirs, respectively) and are comparable with those measured elsewhere on the Catawba River. Lake Norman threadfin shad population estimates ranged from approximately 65 million to 670 million fish from 1993 to 1997 (Table 3).

Lake Wylie - Purse seine sampling identified threadfin shad as the dominant forage fish from 1993 to 1997 on Lake Wylie (Table 2). Threadfin shad comprised from 99.77 to 100.00 % of the forage fish in the purse seine hauls.

Threadfin shad densities (number / hectare) in the four zones of Lake Wylie were variable and ranged from 1,692 to 156,657 during 1993 to 1997 (Table 4). Lake Wylie threadfin shad did not exhibit a greater density uplake compared to downlake; in fact the reverse was true. With the exception of 1993, threadfin shad densities were greater downlake than uplake. Lake Wylie forage fish densities exceeded those of Mt. Island and Fishing Creek (the immediate upstream and downstream reservoirs, respectively) on all occasions except for Fishing Creek in 1994 and 1997. Lake Wylie threadfin shad population estimates ranged from approximately 15 million to 403 million fish from 1993 to 1997 (Table 4).

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Table 1. Forage fish densities, population estimates, and 95% confidence limits in Catawba River reservoirs as estimated by hydroacoustic sampling from 1993 - 1997 (Lakes Norman and Wylie are listed separately).

		James	Rhodhiss	Hickory	Lookout	Mt. Island	Fishing Creek	Wateree
1993*	Density	12,120	48,195	147,271	15,492	75,862	9,999	44,490
	95% Lower Limit	9,876	40,779	117,407	13,327	66,000	8,618	36,608
	95% Upper Limit	14,458	57,047	184,280	17,583	86,863	11,280	52,534
1994*	Density	1,454	15,227	20,715	2,055	3,867	12,932	29,632
	95% Lower Limit	914	12,782	17,651	1,746	2,908	9,013	23,758
	95% Upper Limit	1,999	17,890	23,750	2,364	4,917	17,307	35,428
1995*	Density	7,708	87,465	24,641	38,909	4,312	37,764	322,324
	95% Lower Limit	6,469	58,892	21,580	30,875	2,587	30,211	260,377
	95% Upper Limit	9,020	121,187	28,185	47,421	6,477	44,741	389,926
1996**	Density	7,683	18,351	19,358	4,448	6,798	1,510	85,007
	95% Lower Limit	5,806	16,021	17,268	3,817	5,821	1,272	63,693
	95% Upper Limit	9,848	20,823	21,577	5,056	7,935	1,769	106,675
1997**	Density	870	6,510	30,438	8,655	998	3,163	7,402
	95% Lower Limit	610	5,701	22,920	7,526	791	2,778	5,618
	95% Upper Limit	1,170	7,281	38,466	9,805	1,212	3,574	9,643
1993*	Population Estimate	30,043,000	42,363,000	239,139,000	7,665,000	75,589,000	10,037,000	212,680,000
	95% Lower Limit	24,481,000	35,845,000	190,645,000	6,594,000	65,762,000	8,651,000	175,001,000
	95% Upper Limit	35,838,000	50,144,000	299,234,000	8,700,000	86,550,000	11,323,000	251,134,000
1994*	Population Estimate	3,604,000	13,385,000	33,637,000	1,017,000	3,853,000	12,981,000	141,653,000
	95% Lower Limit	2,266,000	11,235,000	28,662,000	864,000	2,898,000	9,047,000	113,573,000
	95% Upper Limit	4,955,000	15,725,000	38,565,000	1,170,000	4,899,000	17,373,000	169,360,000
1995*	Population Estimate	19,107,000	76,882,000	40,012,000	19,252,000	4,296,000	37,908,000	1,540,838,000
	95% Lower Limit	16,035,000	51,766,000	35,042,000	15,277,000	2,578,000	30,326,000	1,244,706,000
	95% Upper Limit	22,359,000	106,523,000	45,767,000	23,464,000	6,454,000	44,911,000	1,864,002,000
1996**	Population Estimate	19,045,000	16,131,000	31,434,000	2,201,000	6,774,000	1,516,000	406,367,000
	95% Lower Limit	14,392,000	14,082,000	28,040,000	1,889,000	5,800,000	1,277,000	304,478,000
	95% Upper Limit	24,411,000	18,303,000	35,037,000	2,502,000	7,906,000	1,776,000	509,949,000
1997**	Population Estimate	2,157,000	5,722,000	49,425,000	4,282,000	994,000	3,175,000	35,385,000
	95% Lower Limit	1,512,000	5,011,000	37,217,000	3,724,000	788,000	2,789,000	26,856,000
	95% Upper Limit	2,900,000	6,400,000	62,461,000	4,852,000	1,208,000	3,588,000	46,097,000

* 1993 thru 1995 data corrected for inclusion of surface oriented fish.

** 1996 and 1997 data collected with side-looking acoustics to ensonify surface oriented fish.

Table 2. Number and species composition (%) of forage fish collected by purse seining during late summer - early fall, 1993 to 1997.

	1993	1994	1995	1996	1997
James					
# collected	8,578	120	1,320	86	702
Gizzard shad	0.12%	100.00%	99.70%	100.00%	81.05%
Threadfin shad	99.88%	0.00%	0.30%	0.00%	18.95%
Rhodhiss					
# collected	18,552	1,959	965	460	1,041
Gizzard shad	0.92%	100.00%	64.66%	100.00%	72.24%
Threadfin shad	99.08%	0.00%	35.34%	0.00%	27.76%
Hickory					
# collected	93,065	435	2,959	1,985	5,903
Gizzard shad	0.07%	100.00%	91.92%	99.70%	1.56%
Threadfin shad	99.93%	0.00%	8.08%	0.30%	98.44%
Lookout Shoals					
# collected	23,569	1,587	739	699	6,810
Gizzard shad	0.01%	100.00%	100.00%	91.13%	0.01%
Threadfin shad	99.99%	0.00%	0.00%	8.87%	99.99%
Norman					
# collected	13,063	1,619	4,389	4,465	6,711
Gizzard shad	0.00%	0.06%	0.05%	0.00%	0.01%
Threadfin shad	100.00%	99.94%	99.95%	100.00%	99.99%
Mt. Island					
# collected	2,642	583	1,007	1,174	182
Gizzard shad	2.27%	0.51%	18.07%	0.43%	0.00%
Threadfin shad	97.73%	99.49%	81.93%	99.57%	100.00%
Wylie					
# collected	125,894	19,026	6,612	4,321	9,842
Gizzard shad	0.01%	0.01%	0.00%	0.23%	0.01%
Threadfin shad	99.99%	99.99%	100.00%	99.77%	99.99%
Wateree					
# collected	26,867	350	83,622	52,768	47,767
Gizzard shad	0.83%	20.00%	1.63%	10.06%	1.69%
Threadfin shad	99.17%	80.00%	98.37%	89.94%	98.31%

Table 3. Lake Norman forage fish densities and population estimates by zones, and lakewide population estimates and 95% confidence limits as estimated by hydroacoustic sampling from 1993 to 1997.

Density (no./hectare)

Zone	1993*	1994*	1995*	1996**	1997**
1	34,309	14,340	33,013	25,585	2,971
2	45,239	14,186	15,070	14,420	3,520
3	51,257	20,409	57,200	46,434	5,793
4	44,082	21,638	75,374	29,263	3,105
5	73,687	25,816	99,845	38,463	11,139
6	73,687	25,816	99,845	3,638	1,102

Population Estimate

Zone	1993*	1994*	1995*	1996**	1997**
1	78,259,000	32,710,000	75,303,000	58,359,000	6,777,000
2	139,431,000	43,723,000	46,447,000	44,444,000	10,849,000
3	177,120,000	70,524,000	197,656,000	160,454,000	20,018,000
4	54,265,000	26,636,000	92,785,000	36,023,000	3,822,000
5	155,185,000	54,368,000	210,274,000	81,003,000	23,459,000
6	35,222,000	12,340,000	47,726,000	1,739,000	527,000
Total	639,482,000	240,301,000	670,191,000	382,022,000	65,451,000
95% Lower Limit	580,205,000	219,290,000	599,113,000	357,065,000	58,251,000
95% Upper Limit	698,759,000	261,312,000	741,268,000	406,978,000	72,652,000

* 1993 thru 1995 data corrected for inclusion of surface oriented fish.
** 1996 and 1997 data collected with side-looking acoustics to ensonify surface oriented fish.

Table 4. Lake Wylie forage fish densities and population estimates by zones, and lakewide population estimates and 95% confidence limits as estimated by hydroacoustics from 1993 to 1997.

Density (no./hectare)

Zone	1993*	1994*	1995*	1996**	1997**
1	32,714	3,489	156,657	21,288	4,811
2	78,443	13,653	37,902	15,537	5,069
3	76,764	6,634	16,055	5,462	1,692
4	115,432	4,199	41,926	9,783	2,218

Population Estimate

Zone	1993*	1994*	1995*	1996**	1997**
1	20,878,000	2,227,000	99,978,000	13,586,000	3,070,000
2	86,005,000	14,969,000	41,556,000	17,035,000	5,558,000
3	121,318,000	10,484,000	25,373,000	8,632,000	2,674,000
4	174,556,000	6,350,000	63,400,000	14,794,000	3,354,000
Total	402,757,000	34,030,000	230,308,000	54,047,000	14,656,000
95% Lower Limit	374,310,000	29,838,000	196,396,000	48,413,000	13,181,000
95% Upper Limit	431,204,000	38,222,000	264,221,000	59,681,000	16,131,000

* 1993 thru 1995 data corrected for inclusion of surface oriented fish.

** 1996 and 1997 data collected with side-looking acoustics to ensonify surface oriented fish.

Figure 1. Sampling zones in Lakes Norman and Wylie with latitude and longitude boundaries (decimal degrees).

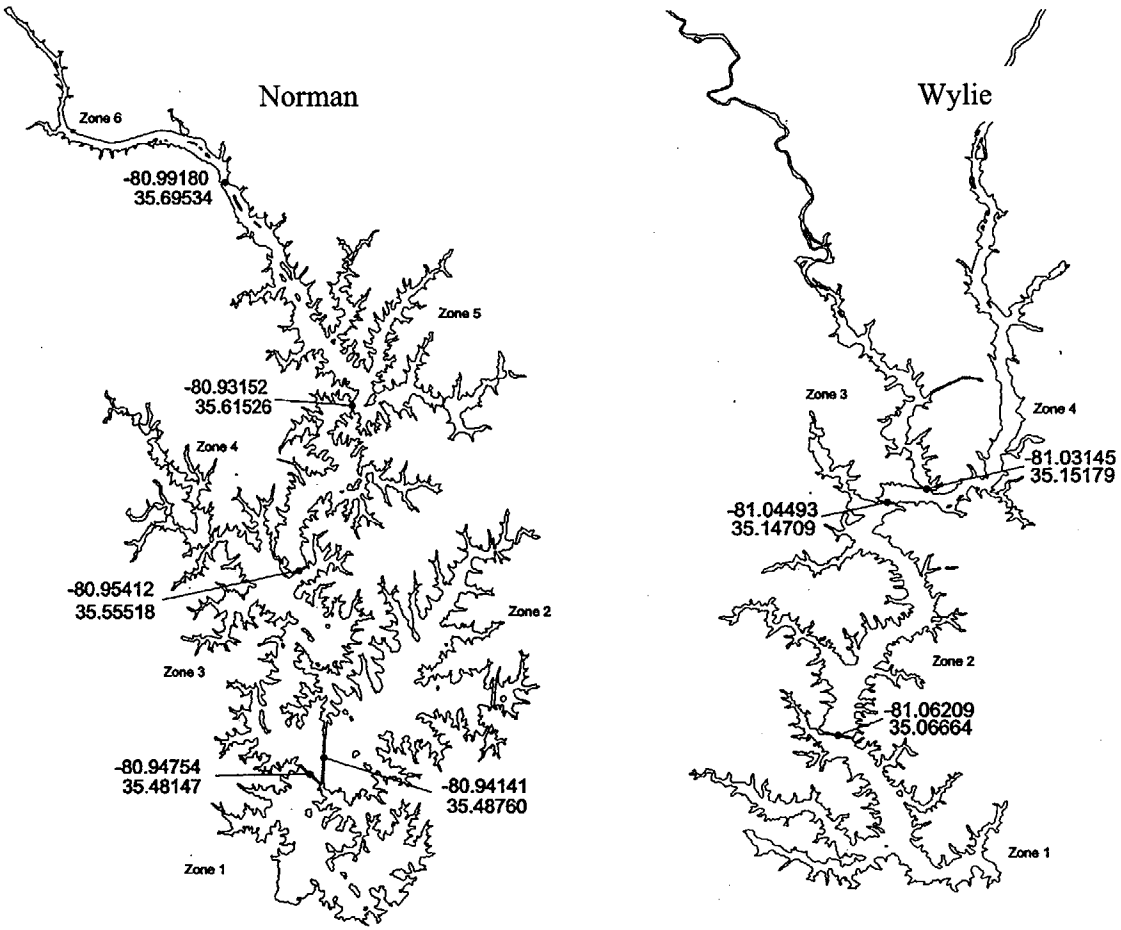


Figure 2. Forage fish densities in Catawba River reservoirs from 1993 to 1997. Data collected from 1993 through 1995 were corrected for inclusion of surface oriented fish.

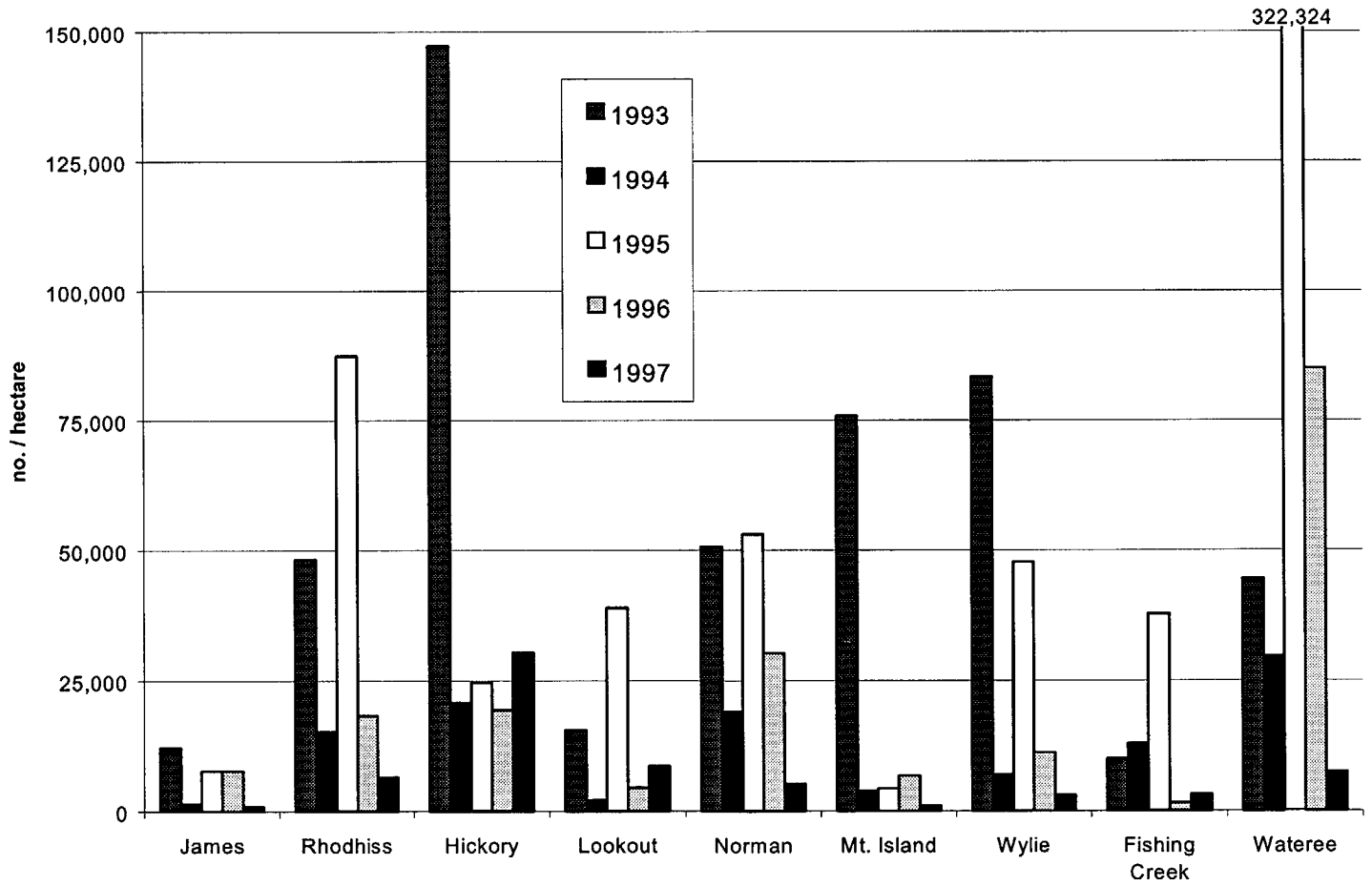
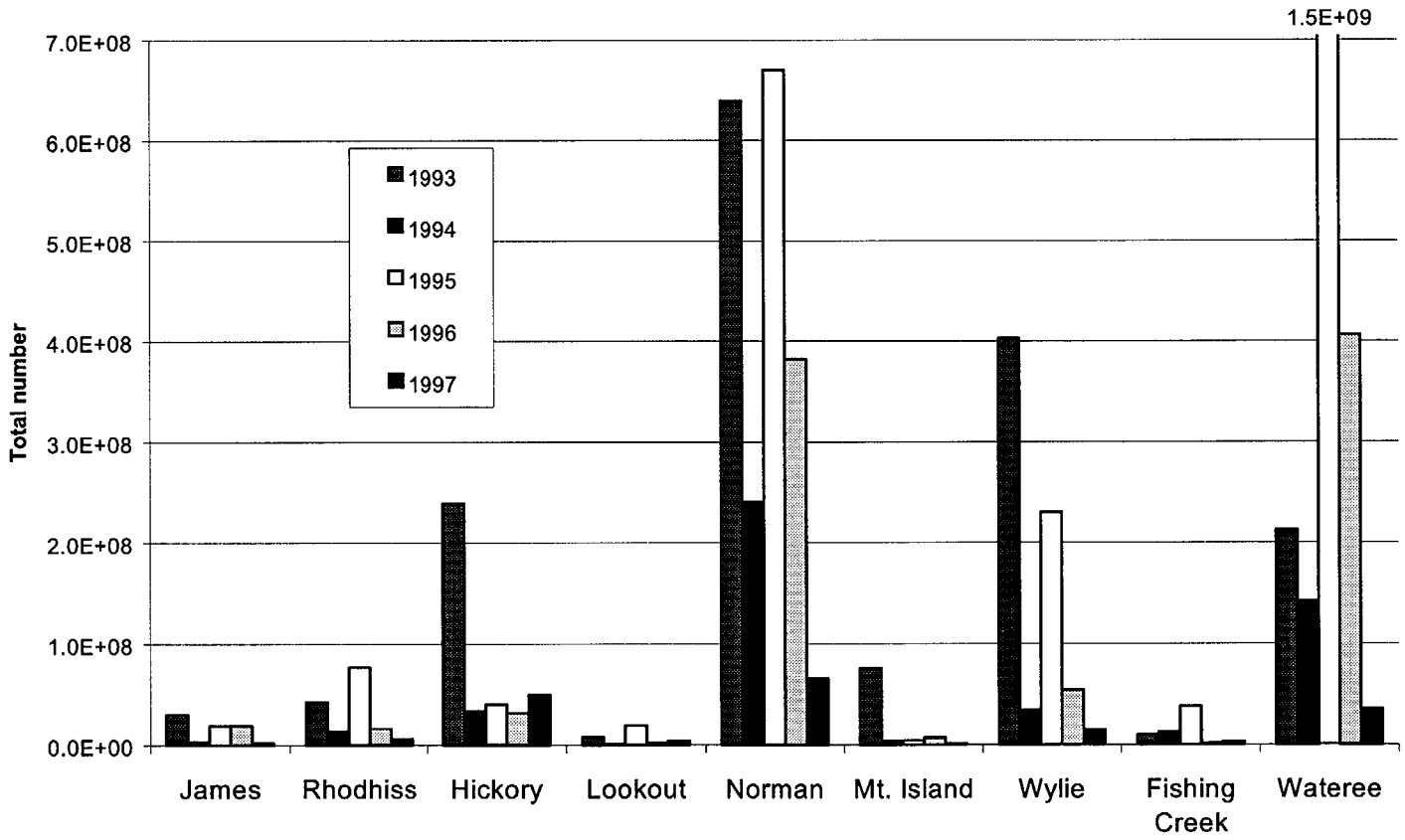
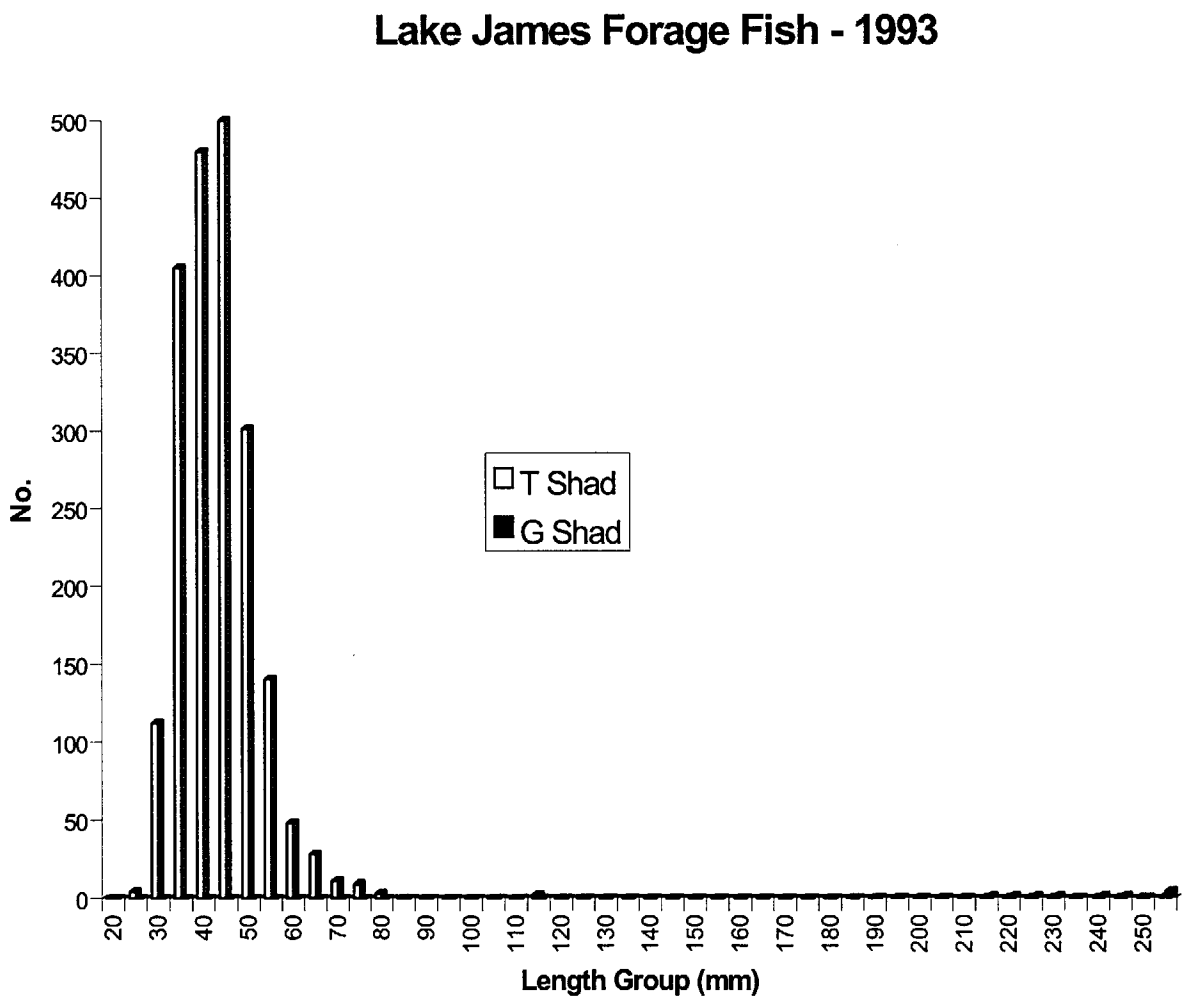
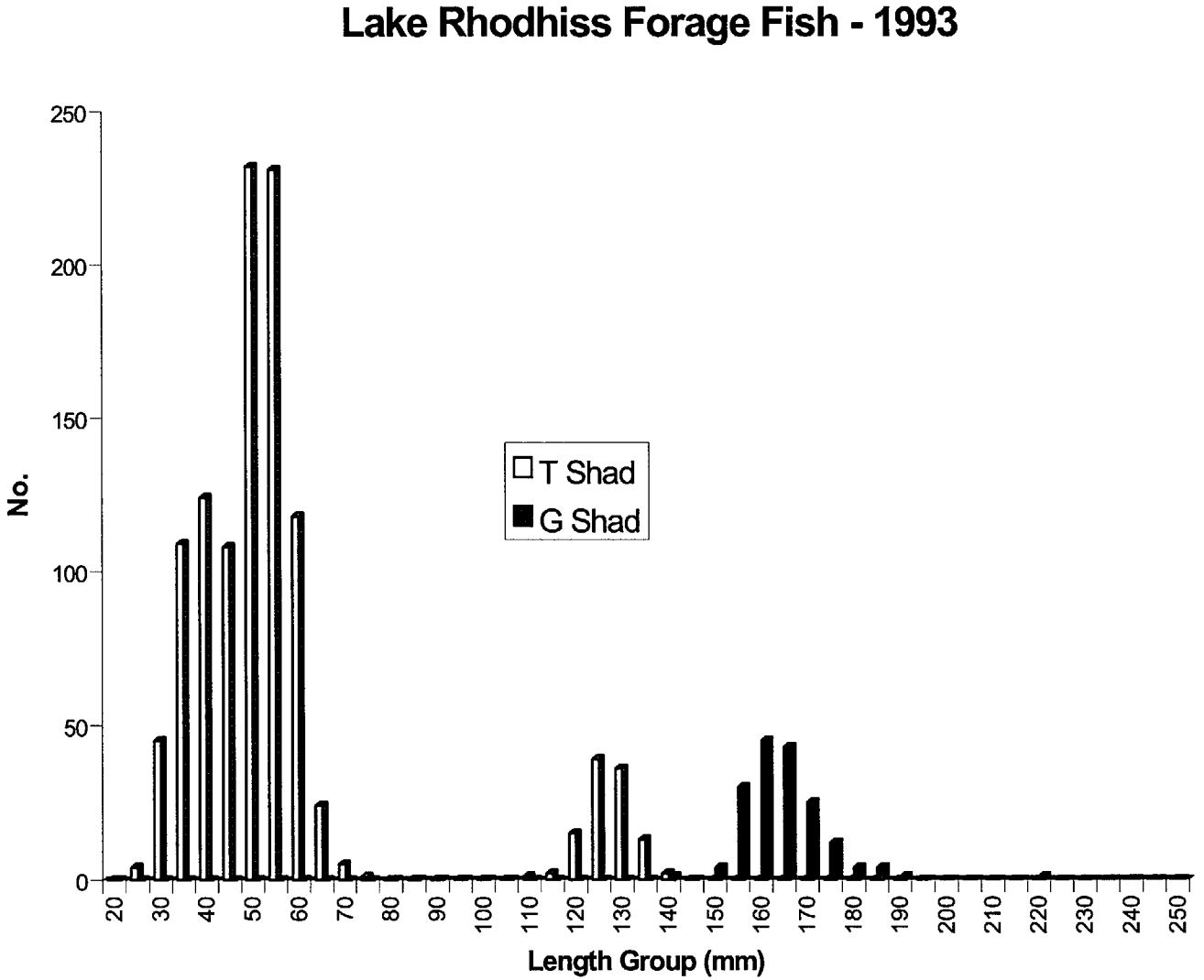


Figure 3. Forage fish population in Catawba River reservoirs from 1993 to 1997. Data collected from 1993 through 1995 were corrected for inclusion of surface oriented fish.

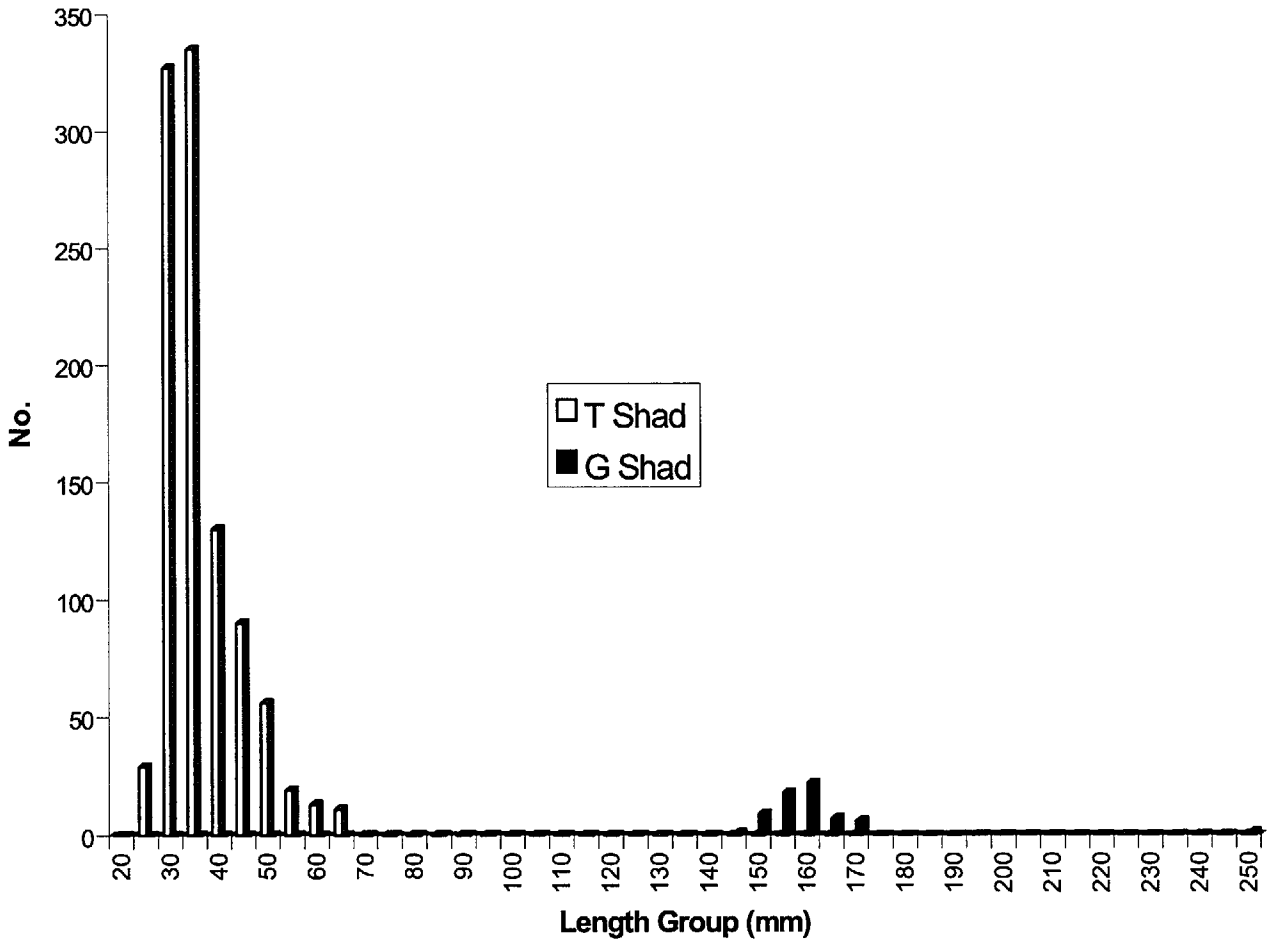


Appendix 1. Length frequency distribution of purse seine-collected forage fish from eight Catawba River reservoirs, 1993 to 1997.

