

PERFORMANCE REPORT

As Required by

FEDERAL AID IN SPORT FISH RESTORATION ACT

TEXAS

FEDERAL AID PROJECT F-30-R-30

STATEWIDE FRESHWATER FISHERIES MONITORING AND MANAGEMENT PROGRAM

2004 Survey Report

Lake Nacogdoches

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EXECUTIVE SUMMARY

Lake Nacogdoches was surveyed in 2004-2005 by electrofishing, trap netting, gill netting, a spring access point creel survey, a structural habitat/aquatic vegetation survey, and an angler access survey. This report summarizes results of these surveys and comparisons are made with historical data (1997-2004). Based on this information, a management plan was developed for the reservoir.

- **Reservoir description:** Lake Nacogdoches is located on Loco Bayou, a tributary of the Angelina River in the Neches River basin. The City of Nacogdoches is the controlling authority. Primary uses are municipal water supply and recreation. At conservation pool, Lake Nacogdoches is 2,212 surface acres in size, has a shoreline length of 16 miles, and a mean depth of 15 feet. Water level fluctuations average 2 feet annually. Two public boat ramps with loading docks provide excellent boat access. One handicap-accessible fishing pier is also present. Habitat in the lake consists of submerged and emergent aquatic vegetation (mainly hydrilla and American lotus) and standing timber. Most of the land around the reservoir is used for timber production, agriculture, and residential use.
- **Prey species:** Primary prey species include gizzard shad, threadfin shad, and bluegill. The 2004 gizzard shad catch rate (71.0/hour) is similar to the historical average (65.3/hour), but the majority of fish are not available as prey. Historically, threadfin shad catch rates have been highly variable (mean = 67.0; SD = 125.7) and are probably not reflective of population status. The 2004 bluegill catch rate (502.0/hour) is higher than 2001, 2002, and historical average (382.0/hour, 287.0/hour, and 359.8/hour, respectively). Increased bluegill catch rates coupled with growth and relative weights of adult largemouth bass indicate adequate prey is available. Few anglers target bluegill (3% of total fishing effort).
- **Catfishes:** Numbers of channel catfish are relatively low in the reservoir (historical average = 0.3/net night). Since 1997, only 5 channel catfish have been collected with gill nets. High densities of largemouth bass and aquatic vegetation probably limit reproduction and recruitment of channel catfish. Few anglers target catfish at Lake Nacogdoches (<1% of total fishing effort).
- **Largemouth bass:** Largemouth bass harvest has been regulated with a 14 – 21-inch slot limit since 1988. Since the mid-1990s, dense aquatic vegetation coverages (either hydrilla or American lotus) have reduced fall electrofishing efficiency and increased data variability. Since 2001, catch rates have ranged from 68.0/hour (2002) to 147.0/hour (2004). Population size structure has also been variable (PSD range = 53 – 74; RSD 14-21 range = 30 – 56) but reflects adequate recruitment into the slot length limit.

Hydrilla and American lotus coverage is typically reduced in spring and lacks dense surface growth, which appears to increase spring sampling efficiency. Largemouth bass spring electrofishing data reflect remarkably similar and high population abundance (CPUE range = 210.0 – 215.0/hour; historical average = 133.2/hour) and size structure (PSD range

= 72 – 78). Recruitment of fish into the slot length limit is high (RSD 14-21 range = 42 – 62).

Growth of largemouth bass < 15 inches is good, as fish recruit into the slot limit in 2.6 years. Relative weights reflect good fish condition (≥ 83 for all inch groups and most > 90). Electrophoresis revealed the percent of Florida largemouth bass (FLMB) alleles (52.6%) and pure FLMB (7.9%) decreased in 2004.

Creel data indicates directed fishing effort towards largemouth bass was 5.5 hours/acre (63% of the total fishing effort) during the spring quarter. Total catch rates (1.0/hour) were high and harvest rates (0.1/hour) were low. Observed harvest was primarily directed below the 14-21 inch slot length limit.

- **Crappie:** Although populations of both white and black crappie are present at Lake Nacogdoches, trap nets catch few crappies and data is inadequate to assess trends in population abundance. The crappie fishery accounted for 25% of the total fishing effort during the spring quarter (2.2 hours/acre). Creel data suggest that crappie abundance has increased since 2001, as directed effort, catch, and harvest rates all increased. Total estimated harvest of white and black crappie increased 5 and 6-fold, respectively.
- **Management strategies:** Current harvest regulations should remain unchanged. Largemouth bass recruitment into the slot length limit appears high and stable and growth rates of sub-slot fish are good. Relative weights are currently at desirable levels. The largemouth bass population will be monitored closely by conducting biennial spring electrofishing surveys and a spring quarter creel survey every four years. The percentage of pure FLMB in the population is below the goal of 20%. In 2006 and 2007, we will request a FLMB stocking at a rate of 50 fish/acre.

INTRODUCTION

This document summarizes fisheries data collected from Lake Nacogdoches in 2004 - 2005; data from previous years are included for comparison. The purpose of this document is to provide information on the fishery and make any management recommendations needed to protect and enhance the sport fishery. While information on other fish species was collected, this report deals primarily with major sport fishes and important prey species. Management strategies are included to address existing problems or opportunities.

Harvest regulations for Lake Nacogdoches in 2004 - 2005.

Species	Bag Limit	Minimum – Maximum
		Length Limits (Inches)
Channel catfish	25	12 – None
Flathead catfish	5	18 – None
Spotted bass	5 ^a	None
Largemouth bass	5 ^{a,b}	14 – 21
Black and white crappie	25	10 – None

^aBag limit for spotted and largemouth bass is 5 in the aggregate.

^bNo more than one largemouth bass \geq 21 inches may be retained.

METHODS

- Fishes were collected by electrofishing (1.0 hours at 12 stations during both March [largemouth bass only] and October), gill netting (5 net nights during February), and trap netting (5 net nights during December). Catch per unit effort (CPUE) for electrofishing was recorded as the number of fish caught per hour of actual electrofishing, and for gill and trap nets as the number of fish caught in one net set overnight. Largemouth bass electrophoresis samples were collected in accordance with the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2004).
- Sampling statistics (CPUE for various length categories), structural indices (Proportional Stock Density [PSD] and Relative Stock Density [RSD]), and relative weights were calculated for target fishes according to Anderson and Neumann (1996).

- Otoliths were used to determine the mean age of 14-inch largemouth bass in accordance with the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2004).
- A seasonal access point creel survey (9 days) was conducted from March - May 2005 to assess angler use and catch in accordance with the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2004).
- A survey of structural habitat and aquatic vegetation and access points was conducted in accordance with the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2004).

LITERATURE CITED

Anderson, R. O., and R. M. Neumann. 1996. Length, weight, and associated structural indices. Pages 447-482 *in* B. R. Murphy and D. W. Willis, editors. Fisheries techniques, 2nd edition. American Fisheries Society, Bethesda, Maryland.

Physical and historical data for Lake Nacogdoches, Texas, 2004 - 2005.

