PERFORMANCE REPORT

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FEDERAL AID IN SPORT FISH RESTORATION ACT

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FEDERAL AID PROJECT F-30-R-30

STATEWIDE FRESHWATER FISHERIES MONITORING AND MANAGEMENT PROGRAM

2004 Survey Report

Ray Hubbard Reservoir

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Executive Summary

Ray Hubbard Reservoir was surveyed in 2004 using electrofishing and trap nets, and in 2003 and 2005 using gill nets. An annual creel survey was conducted from June 1, 2004 through May 31, 2005. This report summarizes the results of the surveys and contains a management plan for the reservoir based on those findings.

- **Reservoir description:** Ray Hubbard Reservoir is a 22,745-acre impoundment constructed on the East Fork of the Trinity River by the City of Dallas in 1968 to provide water for municipal and industrial purposes, and recreation. Ray Hubbard Reservoir is located one-mile east of Rockwall and lies within Dallas, Collin, Rockwall and Kaufman counties. The reservoir is surrounded by urban development and is part of the Dallas-Ft. Worth metroplex. The reservoir has a 1,074 square-mile watershed that lies in the Blackland Prairies vegetation area and is primarily used for agricultural and residential development. The reservoir is 13 miles long and 3 miles wide (widest point). It contains 490,000 acre feet of water at conservation elevation (435.5 ft-msl), and has a maximum depth of 40 feet. Angler and boat access is adequate. At the time of sampling the fishery habitat was primarily dead trees, emergent vegetation, and eroded banks. Hydrilla once covering 199 acres in 2000 has decreased significantly. A creel survey was conducted on Ray Hubbard Reservoir from June 1, 2004 to May 31, 2005.

- **Prey species:** An electrofishing catch rate of 243.0/hour for gizzard shad was lower than previous years and lower than the district average of 270.0/hour. The index of vulnerability (IOV) (i.e., percentage of individual gizzard shad less than 8 inches total length thought to be vulnerable to largemouth bass predation) for 2004 was 67, which was lower than the two previous samples but still indicates the majority of gizzard are available for predators (DiCenzo et al. 1996).

  The 2004 threadfin shad catch rate of 216.5/hour was lower than the previous sample but higher than the district average of 204.0/hour.

  The catch rate for bluegill in 2004 was 100.0/hour, which was higher than the previous year's sample and lower than the district average of 160.0/hour. The catch rate for longear sunfish was 59.0/hour for the 2004 sample which was

similar to the previous year's sample and also lower than the district average of 87.0/hour.

- **Catfishes:** The gill netting catch rate for blue catfish in 2005 was 10.5/net night which is the second highest catch rate on record with numerous fish over 20 pounds being captured. The 2005 catch rate was higher than the district average of 1.9/net night. Size distribution of the blue catfish was above average as indicated by a PSD value of 38. Only 4% of the total angling effort on Ray Hubbard is directed toward blue catfish. However catch rates were high (1.4 fish/hour) and anglers usually kept the blue catfish they caught as indicated by the harvest rate of 1.2 fish/hour.

  The gill netting catch rate for channel catfish in 2005 was 3.7/net night and was similar to the 2003 catch rate but lower than the district average of 5.6/net night. Over 15% of the total angling effort (second only behind largemouth bass) on Ray Hubbard Reservoir is directed toward channel catfish. This high percentage of directed could be the result of anglers not recognizing the difference between the two species. Anglers seeking catfish in general accounted for 11% of the total angling effort.

- **Temperate basses:** The 2005 white bass gill netting catch rate was 9.1/net night, which was lower than the previous sample, but higher than the district average of 8.0/net night. White bass were the fourth most sought after species in Ray Hubbard Reservoir (11% of total angling effort) slightly behind white crappie. Angler catch rate of white bass was high with slightly over 2 fish/hour being caught.

  The palmetto bass gill netting catch rate was 4.1/net. No palmetto bass were captured in 2003 or 2001. Thus annual stockings have benefited the population. Palmetto bass reach harvestable size between ages 2 and 3. In 1997, data indicated that fish age 2 were in poorer condition and were growing slower than in years past. Therefore no fish were stocked in 1997 and 1998 and the stocking rate for subsequent years was reduced to 10 fish/acre. However in 1999 palmetto bass were stocked at only 2.5 fish/acre and no fish were stocked in 2000, or 2001 due to poor hatchery production. Creel data suggest that not many anglers directly seek palmetto bass (2% of total angling effort). This could be the result of poor catch rates (0.0 fish/hour) caused by the decline in the population which resulted by recent inconsistent stockings.

- **Largemouth bass:** The largemouth bass electrofishing catch rate for 2004 (65.5/hour) was much lower than the catch rate in 2000 (96.0/hour) and lower than the district average of 126.0/hour. However the size distribution of largemouth was adequate (PSD= 53; RSD-14= 33). Largemouth bass are the most sought after species in Ray Hubbard Reservoir (18% of total angling effort). However, angler catch rates were low (0.33 fish/hour). Largemouth bass reach legal size at age 2. Electrophoretic analyses indicate the percentage of the Florida bass alleles is 50.0% for the 2004 sample, with a Florida bass genotypic influence of 7.1%.