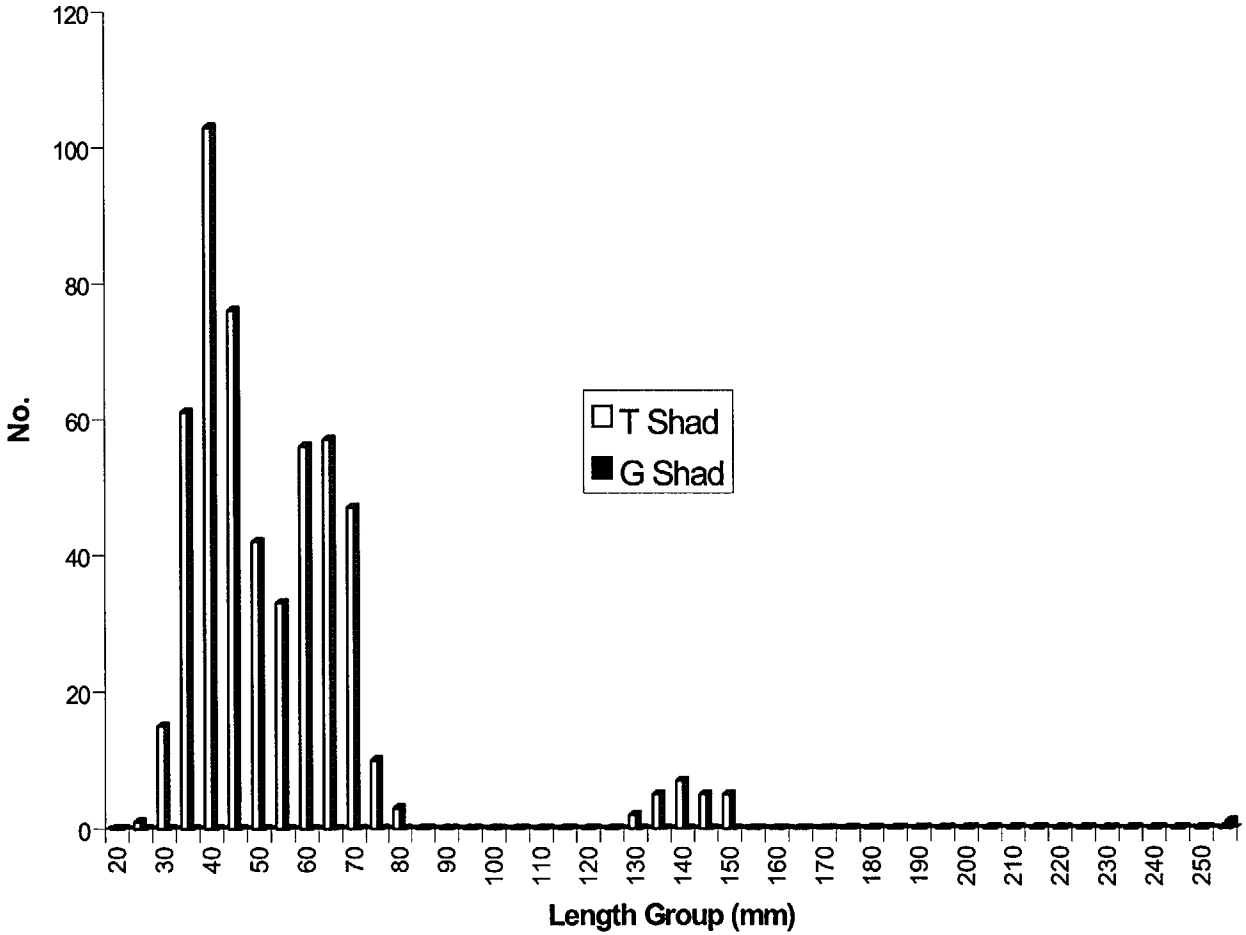

Lake James Forage Fish - 1993
No.
500
450
400
350
300
250
200
150
100
50
0
T Shad
G Shad
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210
220
230
240
250
Length Group (mm)


Lake Rhodhiss Forage Fish - 1993
No.
250
200
150
100
50
0
T Shad
G Shad
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210
220
230
240
250
Length Group (mm)

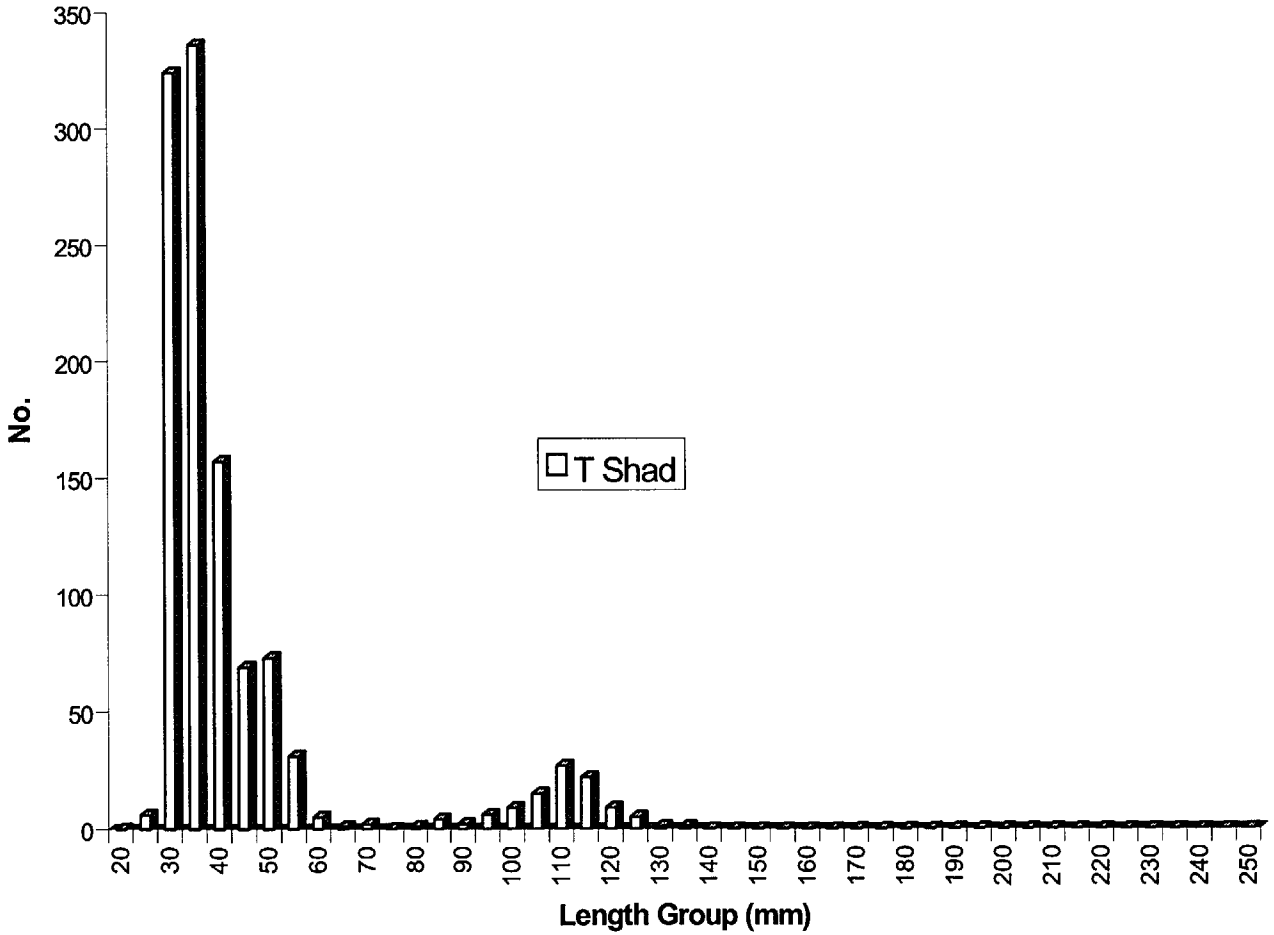
Lake Hickory Forage Fish - 1993

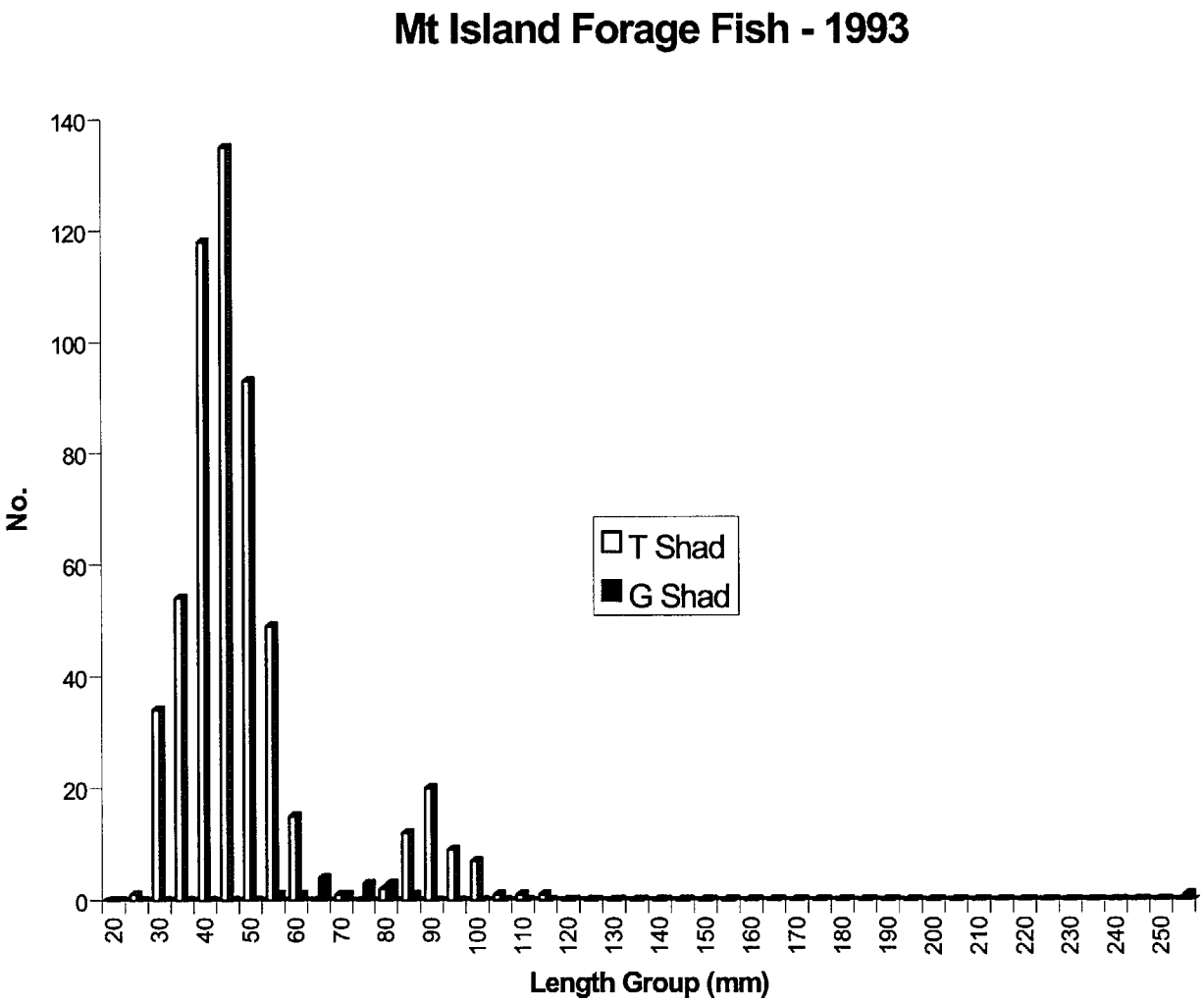


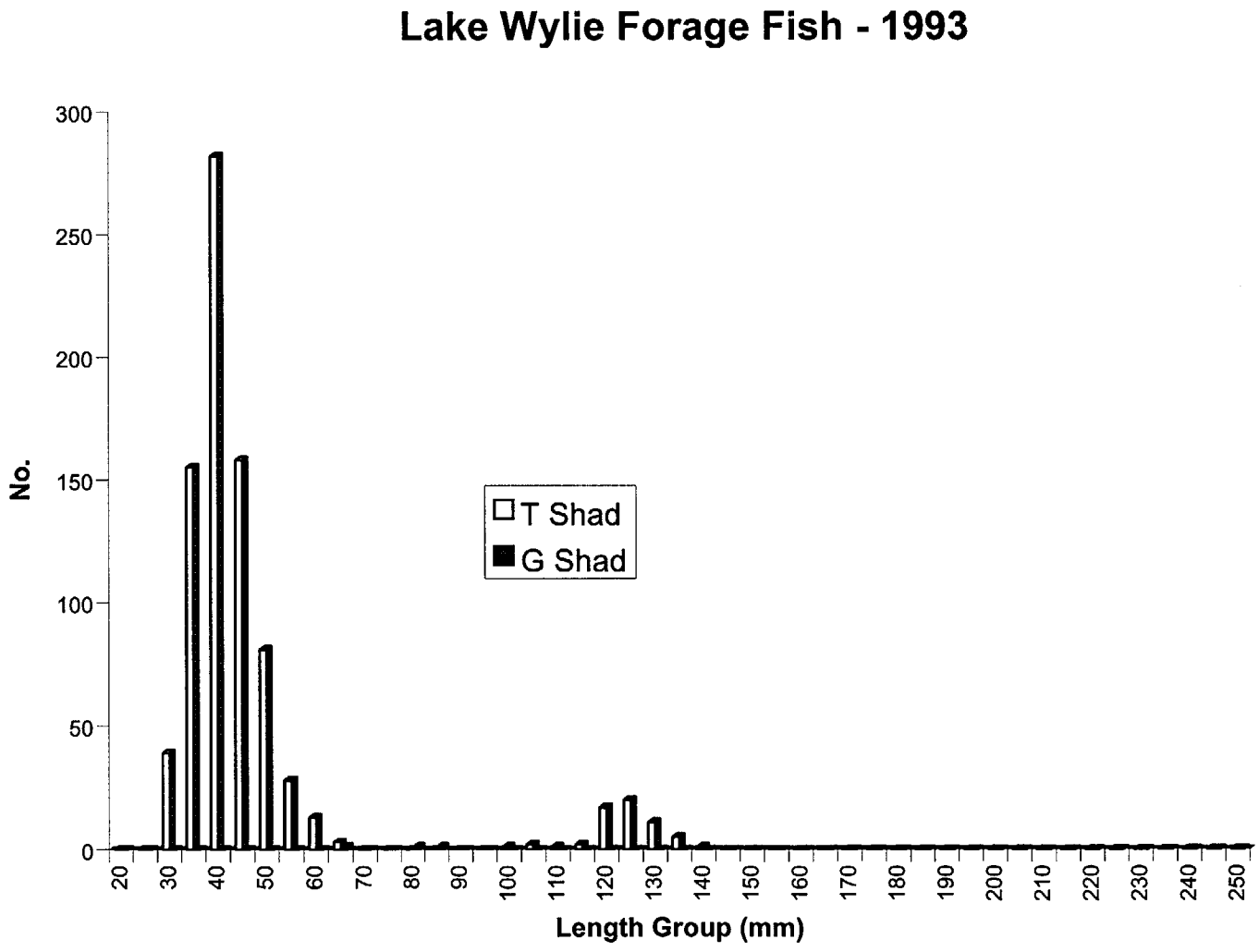
Lookout Shoals Forage Fish - 1993

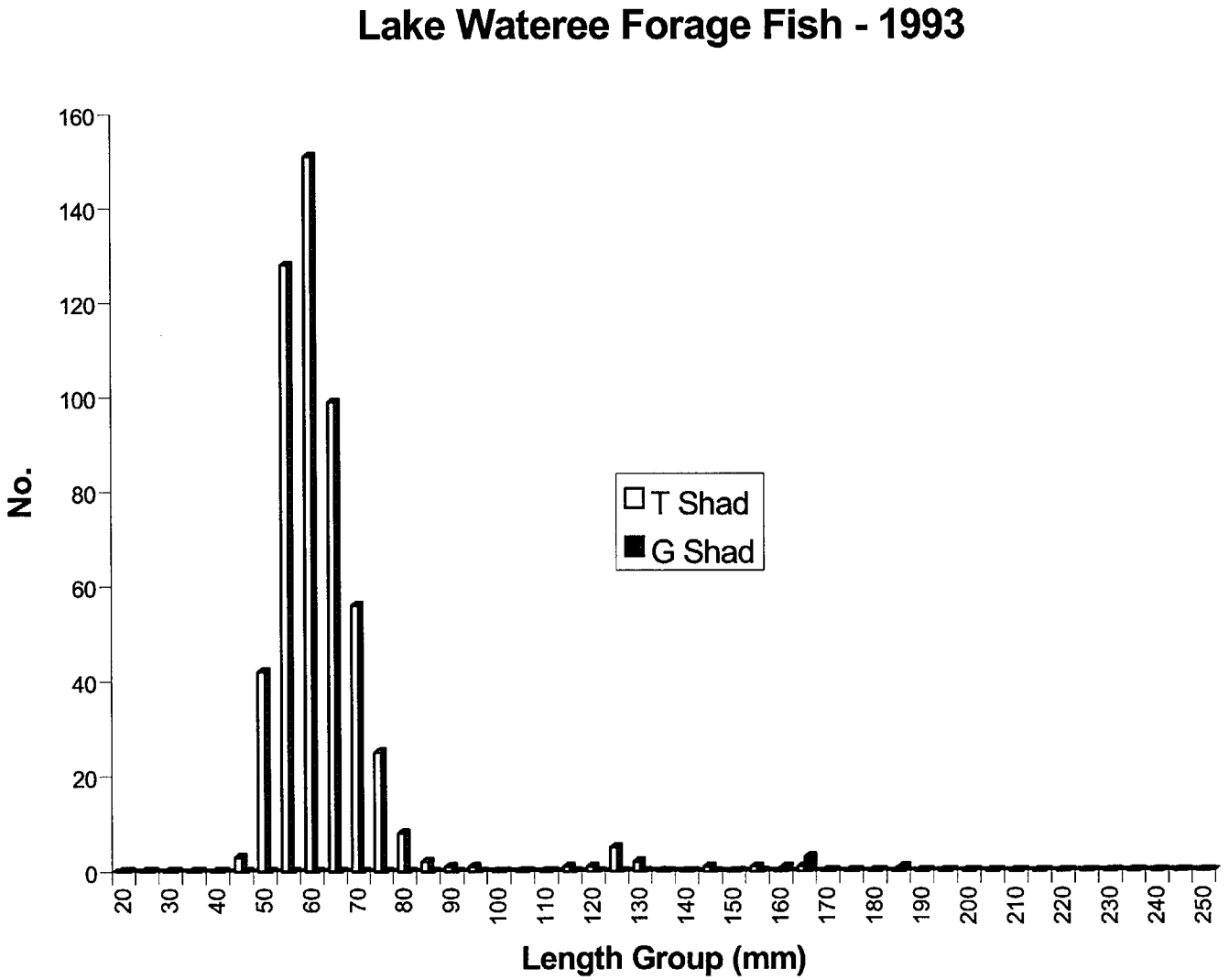


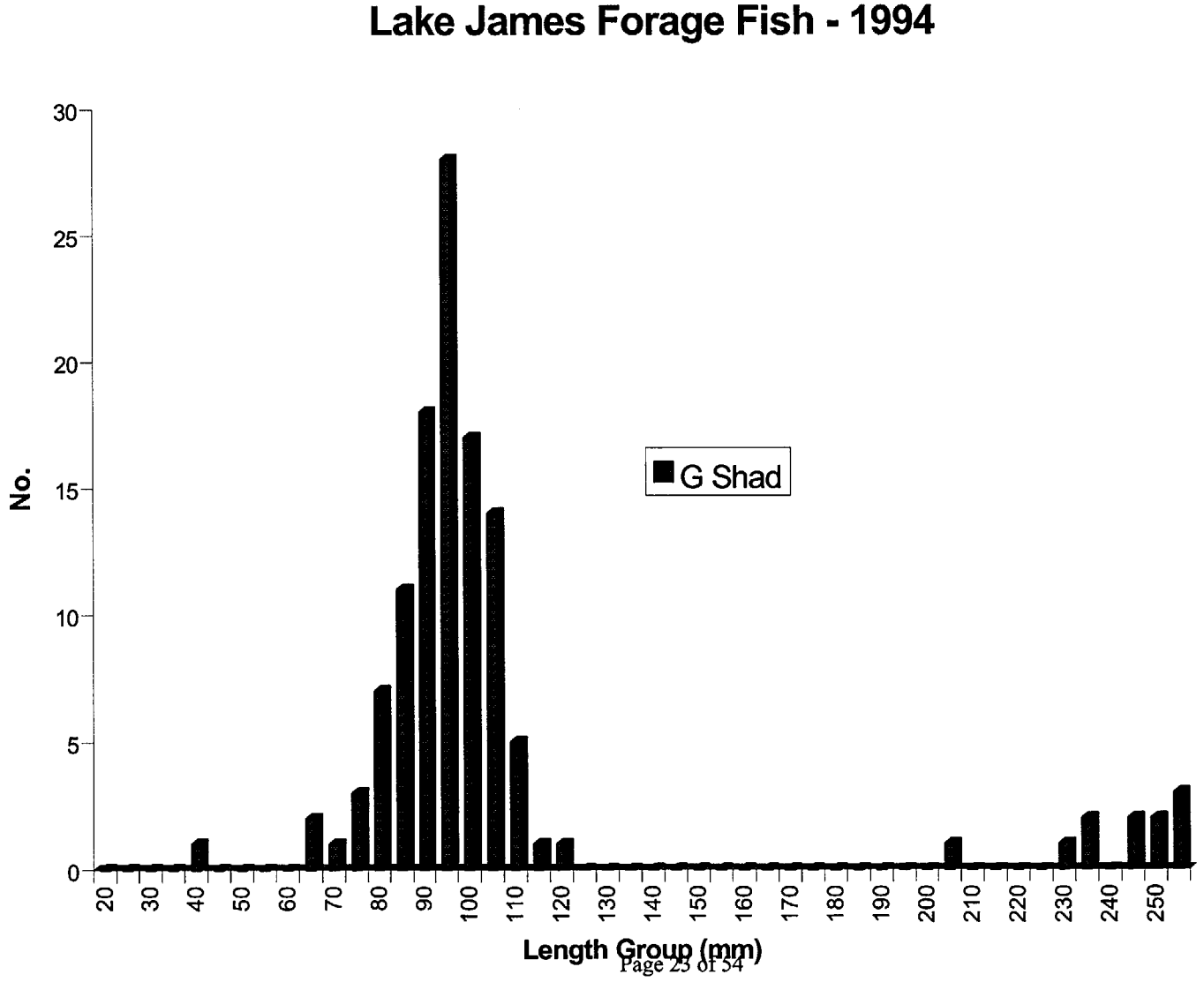
Lake Norman Forage Fish - 1993

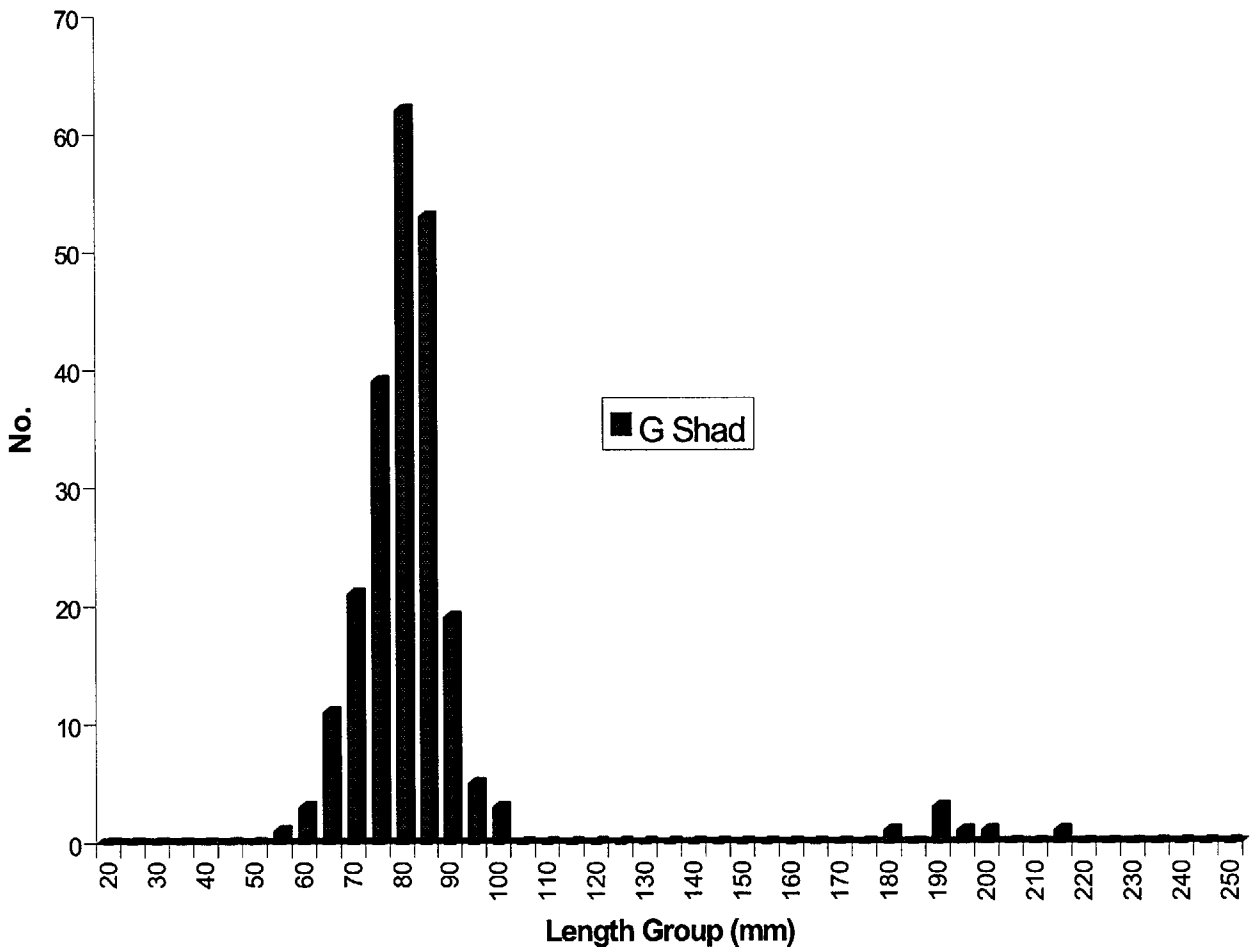



Mt Island Forage Fish - 1993
No.
140
120
100
80
60
40
20
0
T Shad
G Shad
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210
220
230
240
250
Length Group (mm)

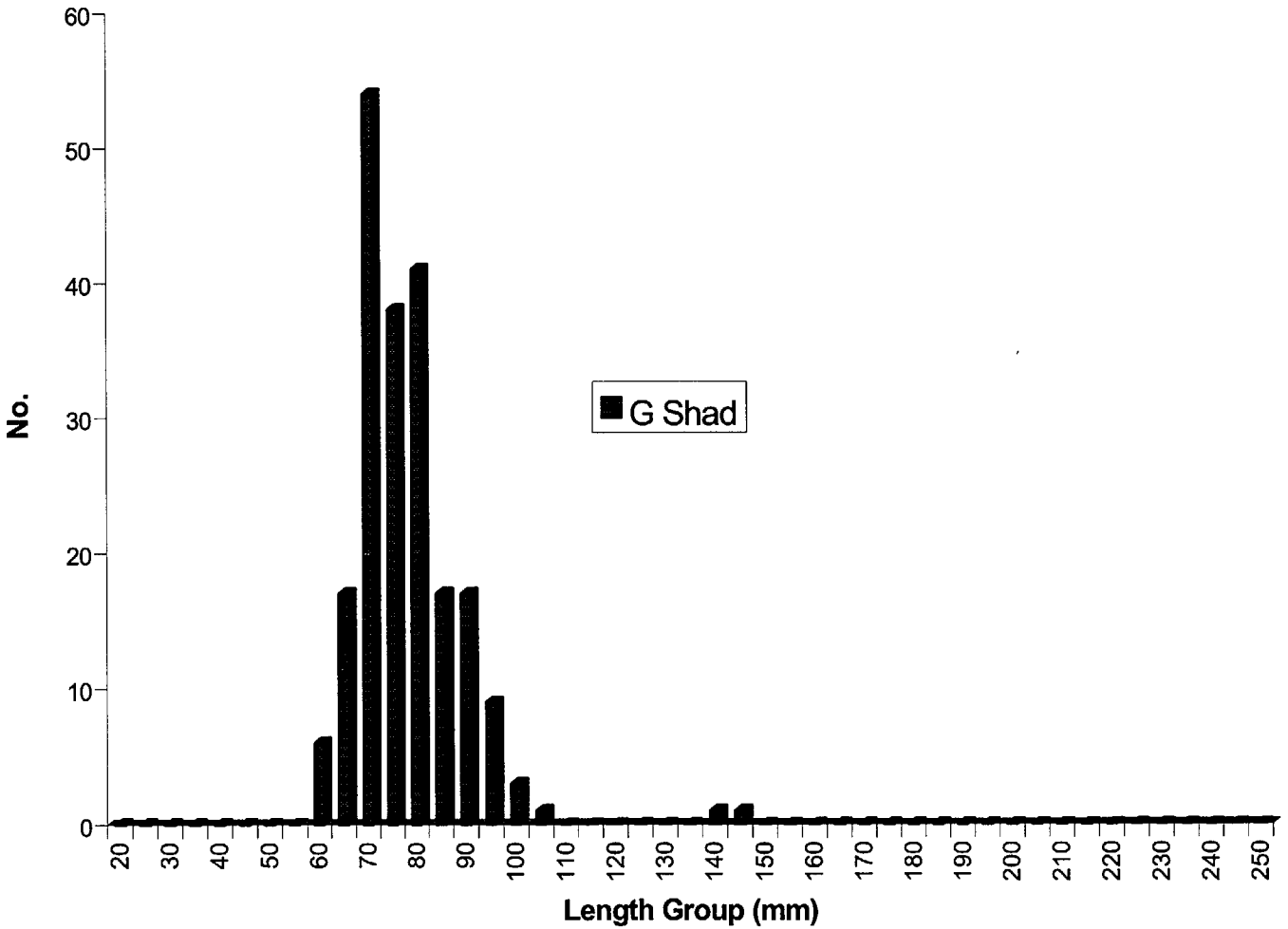

Lake Wylie Forage Fish - 1993
No.
300
250
200
150
100
50
0
T Shad
G Shad
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210
220
230
240
250
Length Group (mm)


Lake Wateree Forage Fish - 1993
No.
160
140
120
100
80
60
40
20
0
T Shad
G Shad
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210
220
230
240
250
Length Group (mm)

