SURVEY REPORT

OKLAHOMA FISHERIES MANAGEMENT PROGRAM

FISH MANAGEMENT SURVEYS AND RECOMMENDATIONS

FOR

BIRCH LAKE

1997

PERFORMANCE REPORT

State: Oklahoma Project No. F 44-D-12

Project Title: Oklahoma Fisheries Management Program

Study Title: Surveys and Recommendations - Birch Reservoir

Period Covered: 1 January 1997 - 31 December 1997

BIRCH LAKE

ABSTRACT

Lake Birch was sampled by spring electrofishing and fall gill netting in 1997 to determine fish population trends and the success of hybrid striped bass introductions. Largemouth bass abundance improved slightly but remained low, while spotted bass abundance continued a decline from a record high in 1994. Spotted bass may be displacing largemouth bass at the Age 0 tropic level as a result of increasing competition. Smallmouth bass abundance was very low but natural recruitment was verified.

Bluegill and gizzard shad abundance and size structure appeared to be providing an adequate forage base.

Recommendations were made to stock hybrid striped bass x white bass; and to conduct a "SSP" survey in 1998 to evaluate smallmouth bass natural recruitment and hybrid striped bass survival.

INTRODUCTION

Lake Birch impounds Birch Creek, 2.4 km south of Barnsdall in Osage County, Oklahoma (Figure 1). Birch Lake covers 460 surface hectares and was constructed in 1976 by the Corps of Engineers. Birch Lake has a mean depth of 4.2 m and a maximum depth of 16 m, a shoreline development ratio of 5.7, a water exchange rate of 1.4, and a secchi disc visibility of around 30-90 cm in the main pool in August; turbidity is primarily from a combination of suspended clay and plankton. Fish habitat consists primarily of rocky outcrops and standing timber. Submerged aquatic vegetation (Potamogetan sp.) abundance has varied with fluctuations in turbidities during recent years. Eleven buoy marked brush row fish attractors are scattered throughout the lake.

Past electrofishing surveys from 1978 through 1983 showed largemouth bass populations to be very abundant but comprised primarily of small fish < 300mm in length. Catch rates (C/f) for quality size (> 300mm) bass were below acceptable values during this period. However, in 1986 or three growing seasons later, a dramatic shift in the population was observed. Overall, bass continued to be very abundant but fish < 300mm decreased in numbers while numbers of larger fish increased substantially resulting in a balanced predator prey population. This trend continued through 1988 but, beginning in 1991 and continuing through 1994, C/f of bass < 300mm declined below acceptable values while fish > 300mm remained above the acceptable value for a quality fishery.

Past gill netting surveys (1978, 1979, 1980, 1984, 1991, 1995 and 1996 have shown stable but low abundance for channel and

flathead catfish populations. Crappie abundance has been cyclic but remained above the minimum acceptable value for a quality fishery, however, the abundance of quality size (> 200mm) fish has generally been low.

Fish attractor buoys were replaced as needed and recent fish stockings have included smallmouth bass, blue catfish, channel catfish and striped bass x white bass hybrids (Table 1). A 330 to 406mm slot length limit on largemouth bass has remained in effect since 1987.

Lake Birch was sampled in 1997 by spring electrofishing and fall gill netting to evaluate the effects of the 330 to 406mm slot length limit on the largemouth bass population and to determine the status of smallmouth bass and hybrid striped bass introductions.

RESULTS

Largemouth bass

1. Largemouth bass abundance from 1997 spring electrofishing (C/f=38.6) was slightly below the minimum acceptable value for a quality fishery (C/f=40). The total bass C/f has declined in recent sample years (Table 2).
2. In 1997 spring electrofishing, the abundance of bass 200-299mm was satisfactory, while those < 200, >300 and > 356mm were slightly below acceptable values. The abundance of all bass size groups have fluctuated but generally decline in recent samples.

3. Body condition values (W_r) were unsatisfactory for bass < 300mm but all other size groups were in good condition. Condition values for all size groups have declined in recent samples.

4. Bass abundance for fish over 300mm declined below acceptable levels for the first time since 1983. This decline probably resulted from several consecutive years of low recruitment beginning about 1991 and continuing through 1995. Low recruitment during this period may have been caused by increased competition and/or excessive predation on Age 0 fish and undesirable environmental conditions during spawning and nursery periods. The large increase in spotted bass abundance is also suspected to be a factor in the decline of largemouth bass recruitment.