Inland Fisheries (IF) water body code: 0521 IF District: 3D - Jasper

Controlling authority: City of Nacogdoches

Waterbody uses: Municipal and recreation

County (dam): Nacogdoches

Latitude: 31° 39'

Longitude: 94° 46'

Nearest major metropolitan area and distance: Houston - 125 miles

Reservoir description: Secondary stream

River system: Angelina

Mean depth (ft): 15.0

Maximum depth (ft): 40.0

Shoreline development index: 2.3

Watershed (mi²): 90

Secchi disc range (ft): 3+

Conductivity (umhos/cm): 120

Size: 2,212 acres

Average annual fluctuation (ft): 2.0

Access: Boat: Adequate - 2 ramps
 Bank: Adequate – 2 areas
 Handicap: Adequate – 1 fishing pier

Survey History:

Method	Year								
Gill net	1978	1980	1981	1984-1986	1991	1994	1997	2001	2005
Electrofishing	1978	1981	1982	1986-1995	1997-1999	2001	2002	2004	2005
Trap net	1988	1991	1994	1997	2000	2004			
Creel survey	1984-1988		1991	1992	2001	2005			
Habitat	1994	1997	2000	2004					
Vegetation	1992	1994	1997	2000-2004					
Cove rotenone	1980-1982		1984-1987						

Survey of littoral zone and physical habitat types, Lake Nacogdoches, Texas, 2004. A linear shoreline distance (miles) was recorded for each habitat type found.

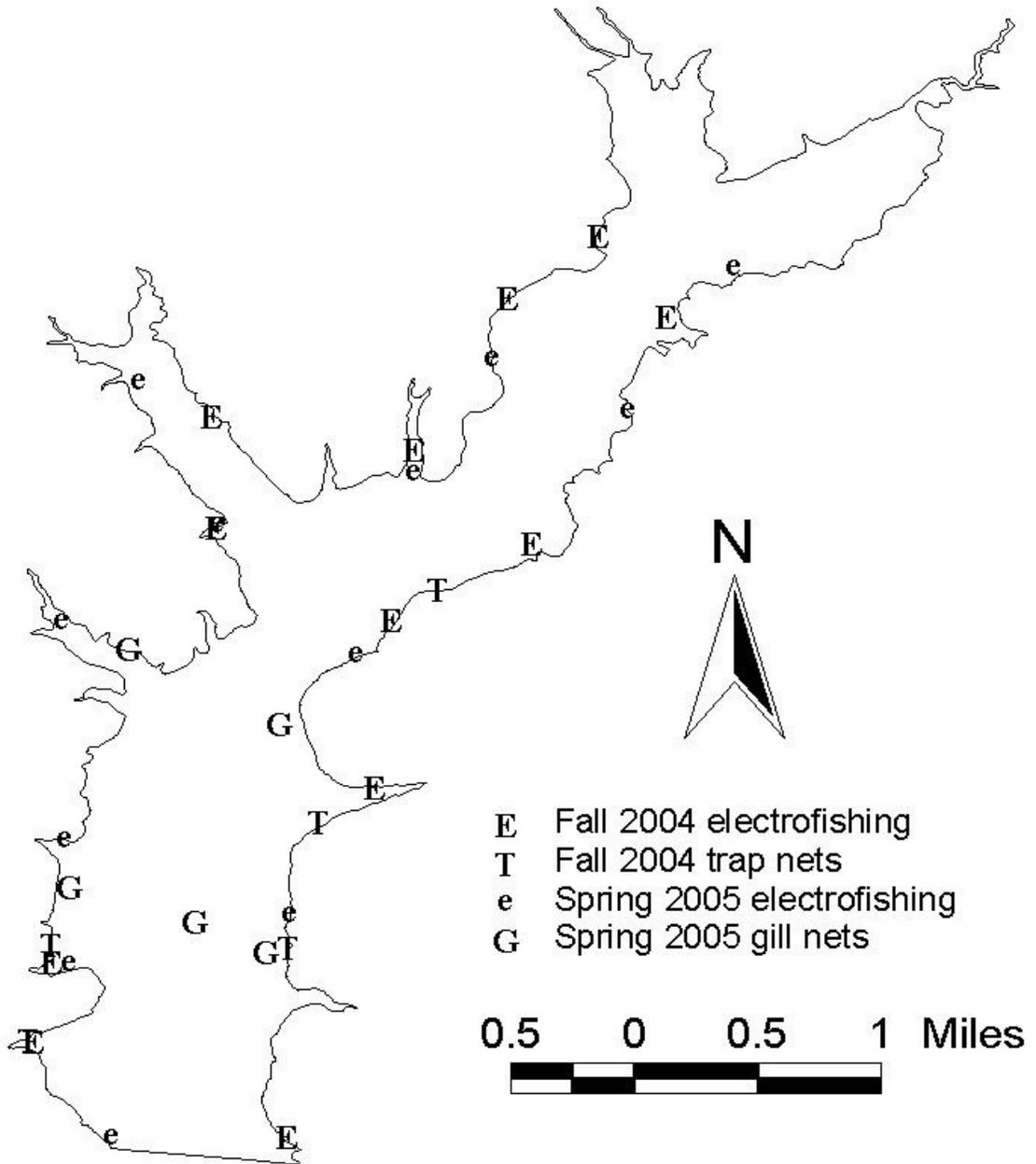
Shoreline habitat type	Shoreline distance	
	Miles	Percent of total
Riprap	0.2	0.5
Rocky shoreline	7.6	27.9
Eroded bank	0.9	3.3
Indescript	1.7	6.2
Overhanging brush	16.0	58.6

Survey of aquatic vegetation, Lake Nacogdoches, Texas, 2000, 2002-2004. Acreage of each species and percent of total surface area coverage (in parentheses) are presented.

Species	2000	2002	2003	2004
American lotus	69 (3)	242 (10)	251 (11)	667 (28)
Cattail	trace	trace	trace	trace
Chara		trace		
Coontail			trace	
Hydrilla	430 (18)	566 (24)	257 (11)	37 (2)
<i>Ludwigia spp.</i>			trace	
<i>Potamogeton spp.</i>	trace	38 (2)	27 (1)	10 (<1)
<i>Sagittaria spp.</i>		17 (1)		
Slender spikerush		6 (<1)	9(<1)	trace
Torpedograss		25 (1)	7 (<1)	trace
Water shield			trace	trace
White water lily	trace			
Grand total	499 (21)	899 (38)	552 (23)	717 (30)

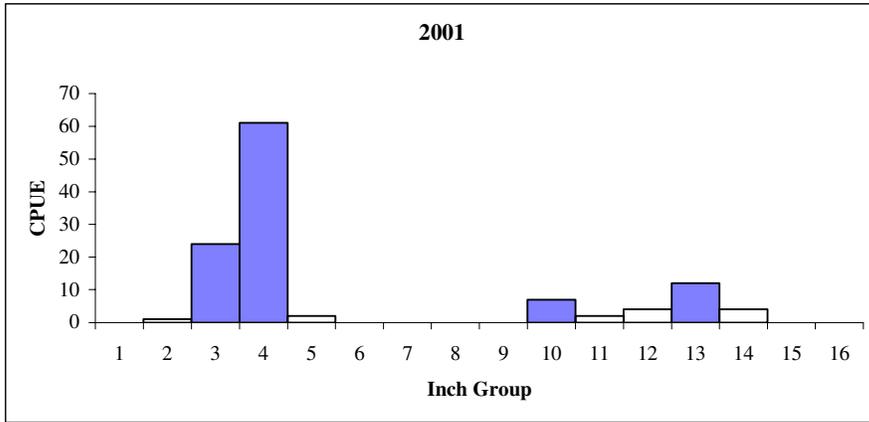
Stocking history at Lake Nacogdoches, Texas. FGL = 1-3 inches.