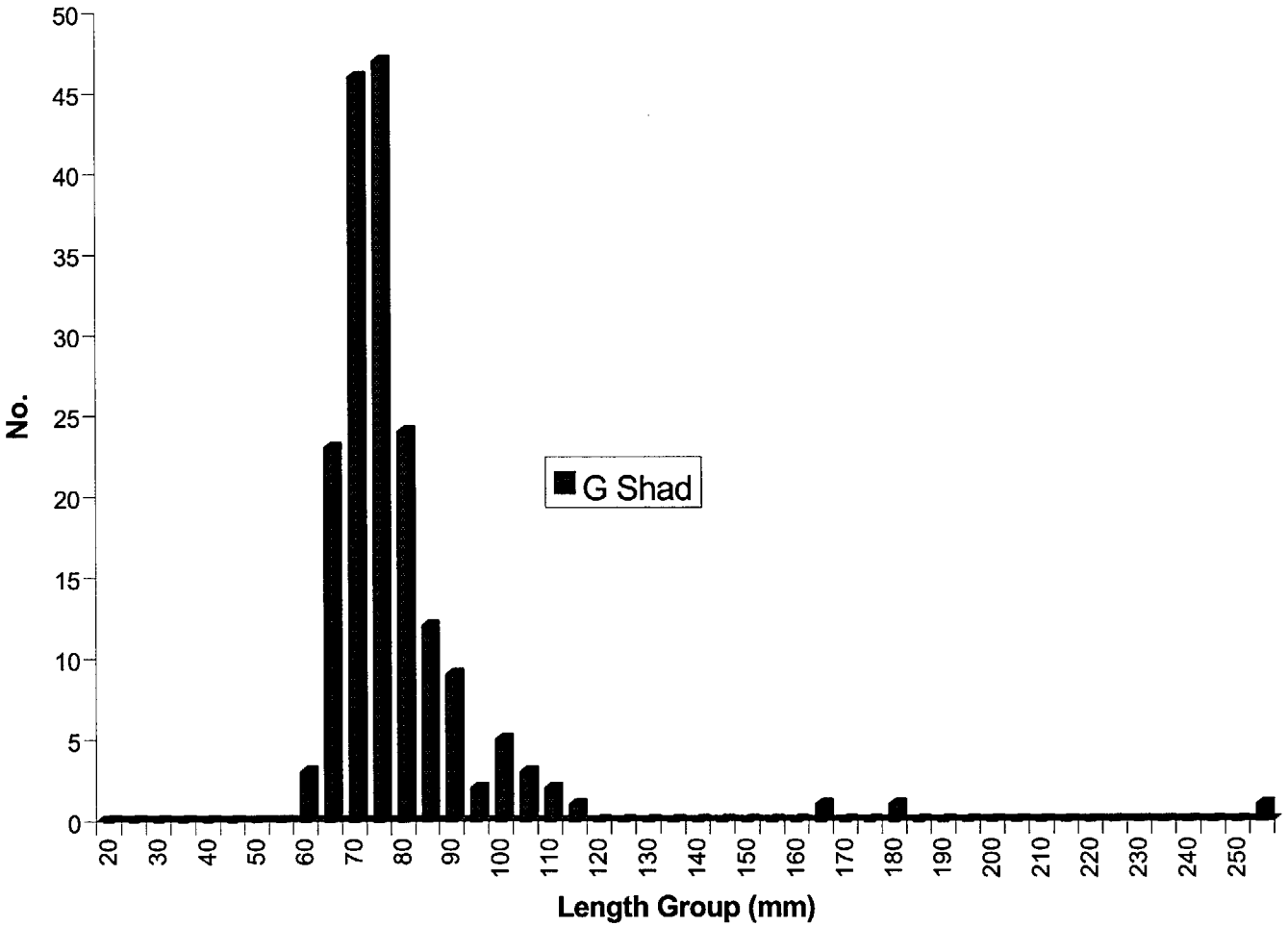

Lake James Forage Fish - 1994
No.
30
25
20
15
10
5
0
G Shad
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210
220
230
240
250
Length Group (mm)


Lake Rhodhiss Forage Fish - 1994
No.
70
60
50
40
30
20
10
0
G Shad
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210
220
230
240
250
Length Group (mm)

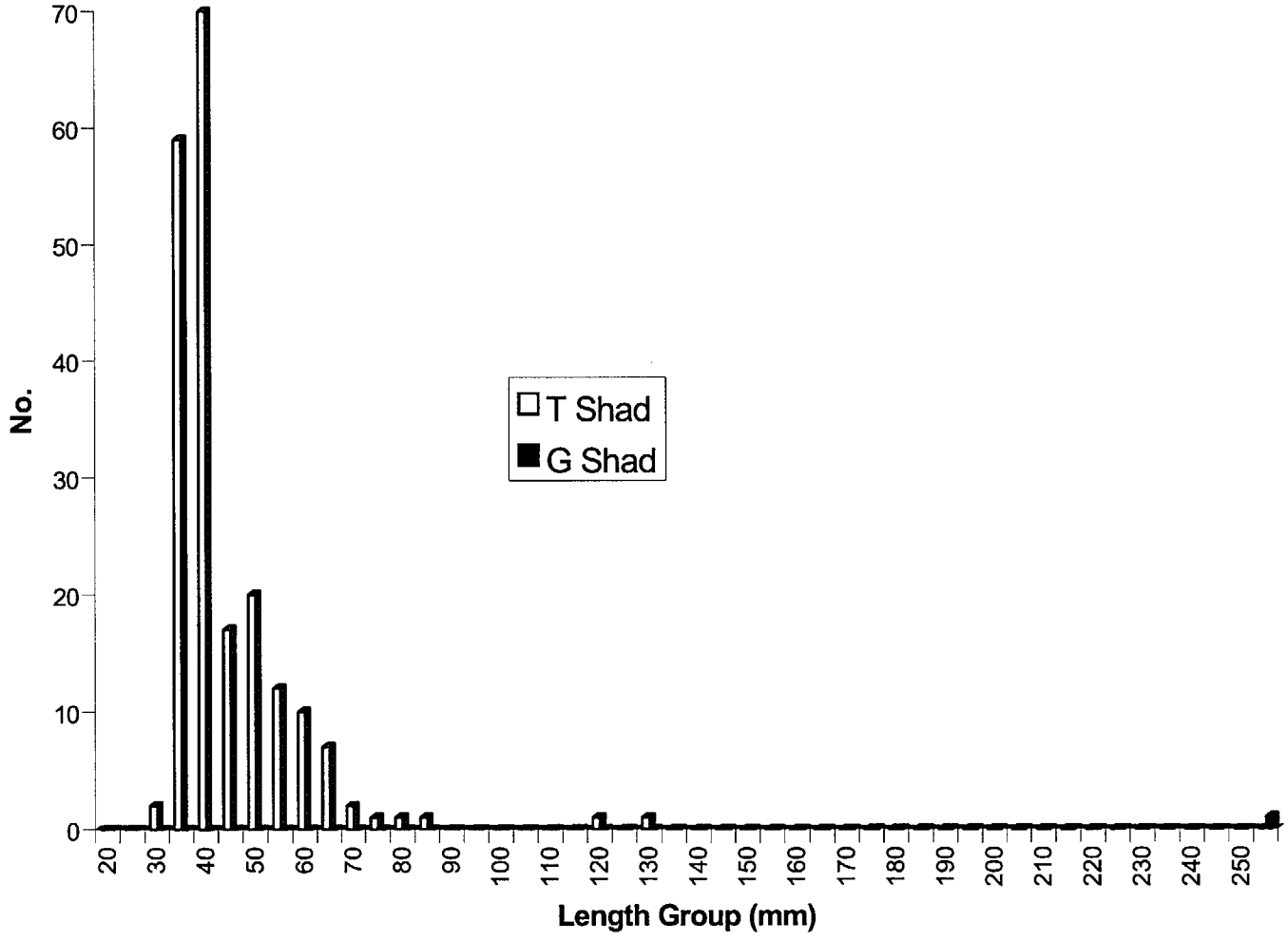
Lake Hickory Forage Fish - 1994



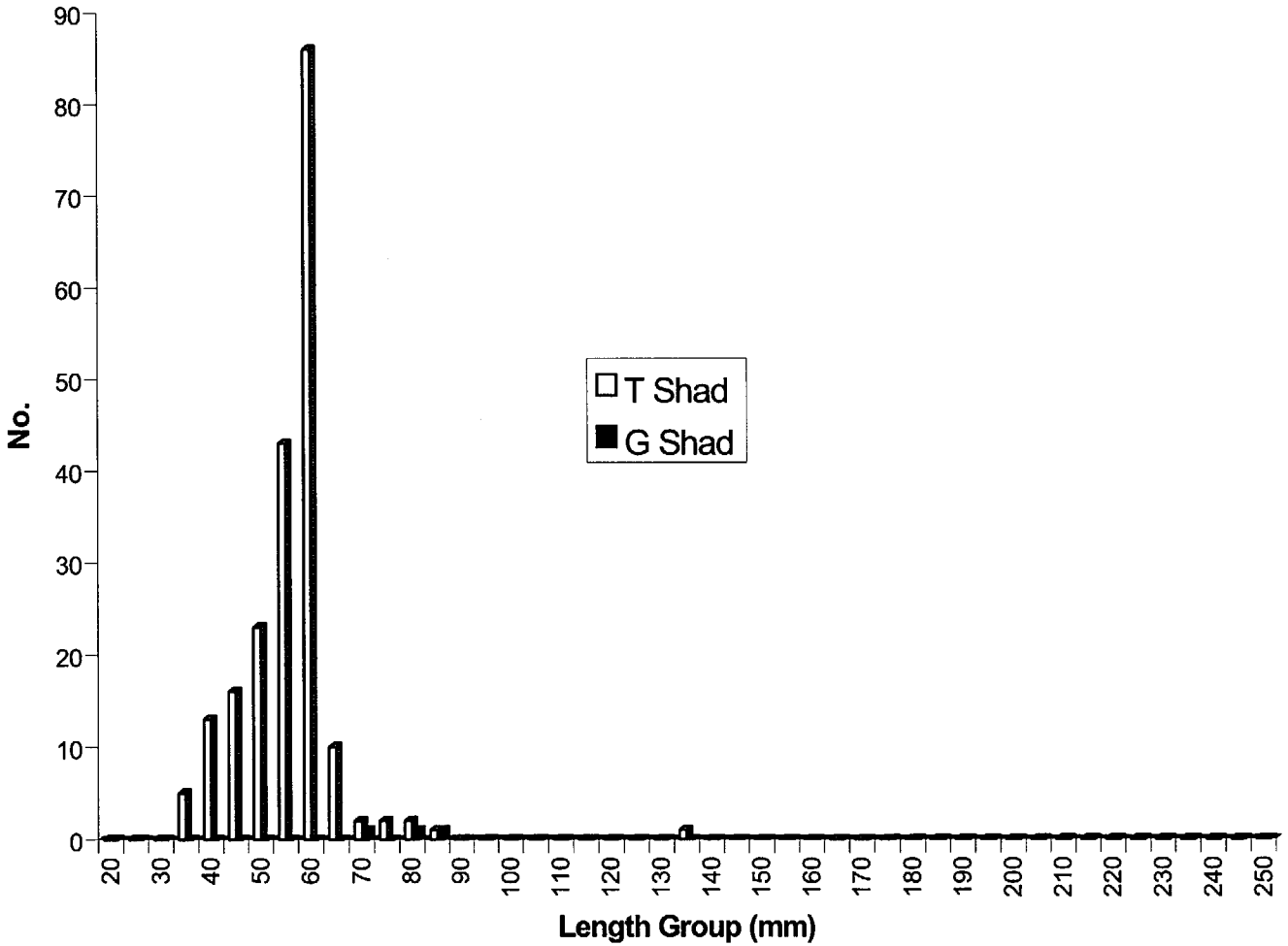
Lookout Shoals Forage Fish - 1994



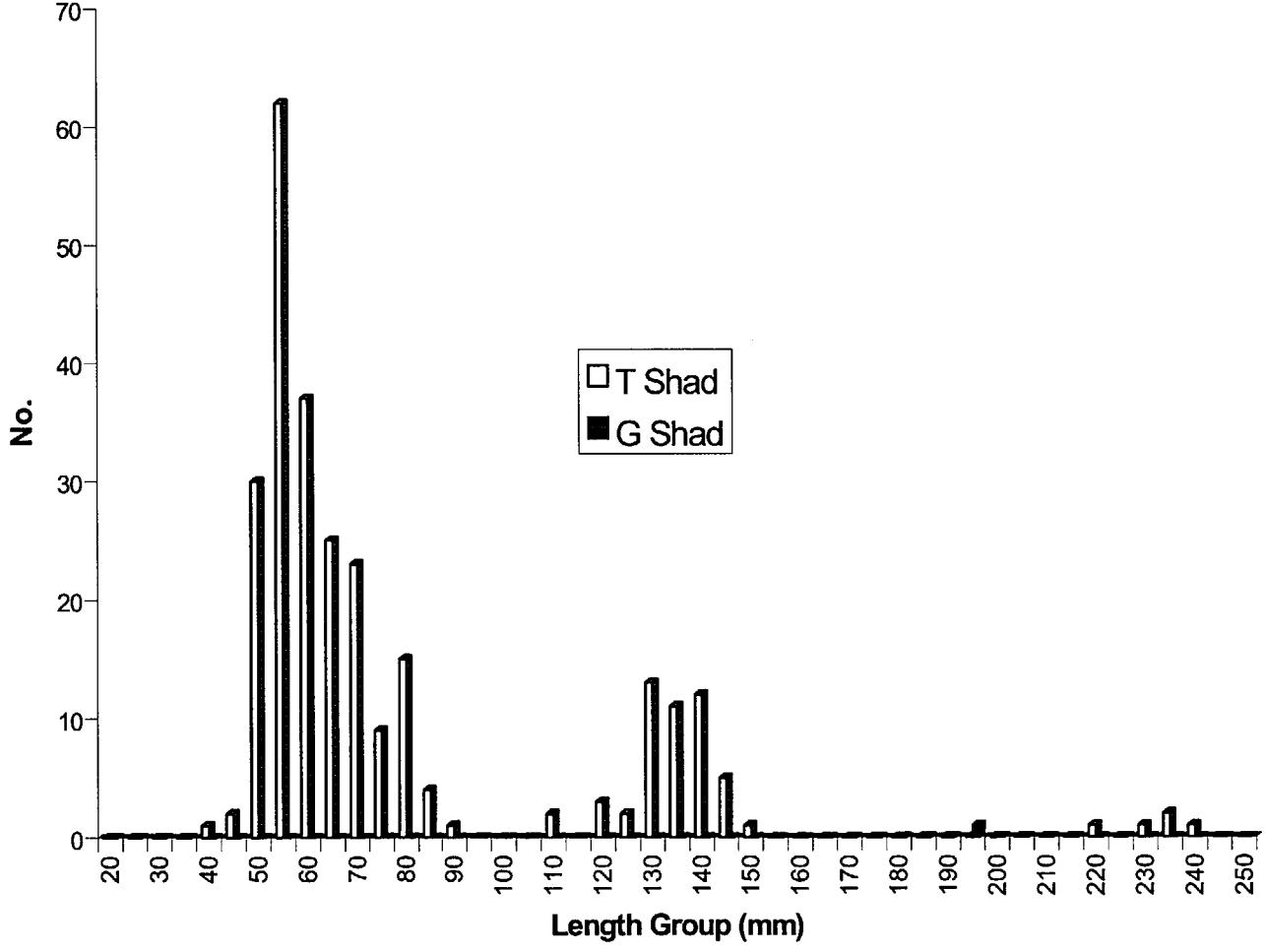
Lake Norman Forage Fish - 1994

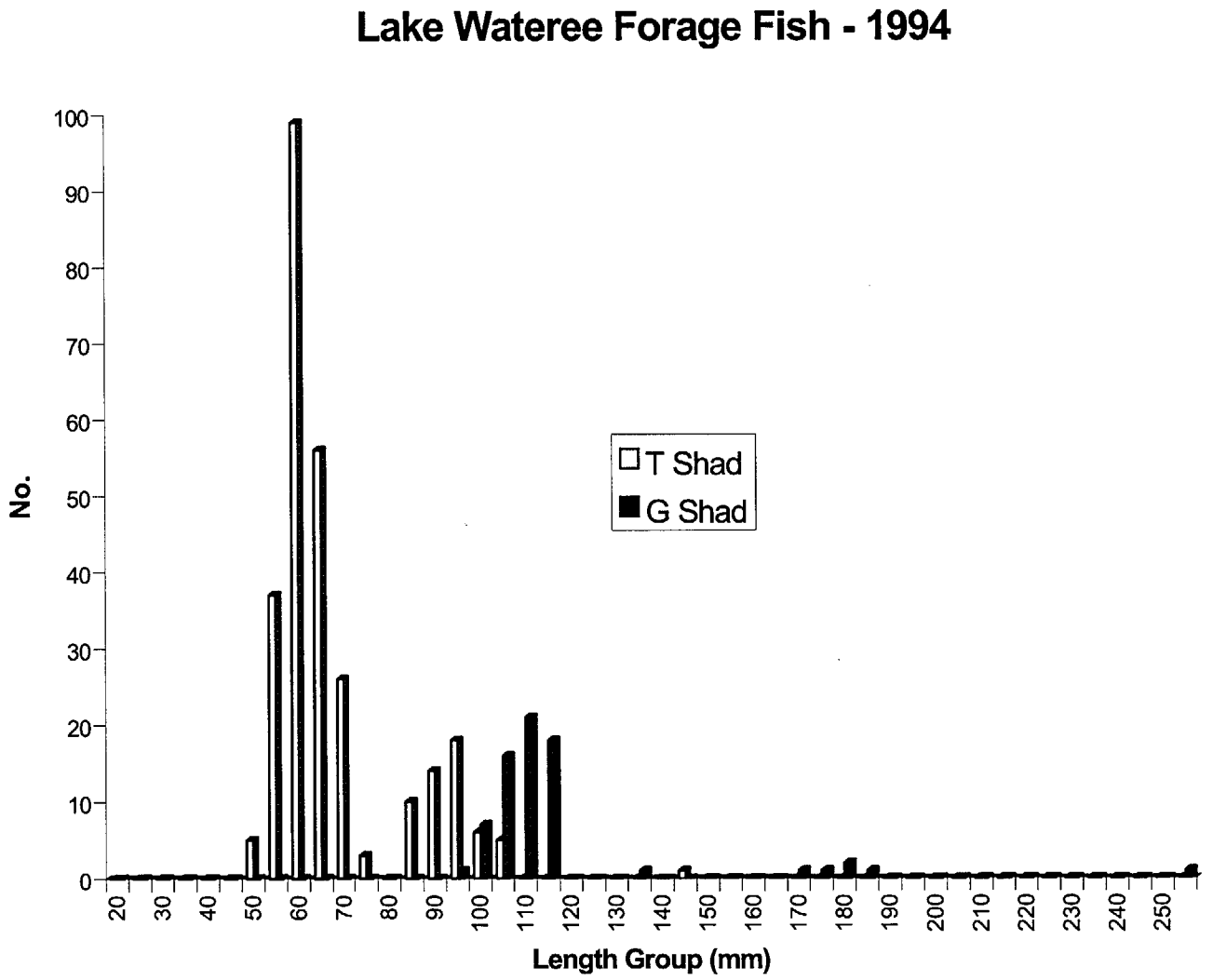


Mt. Island Forage Fish - 1994

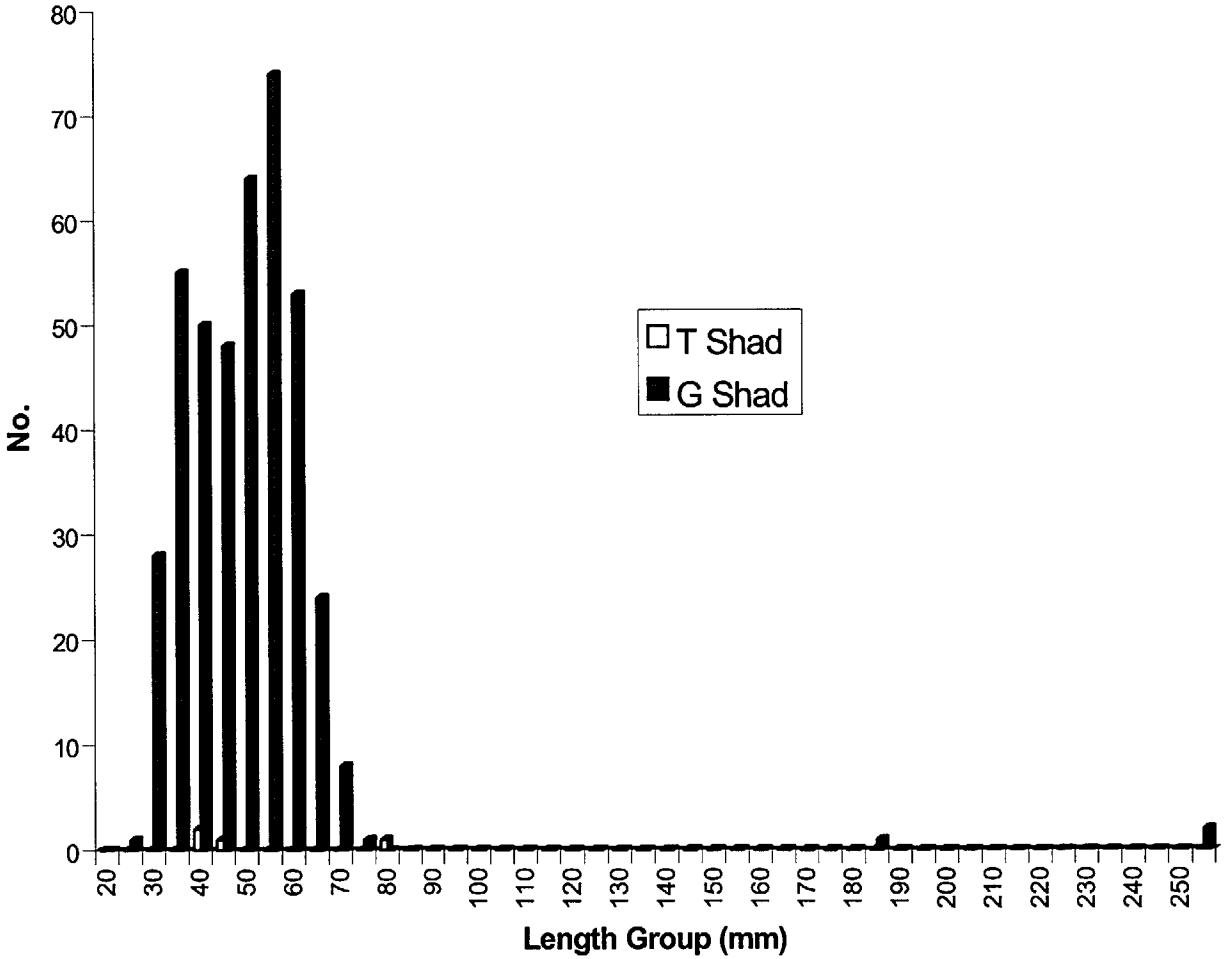


Lake Wylie Forage Fish - 1994

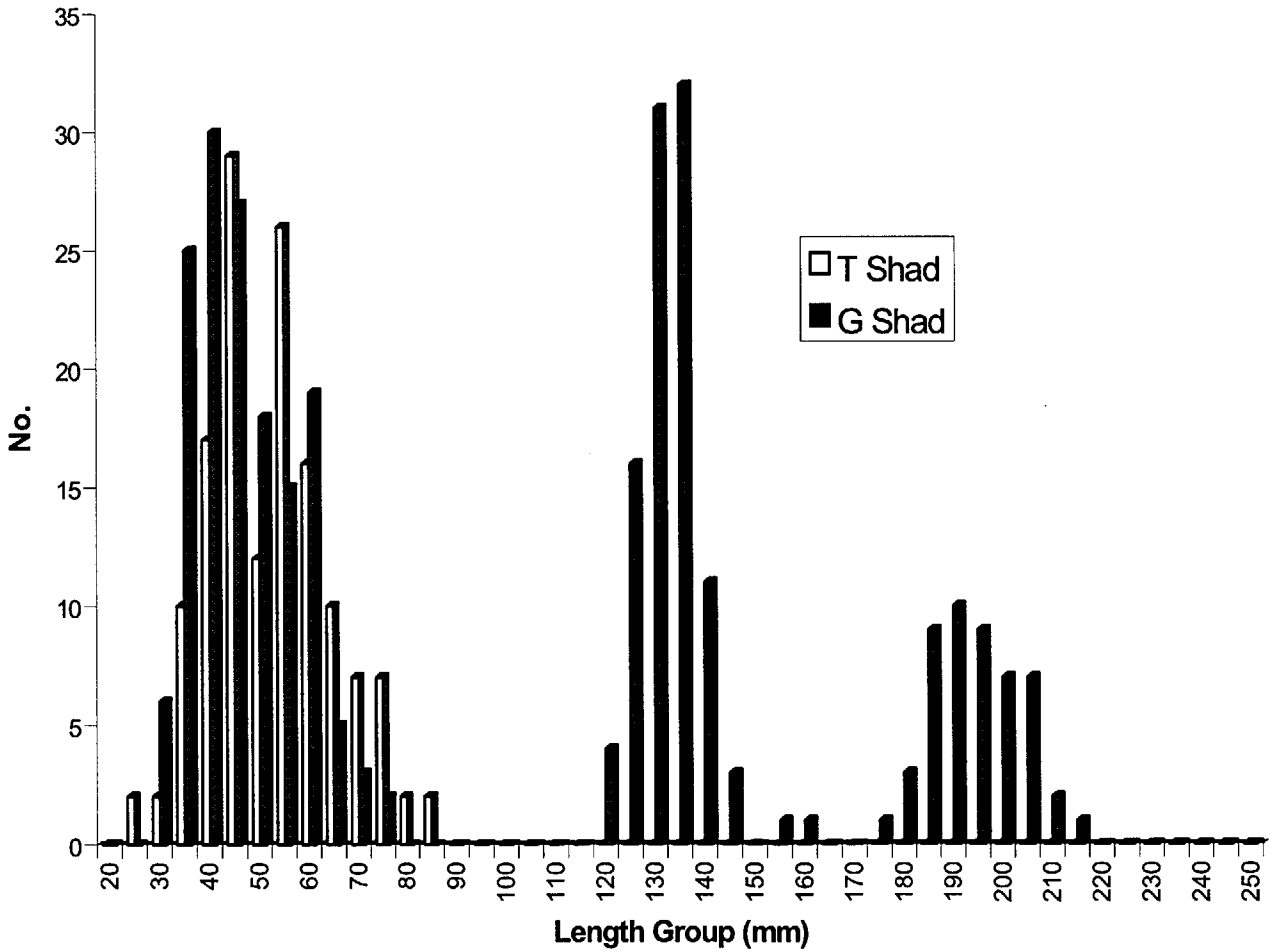



Lake Wateree Forage Fish - 1994
No.
100
90
80
70
60
50
40
30
20
10
0
T Shad
G Shad
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210
220
230
240
250
Length Group (mm)