Spotted bass

1. Spotted bass abundance from 1997 spring electrofishing (C/f=10.1) was considered to be unacceptable for a quality fishery. The total bass C/f has declined from a peak high of 46.5 in 1994 (Table 3).

2. In 1997 spring electrofishing, the abundance of all size groups of bass was unsatisfactory. The abundance of all bass size groups has declined in recent samples.

3. Body condition values (W_r) were unsatisfactory of all bass size groups. Condition values for all size groups have declined in recent samples.

4. Spotted abundance continued a decline to a level not observed since 1988. Low abundance, an undesirable structure and poor body conditions indicated spotted bass were not providing a quality fishery in 1997.

Smallmouth bass

1. Only one smallmouth bass was collected in 1997. This fish was 92mm in length and represented natural recruitment.

Crappie

1. Crappie abundance from 1997 fall gill netting (C/f=0.66) was considerably above the minimum acceptable value for a quality fishery (C/f=0.20). The total crappie C/f decreased in 1997 following record highs in 1995 and 1996 (Table 5).
2. Crappie < 200mm were too abundant. The abundance of > 200 and > 250mm fish was unsatisfactory. The abundance of crappie < 200 mm has decreased considerably since 1996.
3. Body condition values (W_r) were satisfactory for all crappie size groups. Condition values for most size groups has decreased in recent samples.
4. Growth for all Age groups, except Age IV, was below acceptable rates. Age I and II fish were the dominant groups in the population (Figure 2 and Table 6).
5. Crappie abundance, size structure and relative weight conditions indicated a less than desirable quality fishery was present in 1997, and the abundance of crappie < 200mm combined with slow growth rates, indicated stockpiling was occurring.

White bass

1. White bass abundance from 1997 fall gill netting (C/f=0.12) was well below the minimum acceptable value for a quality fishery (C/f=0.20). The total white bass C/f has continued a general decline since 1995 (Table 7).
2. The abundance of white bass 200 - 299mm was satisfactory, while other size groups were below acceptable values. The abundance of all size groups have fluctuated considerably during the last seven years.
3. Body condition values (W_r) were satisfactory for all size groups of white bass.
4. White bass abundance and size structure indicated a quality fishery was not present in 1997. Recruitment appeared to be very limited in 1997.

Hybrid striped bass x white bass

1. Hybrid striped bass abundance from 1997 fall gill netting (C/f=0.24) was above the minimum acceptable value for a quality fishery (C/f=0.10). The total hybrid striped bass C/f has increased in 1997 (Table 8).
2. The abundance of all hybrid striped bass size groups was satisfactory. The abundance of all size groups has increased in 1997.
3. Body condition values (W_r) were satisfactory for 300-499mm fish but those < 300mm were below the acceptable value. Condition values improved for all size groups in 1997.
4. Age 0 and III fish were the dominant year classes of the past three stockings (Figure 4).

5. Hybrid striped bass abundance, size structure and body conditions were indicative of a quality fishery in 1997.

Channel Catfish

1. Channel catfish abundance from 1997 fall gill netting (C/f=0.14) was below the minimum acceptable value for a quality fishery (C/f=0.20). The total channel catfish C/f has been steadily increasing in recent sample years but declined in 1997 (Table 9).
2. The abundance of channel catfish > 300 and > 400mm was satisfactory, while those < 300mm were below the acceptable value. The abundance of all channel catfish size groups has been relatively stable in recent samples.
3. Body condition values (W_r) for all size groups were slightly below the acceptable value. Condition values for fish > 300 and > 400mm have remained stable in recent samples.
4. Limited natural recruitment appears to be the major factor affecting channel catfish abundance.

Flathead catfish

1. No flathead catfish were collected in 1997. Trend data has indicated annual flathead abundance is highly variable but generally low.

Bluegill

1. Bluegill abundance from 1997 spring electrofishing (C/f=121.1) was well above the minimum acceptable value for a quality forage supply. The total bluegill C/f has generally increased during recent sample years (Table 10).

2. In 1997 spring electrofishing, the abundance of all bluegill size groups was satisfactory, except for those > 150mm. The abundance of all bluegill size groups has declined in recent sample years.

3. Body condition values (W_r) were nearly satisfactory for all size groups. Condition values for all size groups have been stable in recent samples.