Species	Year	Number	Size
Channel catfish	1976	110,000	FGL
	1977	100,300	FGL
	Total	210,300	
Florida largemouth bass	1977	221,400	FGL
	1999	500	FGL
	2000	110,743	FGL
	2002	110,152	FGL
	Total	442,795	

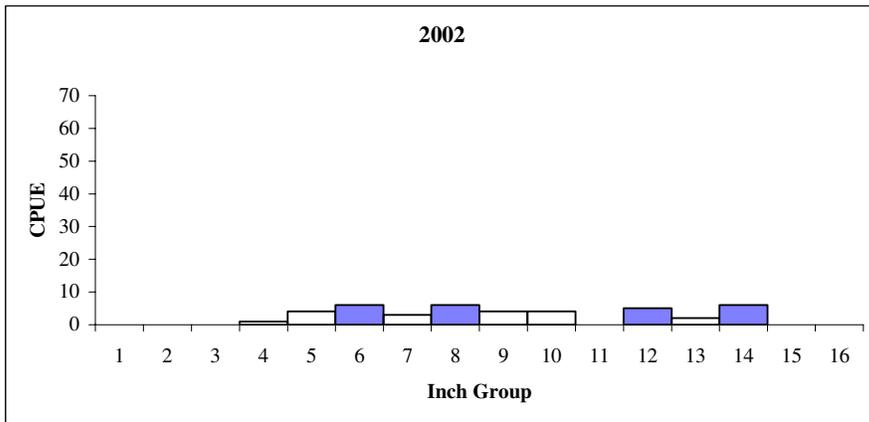


Location of sampling sites, Lake Nacogdoches, Texas, 2004-2005.

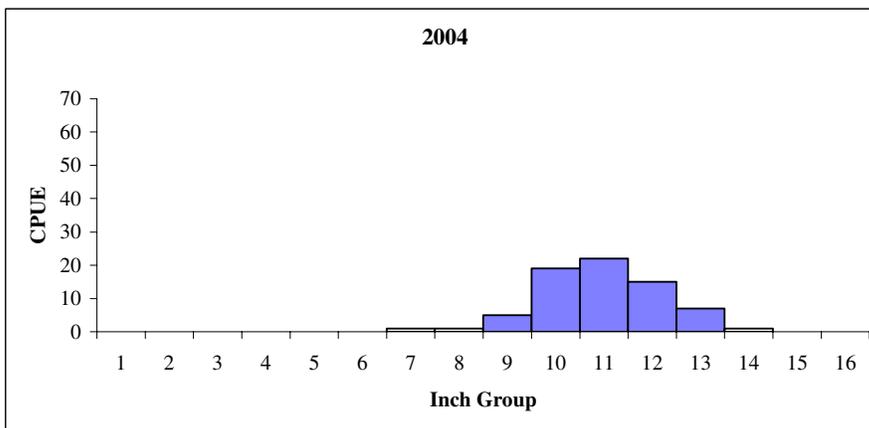
Gizzard Shad



Effort = 1
 Total CPUE = 117.0
 Stock CPUE = 29.0
 PSD = 76



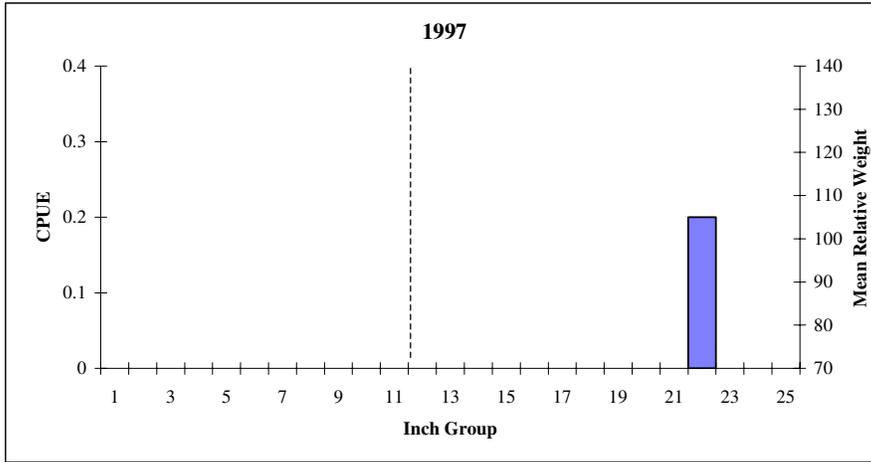
Effort = 1
 Total CPUE = 41.0
 Stock CPUE = 30.0
 PSD = 43



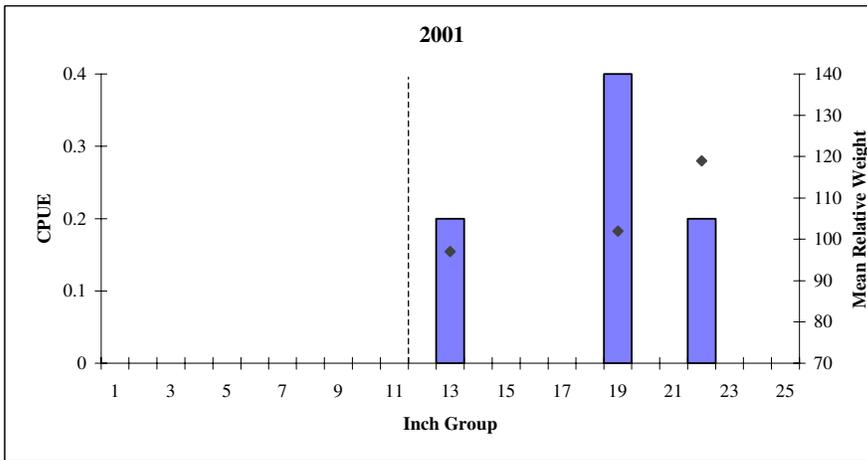
Effort = 1
 Total CPUE = 71.0
 Stock CPUE = 71.0
 PSD = 63

Number of gizzard shad caught per hour (CPUE, bars) and population indices for fall electrofishing surveys, Lake Nacogdoches, Texas.