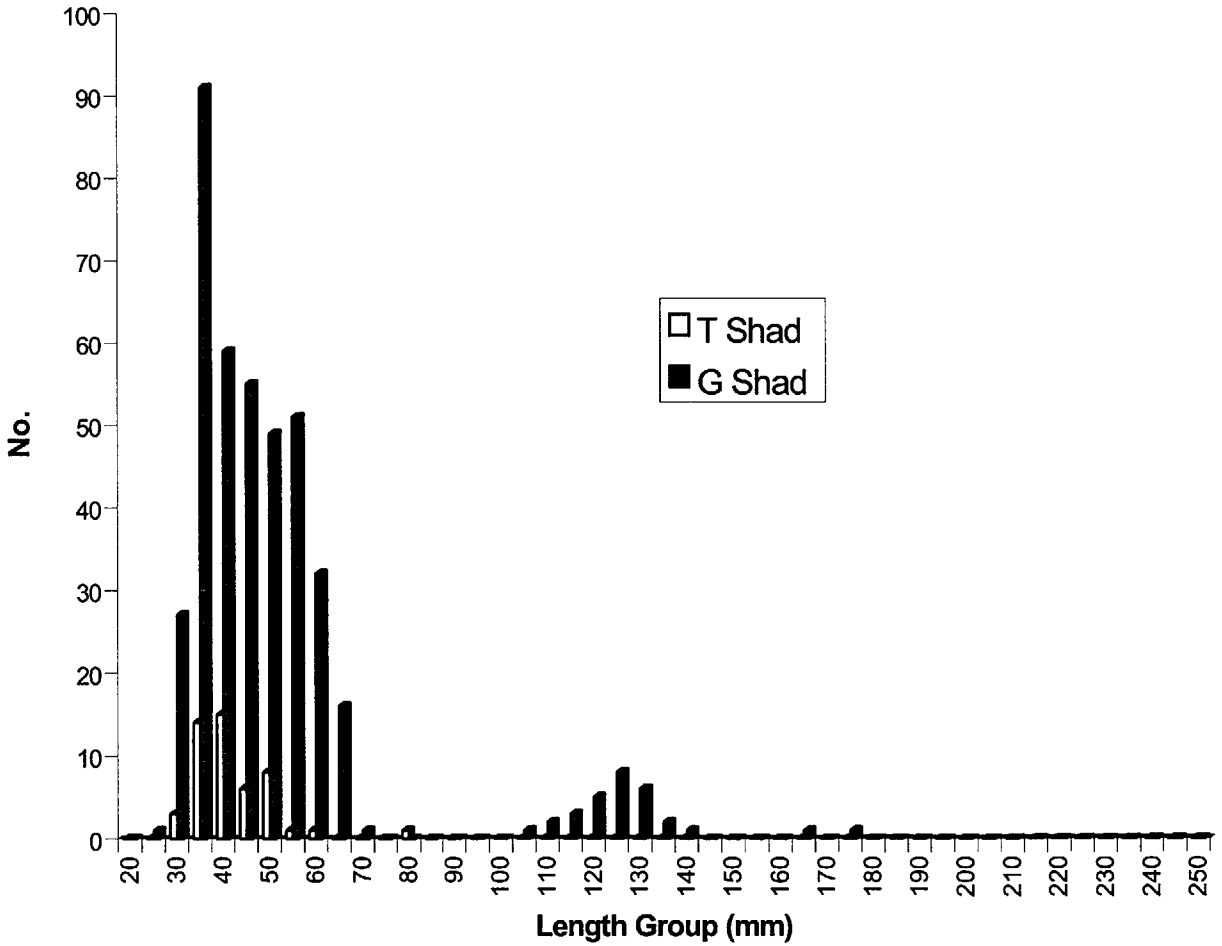
Lake James Forage Fish - 1995

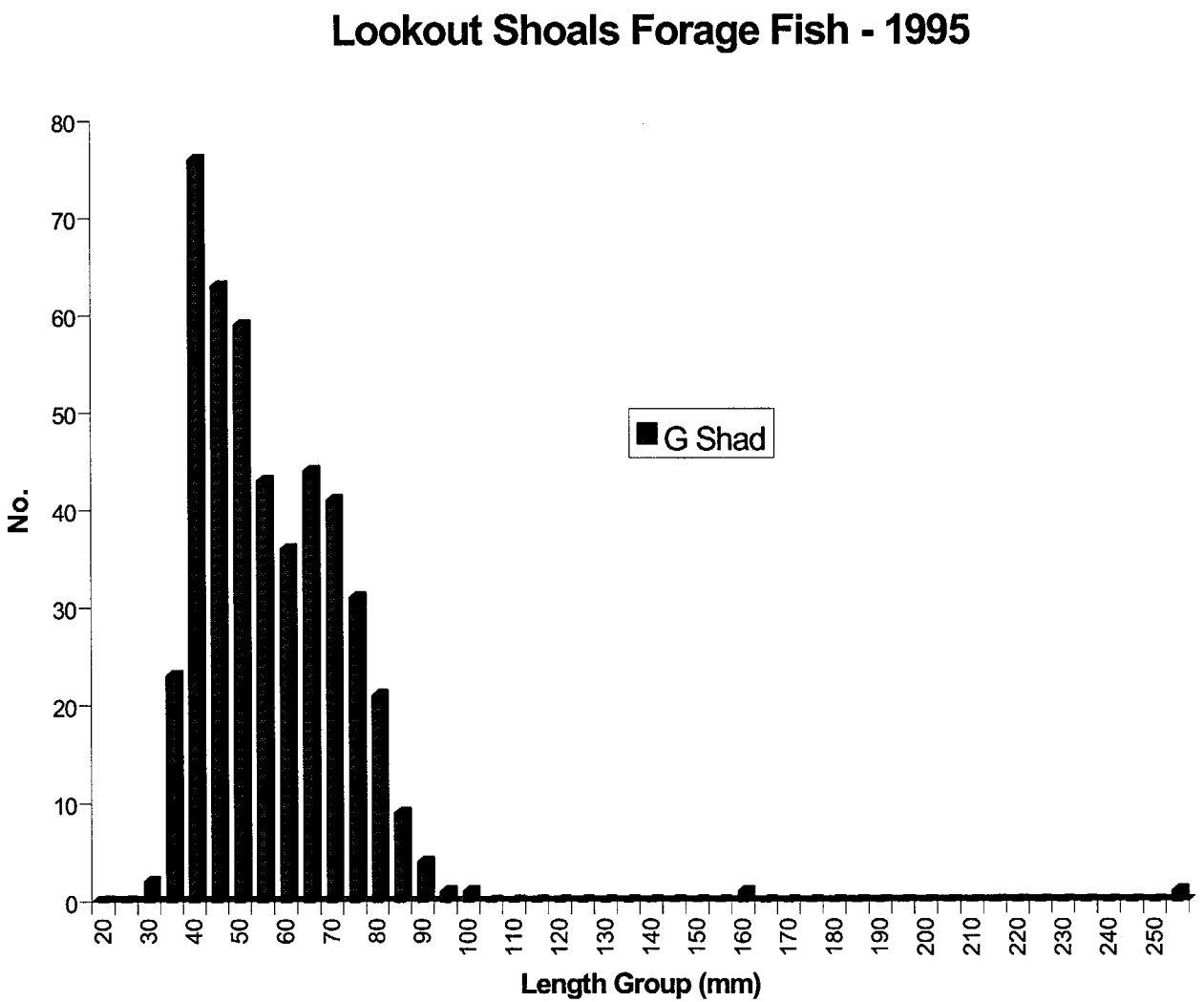


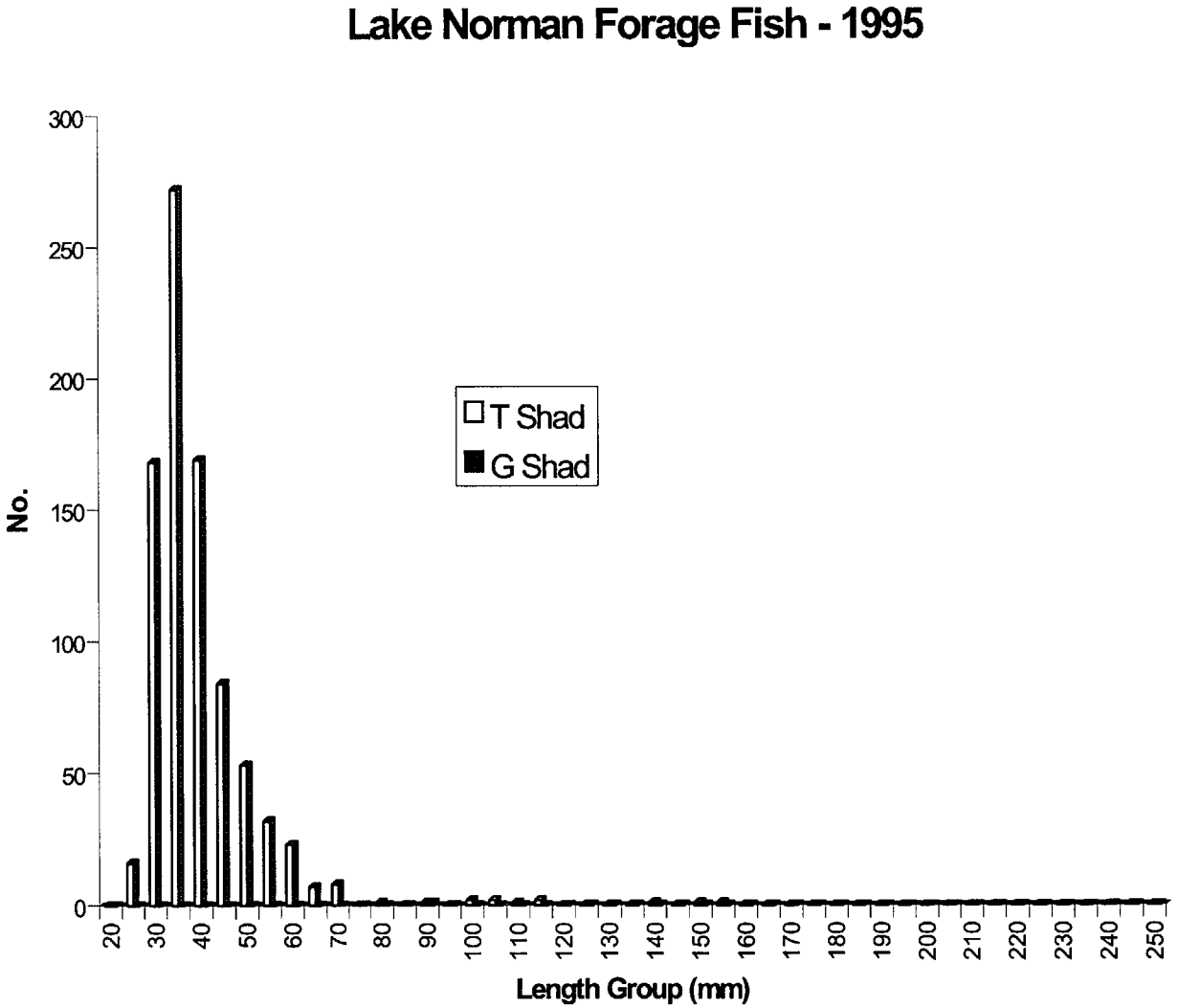
Lake Rhodhiss Forage Fish - 1995



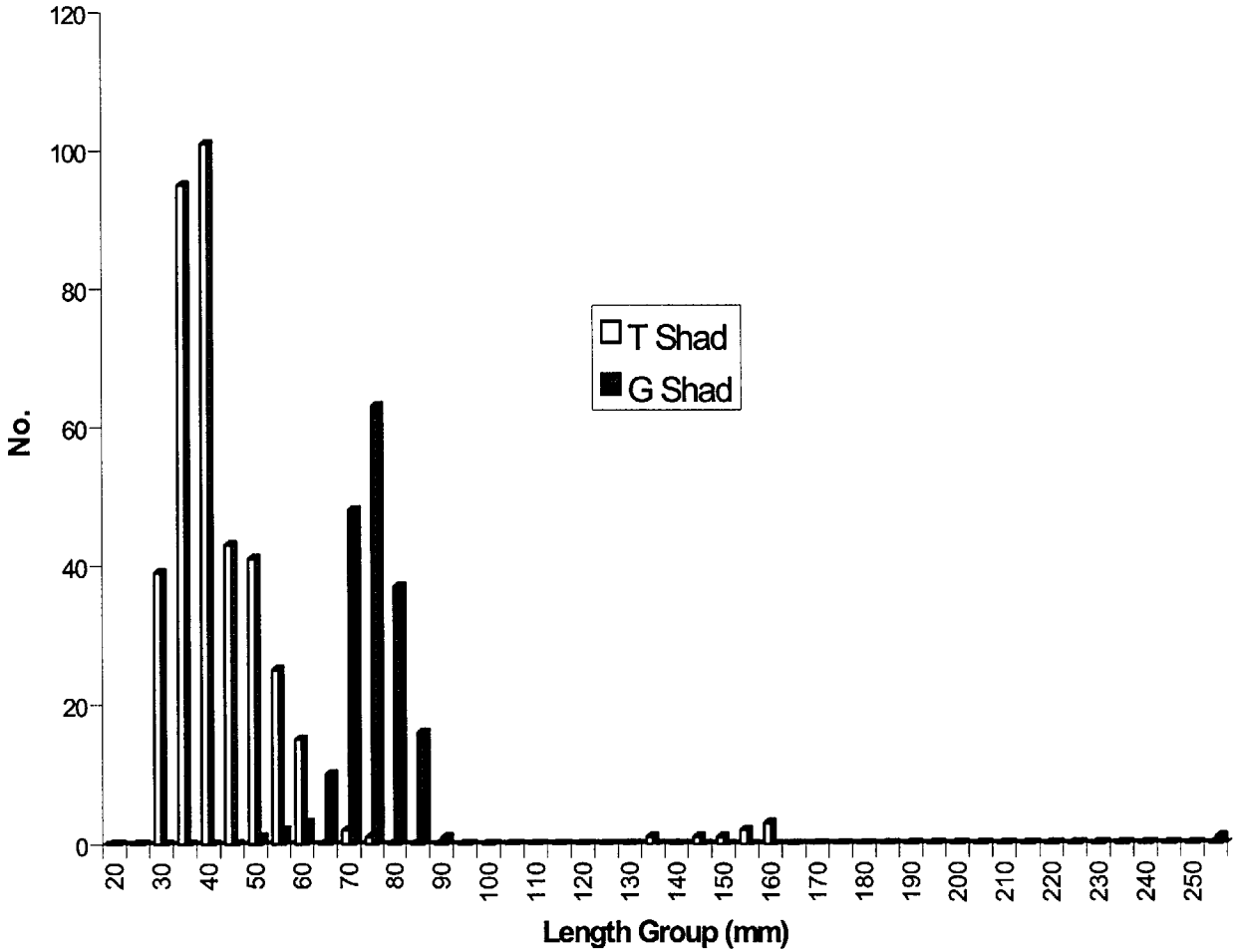
Lake Hickory Forage Fish - 1995



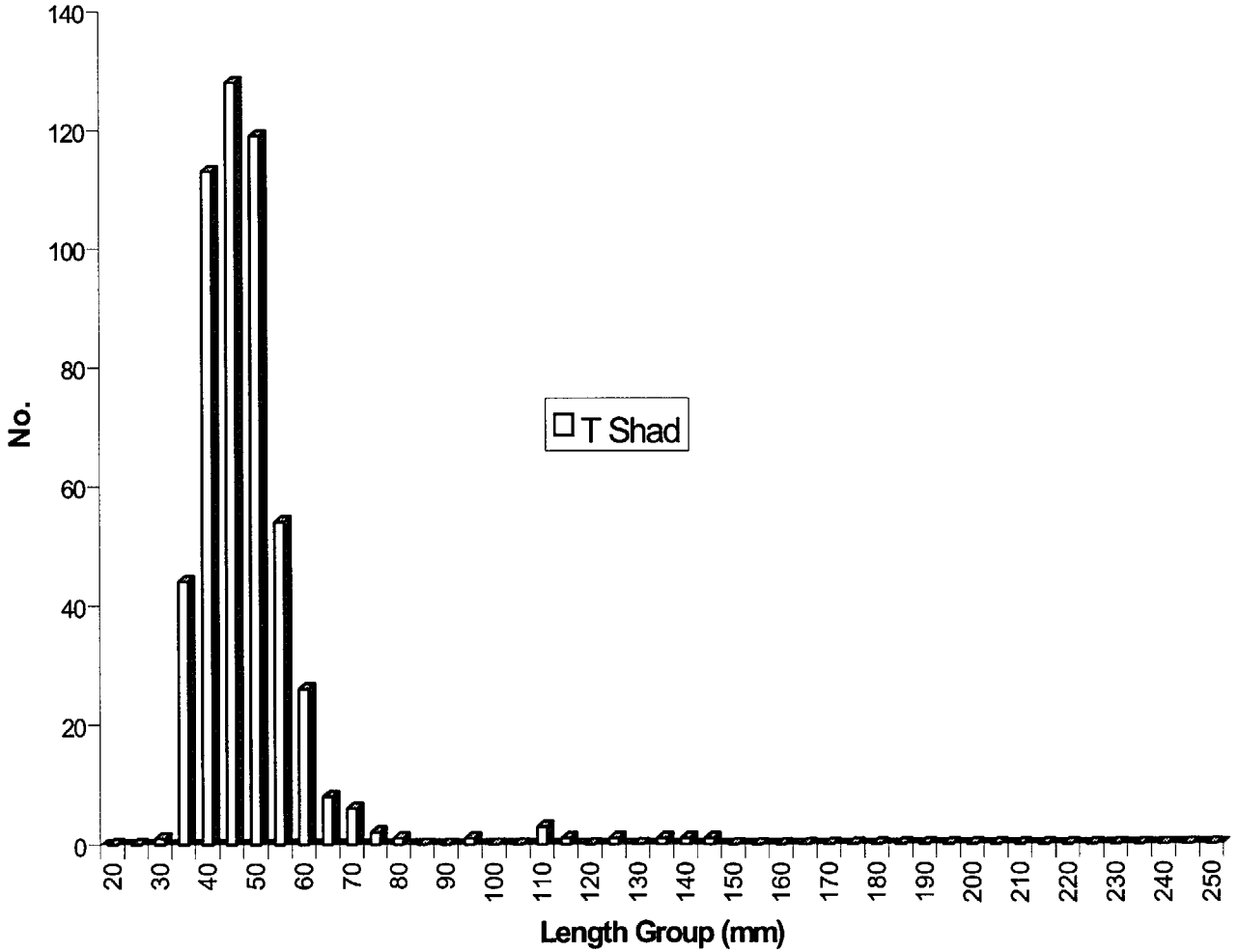

Lookout Shoals Forage Fish - 1995
No.
80
70
60
50
40
30
20
10
0
G Shad
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210
220
230
240
250
Length Group (mm)

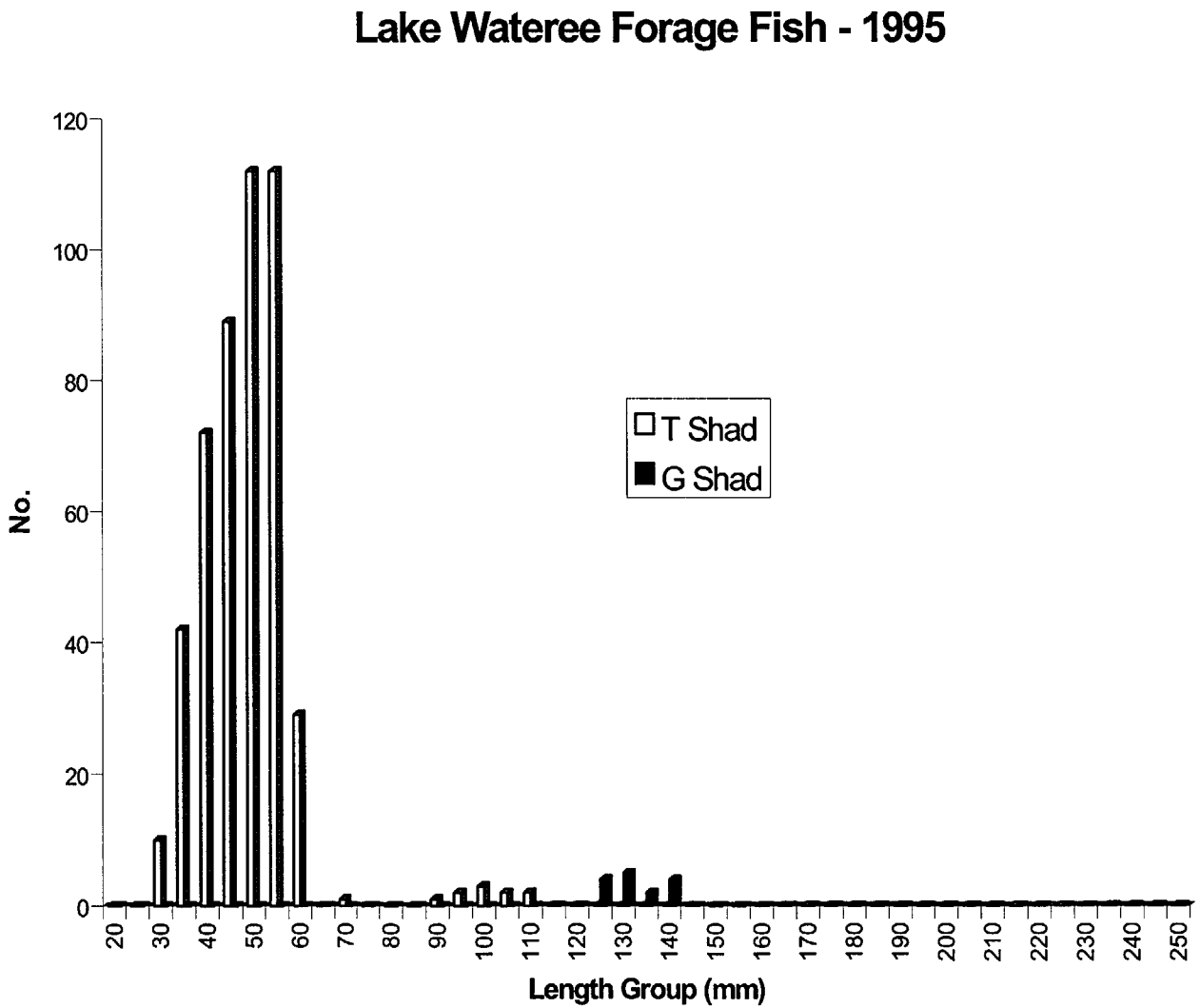

Lake Norman Forage Fish - 1995
300
250
200
150
100
50
0
No.
T Shad
G Shad
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210
220
230
240
250
Length Group (mm)

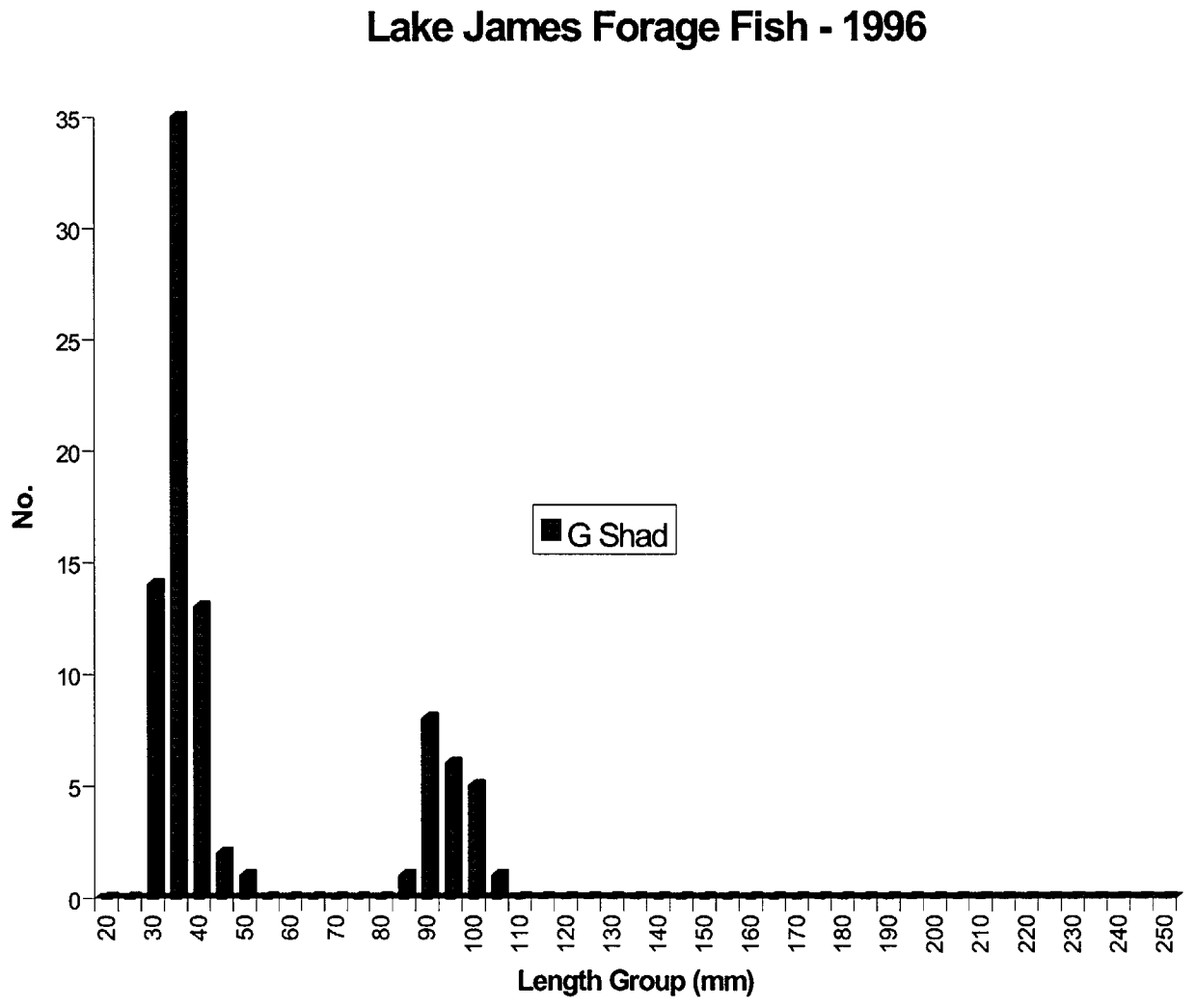
Mt. Island Forage Fish - 1995

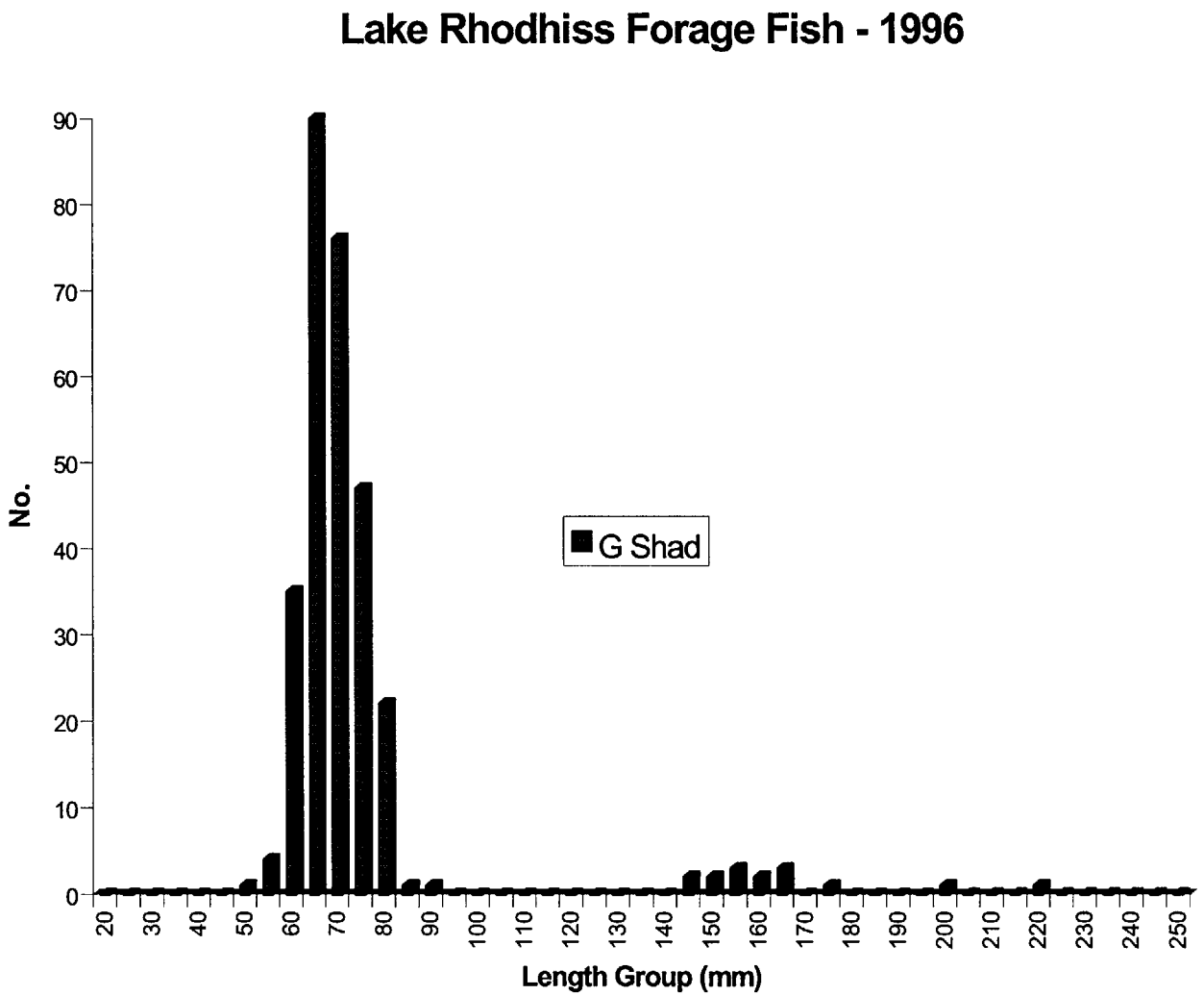


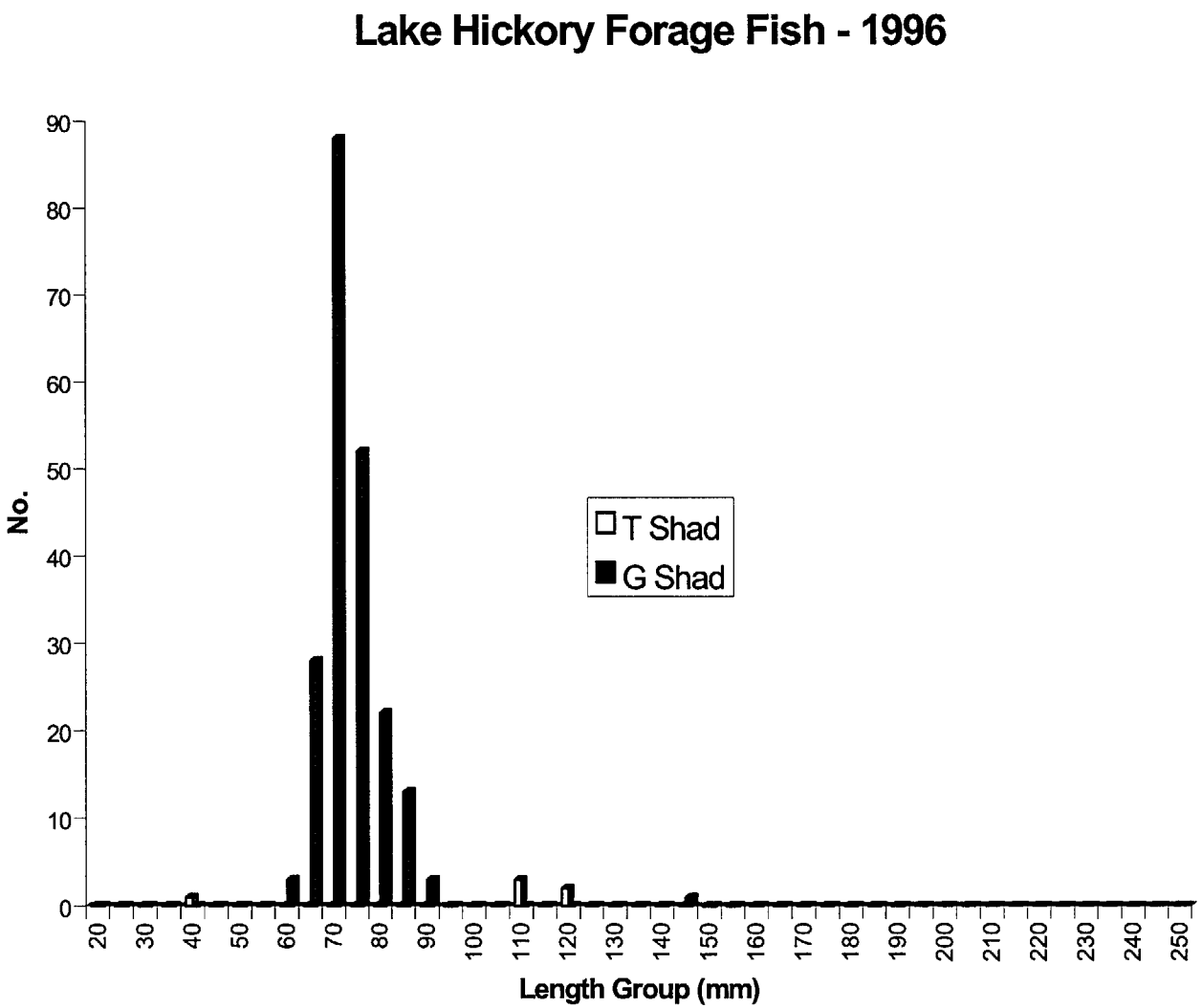
Lake Wylie Forage Fish - 1995

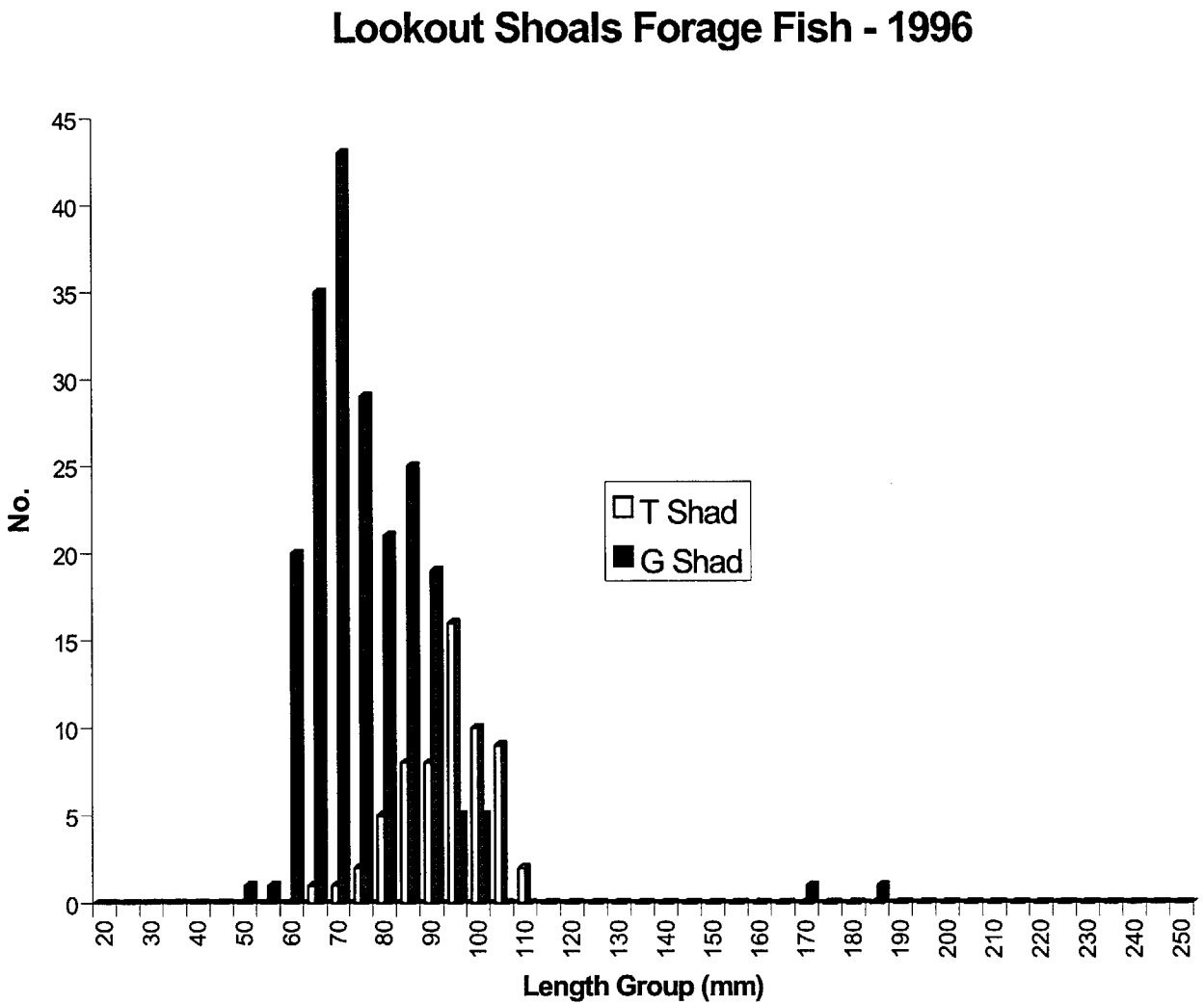



Lake Wateree Forage Fish - 1995
No.
120
100
80
60
40
20
0
T Shad
G Shad
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210
220
230
240
250
Length Group (mm)