4. Bluegill abundance and size structure were indicative of a adequate forage base in 1997. However, quality size bluegill (> 150mm) were not present in sufficient numbers for a quality fishery.

Gizzard Shad

1. Shad abundance from 1997 spring electrofishing (C/f=26.6) was below the minimum acceptable value for a quality forage supply (C/f=40), while shad abundance from 1997 fall gill netting (C/f=0.35) was above the minimum acceptable value for a quality forage supply (C/f=0.20). The total shad C/f has declined in recent sample years (Table 11).

2. In spring electrofishing, the abundance of shad < 200mm was unsatisfactory, while those collected by gill netting were above the acceptable value. The abundance of all shad size groups has declined in recent samples.

3. In both spring electrofishing and fall gill netting, body condition values (W_r) were unsatisfactory for all size groups. Condition values for all size groups have been stable but below acceptable values in recent sample years.

4. Shad have continued to be available in adequate numbers and sizes for forage in the fall but were not sufficiently abundant during the spring. An overall decline in shad abundance indicates increased predation and/or lower natural recruitment during 1996 and 1997.

Non-game fish species

1. The combined abundance of non-game species from 1997 fall gill netting (C/f=0.34) was slightly above previous samples which has remained relatively stable (Table 12). River carpsucker accounted for the increase in total abundance.

RECOMMENDATIONS

Fish stockings

1. Several successive annual stockings of striped bass x white bass hybrids are needed to evaluate their effectiveness as a predator on the abundant, slow growing crappie population. Hybrid fingerlings should be stocked at a rate of 25 fish per hectare for at least three consecutive years or longer.
2. Spring electrofishing and fall gill netting should be conducted in 1998 to evaluate the status of smallmouth bass recruitment and hybrid striped bass survival.

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Table 1. Species, number and size of fish stocked in Birch Lake, 1976-1997.

DATE	SPECIES	NUMBER	SIZE
1976	Channel catfish	10,000	Growouts
1977	Largemouth bass (Native)	94,000	Fingerlings
1977	Largemouth bass (Florida)	45,082	Fingerlings
1978	Walleye	788,567	Fry
1978	Channel catfish	32,065	Fingerlings
1979	Walleye	230,000	Fry
1980	Threadfin shad	4,500	Adults
1980	Inland silversides	24,800	Adults
1981	Threadfin shad	2.400	Adults
1982	Threadfin shad	5,000	Adults
1983	Threadfin shad	2,431	Adults
1985	Channel catfish	58,190	Fingerlings
1987	Channel catfish	111,535	Growouts
1988	Walleye	98,000	Fry
1989	Channel catfish	109,998	Growouts
1991	Smallmouth bass (Reservoir strain)	1,962	5-8 inches
1992	Smallmouth bass (Reservoir strain)	11,370	Fingerlings
1992	Blue catfish	356	Growouts
1992	Channel catfish	57,236	Fingerlings
1993	Striped bass hybrids	255	7.5 inch
1995	Striped bass hybrids	11,370	1.5 inch
1996	Striped bass hybrids	12,000	1.25 inch
1997	Striped bass hybrids	11,370	2.0 inch

Table 2. Total number (No.), catch rates (C/f), and relative weights (W_r) by size groups of **largemouth bass** collected by spring electrofishing from Birch Lake. Numbers in parentheses represent acceptable C/f values for a quality fishery. Acceptable W_r values are ≥90.

	Total (≥40)		<200 mm (15-45)		200-299 mm (15-30)		≥300 mm (≥15)		≥356 mm (≥10)	
Year	No.	C/f	C/f	W_r	C/f	W_r	C/f	W_r	C/f	W_r
1978	144	72.0	63.0		8.0		1.5		0.5	
1980	257	34.3	11.2	86	22.0	80	1.1	99	1.1	99
1981	1,074	59.6	31.2	82	22.5	77	2.4	96	1.3	99
1982	574	25.2	15.9	84	4.2	82	5.1	88	1.7	94
1983	596	28.5	11.9	84	10.6	83	6.0	92	2.3	97
1986	168	54.2	2.4	80	29.2	80	24.0	90	8.7	96
1988	168	70.0	18.8	71	16.7	84	34.6	99	25.8	101
1991	165	51.6	9.1	83	8.4	97	34.1	100	26.9	100
1994	151	29.9	2.6	84	5.0	91	22.4	94	14.7	96
1995	159	33.8	10.9	87	7.4	87	15.5	97	11.7	98
1997	153	38.6	13.1	88	15.4	82	10.1	94	9.1	96

Table 3. Total number (No.), catch rates (C/f), and relative weights (W_r) by size groups of **spotted bass** collected by spring electrofishing from Birch Lake. Acceptable W_r values are ≥90.