- **White crappie:** The trap netting catch rate for white crappie in 2004 was 13.7/net night, which was similar to the 2000 catch rate and similar to the district average of 16.4/net night. The white crappie size distribution was above average (RSD-10= 50). White crappie were the third most sought after species in Ray Hubbard Reservoir (12% of total angling effort). Angler catch rate of white crappie was high with slightly over 1 fish/hour being caught.

- **Management strategies**

  Based on current information, existing regulations should be maintained on Ray Hubbard Reservoir. The stocking of palmetto bass should be continued as long as forage species are adequate. The palmetto bass and catfish fishery will be monitored by gillnetting on a bi-annual basis with the next sample collected in 2007. Ray Hubbard Reservoir has a tremendous blue catfish population which needs to be better publicized to increase angler utilization. Because of the low catch rate of largemouth bass and the past history of the reservoir producing trophy largemouth bass, electrofishing will be conducted annually. Florida largemouth bass will also be requested for stocking based on past trophy production.

Introduction

This document is a summary of the fisheries data collected from Ray Hubbard Reservoir in 2004 - 2005. The purpose of the document is to provide fisheries information and make management recommendations to protect and improve the sport fishery. While information on other species of fishes was collected, this report deals primarily with major sport fishes and important prey species. Management strategies are included to address existing problems or opportunities. Historical data are presented with the 2004-2005 data for comparison.

Harvest regulations for Ray Hubbard Reservoir 2004-2005.

Species	Bag Limit	Minimum-Maximum Length
Bass, largemouth	5	14-No limit
Bass, striped, its hybrids and subspecies	5	18-No limit
Bass, white	25	10-No limit
Catfish, flathead	5	18-No limit
Catfish, blue and channel	25	12-No limit
Crappie, white	25	10-No limit

Methods

- Fishes were collected by electrofishing (2.0 hours at 24 stations), gill netting (15 net nights at 15 stations)and trap netting (15 net nights at 15 stations). Catch per unit effort (CPUE) for electrofishing was recorded as the number of fish caught per hour of actual electrofishing, and for gill net and trap nets as the number of fish caught in one net set overnight. Stations were randomly selected. Habitat data, vegetation coverage, and largemouth bass electrophoresis samples were collected according to the Texas Parks and Wildlife Department (TPWD) Inland Fisheries Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2003).

- Sampling statistics (CPUE for various length categories) and structural indices (Proportional Stock Density [PSD] and Relative Stock Density [RSD]) were calculated for target fishes according to Anderson and Neumann (1996). Standard weight equations used to calculate relative weight were from Anderson and Neumann (1996) and Mouneke and Pope (1999).

- Ages were determined for selected palmetto and largemouth bass using otoliths.

- A creel survey consisting of 36 days was conducted from June 1, 2004 to May 31, 2005. Nine surveys were conducted every quarter. Creel survey information was collected as described in the TPWD Inland Fisheries Assessment Manual (TPWD, Inland Fisheries Division, unpublished manual revised 2003).

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.

DiCenzo, V. J., M. J. Maceina, and M. R. Stimpert. 1996. Relations between Reservoir trophic state and gizzard shad population characteristics in Alabama reservoirs. North American Journal of Fisheries Management 16: 888–895.

Muoneke, M. I., and K. L. Pope. 1999. Development and evaluation of standard weight (W_s) equation for blue catfish. North American Journal of Fisheries Management 19:878–879.

Physical and historical data for Ray Hubbard Reservoir, Texas 2004-2005.

Inland Fisheries water body code: 0600 IF District: 2D

Reservoir size (Acres): 21,671

Controlling authority: City of Dallas

Counties: Rockwall (location of dam)

Latitude: 32° 29' Longitude: 98° 47'

Nearest major metropolitan area and distance: Fort Worth-Dallas - 0 miles

Reservoir description: mainstream River system: Trinity

Mean depth (ft): 21.5 Maximum depth (ft): 40.0

Shoreline development index: N/A

Secchi disc range (ft): 2-4 Conductivity (umhos/cm): 200

Survey History

Method	Year						
Gill netting	1987	1989	1991	1994	1997	2001	2005
Electrofishing	1987	1990	1994	1997	2000	2004	
Trap netting	1989	1991	1994	1997	2000	2004	
Vegetation surveying	1994	1997	2000	2004			
Habitat surveying	1994	1997	2000	2004			

Survey of littoral zone and physical habitat types, Ray Hubbard Reservoir, Texas, Summer 2004. A linear shoreline distance (miles) was recorded for each habitat type found. For non-shoreline habitat types, acreages are also listed.