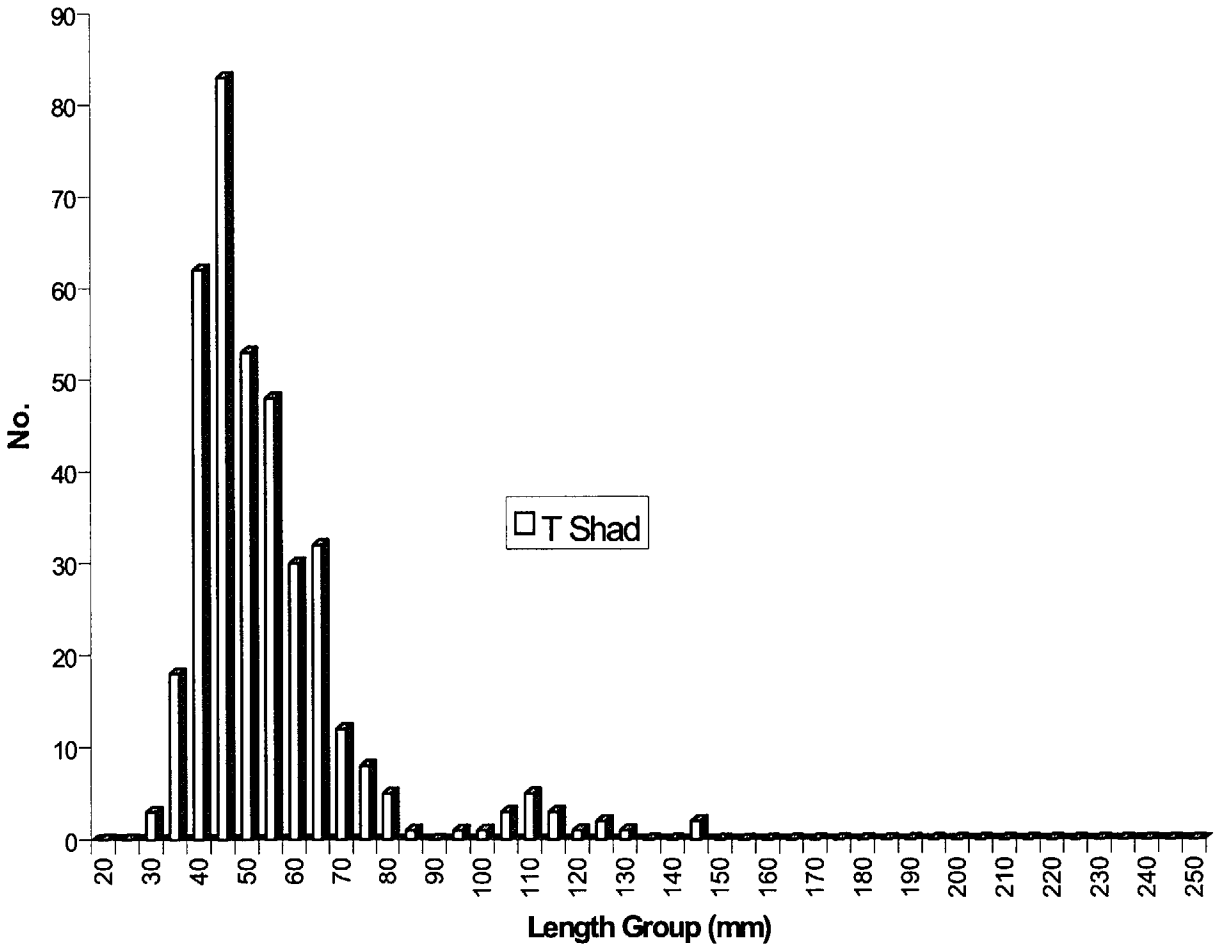

Lake James Forage Fish - 1996
No.
35
30
25
20
15
10
5
0
G Shad
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210
220
230
240
250
Length Group (mm)

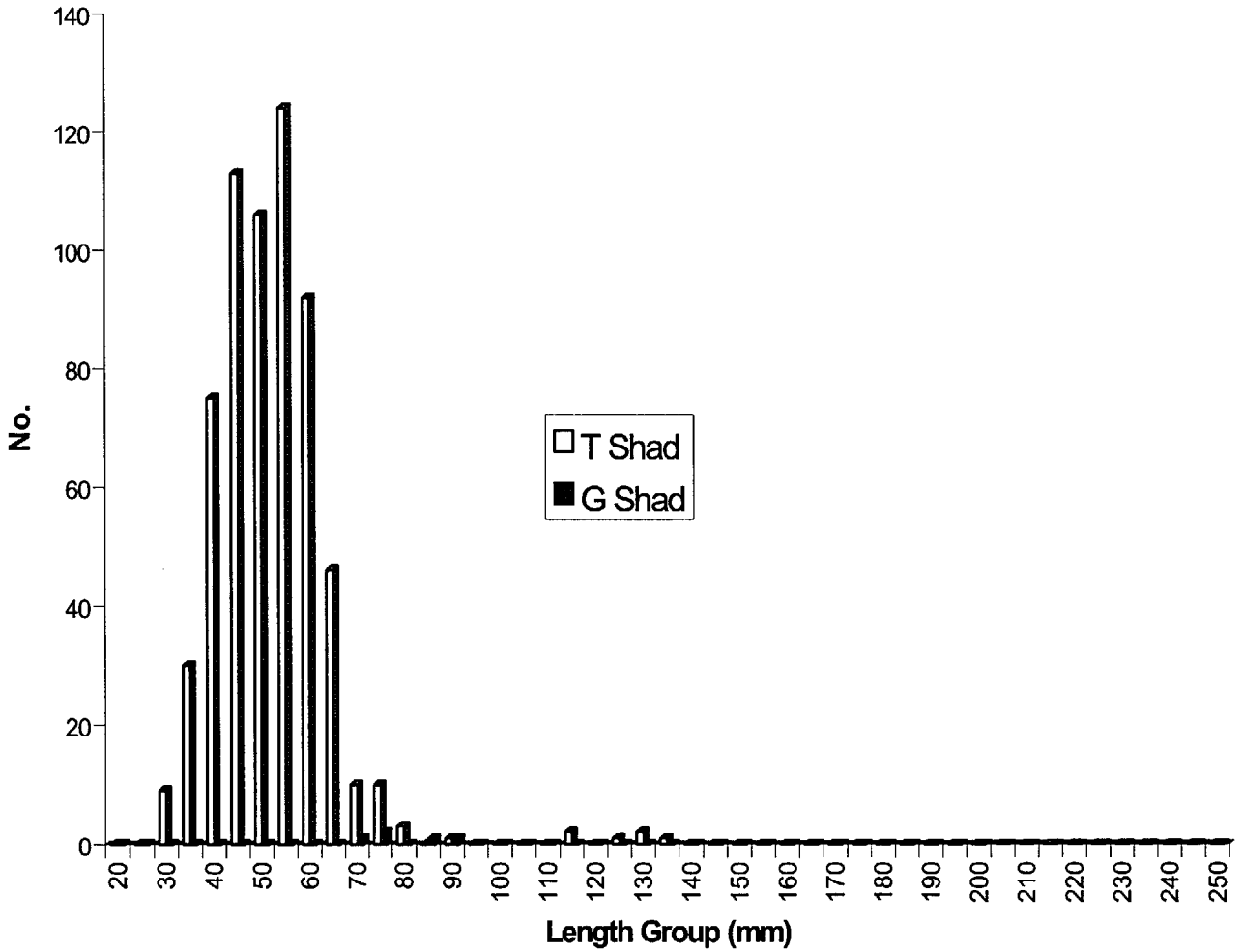

Lake Rhodhiss Forage Fish - 1996
No.
0
10
20
30
40
50
60
70
80
90
G Shad
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210
220
230
240
250
Length Group (mm)

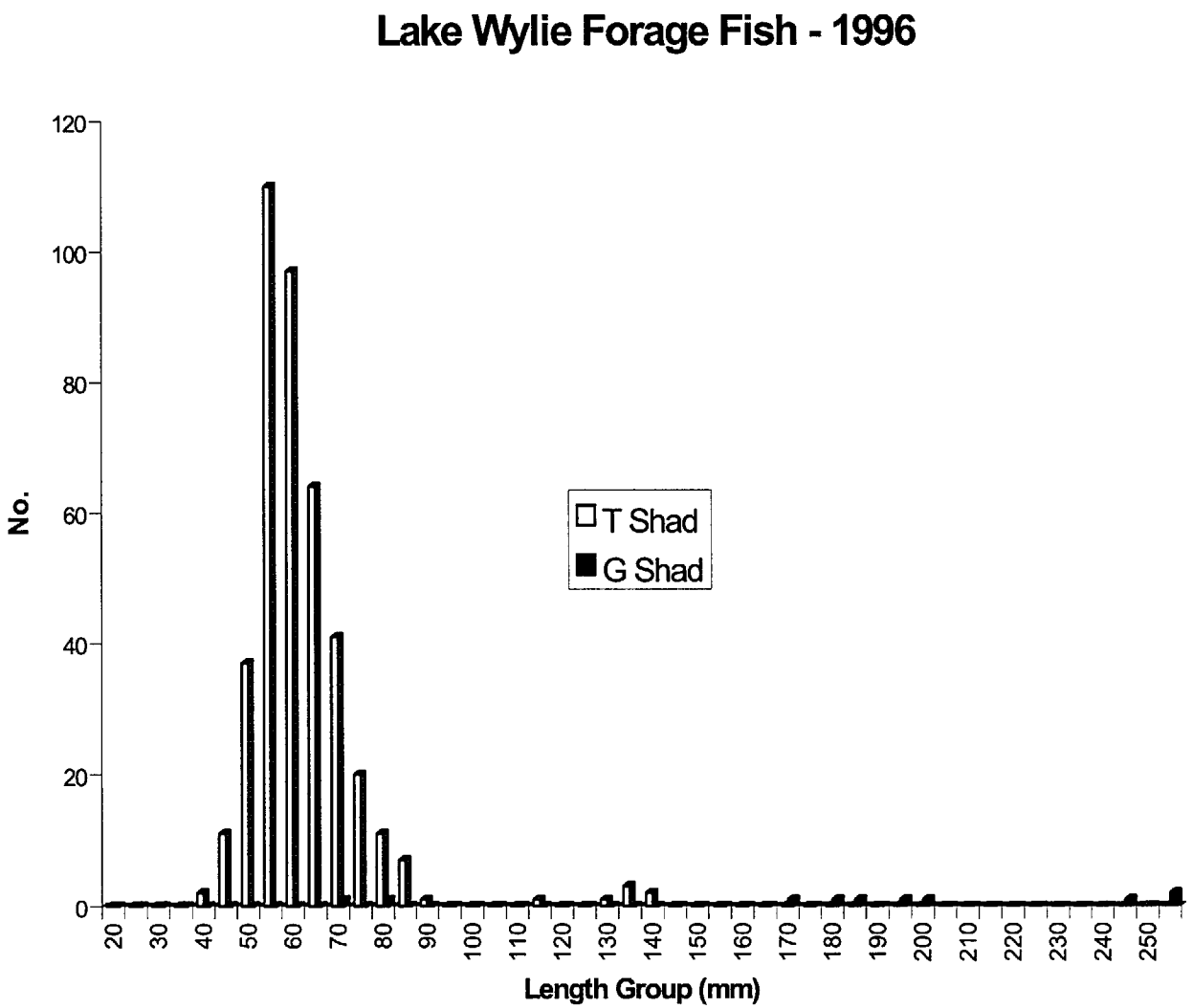

Lake Hickory Forage Fish - 1996
No.
90
80
70
60
50
40
30
20
10
0
T Shad
G Shad
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210
220
230
240
250
Length Group (mm)


Lookout Shoals Forage Fish - 1996
No.
45
40
35
30
25
20
15
10
5
0
T Shad
G Shad
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210
220
230
240
250
Length Group (mm)

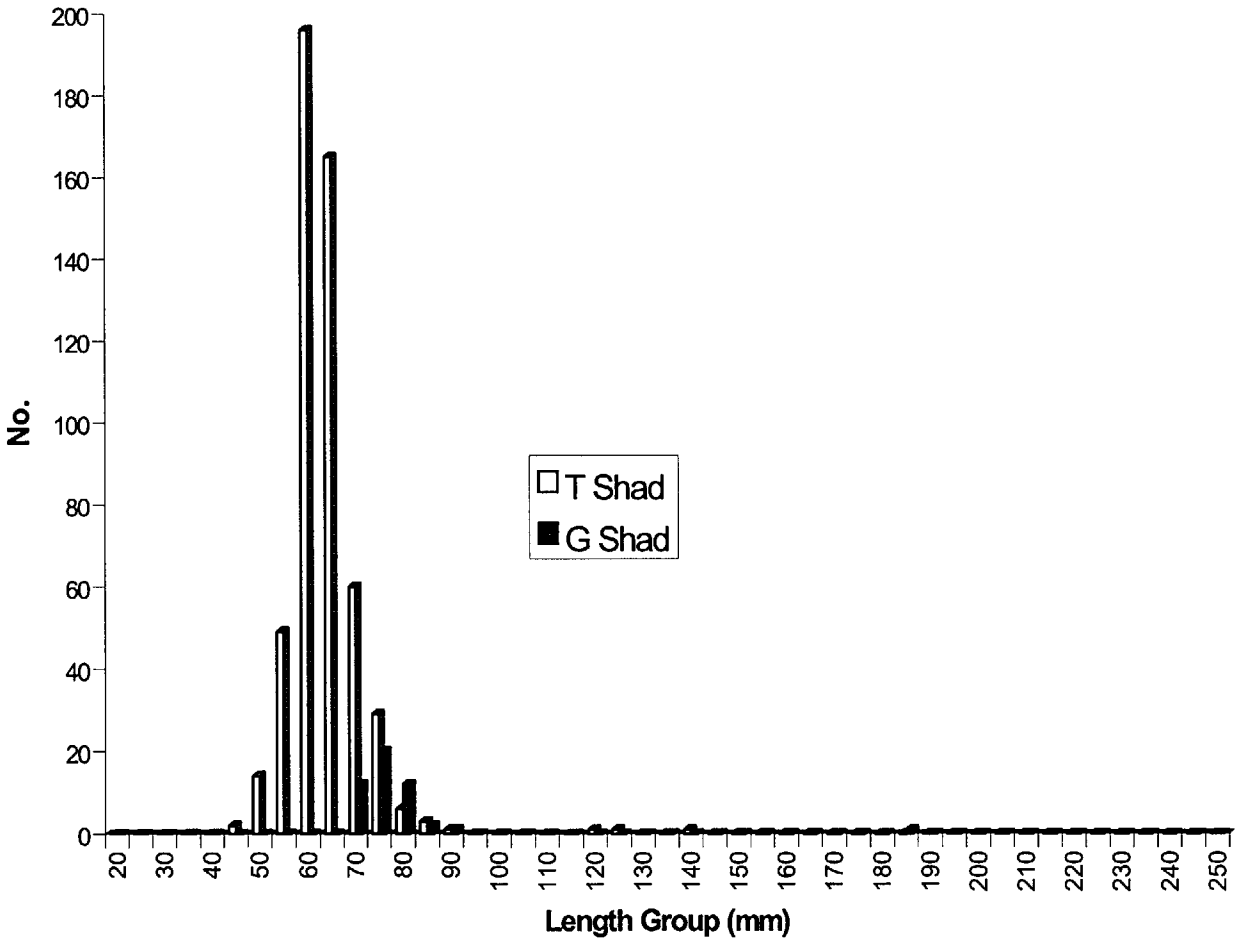
Lake Norman Forage Fish - 1996

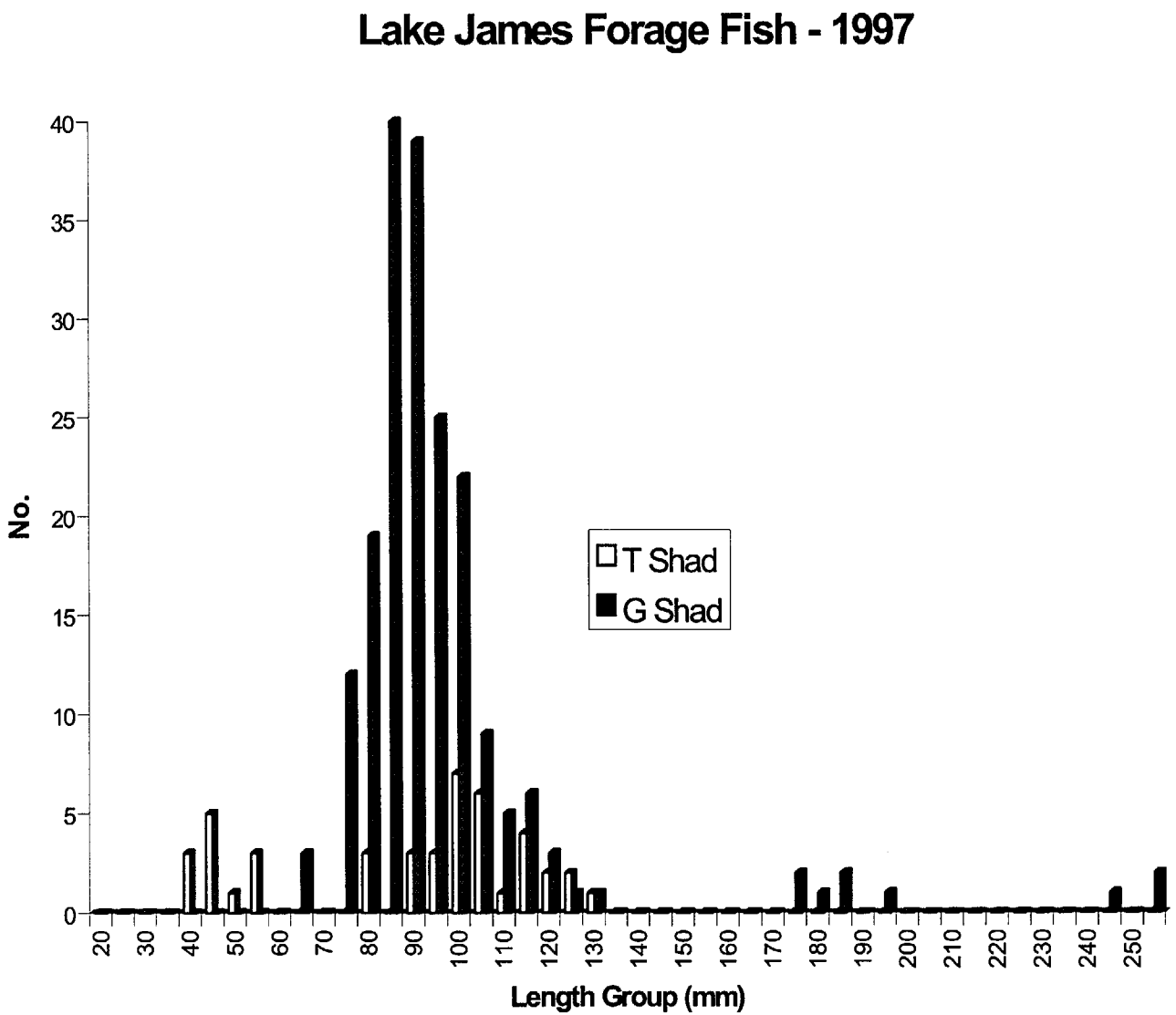


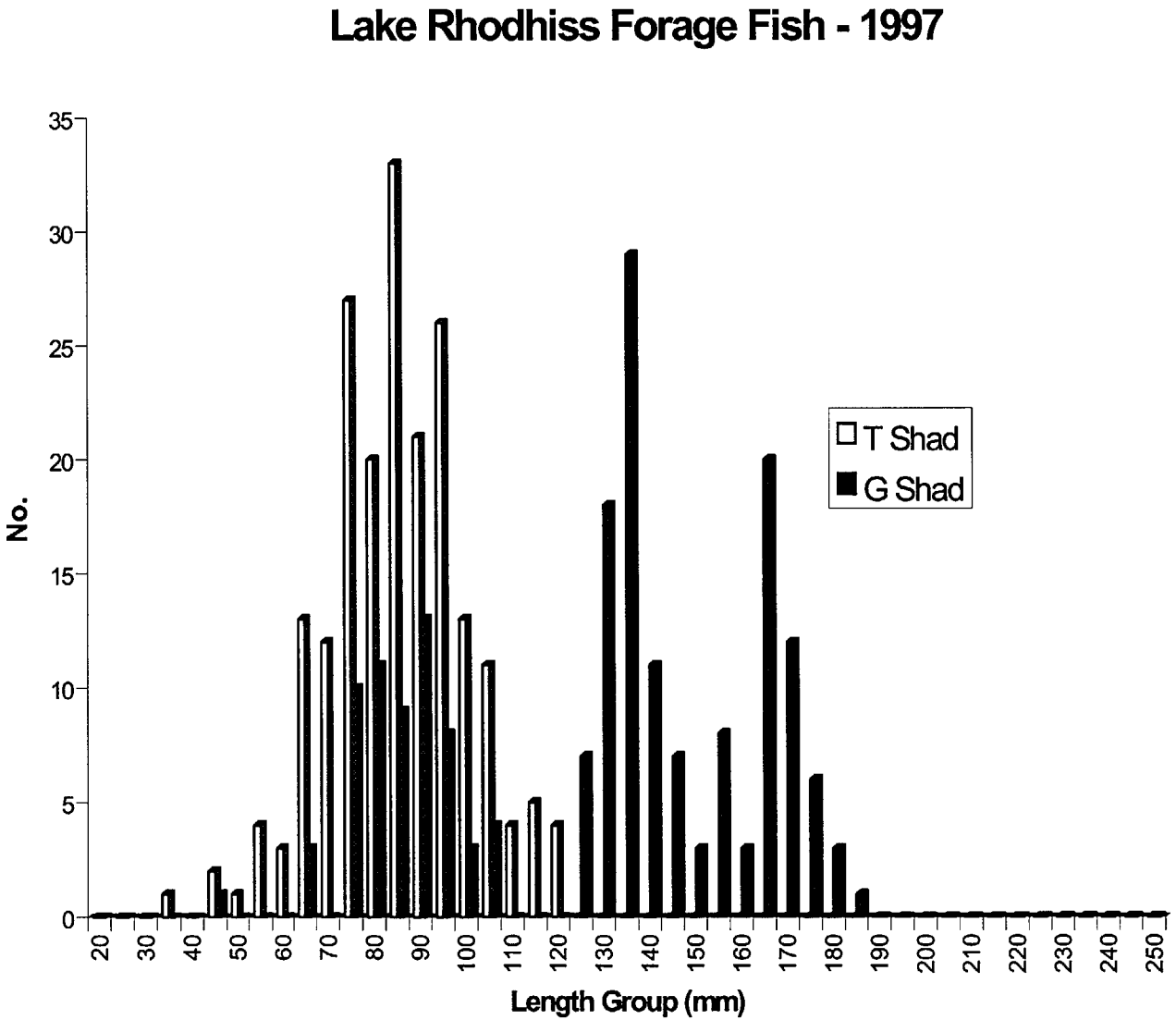

Mt. Island Forage Fish - 1996
No.
140
120
100
80
60
40
20
0
T Shad
G Shad
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210
220
230
240
250
Length Group (mm)


Lake Wylie Forage Fish - 1996
No.
120
100
80
60
40
20
0
T Shad
G Shad
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210
220
230
240
250
Length Group (mm)

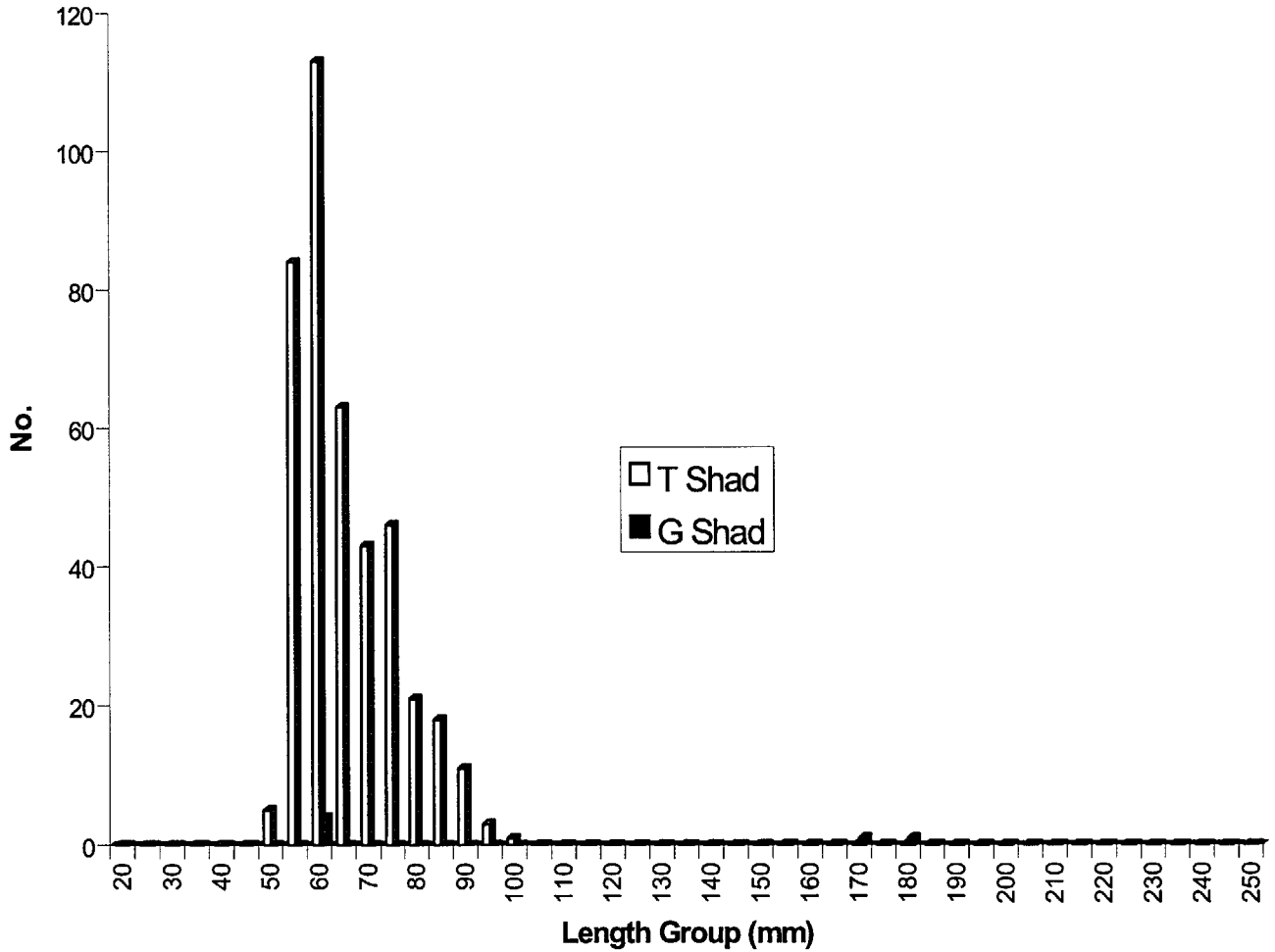
Lake Wateree Forage Fish - 1996



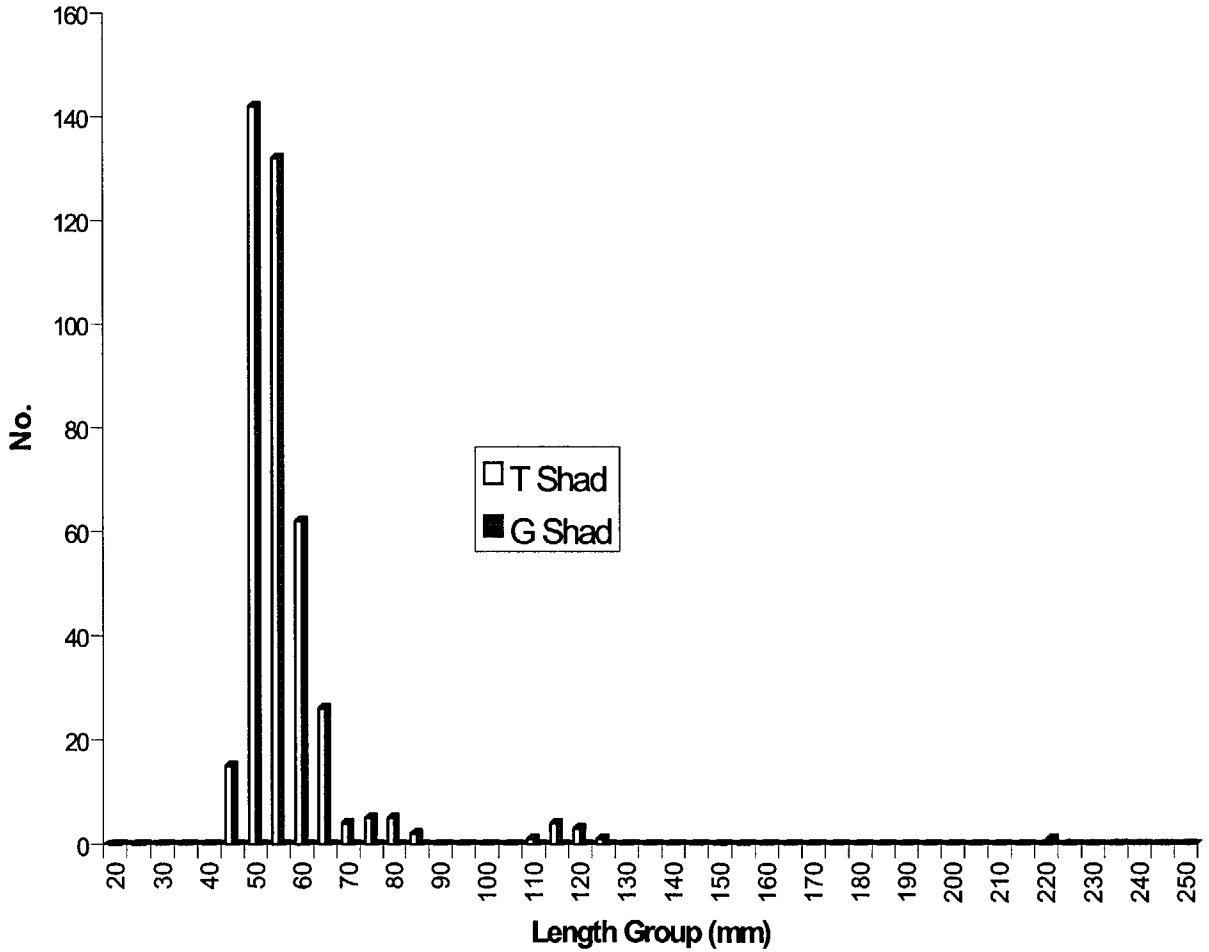

Lake James Forage Fish - 1997
No.
0
5
10
15
20
25
30
35
40
T Shad
G Shad
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210
220
230
240
250
Length Group (mm)


Lake Rhodhiss Forage Fish - 1997
No.
0
5
10
15
20
25
30
35
T Shad
G Shad
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210
220
230
240
250
Length Group (mm)