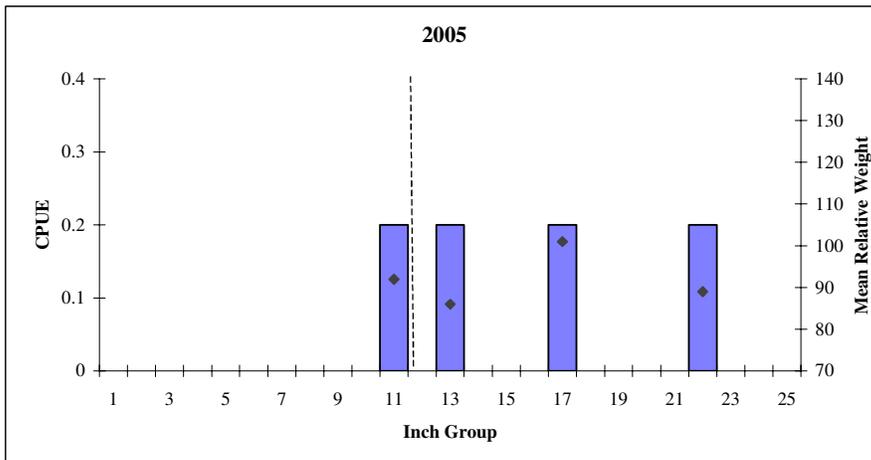
Channel Catfish



Effort = 5
 Total CPUE = 0.2
 Stock CPUE = 0.2
 PSD = 100



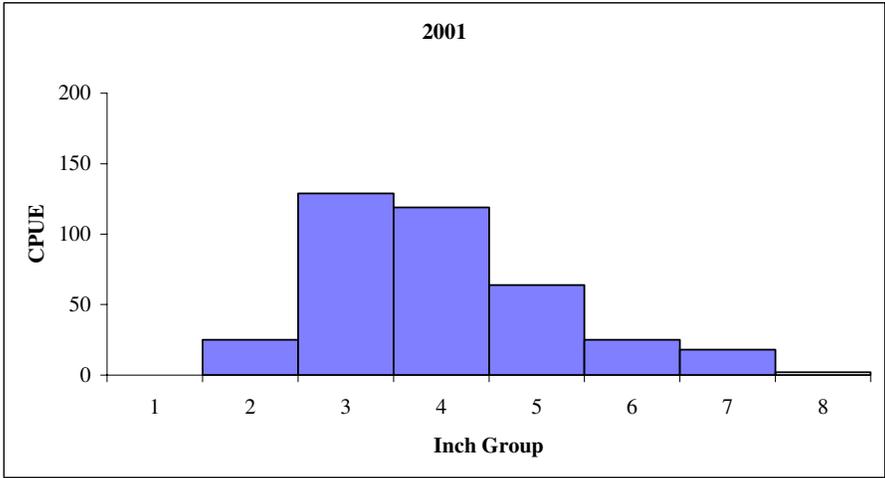
Effort = 5
 Total CPUE = 0.8
 Stock CPUE = 0.8
 PSD = 75



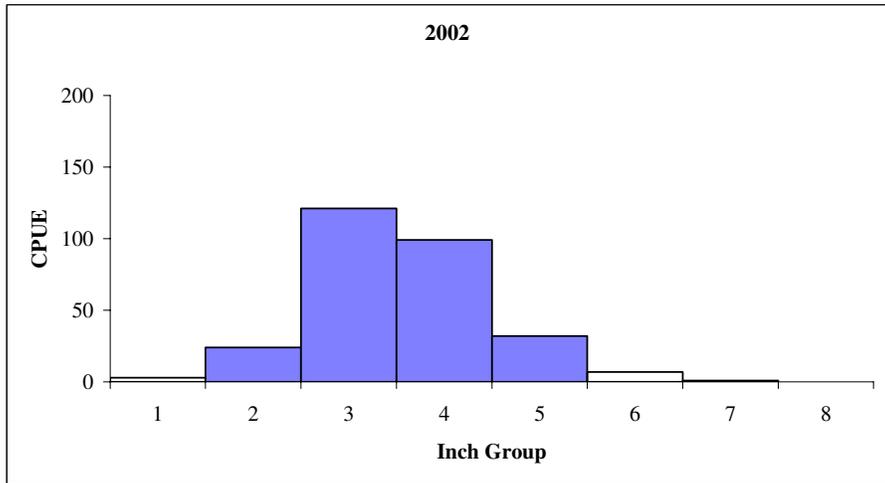
Effort = 5
 Total CPUE = 0.8
 Stock CPUE = 0.8
 PSD = 50

Number of channel catfish caught per net night (CPUE, bars), mean relative weight (points), and population indices for spring gill net surveys, Lake Nacogdoches, Texas. Broken vertical lines denote legal minimum length.

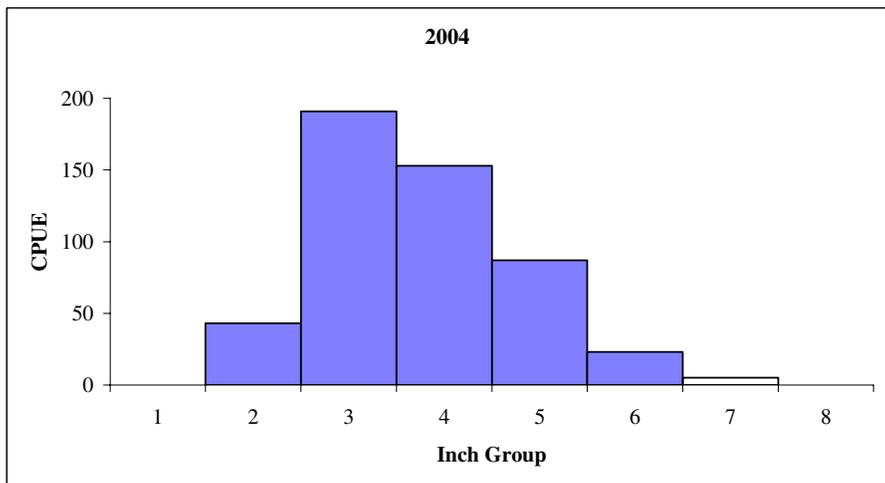
Bluegill



Effort = 1
Total CPUE = 382.0
Stock CPUE = 357.0
PSD = 13



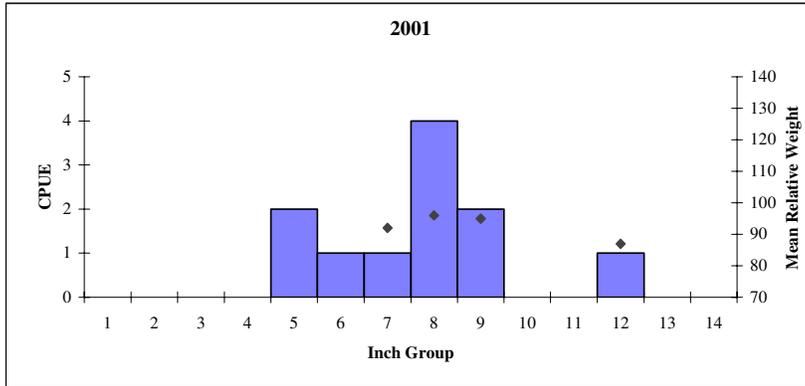
Effort = 1
Total CPUE = 287.0
Stock CPUE = 260.0
PSD = 3