	Total		<200 mm		200-299 mm		≥300 mm		≥356 mm	
Year	No.	C/f	C/f	W_r	C/f	W_r	C/f	W_r	C/f	W_r
1978	8	4.0	2.5		1.0		0.5			
1980	6	0.8			0.7		0.1			
1981	38	2.1	0.39		1.66		0.06			
1982	2	0.1					0.2	97	0.01	95
1983	2	0.1			0.1	82				
1986	11	3.5	1.29	82	1.61	82	0.64	81		
1988	28	11.7	9.17	77	1.67	78	0.83	97	0.42	95
1991	48	15.0	2.5	100	8.75	87	3.75	87	1.25	90
1994	235	46.5	12.9	72	21.2	79	12.5	84	5.1	84
1995	101	21.5	6.2	76	10.2	80	5.1	81	2.3	81
1997	40	10.1	5.8	77	2.5	73	1.8	82	1.0	84

Table 4. Total number (No.), catch rates (C/f), and relative weights (W_r) by size groups of **smallmouth bass** collected by spring electrofishing from Birch Lake. Numbers in parentheses represent acceptable C/f values for a quality fishery. Acceptable W_r values are ≥90.

	Total (≥15)		<200 mm -		200-299 mm -		≥300 mm -		≥356 mm (≥2)	
Year	No.	C/f	C/f	W_r	C/f	W_r	C/f	W_r	C/f	W_r
1994	5	1.0	0.2		0.2	71	0.6	89		
1995	5	1.1	0		0.6	76	0.4	91	0.2	92
1997	1	0.3	0.3							

Table 5. Total number (No.), catch rates (C/f), and relative weights (W_r) by size groups of **crappie** collected by gill netting from Birch Lake. Numbers in parentheses represent acceptable C/f values for a quality fishery. Acceptable W_r values are ≥90.

	Total (≥.20)		<200 mm (.05-.30)		≥200 mm (≥.08)		≥250 mm (≥.04)	
Year	No.	C/f	C/f	W_r	C/f	W_r	C/f	W_r
1978	33	0.28	0.27	98	0.01	78		
1979	91	0.78	0.77	104	0.01	72		
1980	25	0.21	0.20	89	0.01	85		
1984	25	0.22	0.03	88	0.19	94	0.04	94
1991	75	0.68	0.67	88	0.01	90		
1995	169	1.52	1.13	94	0.40	94	0.05	93
1996	177	1.60	1.51	90	0.08	78	0.03	75
1997	67	0.66	0.61	94	0.05	98	0.03	98

Table 6. Mean length at age of **crappie** collected by gill netting from Birch Lake. Numbers in parentheses represent values for acceptable growth rates.

Year	Age 1 (≥160 mm)	Age 2 (≥200 mm)	Age 3 (≥225 mm)	Age 4 (≥250 mm)
1991	133	159	181	163
1995	146	174	229	246
1996	138	177	196	241
1997	153	179	213	300

Table 7. Total number (No.), catch rates (C/f), and relative weights (W_r) by size groups of **white bass** collected by gill netting from Birch Lake. Numbers in parentheses represent acceptable C/f values for a quality fishery. Acceptable W_r values are ≥90.

	Total (≥.20)		<200 mm (≥.05)		200-299 mm (.05-.30)		≥300 mm (≥.10)	
Year	No.	C/f	C/f	W_r	C/f	W_r	C/f	W_r
1991	24	0.22	0.01	87	0.05	92	0.16	95
1995	42	0.38	0.08	85	0.04	91	0.26	93
1996	4	0.04	0.01	102			0.03	83
1997	12	0.12			0.05	90	0.07	92

Table 8. Total number (No.), catch rates (C/f), and relative weights (W_r) by size groups of **striped bass x white bass hybrids** collected by gill netting from Birch Lake. Numbers in parentheses represent acceptable C/f values for a quality fishery. Acceptable W_r values are ≥90.