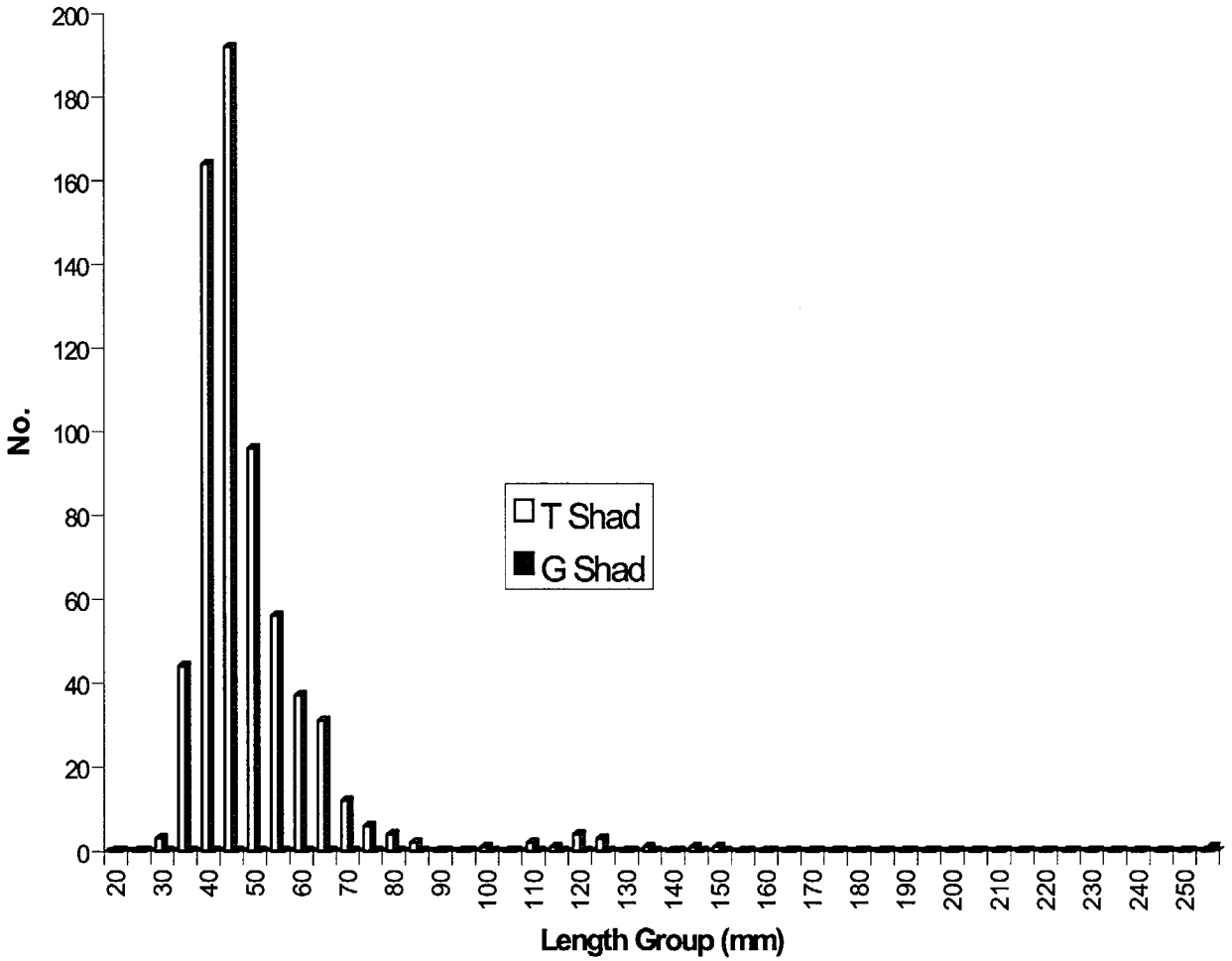
Lake Hickory Forage Fish - 1997

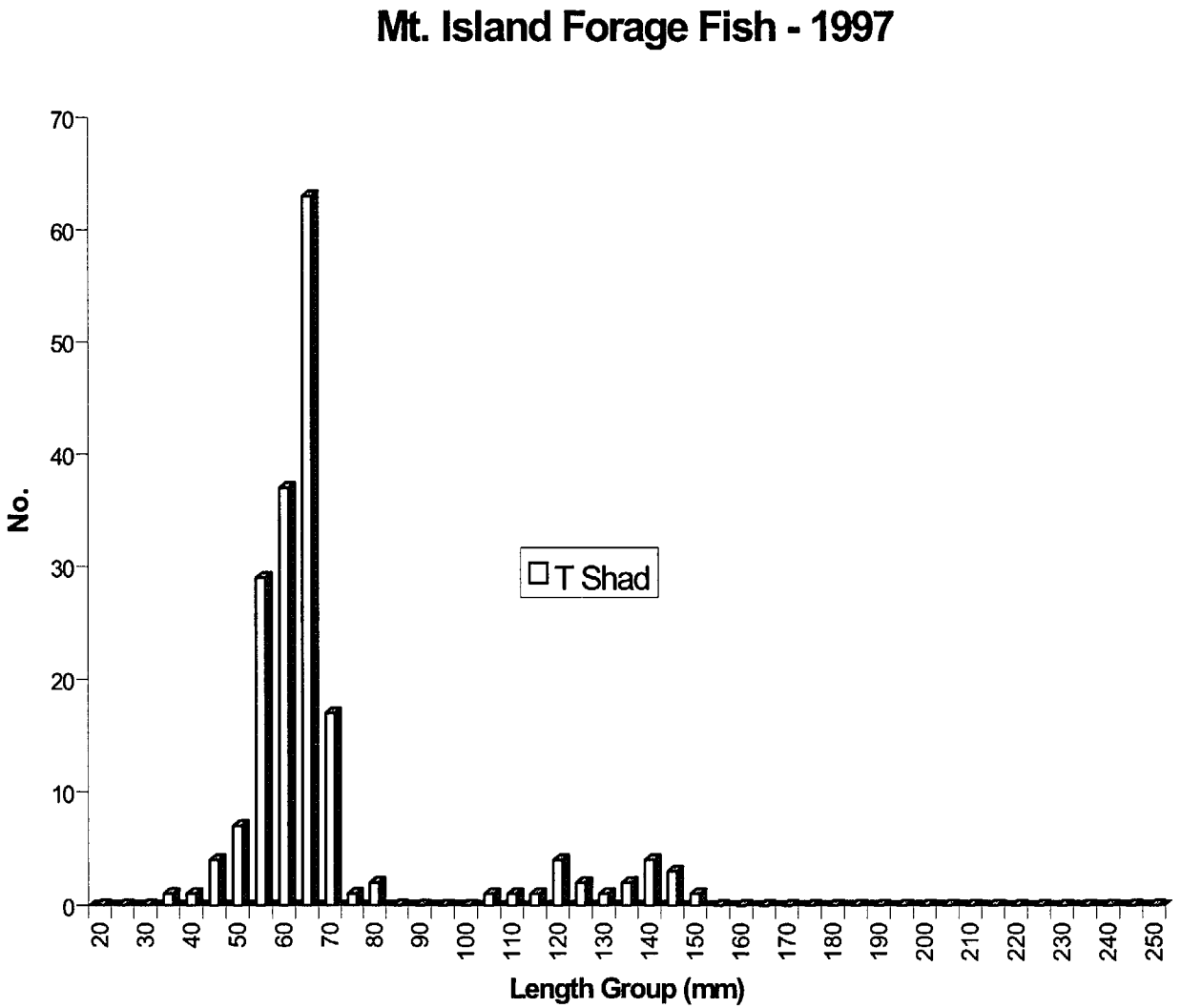


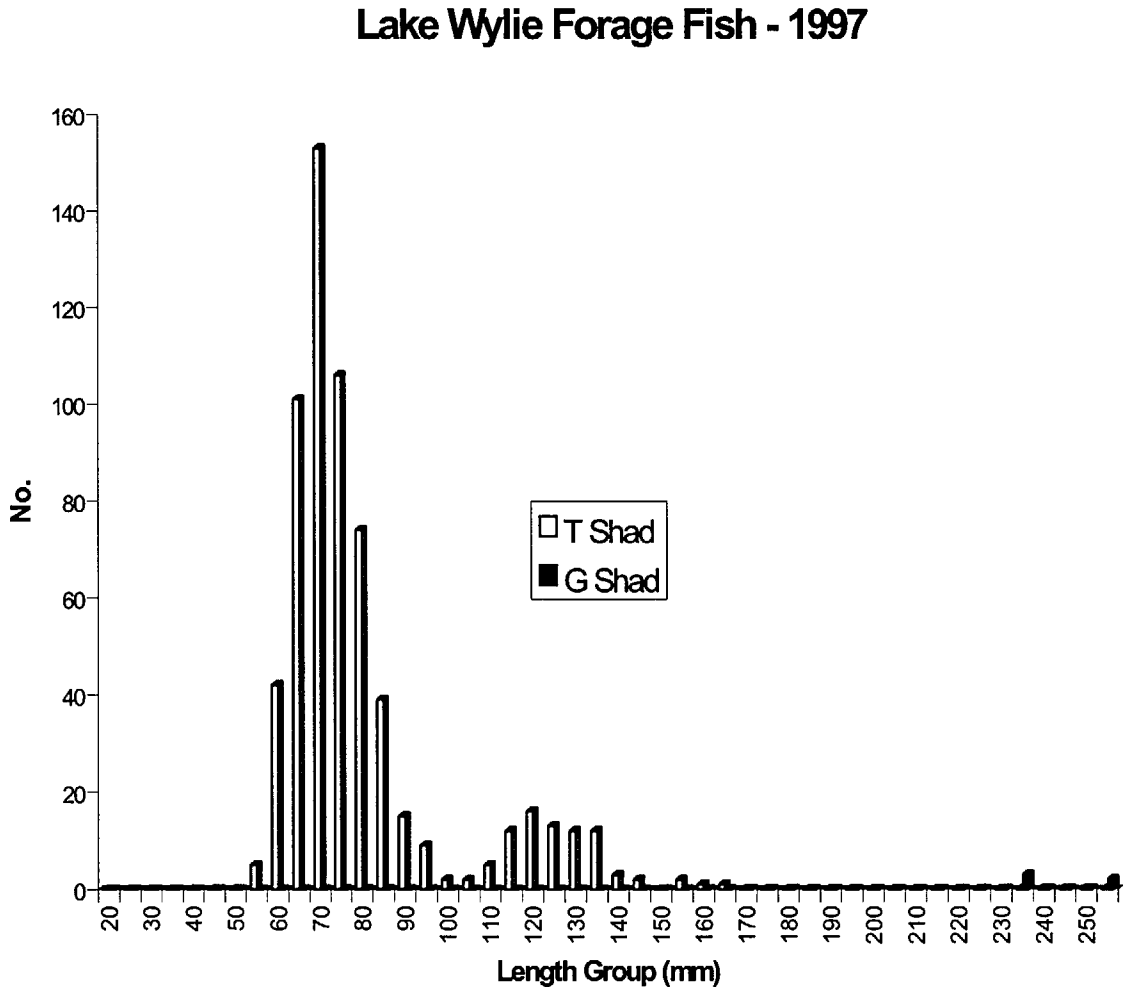
Lookout Shoals Forage Fish - 1997

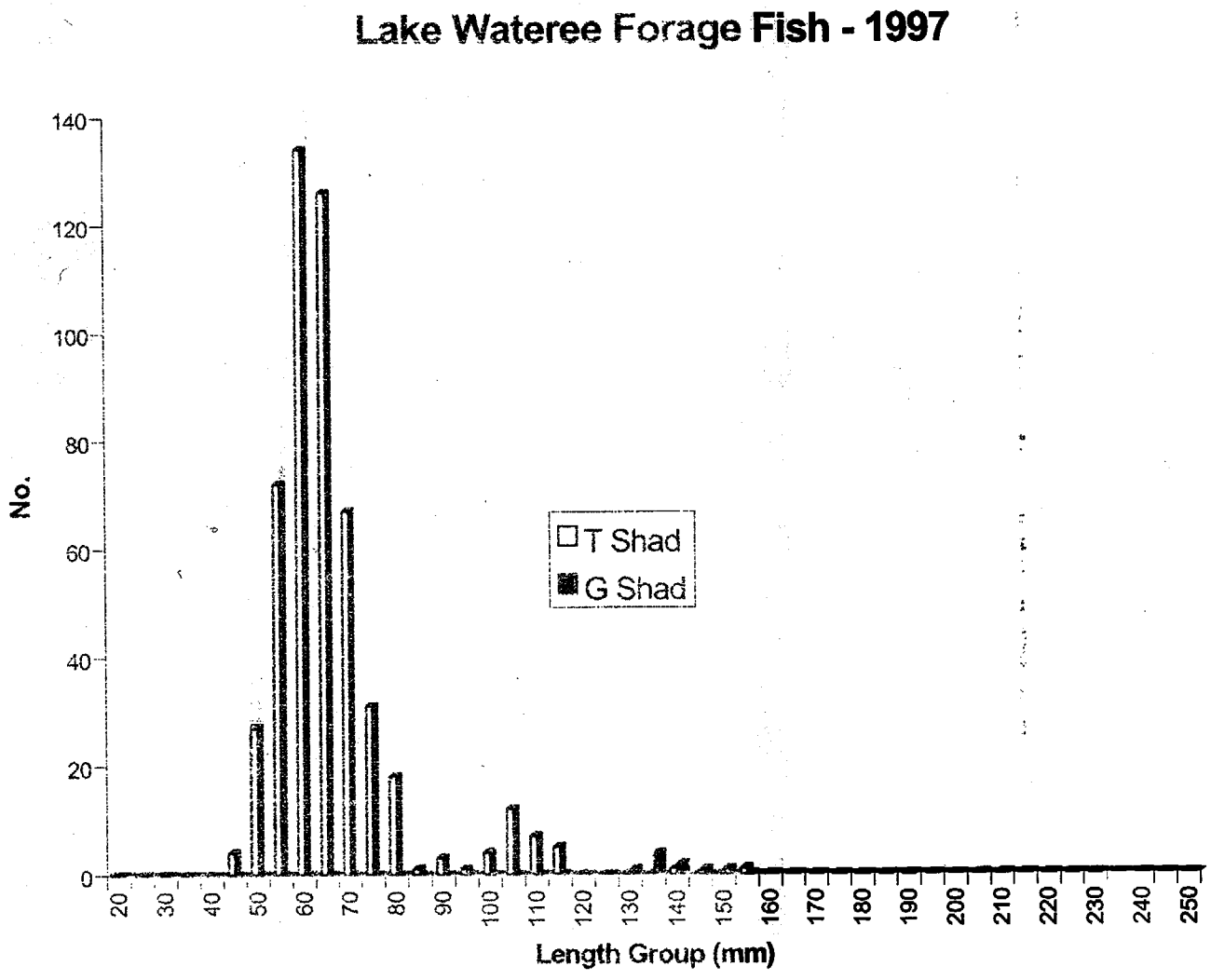


Lake Norman Forage Fish - 1997




Mt. Island Forage Fish - 1997
No.
70
60
50
40
30
20
10
0
T Shad
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210
220
230
240
250
Length Group (mm)


Lake Wylie Forage Fish - 1997
No.
160
140
120
100
80
60
40
20
0
T Shad
G Shad
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210
220
230
240
250
Length Group (mm)


Lake Wateree Forage Fish - 1997
No.
140
120
100
80
60
40
20
0
T Shad
G Shad
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210
220
230
240
250
Length Group (mm)

Application to Renew the Operating Licenses of
McGuire Nuclear Station and Catawba Nuclear Station

Responses to NRC Requests for Additional Information
Concerning the Catawba Environmental Report
NRC Letter dated December 12, 2001

Attachment 3

Number and Percent Composition of Fishes Collected in Electrofishing Samples at Locations 215 and 216 on Lake Wylie during 1991, 1993, 1994, 1995, and 1996

Attachment 3
Application to Renew the Operating Licenses of
McGuire Nuclear Station and Catawba Nuclear Station

Responses to NRC Requests for Additional Information
Concerning the Catawba Environmental Report
NRC Letter dated December 12, 2001

Number and percent composition of fishes collected in electrofishing samples at Locations 215 and 216 on Lake Wylie during 1991.

Location	Taxon / Water Temperature	Jan 9.5 C		Apr 15.5 C	
		No.	%	No.	%
215	*Dorosoma cepedianum*	45	30.8%	24	12.1%
	Dorosoma petenense	8	5.5%	0	0.0%
	Cyprinella chloristia	1	0.7%	4	2.0%
	Cyprinella nivea	3	2.1%	2	1.0%
	Cyprinus carpio	0	0.0%	1	0.5%
	Notemigonus crysoleucas	0	0.0%	4	2.0%
	Ameiurus catus	1	0.7%	11	5.5%
	Lepomis auritus	0	0.0%	1	0.5%
	Lepomis gibbosus	2	1.4%	8	4.0%
	Lepomis gulosus	3	2.1%	0	0.0%
	Lepomis macrochirus	57	39.0%	41	20.6%
	Lepomis microlophus	9	6.2%	1	0.5%
	Micropterus salmoides	15	10.3%	82	41.2%
	Pomoxis nigromaculatus	0	0.0%	19	9.5%
	Perca flavescens	2	1.4%	1	0.5%
	Total	146	100.0%	199	100.0%

Location	Taxon / Water Temperature	Jan (Not Sampled)		Apr 16.0 C	
		No.	%	No.	%
216	*Dorosoma petenense*			14	6.1%
	Cyprinella chloristia			3	1.3%
	Cyprinella nivea			2	0.9%
	Cyprinus carpio			1	0.4%
	Notropis hudsonius			1	0.4%
	Ameiurus catus			28	12.2%
	Lepomis auritus			3	1.3%
	Lepomis gibbosus			9	3.9%
	Lepomis macrochirus			95	41.3%
	Lepomis microlophus			6	2.6%
	Micropterus salmoides			58	25.2%
	Pomoxis nigromaculatus			3	1.3%
	Etheostoma olmstedi			1	0.4%
	Perca flavescens			6	2.6%
	Total			230	100.0%

Number and percent composition of fishes collected in electrofishing samples at Locations 215 and 216 on Lake Wylie during 1993.

Location	Taxon	Mar 11.0 C		Oct 19.6 C	
	Water Temperature	No.	%	No.	%
215	*Dorosoma cepedianum*	32	7.8%	45	9.6%
	Dorosoma petenense	18	4.4%	101	21.4%
	Cyprinella chloristia	0	0.0%	6	1.3%
	Cyprinella nivea	5	1.2%	12	2.5%
	Notemigonus crysoleucas	3	0.7%	0	0.0%
	Ameiurus catus	8	1.9%	1	0.2%
	Ameiurus platycephalus	1	0.2%	0	0.0%
	Lepomis auritus	5	1.2%	1	0.2%
	Lepomis gibbosus	2	0.5%	3	0.6%
	Lepomis gulosus	8	1.9%	1	0.2%
	Lepomis macrochirus	193	47.0%	253	53.7%
	Lepomis microlophus	9	2.2%	1	0.2%
	Lepomis hybrid	1	0.2%	0	0.0%
	Micropterus salmoides	107	26.0%	45	9.6%
	Pomoxis nigromaculatus	17	4.1%	0	0.0%
	Perca flavescens	2	0.5%	2	0.4%
	Total	411	100.0%	471	100.0%

Location	Taxon	Mar 11.3 C		Dec 11.0 C	
	Water Temperature	No.	%	No.	%
216	*Dorosoma cepedianum*	16	7.1%	5	4.7%
	Dorosoma petenense	3	1.3%	0	0.0%
	Cyprinella chloristia	0	0.0%	3	2.8%
	Cyprinella nivea	3	1.3%	2	1.9%
	Ameiurus catus	22	9.8%	0	0.0%
	Lepomis auritus	2	0.9%	0	0.0%
	Lepomis gibbosus	1	0.4%	1	0.9%
	Lepomis gulosus	6	2.7%	2	1.9%
	Lepomis macrochirus	97	43.3%	60	56.1%
	Lepomis microlophus	5	2.2%	9	8.4%
	Micropterus salmoides	39	17.4%	16	15.0%
	Perca flavescens	30	13.4%	9	8.4%
	Total	224	100.0%	107	100.0%

Number and percent composition of fishes collected in electrofishing samples at Locations 215 and 216 on Lake Wylie during 1994.

Location	Taxon Water Temperature	Apr 15.4 C		Nov 19.2 C	
		No.	%	No.	%
215	*Lepisosteus osseus*	1	0.2%	0	0.0%
	Dorosoma cepedianum	32	6.1%	32	12.9%
	Cyprinella chloristia	0	0.0%	13	5.2%
	Cyprinella nivea	40	7.6%	0	0.0%
	Ameiurus catus	4	0.8%	1	0.4%
	Lepomis auritus	3	0.6%	2	0.8%
	Lepomis gibbosus	2	0.4%	3	1.2%
	Lepomis gulosus	5	1.0%	3	1.2%
	Lepomis macrochirus	348	66.4%	171	68.7%
	Lepomis microlophus	0	0.0%	4	1.6%
	Micropterus salmoides	75	14.3%	18	7.2%
	Perca flavescens	14	2.7%	2	0.8%
	Total	524	100.0%	249	100.0%

Location	Taxon Water Temperature	May 21.9 C		Nov 19.2 C	
		No.	%	No.	%
216	*Dorosoma cepedianum*	13	4.9%	39	30.7%
	Cyprinella nivea	2	0.7%	12	9.4%
	Ameiurus catus	4	1.5%	0	0.0%
	Ictalurus punctatus	1	0.4%	0	0.0%
	Lepomis auritus	6	2.2%	2	1.6%
	Lepomis gibbosus	5	1.9%	0	0.0%
	Lepomis gulosus	16	6.0%	1	0.8%
	Lepomis macrochirus	160	59.9%	49	38.6%
	Lepomis microlophus	11	4.1%	1	0.8%
	Micropterus salmoides	33	12.4%	16	12.6%
	Etheostoma olmstedi	0	0.0%	4	3.1%
	Perca flavescens	16	6.0%	3	2.4%
	Total	267	100.0%	127	100.0%

Number and percent composition of fishes collected in electrofishing samples at Locations 215 and 216 on Lake Wylie during 1995.

Location	Taxon Water Temperature	Mar 15.3 C		Sep 29.3 C	
		No.	%	No.	%
215	*Dorosoma cepedianum*	48	9.0%	55	19.4%
	Cyprinella chloristia	0	0.0%	27	9.5%
	Cyprinella nivea	26	4.9%	0	0.0%
	Cyprinus carpio	1	0.2%	0	0.0%
	Ameiurus catus	19	3.6%	0	0.0%
	Lepomis auritus	3	0.6%	7	2.5%
	Lepomis gulosus	1	0.2%	4	1.4%
	Lepomis macrochirus	271	50.8%	168	59.2%
	Lepomis microlophus	5	0.9%	1	0.4%
	Micropterus salmoides	123	23.1%	22	7.7%
	Pomoxis nigromaculatus	12	2.3%	0	0.0%
	Perca flavescens	24	4.5%	0	0.0%
	Total	533	100.0%	284	100.0%

Location	Taxon Water Temperature	Mar 15.3 C		Sep 29.3 C	
		No.	%	No.	%
216	*Dorosoma cepedianum*	105	28.2%	45	16.7%
	Dorosoma petenense	0	0.0%	82	30.4%
	Cyprinella chloristia	2	0.5%	20	7.4%
	Carpiodes cyprinus	0	0.0%	1	0.4%
	Ameiurus catus	27	7.3%	2	0.7%
	Lepomis auritus	8	2.2%	4	1.5%
	Lepomis gulosus	5	1.3%	20	7.4%
	Lepomis macrochirus	126	33.9%	84	31.1%
	Lepomis microlophus	12	3.2%	1	0.4%
	Micropterus salmoides	78	21.0%	10	3.7%
	Pomoxis nigromaculatus	2	0.5%	0	0.0%
	Perca flavescens	7	1.9%	1	0.4%
	Total	372	100.0%	270	100.0%

Number and percent composition of fishes collected in electrofishing samples at Locations 215 and 216 on Lake Wylie during 1996.

Location	Taxon / Water Temperature	Mar 14.0 C		Oct 16.5 C	
		No.	%	No.	%
215	*Dorosoma cepedianum*	39	7.8%	53	10.5%
	Cyprinella nivea	17	3.4%	4	0.8%
	Cyprinus carpio	3	0.6%	5	1.0%
	Ictiobus bubalus	0	0.0%	3	0.6%
	Ameiurus catus	4	0.8%	1	0.2%
	Ictalurus punctatus	0	0.0%	1	0.2%
	Morone chrysops	1	0.2%	2	0.4%
	Lepomis auritus	5	1.0%	32	6.3%
	Lepomis gulosus	2	0.4%	2	0.4%
	Lepomis macrochirus	246	48.9%	318	63.0%
	Lepomis microlophus	4	0.8%	7	1.4%
	Lepomis hybrid	1	0.2%	0	0.0%
	Micropterus salmoides	159	31.6%	68	13.5%
	Pomoxis nigromaculatus	3	0.6%	8	1.6%
	Perca flavescens	19	3.8%	1	0.2%
	Total	503	100.0%	505	100.0%

Location	Taxon / Water Temperature	Mar 14.0 C		Oct 16.5 C	
		No.	%	No.	%
216	*Dorosoma cepedianum*	15	9.3%	78	35.9%
	Dorosoma petenense	0	0.0%	6	2.8%
	Cyprinella nivea	0	0.0%	1	0.5%
	Ameiurus catus	15	9.3%	4	1.8%
	Ictalurus punctatus	0	0.0%	1	0.5%
	Lepomis auritus	0	0.0%	2	0.9%
	Lepomis gulosus	0	0.0%	1	0.5%
	Lepomis macrochirus	38	23.5%	84	38.7%
	Lepomis microlophus	4	2.5%	3	1.4%
	Micropterus salmoides	39	24.1%	17	7.8%
	Pomoxis nigromaculatus	1	0.6%	0	0.0%
	Perca flavescens	50	30.9%	20	9.2%
	Total	162	100.0%	217	100.0%

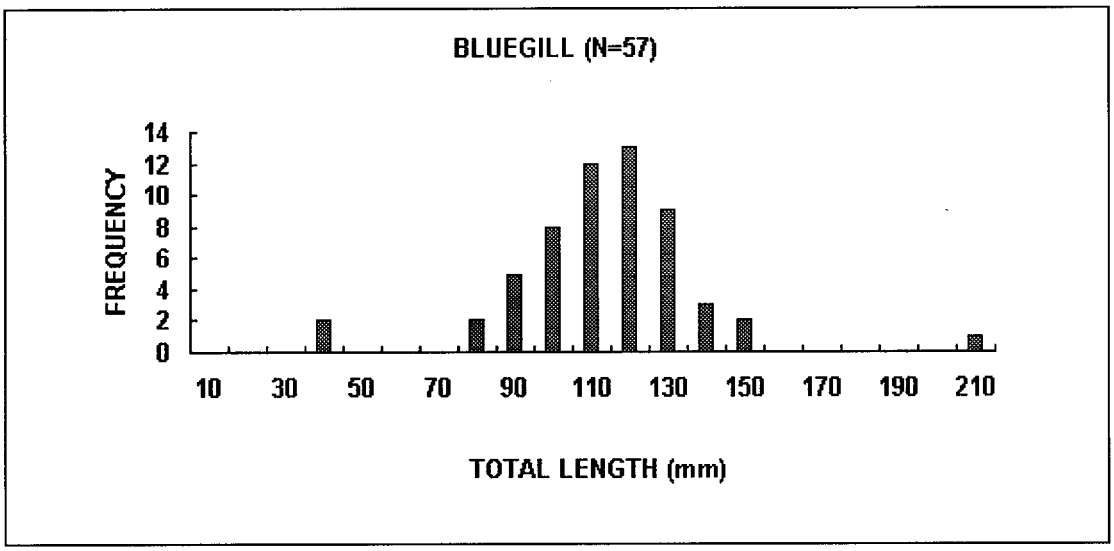
Application to Renew the Operating Licenses of
McGuire Nuclear Station and Catawba Nuclear Station

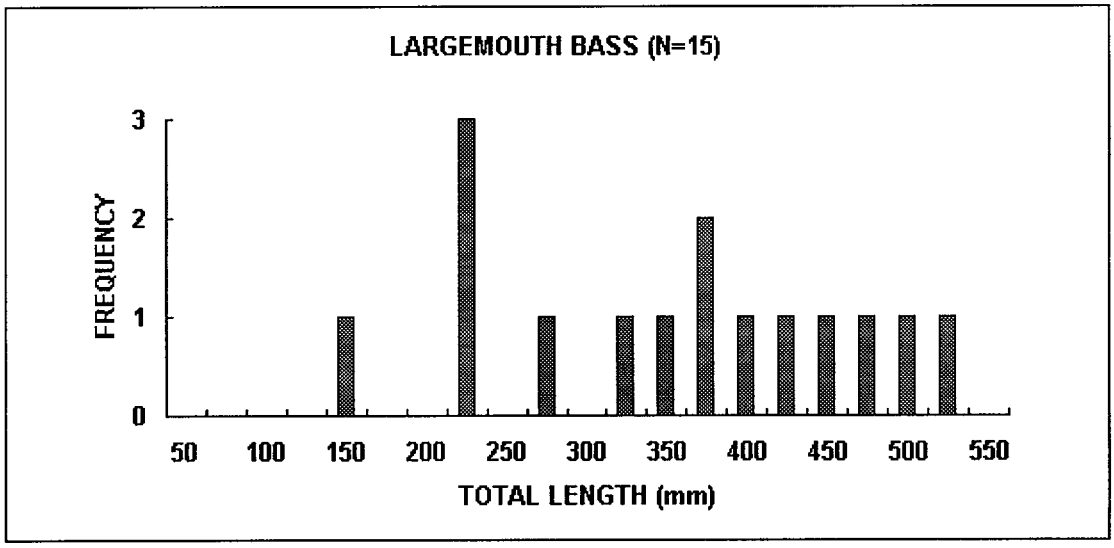
Responses to NRC Requests for Additional Information
Concerning the Catawba Environmental Report
NRC Letter dated December 12, 2001

Attachment 4

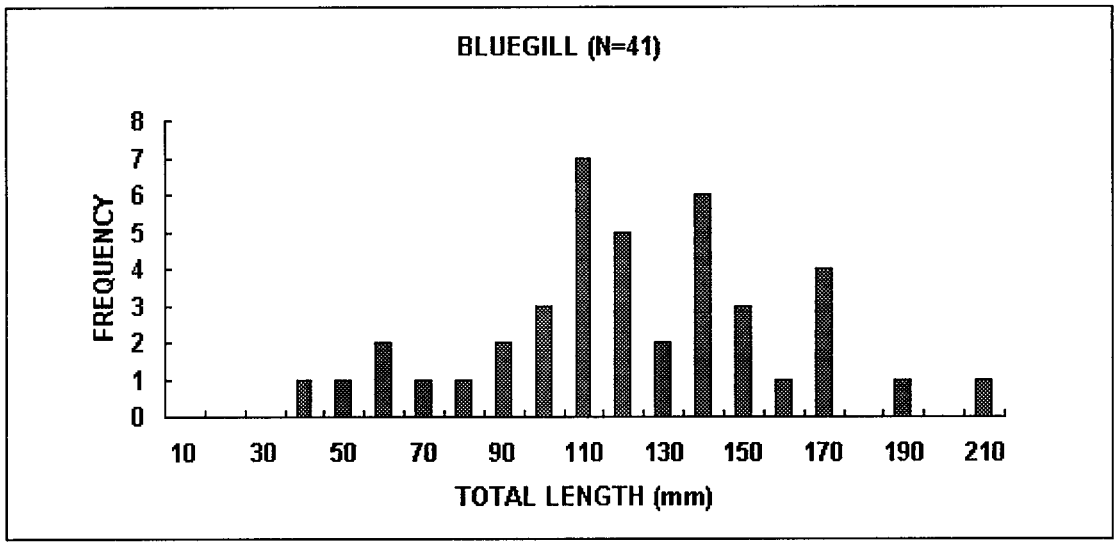
Length-Frequency Distributions for Bluegill & Largemouth Bass from Locations 215 and 216