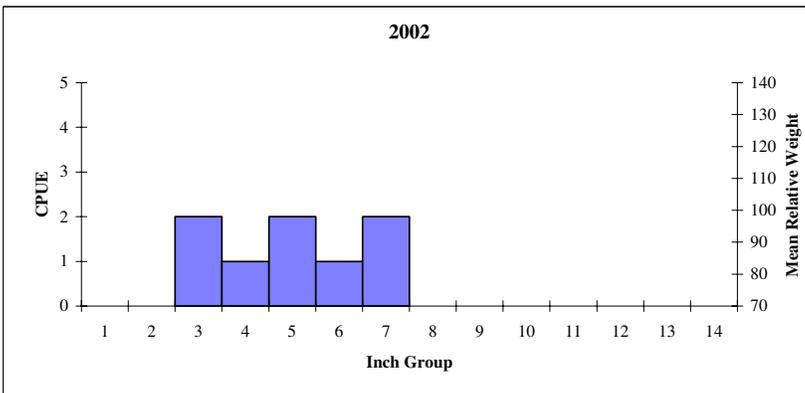
Effort = 1
Total CPUE = 502.0
Stock CPUE = 459.0
PSD = 6

Number of bluegill caught per hour (CPUE, bars) and population indices for fall electrofishing surveys, Lake Nacogdoches, Texas.

Spotted Bass



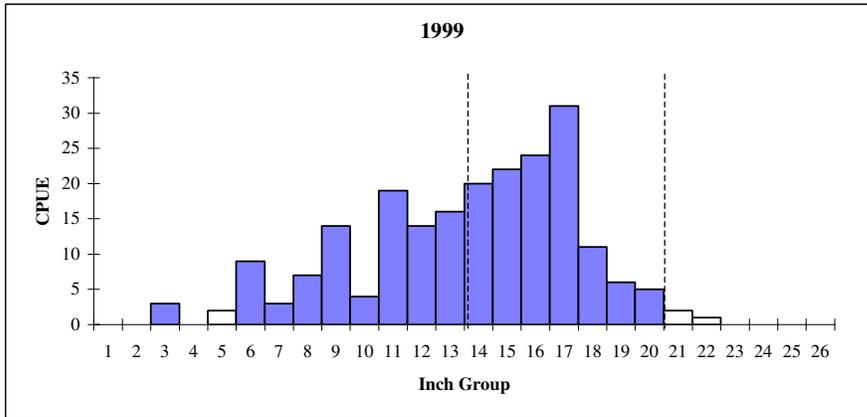
Effort = 1
 Total CPUE = 11.0
 Stock CPUE = 8.0
 PSD = 13



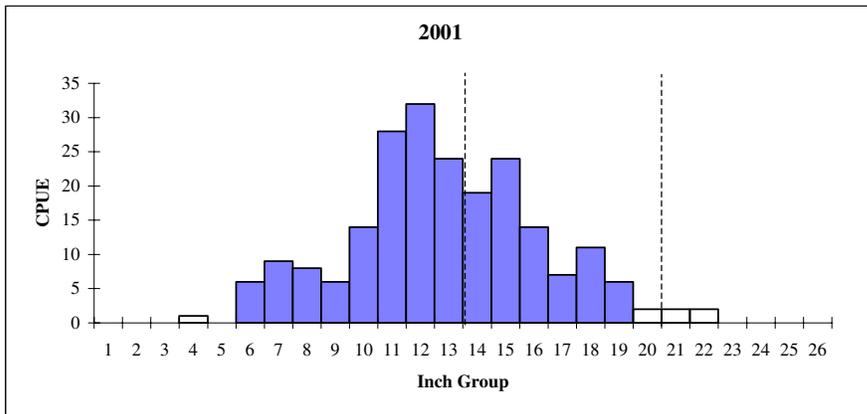
Effort = 1
 Total CPUE = 8.0
 Stock CPUE = 2.0
 PSD = 0

Number of spotted bass caught per hour (CPUE, bars), mean relative weight (lines), and population indices for fall electrofishing surveys, Lake Nacogdoches, Texas. No spotted bass were collected in 2004.

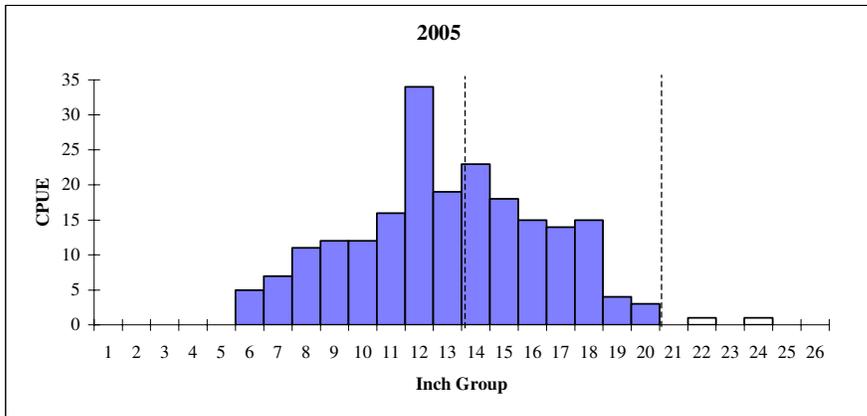
Largemouth Bass



Effort = 1
 Total CPUE = 213.0
 Stock CPUE = 196.0
 PSD = 78
 RSD-14-21 = 62



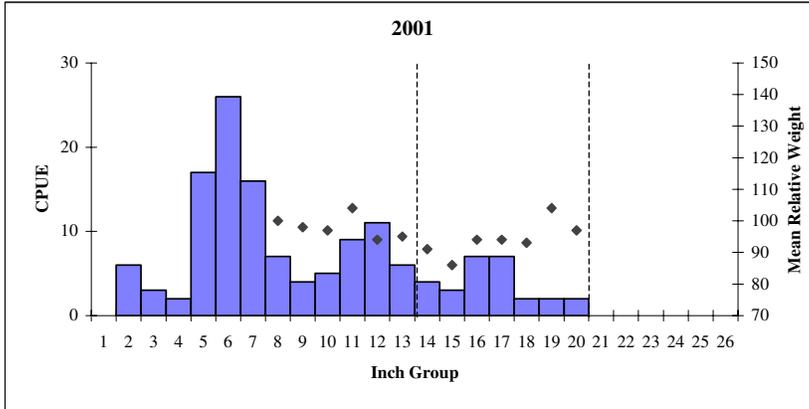
Effort = 1
 Total CPUE = 215.0
 Stock CPUE = 199.0
 PSD = 72
 RSD-14-21 = 42