	Total (≥.10)		<300 mm (≥.03)		300-499 mm (≥.05)		≥500 mm (≥.02)	
Year	No.	C/f	C/f	W_r	C/f	W_r	C/f	W_r
1995	15	0.14	0.14	93				
1996	16	0.14	0.04	73	0.11	77		
1997	24	0.24	0.10	84	0.14	92		

Table 9. Total number (No.), catch rates (C/f), and relative weights (W_r) by size groups of **channel catfish** collected by gill netting from Birch Lake. Numbers in parentheses represent acceptable C/f values for a quality fishery. Acceptable W_r values are ≥90.

	Total (≥.20)		<300 mm (≥.10)		≥300 mm (≥.10)		≥400 mm (≥.05)	
Year	No.	C/f	C/f	W_r	C/f	W_r	C/f	W_r
1978	15	0.13	0.02	88	0.11	85	0.04	90
1979	27	0.23	0.03	80	0.21	84	0.16	83
1980	26	0.22	0.02	83	0.20	83	0.08	87
1984	0							
1991	17	0.16	0.06	90	0.10	82	0.04	80
1995	20	0.18	0.06	88	0.12	87	0.06	89
1996	25	0.23	0.05	84	0.18	85	0.08	89
1997	14	0.14			0.14	88	0.06	86

Table 10. Total number (No.), catch rates (C/f), and relative weights (W_r) by size groups of **bluegill** collected by spring electrofishing from Birch Lake. Numbers in parentheses represent acceptable C/f values for a quality fishery. Acceptable W_r values are ≥90.

	Total (≥45)		<75 mm (≥10)		75-149 mm (20-100)		≥150 mm (≥15)	
Year	No.	C/f	C/f	W_r	C/f	W_r	C/f	W_r
1978	51	25.5	0.5		20.5		4.5	
1980	181	63.9	1.9		11.3	85	10.9	115
1981	312	210.0	2.2		23.4	102	21.2	115
1982	730	34.0	26.05		31.67	96	8.91	89
1983	678	52.8	11.00		14.61	93	5.39	89
1986	164	86.4	17.46		32.14	85	16.67	90
1988	169	90.5	21.58		64.21	81	3.16	84
1991	170	131.1	21.21		105.30	92	2.27	81
1994	154	233.3	10.6		216.7	86	6.1	90
1995	167	79.9	15.3		62.2	90	2.4	92
1997	155	121.1	53.9		62.5	89	4.7	91

Table 11. Total number (No.), catch rates (C/f), and relative weights (W_r) by size groups of **gizzard shad** collected by spring electrofishing and gill netting from Birch Lake. Numbers in parentheses represent acceptable C/f values for a quality fishery. Acceptable W_r values are ≥90.

	Total[1] (≥40)		<200 mm[1] (≥20)		Total[2] (≥.20)		<200 mm[2] (≥.10)	
Year	No.	C/f	C/f	W_r	C/f	W_r	C/f	W_r
1978	49	24.52	16.50		0.08	87	0.06	88
1979					0.11	90	0.09	90
1980	479	63.88	27.6	99	0.61	89	0.54	89
1981	788	210.00						
1982	647	34.00	31.81	79				
1983	570	52.80	19.83	81				
1984					0.08	97	0.05	102
1986	218	86.40	77.78	78				
1988	172	90.50	52.63	77				
1991	173	131.06	120.46	76	0.02	86	0.01	90
1994	152	253.3	226.7	74				
1995	164	41.84	30.10	81	0.86	83	0.84	83
1996					0.64	83	0.60	83
1997	104	26.26	12.12	80	0.35	75	0.29	75

[1] Spring electrofishing
[2] Gill netting

Table 12. Total number (No.) and catch rates (C/f) of **non-game** fish collected by gill netting from Birch Lake.

	CRP[1]		SBF[1]		RCS[1]		DRM[1]		Total	
Year	No.	C/f	No.	C/f	No.	C/f	No.	C/f	No.	C/f
1978	2	0.02	18	0.16	3	0.03			23	0.21
1979	6	0.05	15	0.13	2	0.02	2	0.02	25	0.22
1980	2	0.02	12	0.10	6	0.05	2	0.02	22	0.19
1984	2	0.02	17	0.15	4	0.04	2	0.02	25	0.23
1991	5	0.05	2	0.02	1	0.01	5	0.05	13	0.13
1995	2	0.02	18	0.16	1	0.01	0		21	0.19
1996	3	0.03	16	0.14			5	0.05	24	0.22
1997	4	0.04	13	0.13	2	0.02	15	0.15	34	0.34

[1] BBH=black bullhead; YBH=yellow bullhead; DRM=freshwater drum; CRP=common carp; GCP=grass carp; SBF=smallmouth buffalo; BBF=bigmouth buffalo; BUF=buffalo spp.; RCS=river carpsucker; QCS=quillback carpsucker; RRH=river redhorse; GRH=golden redhorse; LNG=longnose gar; SPG=spotted gar; SHG=shortnose gar; GAR=gar spp;.