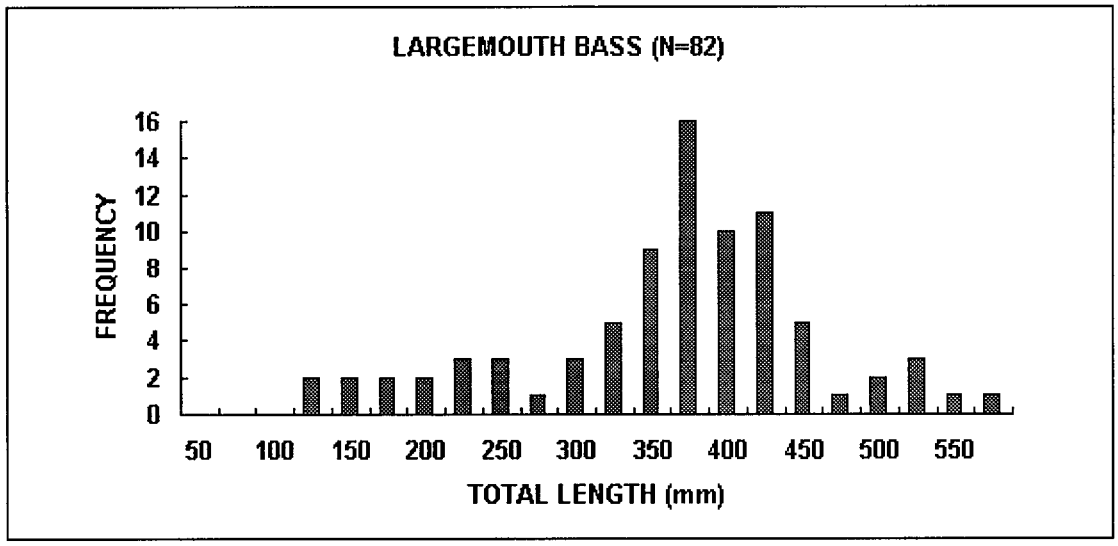
1991 - Location 215 WINTER



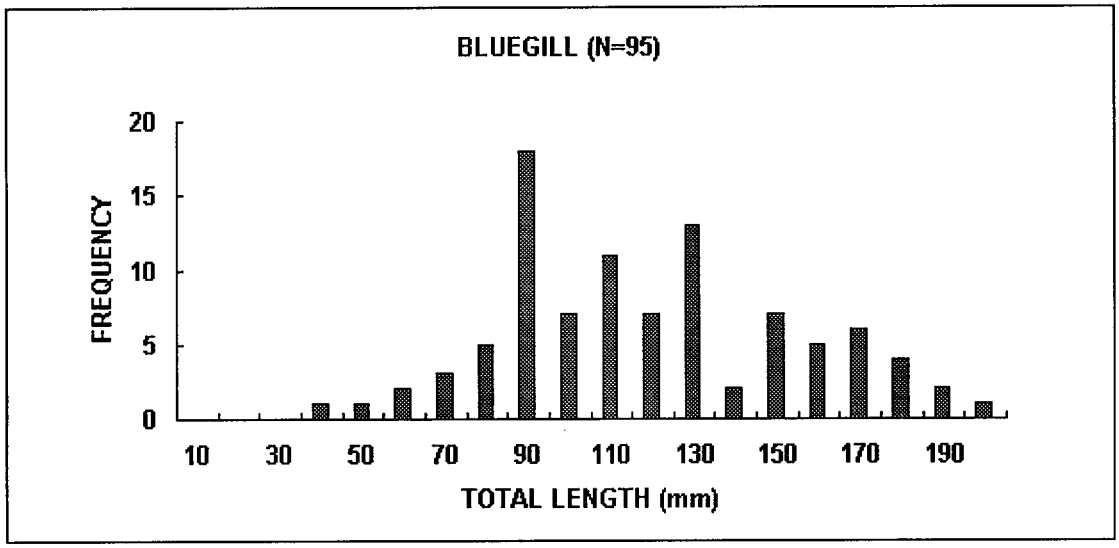


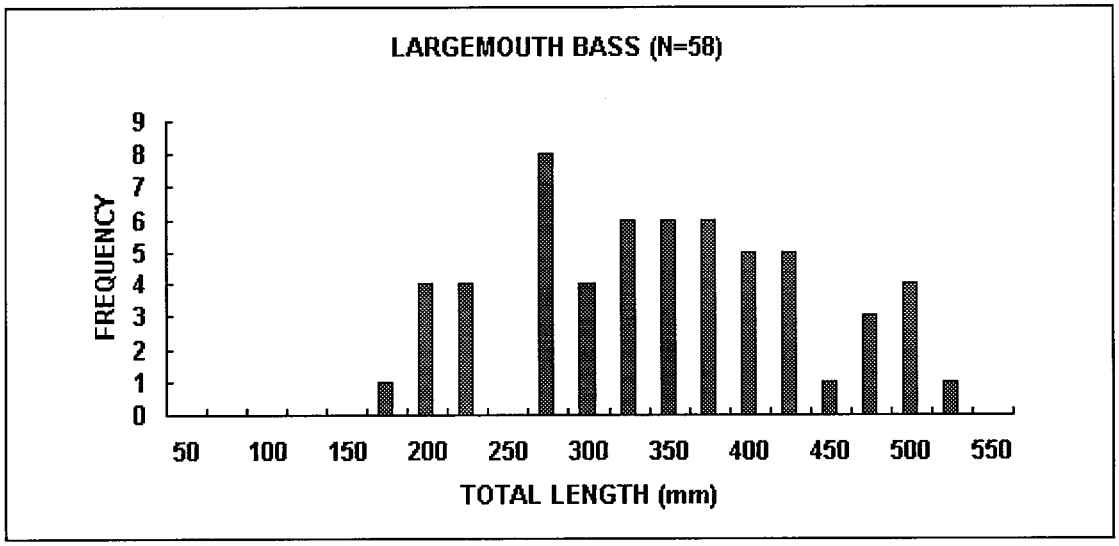
1991 - Location 215 SPRING



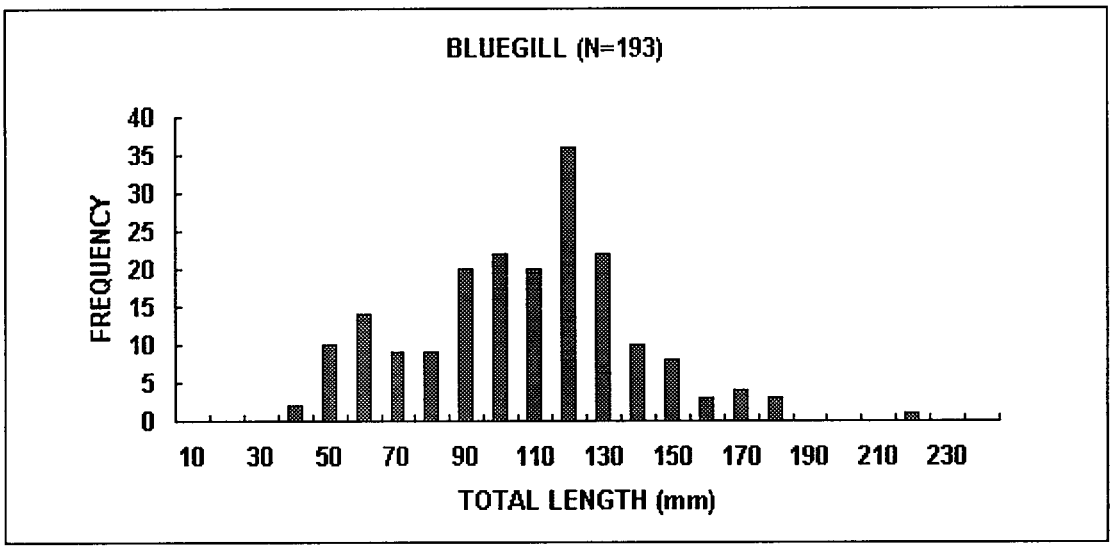


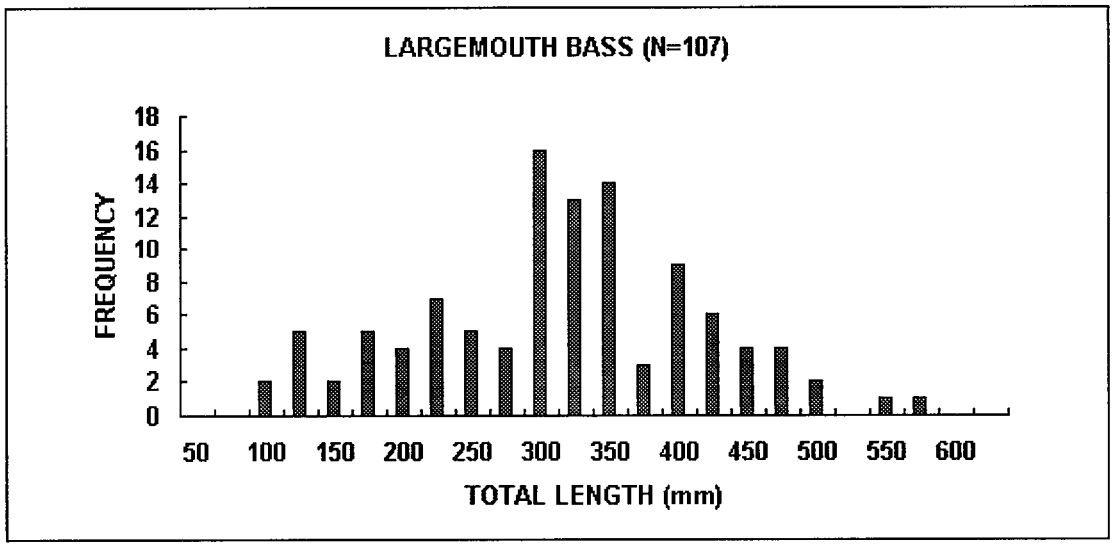
1991 - Location 216 SPRING





1993 - Location 215 SPRING





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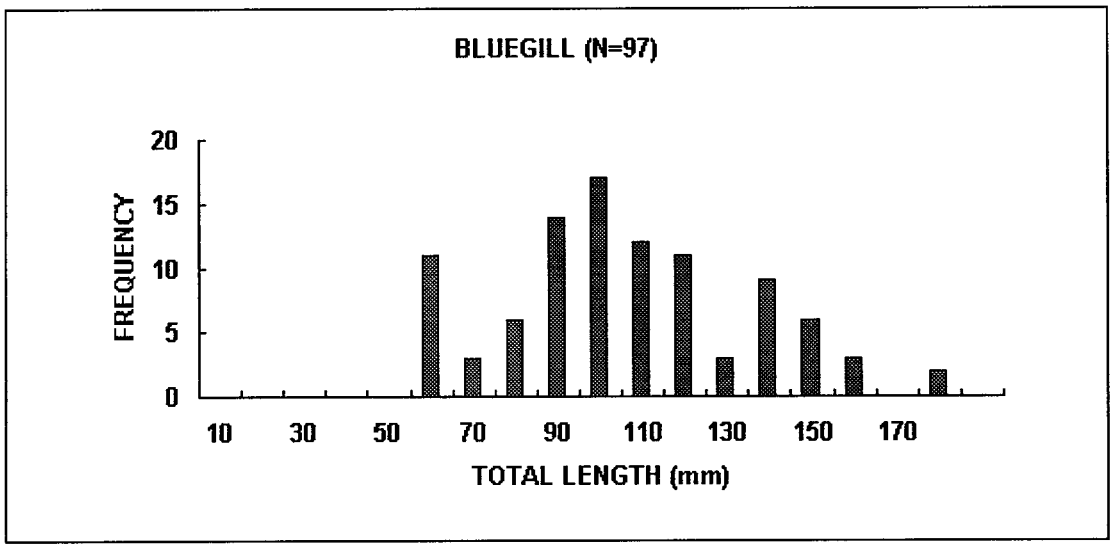
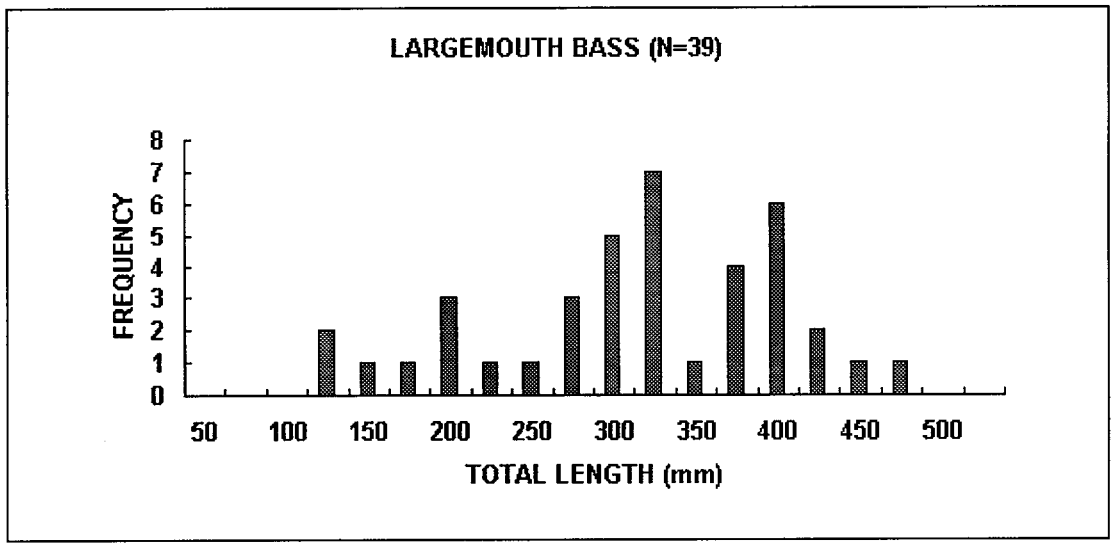
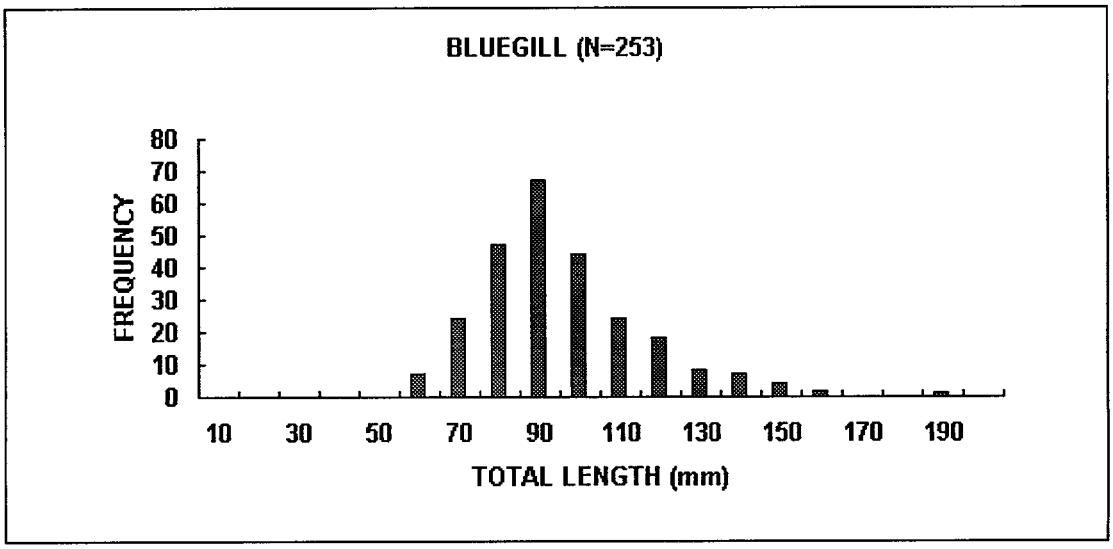
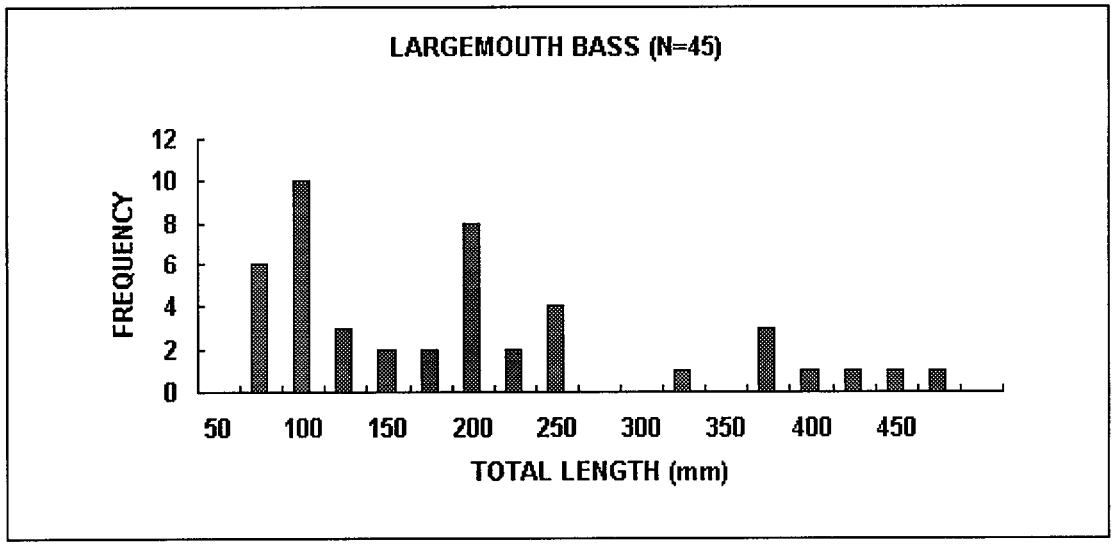