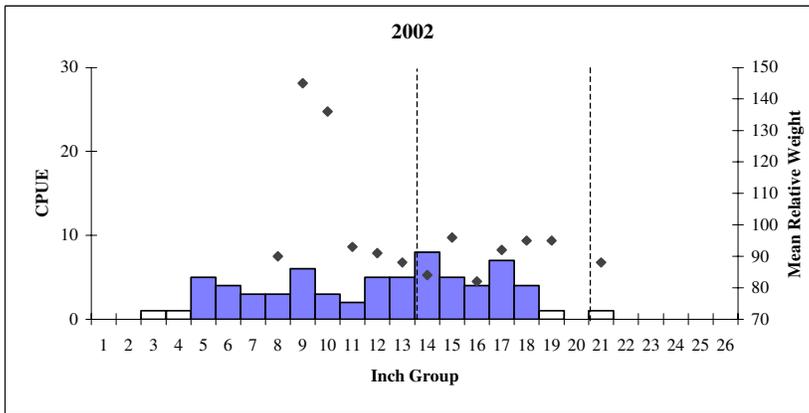
Effort = 1
 Total CPUE = 210.0
 Stock CPUE = 198.0
 PSD = 74
 RSD-14-21 = 46

Number of largemouth bass caught per hour (CPUE, bars) and population indices for spring electrofishing surveys, Lake Nacogdoches, Texas. Broken vertical lines denote slot length limit.

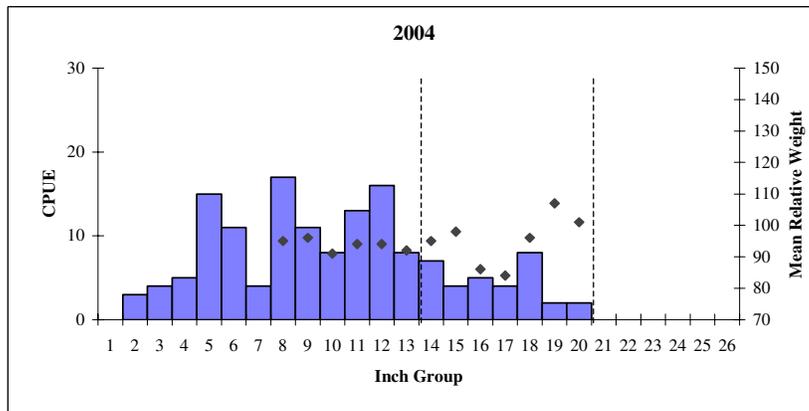
Largemouth Bass



Effort =	1
Total CPUE =	139.0
Stock CPUE =	69.0
PSD =	64
RSD 14-21 =	39
% FLMB =	15.5



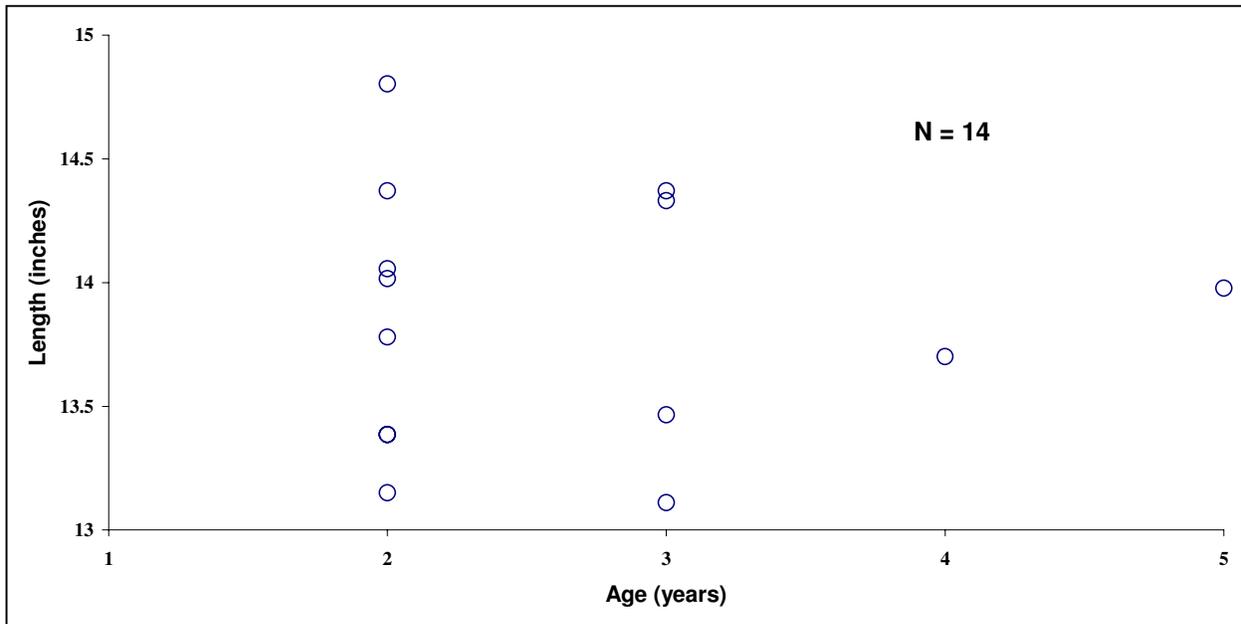
Effort =	1
Total CPUE =	68.0
Stock CPUE =	54.0
PSD =	74
RSD 14-21 =	56
% FLMB =	NA



Effort =	1
Total CPUE =	147.0
Stock CPUE =	105.0
PSD =	53
RSD 14-21 =	30
% FLMB =	7.9

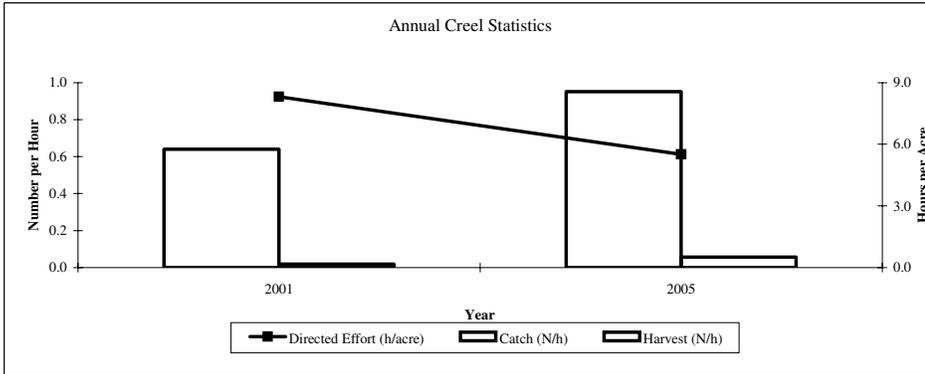
Number of largemouth bass caught per hour (CPUE, bars), mean relative weight (lines) and population indices for fall electrofishing surveys, Lake Nacogdoches, Texas. % FLMB = percent pure Florida largemouth bass present in a subsample of age-0 fish. Broken vertical lines denote slot length limit.