Figure 1.

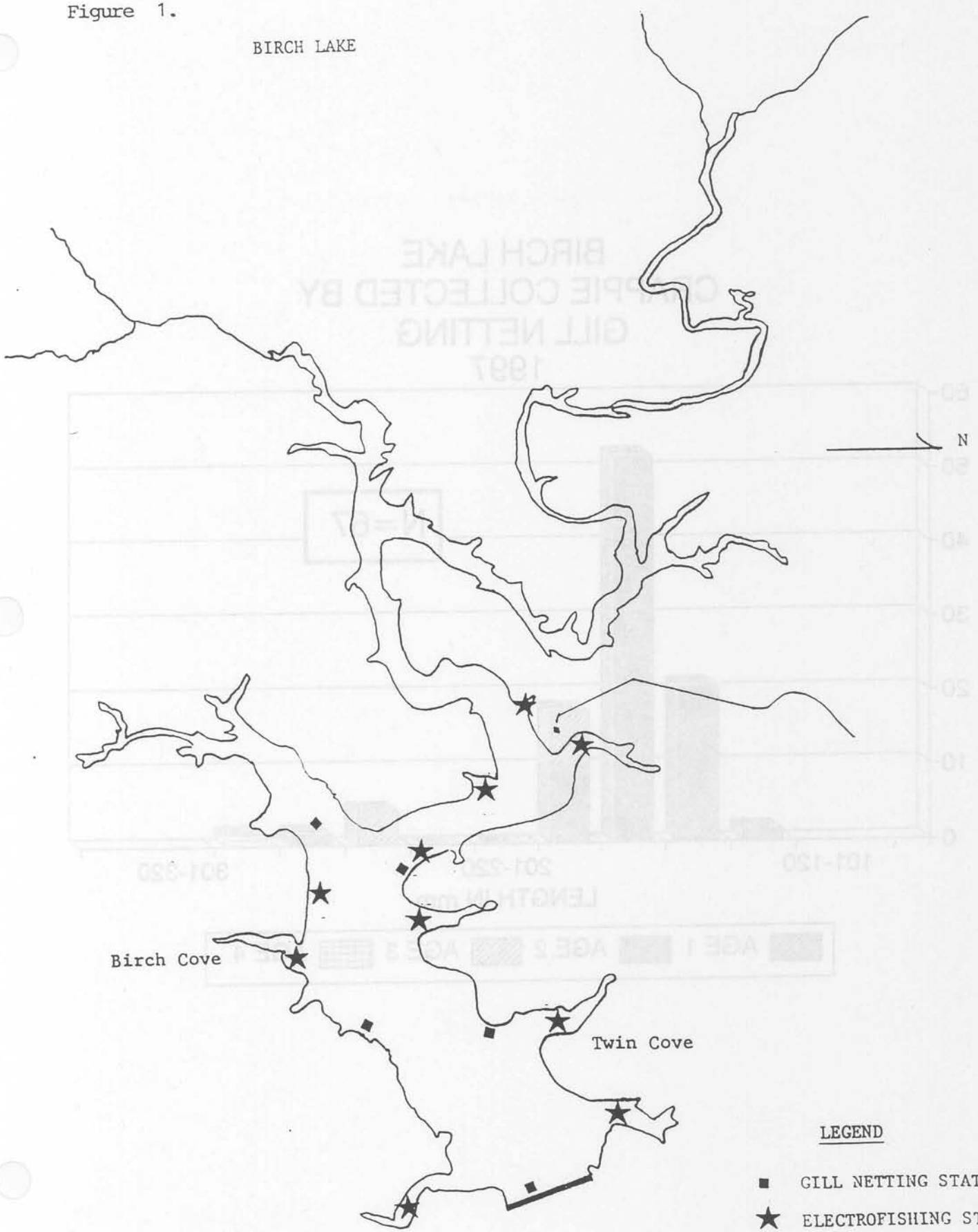

BIRCH LAKE
N
Birch Cove
Twin Cove
LEGEND
GILL NETTING STATIONS
ELECTROFISHING STATIONS

Figure 2.