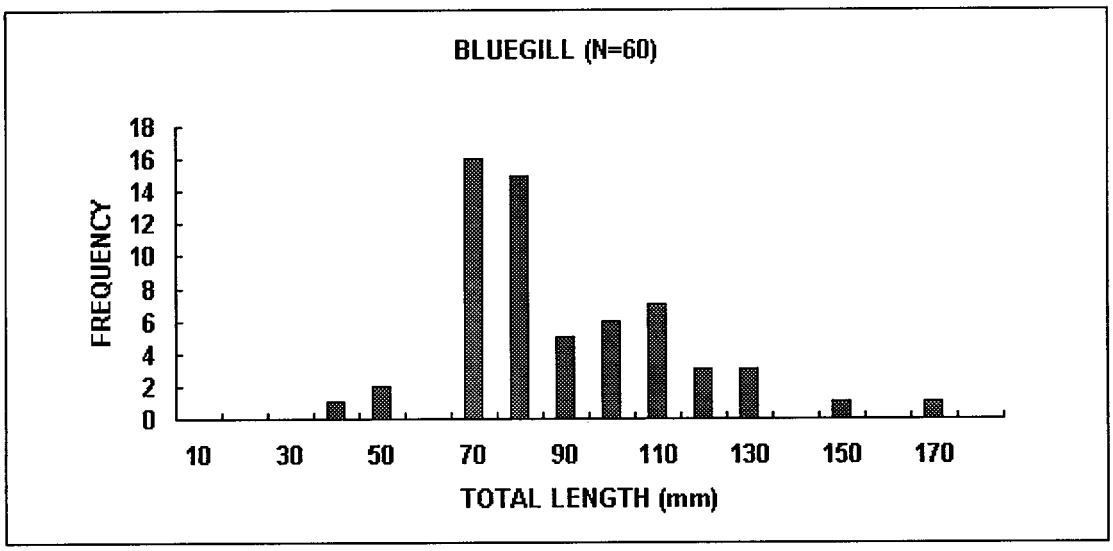


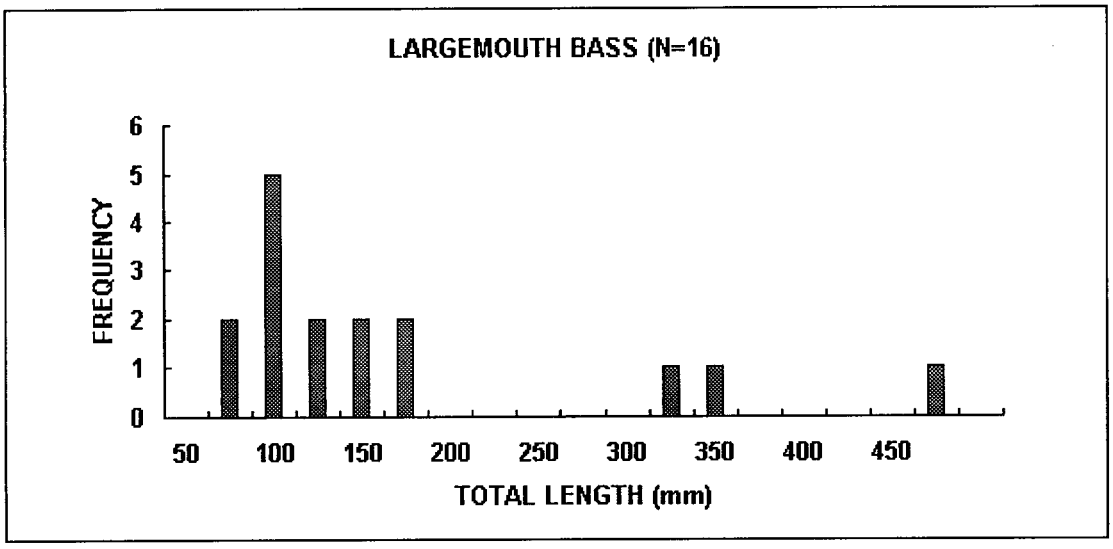
1993 - Location 215 FALL



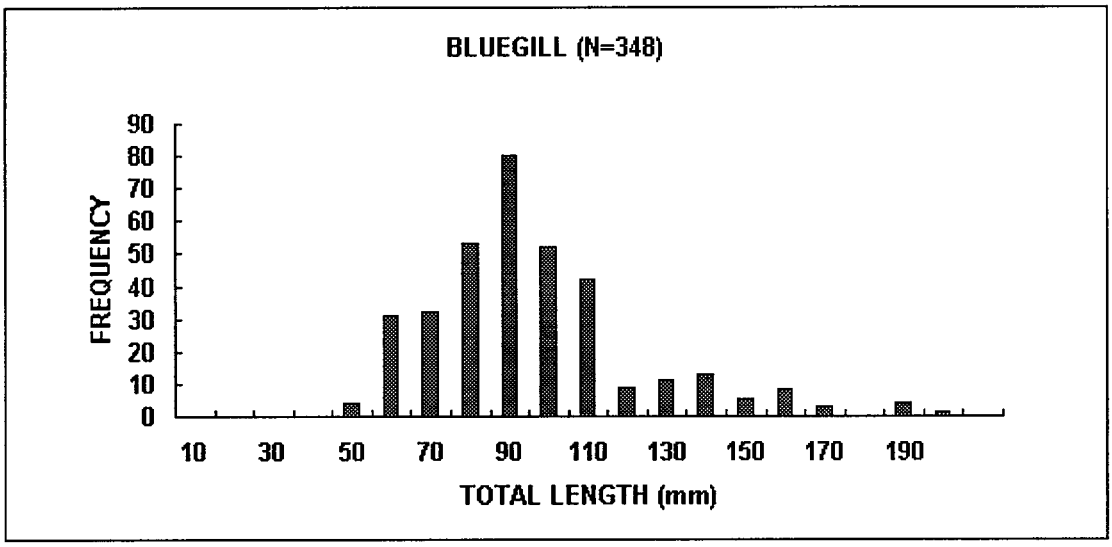


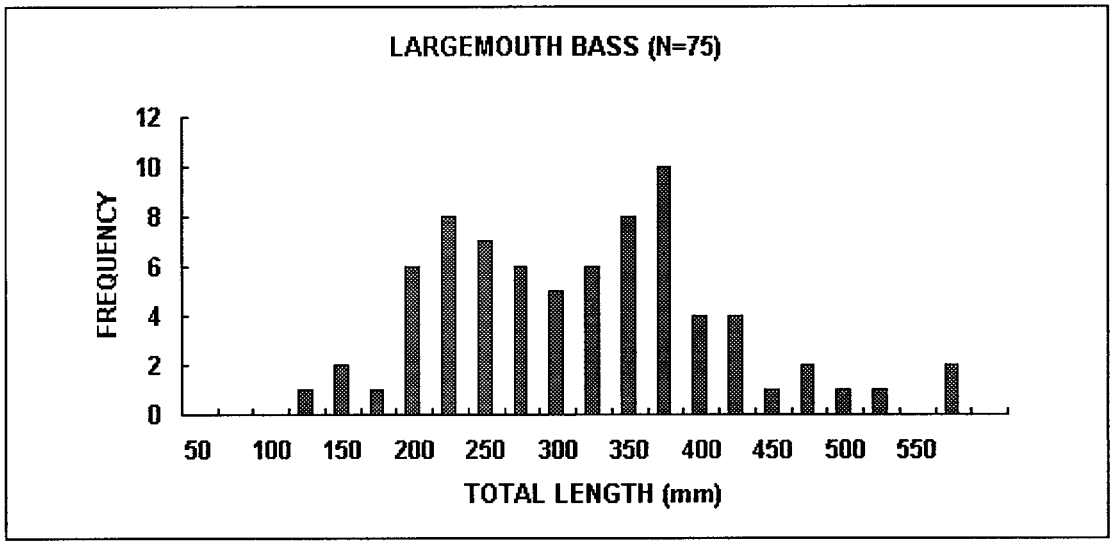
1993 - Location 216 FALL



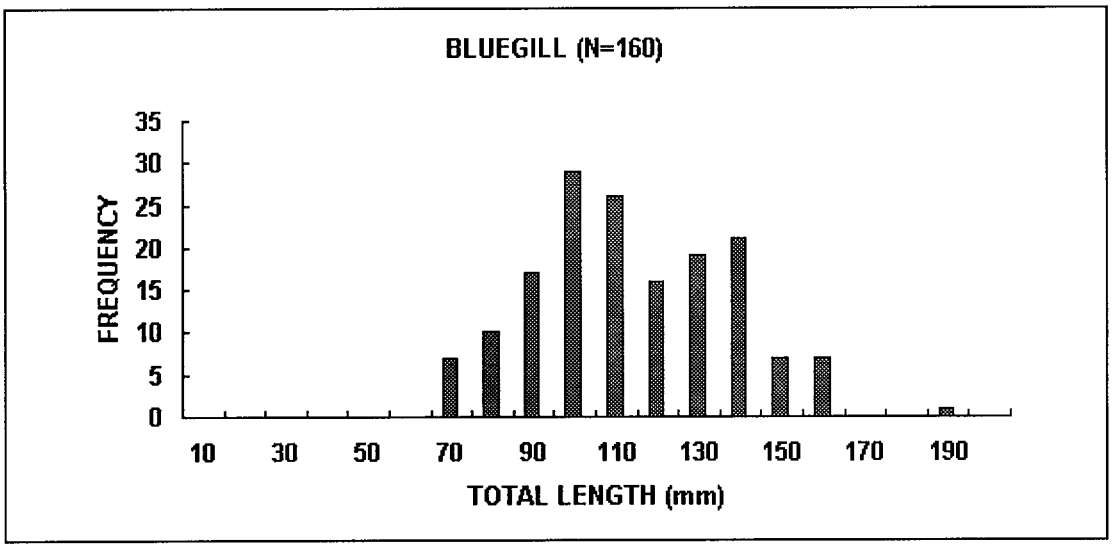


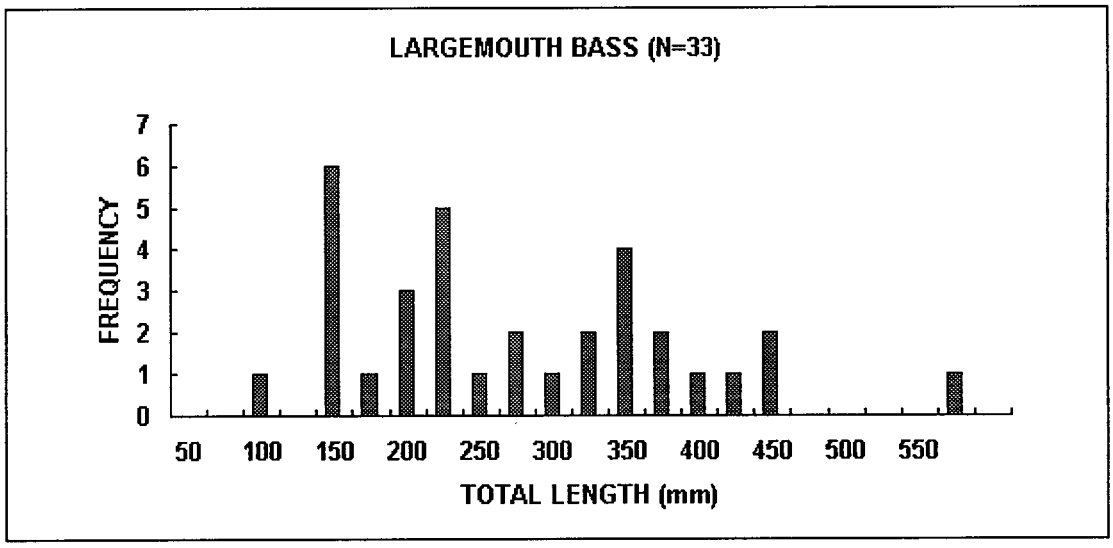
1994 - Location 215 SPRING



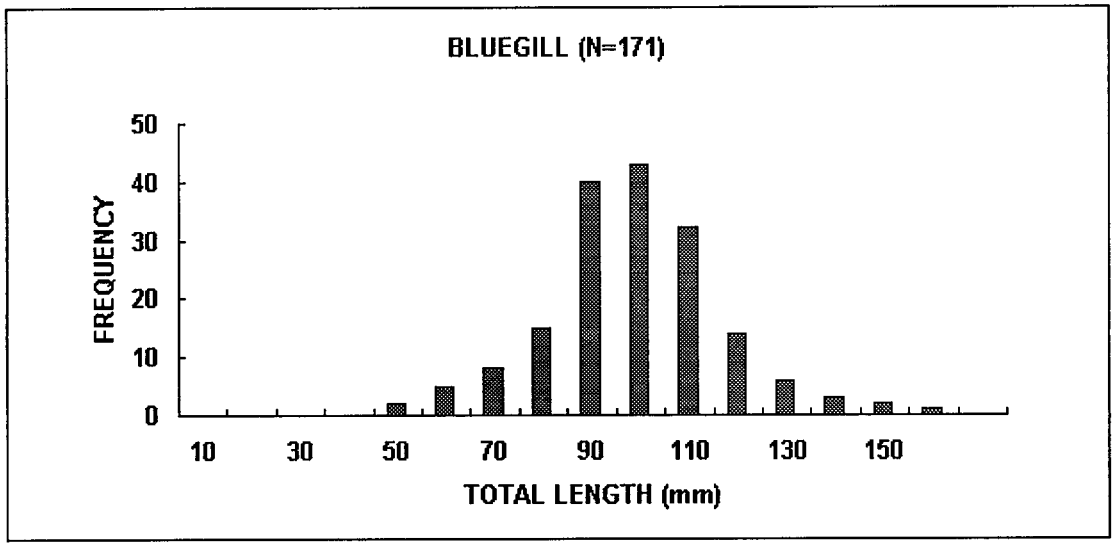


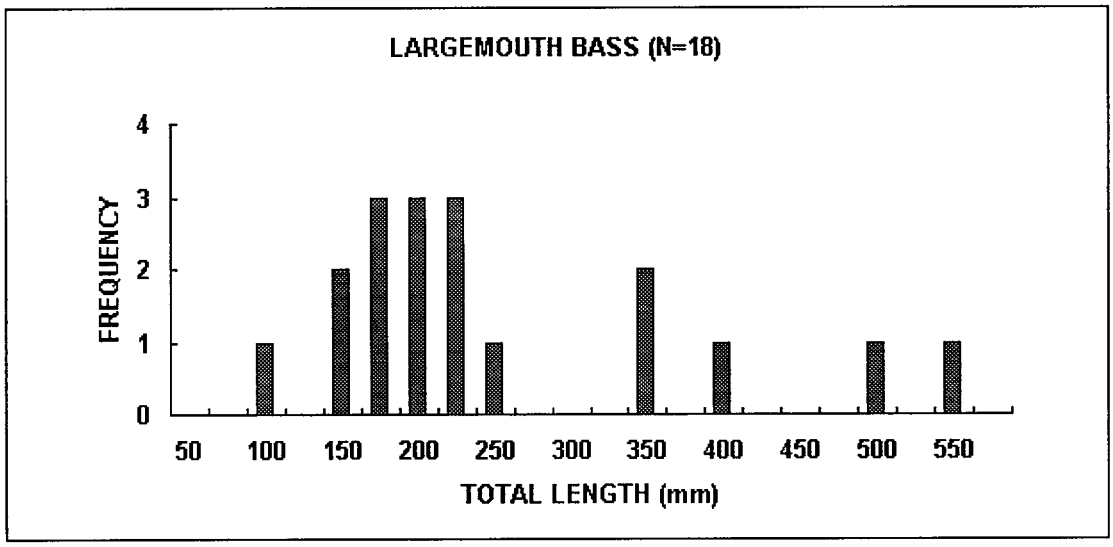
1994 - Location 216 SPRING



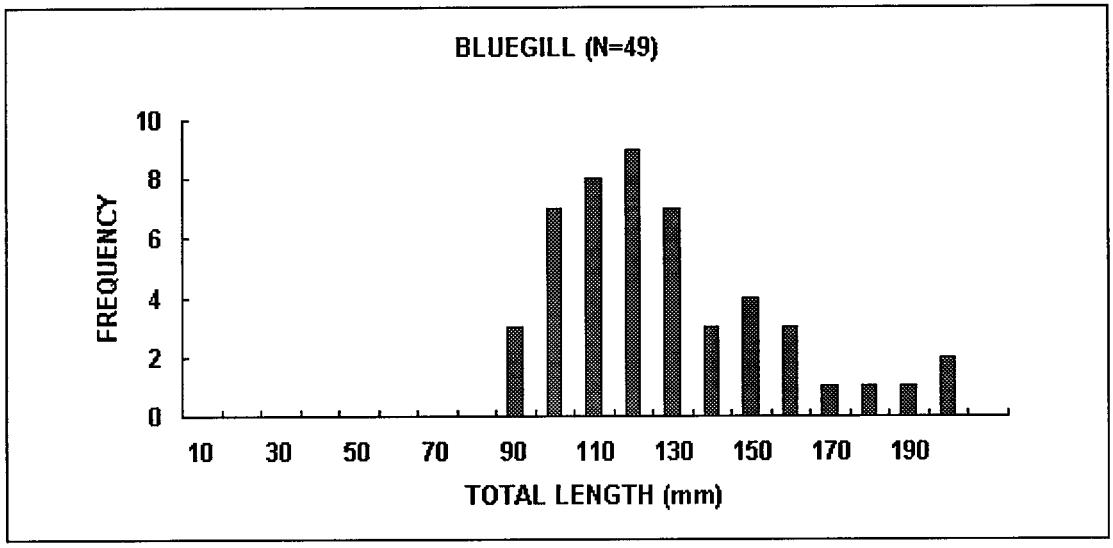


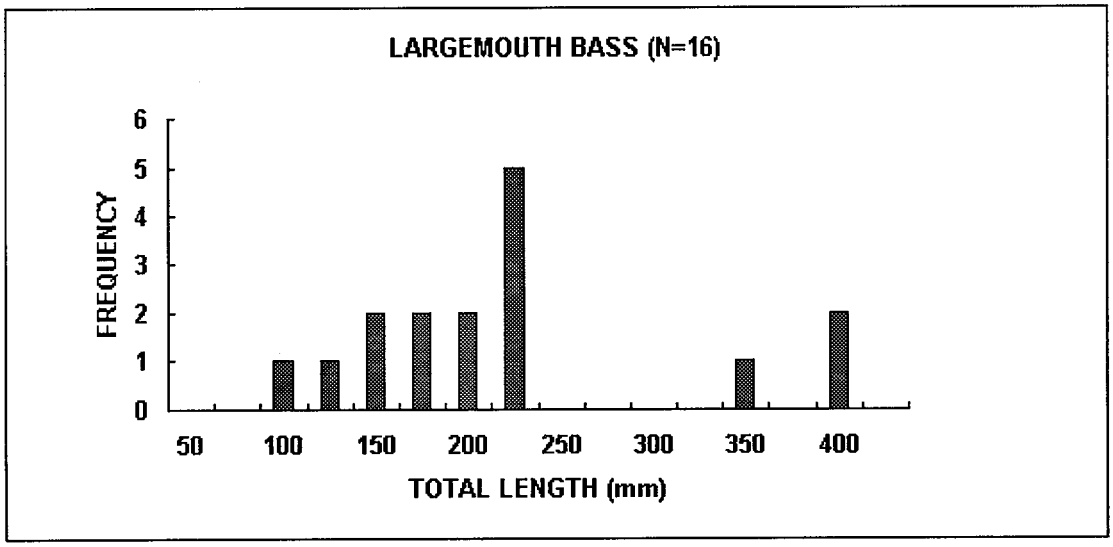
1994 - Location 215 FALL



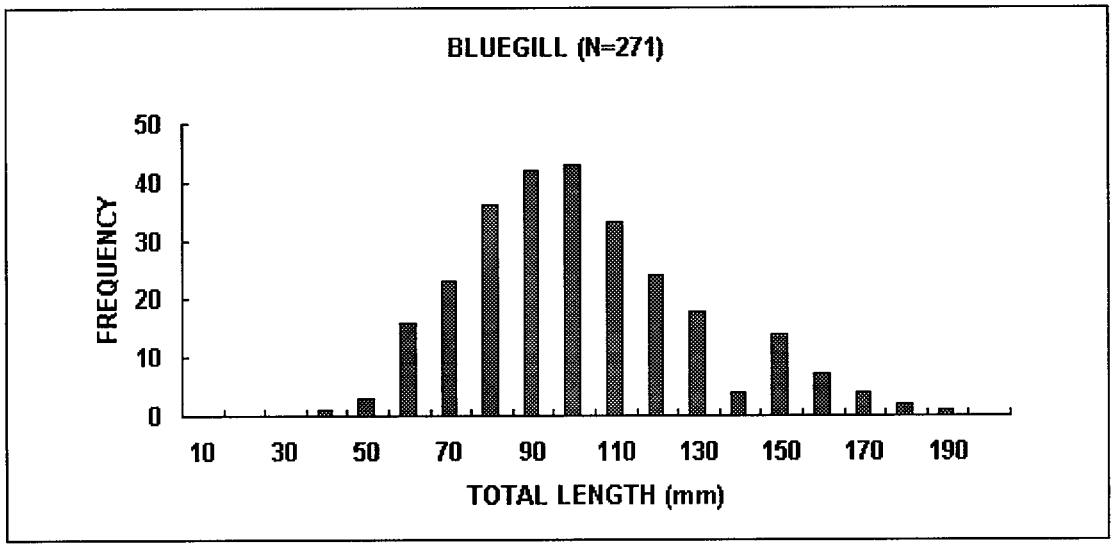


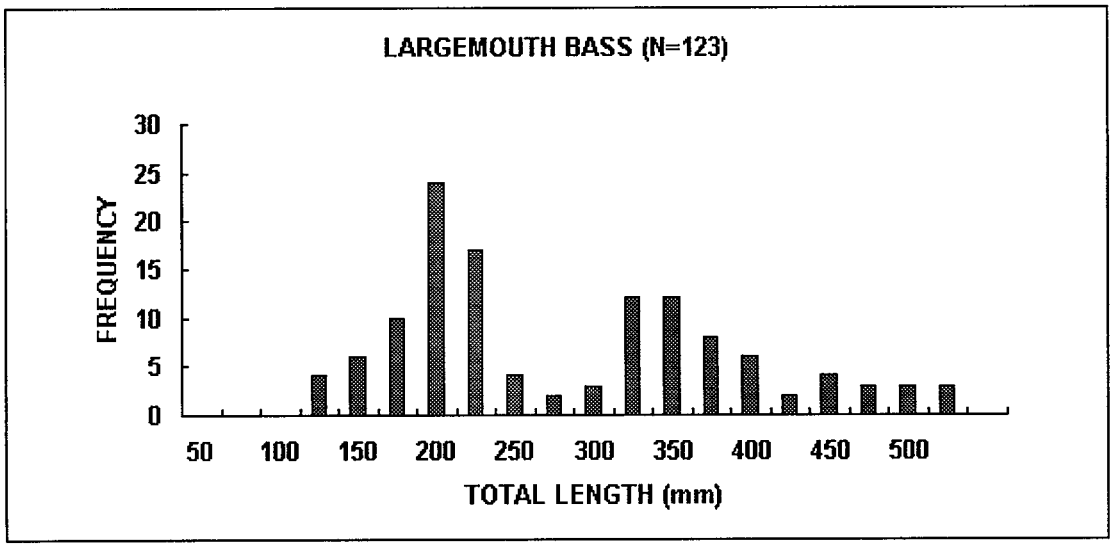
1994 - Location 216 FALL



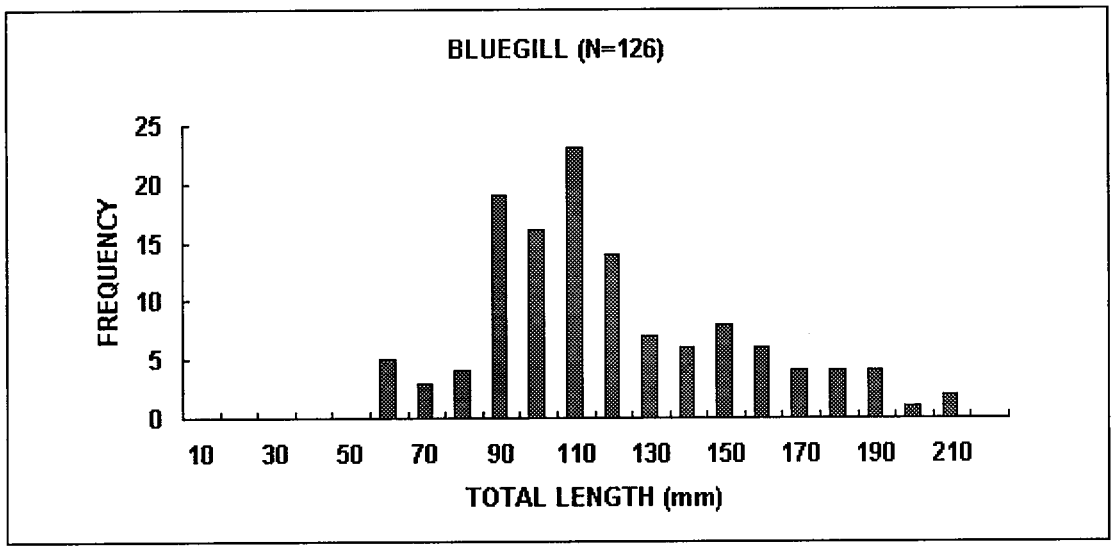


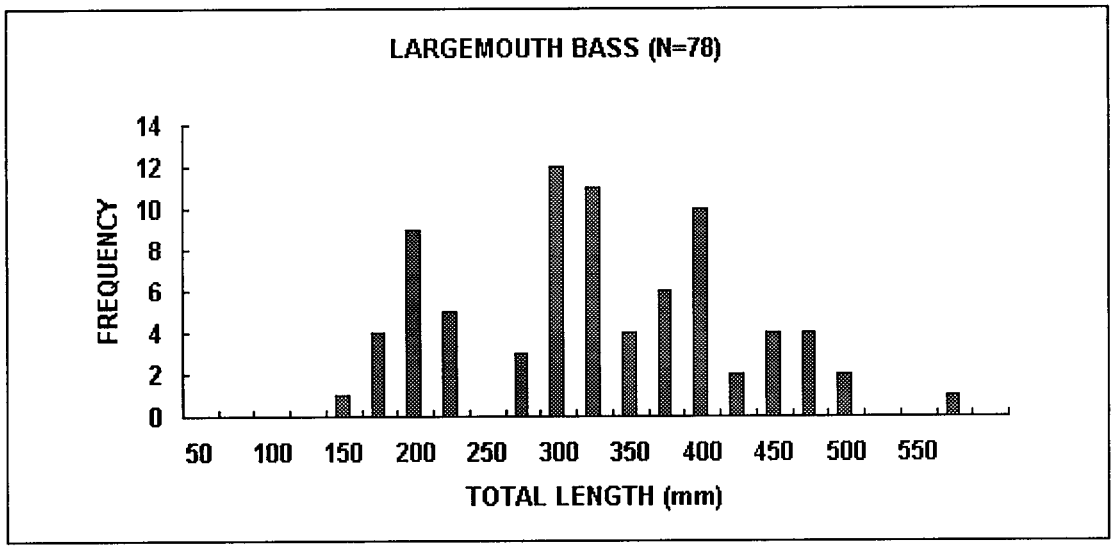
1995 - Location 215 SPRING



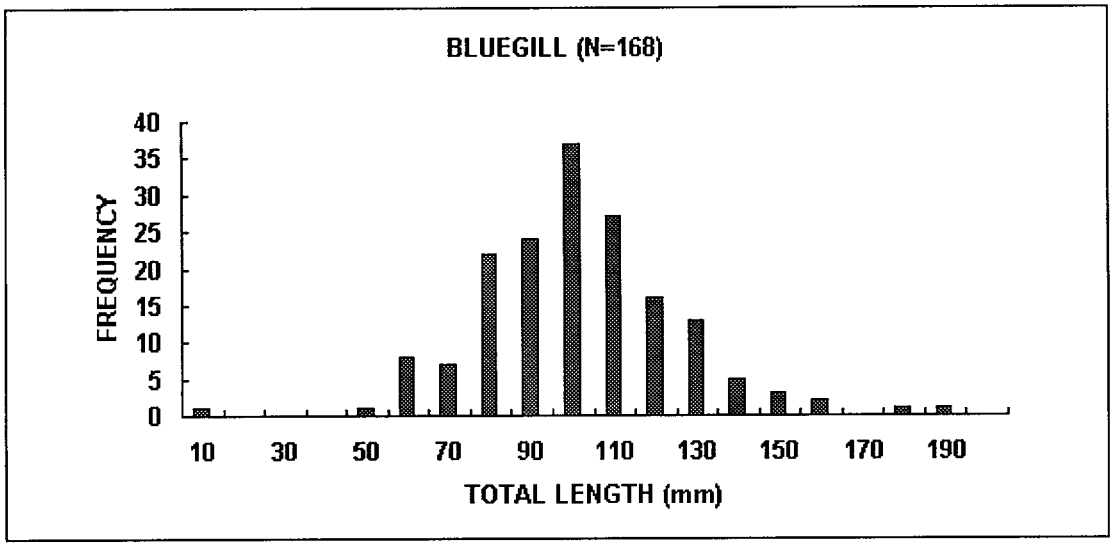


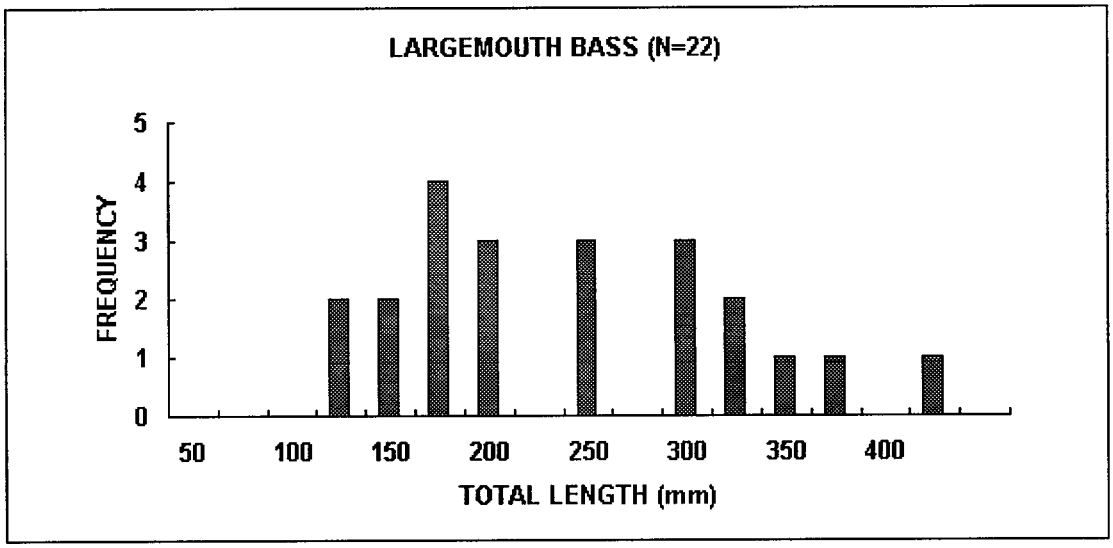
1995 - Location 216 SPRING





1995 - Location 215 FALL





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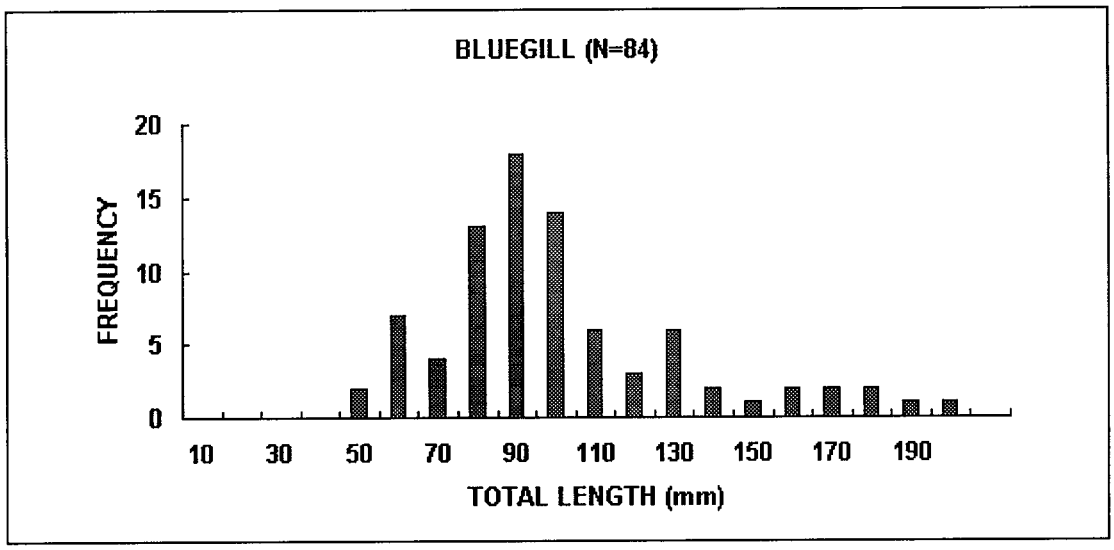
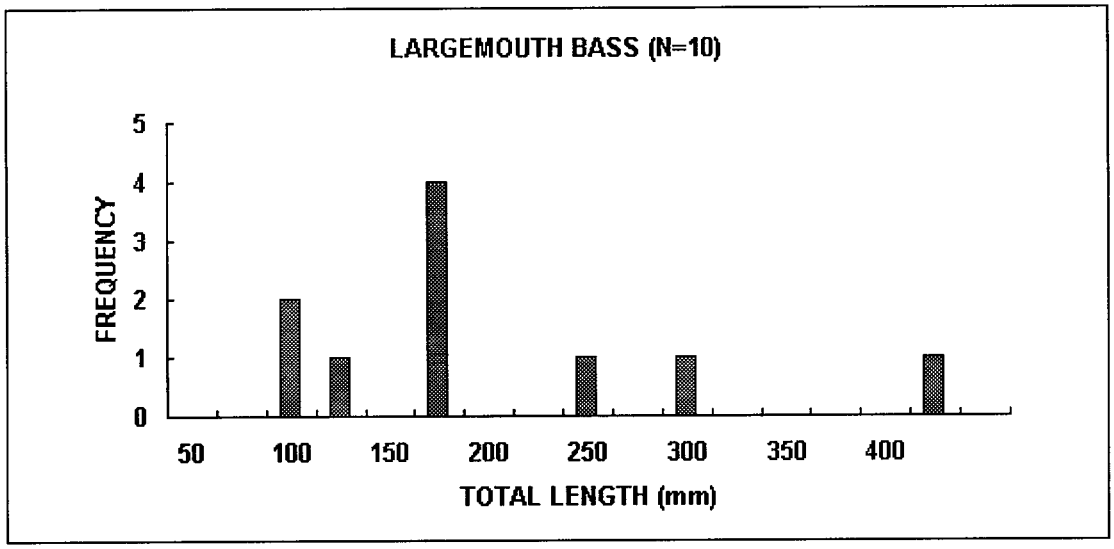
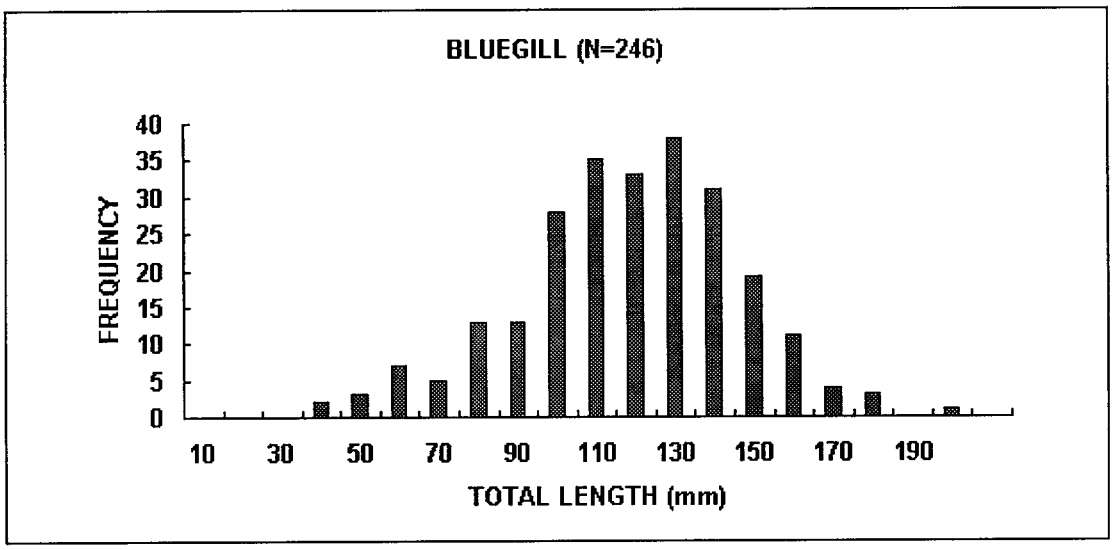
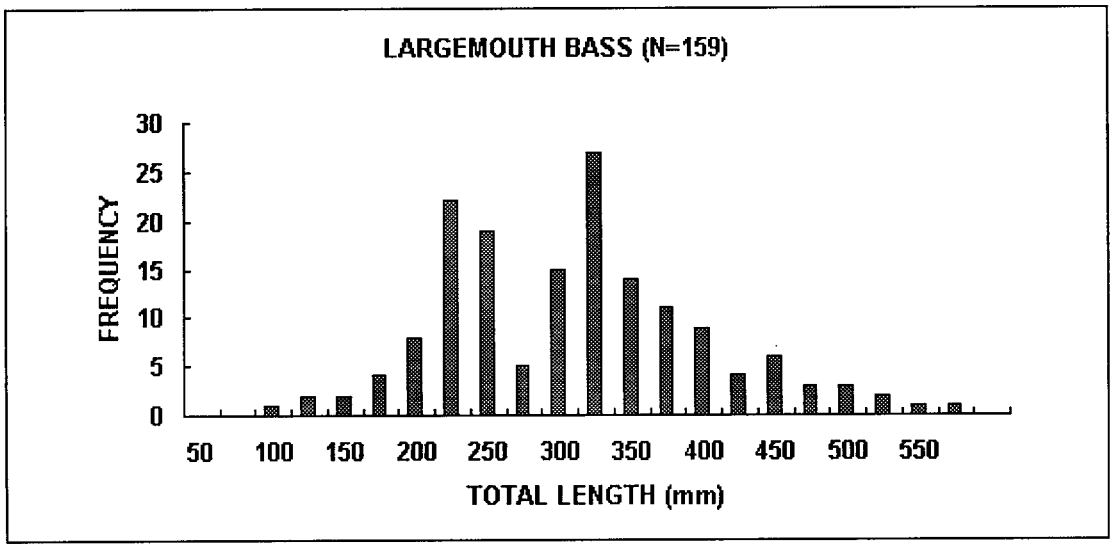


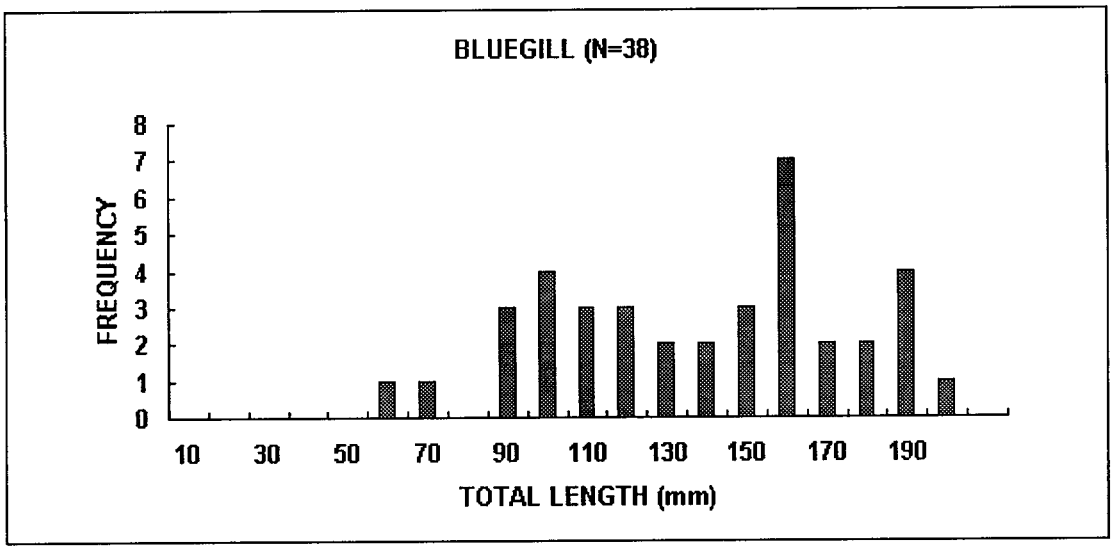


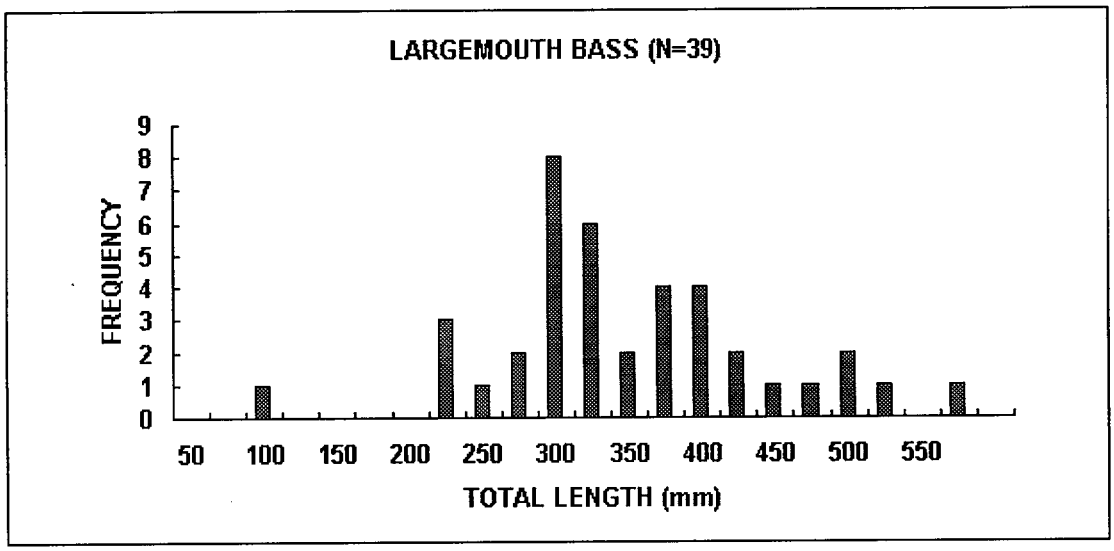
1996 - Location 215 SPRING



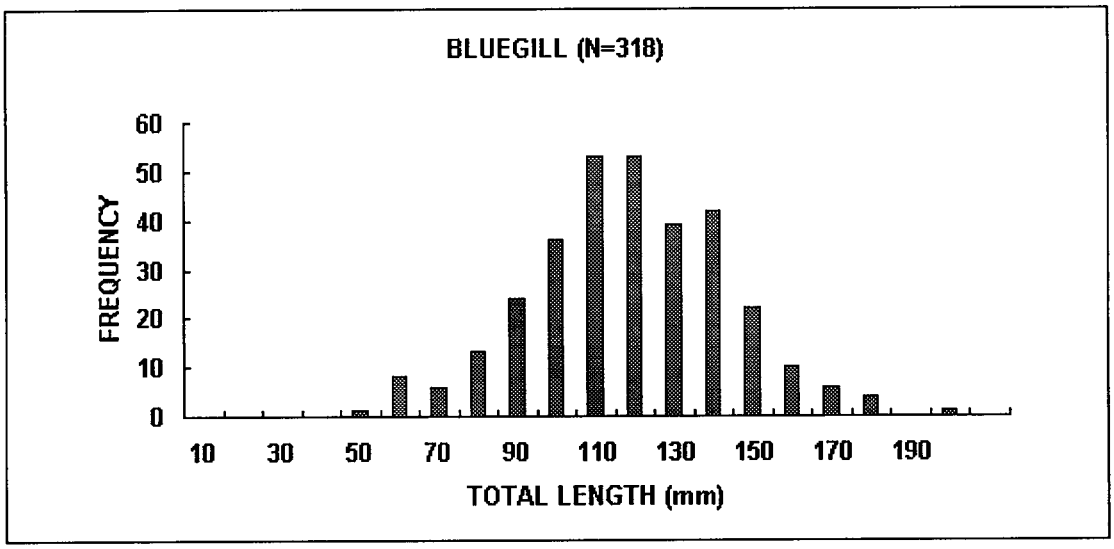


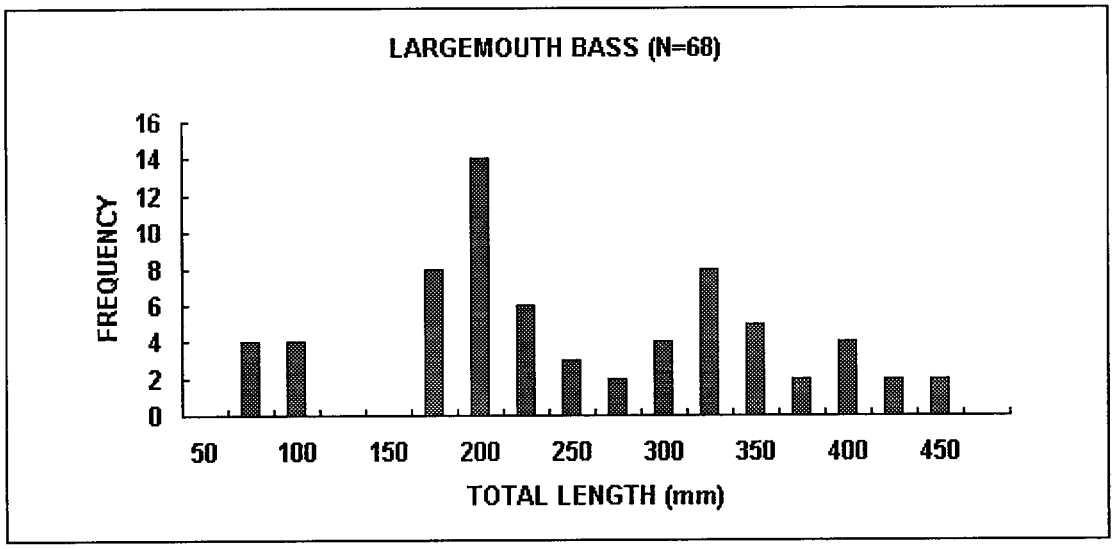
1996 - Location 216 SPRING





1996 - Location 215 FALL





1996 - Location 216 FALL