Largemouth Bass

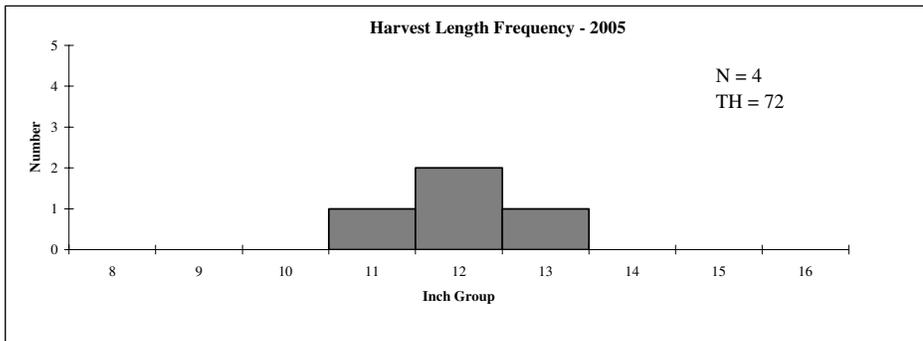


Age distribution of 13.0 - 15.0 inch largemouth bass collected from fall electrofishing surveys, Lake Nacogdoches, Texas, 2004.

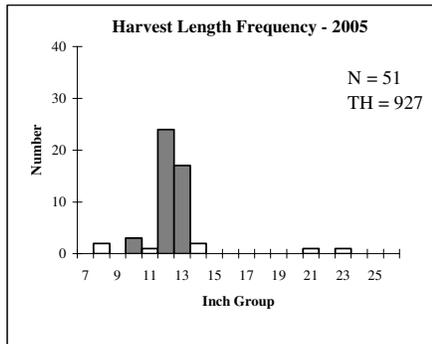
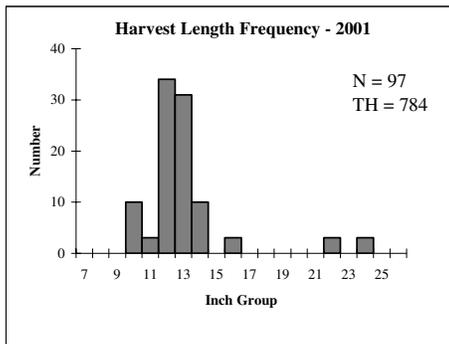
Black basses



Spring creel statistics for anglers seeking black basses at Lake Nacogdoches, Texas. Creel periods were from March through May.

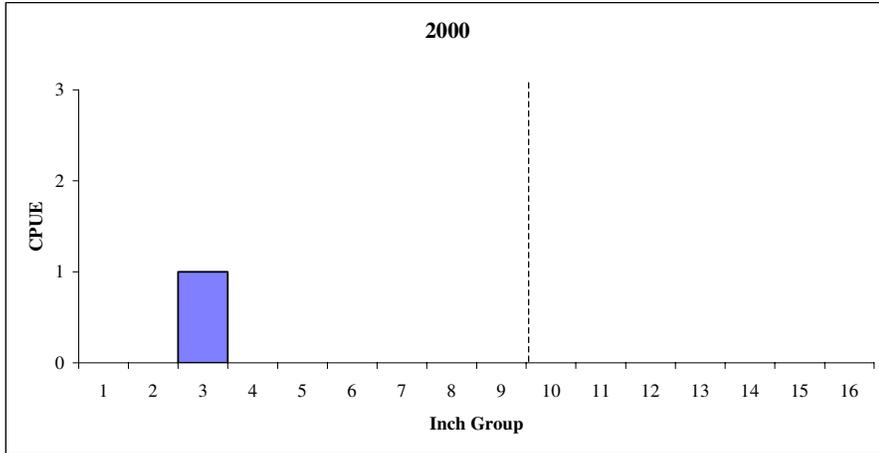


Length frequency of harvested spotted bass observed during creel surveys at Lake Nacogdoches, Texas, March through May, all anglers combined. N = number of fish observed during creel surveys. TH = total estimated harvest during spring quarter. No spotted bass were observed in 2001.



Length frequency of harvested largemouth bass observed during creel surveys at Lake Nacogdoches, Texas, March through May, all anglers combined. The slot length limit is 14 - 21 inches. N = number of fish observed during creel surveys. TH = total estimated harvest during spring quarter.

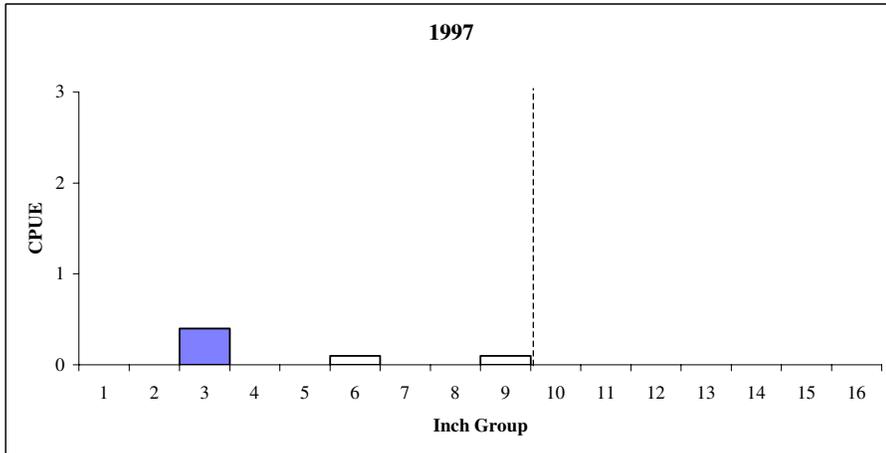
White Crappie



Effort = 5
 Total CPUE = 1.0
 Stock CPUE = 0.0
 PSD = 0
 RSD-10 = 0

Number of white crappie caught per net night (CPUE, bars) and population indices for fall trap net surveys, Lake Nacogdoches, Texas. Broken vertical lines denote minimum legal length. No white crappie were caught in 1997 or 2004.