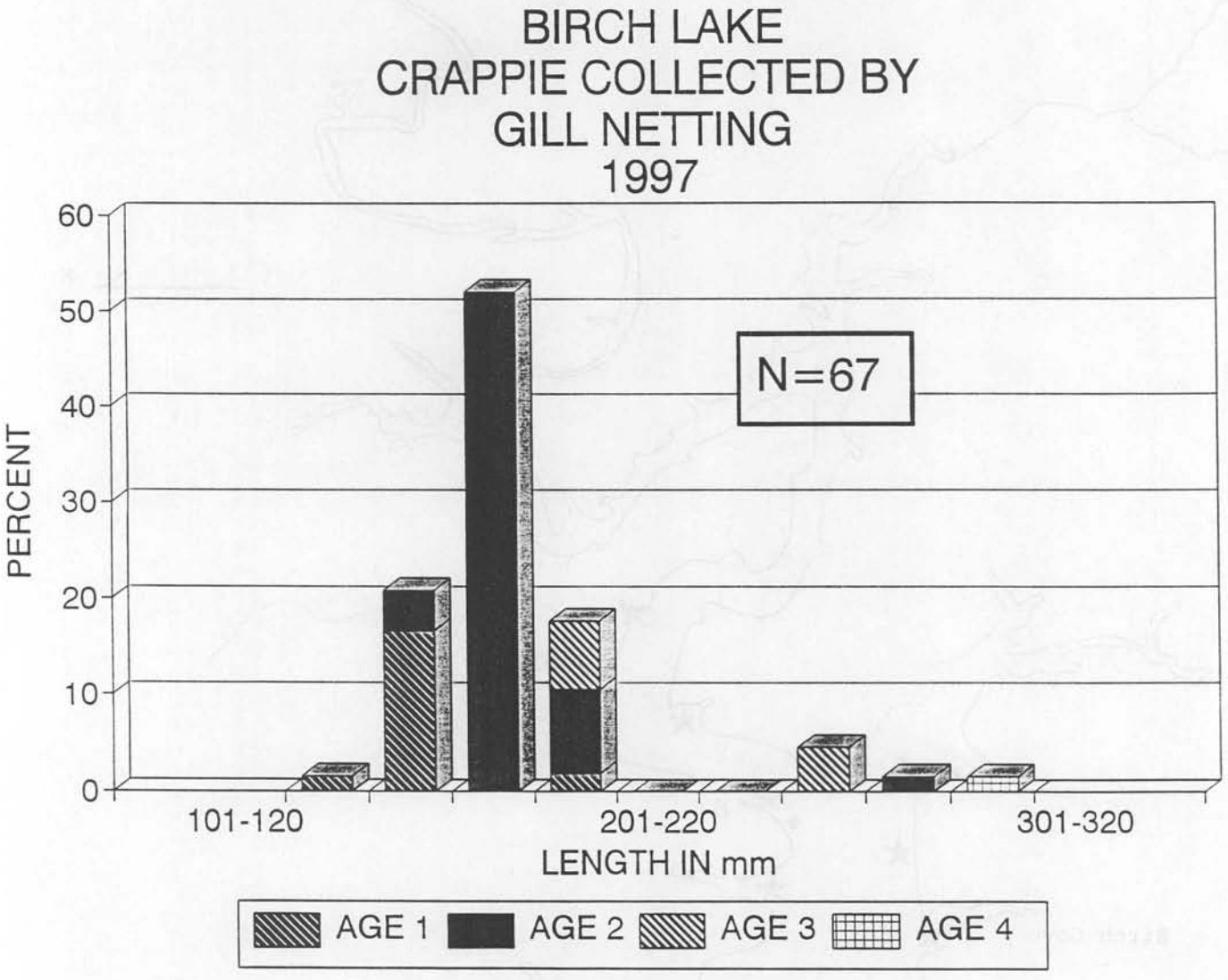
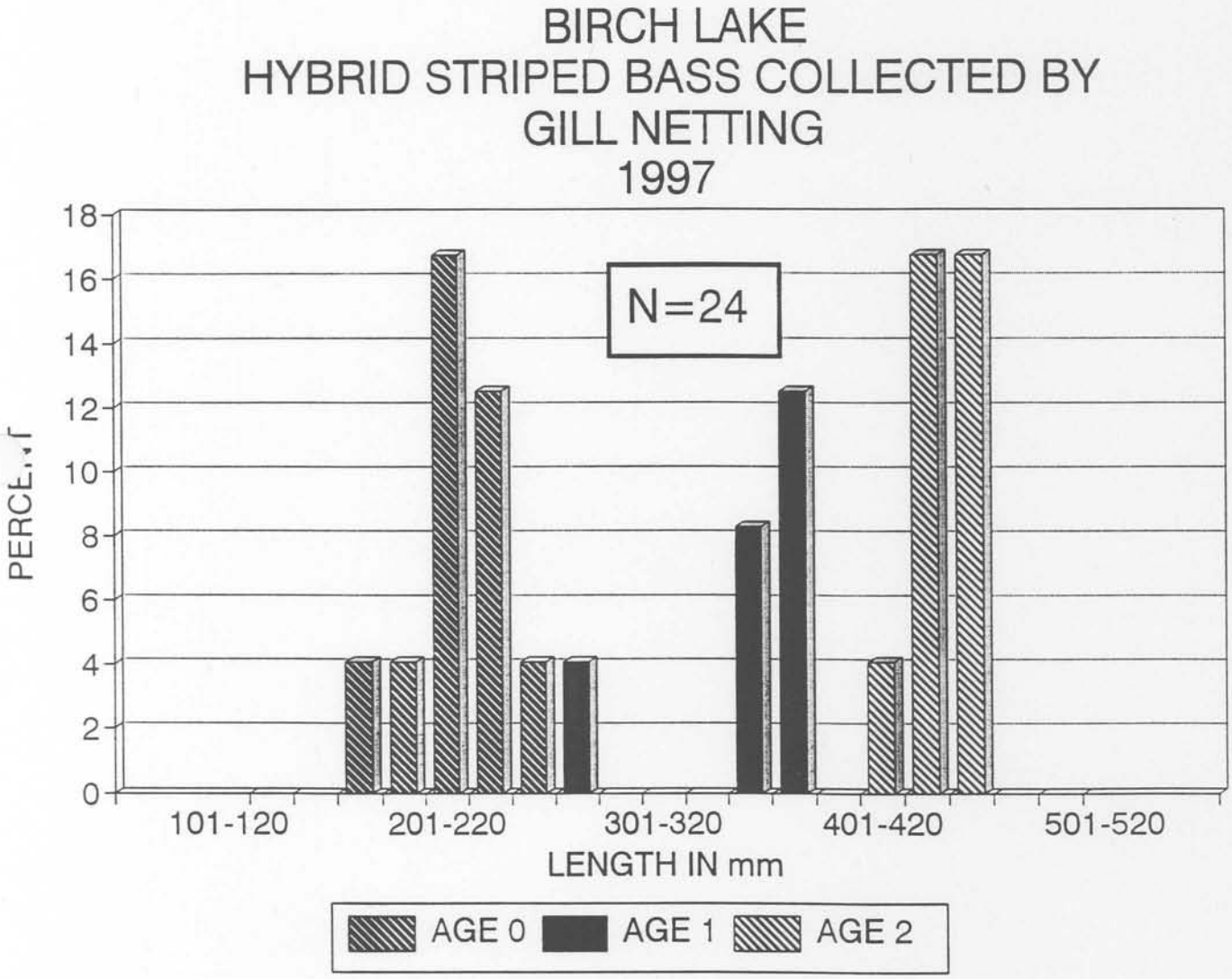

BIRCH LAKE
CRAPPIE COLLECTED BY
GILL NETTING
1997
60
50
40
30
20
10
0
PERCENT
N=67
101-120
201-220
301-320
LENGTH IN mm
AGE 1
AGE 2
AGE 3
AGE 4

Figure 3.


BIRCH LAKE
HYBRID STRIPED BASS COLLECTED BY
GILL NETTING
1997
N=24
PERCENT
18
16
14
12
10
8
6
4
2
0
101-120
201-220
301-320
401-420
501-520
LENGTH IN mm
AGE 0
AGE 1
AGE 2