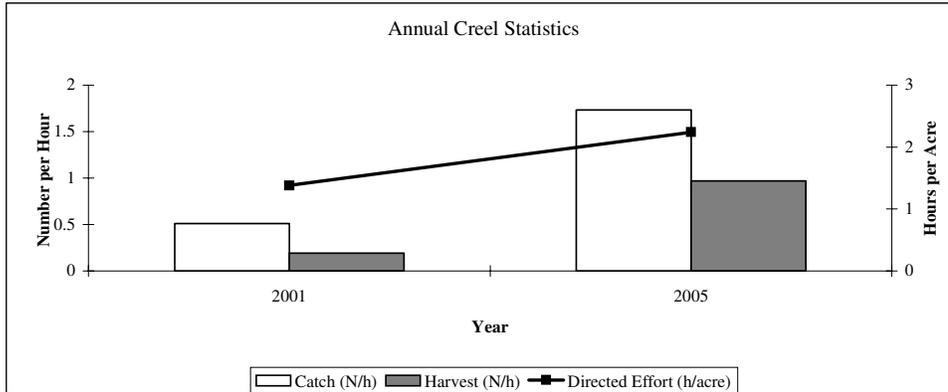
Black Crappie



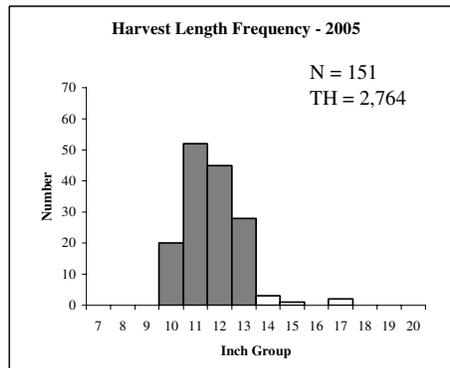
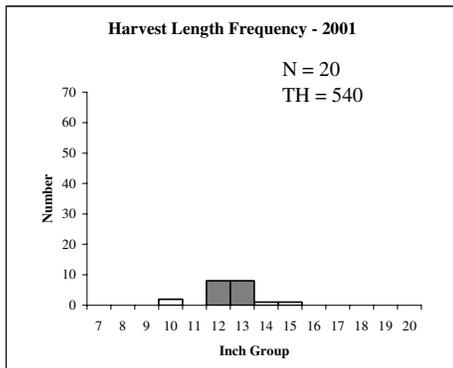
Effort = 10
 Total CPUE = 0.6
 Stock CPUE = 0.2
 PSD = 50
 RSD-10 = 0

Number of black crappie caught per net night (CPUE, bars) and population indices for fall trap net surveys, Lake Nacogdoches, Texas. Broken vertical lines denote minimum legal length. No black crappie were caught in 2000 or 2004.

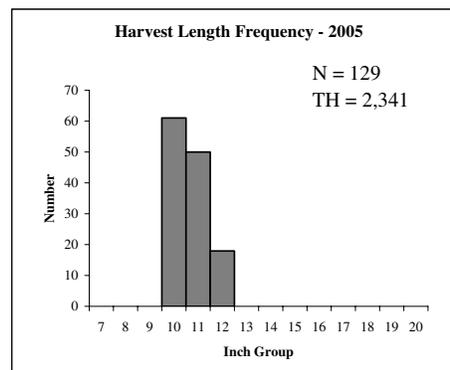
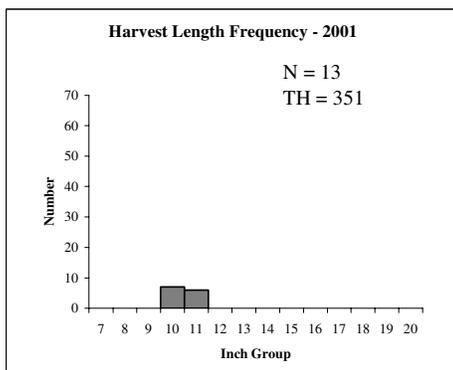
Crappie



Creel statistics for anglers seeking crappie at Lake Nacogdoches, Texas. Creel periods were from March through May.



Length frequency of harvested white crappie observed during creel surveys at Lake Nacogdoches, Texas, March through May, all anglers combined. The minimum length limit is 10 inches. N = number of fish observed during creel surveys. TH = total estimated harvest during spring quarter.



Length frequency of harvested black crappie observed during creel surveys at Lake Nacogdoches, Texas, March through May, all anglers combined. The minimum length limit is 10 inches. N = number of fish observed during creel surveys.

Fisheries Management Plan
Lake Nacogdoches, Texas
 Prepared - July 2005

ISSUE 1 The largemouth bass fishery is the most popular at Lake Nacogdoches. Data indicate the density of 14 – 21-inch fish is relatively high and growth of sub-slot fish is good. Recruitment of largemouth bass into the slot length limit appears high and stable.

MANAGEMENT STRATEGIES

1. Continue to regulate largemouth bass harvest with a 14 – 21-inch slot length limit.
2. Contact local newspapers and publicize results of monitoring surveys and management recommendations. Distribute the management plan to City of Nacogdoches staff.
3. Monitor largemouth bass population biennially to ensure that growth rates and population structure of largemouth bass justify a slot limit.
4. Continue to conduct a spring creel survey every four years to monitor angler catch and harvest of largemouth bass.
5. In 2006 and 2007, stock FLMB at a rate of 50 fish/acre. Conduct electrophoretic analysis every four years to monitor the percent FLMB present in the population.

ISSUE 2 Creel data reflect expanding crappie populations and an increasingly popular fishery. Spring 2001 and 2005 surveys indicate directed fishing effort for crappie increased from 13% to 25% of total fishing effort and total estimated harvest increased from 891 to 5,105 fish.

MANAGEMENT STRATEGIES

1. Due to the ineffectiveness of trap netting at Lake Nacogdoches, a spring creel survey will be conducted every 4 years to monitor crappie populations and the fishery.

ISSUE 3 Although hydrilla is present in the reservoir, current coverage is not considered problematic. Historically, hydrilla coverage has exceeded 40% of total surface area.

MANAGEMENT STRATEGIES

1. Conduct vegetation surveys annually to monitor amount of hydrilla present. If problems arise, consult with the City of Nacogdoches to develop a management plan for hydrilla control.

APPENDIX 1

Number (N) and catch per unit effort (CPUE) of species collected from all gear types, Lake Nacogdoches, Texas, 2004 - 2005. Gill net CPUE is the number of fish per net night, and electrofishing CPUE is the number of fish per hour. Only data from targeted species were recorded from electrofishing. No targeted species were collected with trap nets.

Species	<u>Gill net</u>		<u>Electrofishing</u>	
	N	CPUE	N	CPUE
Gizzard shad	8	1.6	71	71.0
Threadfin shad			7	7.0
Spotted sucker	19	3.8		
Channel catfish	4	0.8		
Warmouth			4	4.0
Bluegill			502	502.0
Longear sunfish			5	5.0
Redear sunfish			62	62.0
Spotted sunfish			9	9.0
Largemouth bass	10	2.0	147	147.0
White crappie	6	1.2		
Black crappie	4	0.8		

APPENDIX 2

Results of electrophoretic analysis of largemouth bass collected by electrofishing from Lake Nacogdoches, Texas, 2000, 2001, and 2004.

Year	Sample size	Genotype				% Florida largemouth bass alleles	% Pure Florida largemouth bass
		Florida	F1	FX	Northern		
2000	44	10	13	21	0	71.0	22.7
2001	45	7	11	25	2	54.7	15.5
2004	38	3	11	23	1	52.6	7.9

APPENDIX 3

Angler access survey information from Lake Nacogdoches, Texas, 2004 - 2005.

Boat ramp	Latitude/ Longitude	Use fee?	Boat lanes	Parking capacity	ADA accommodations?	Bank fishing?	Improvements
East park (dam)	31.58580 /-94.82179	No	2	60	No	Yes	None
West park (dam)	31.59321 /-94.83740	No	2	60	Yes	Yes	None