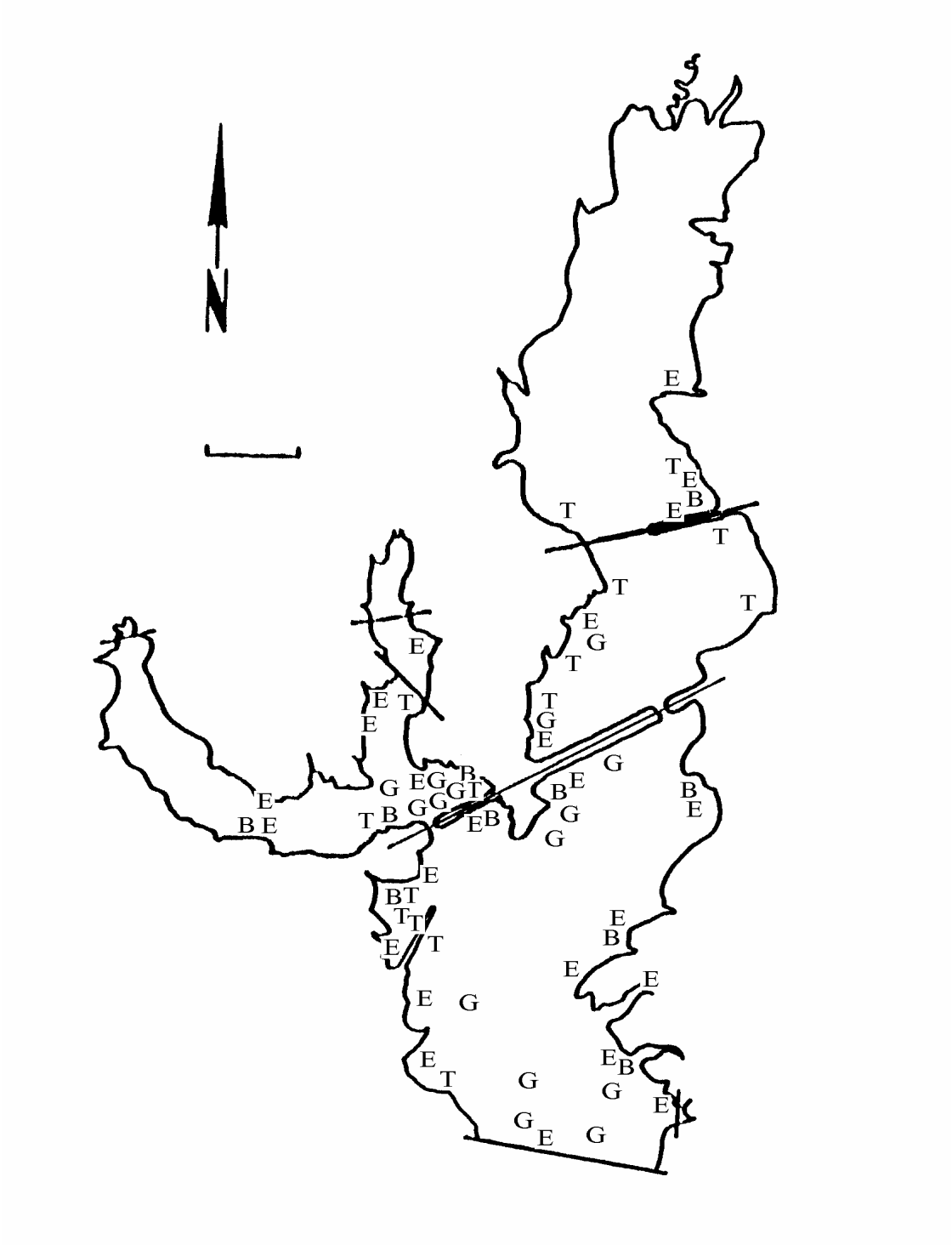
Habitat		Miles	Acres
Water's Edge	Nondescript	2	
	Dead Trees	26	
	Native emergent	30	
	Gravel	<1	
	Eroded bank	20	
	Rip rap	23	
	Overhanging brush	3	
	Bulkhead	8	
Vegetation	Native floating	1	
	Native submerged	<1	
	Hydrilla	<1	<1
Near shore	Boat docks, piers	2	
	Dead trees	44	
Open water	Dead trees		3994
Total reservoir shoreline length		112	

Stocking history of Ray Hubbard Reservoir, Texas 2005. Sizes of fish are indicated as UNK – unknown, AD – adult, and FG – fingerling.

Species	Year	Number	Size
Blue catfish	1990	109,175	FG
	1993	399,958	FG
	Species total	509,133	
Channel catfish	1971	96,830	UNK
	Species total	96,830	
Striped bass	1979	111,225	UNK
	1981	113,482	UNK
	1983	115,868	UNK
	1984	338,680	FG
	1986	225,200	FG
	1996	11,598	FG
	Species total	916,053	
Palmetto bass	1976	149,616	UNK
	1979	114,000	UNK
	1980	101,800	UNK
	1982	232,701	UNK
	1985	271,952	UNK
	1987	455,017	FG
	1988	455,847	FG
	1989	460,946	FG
	1991	235,994	FG
	1992	325,185	FG
	1993	1,111,853	FG/FRY
	1994	341,661	FG
	1995	346,142	FG
	1996	250,702	FG
	1999	56,945	FG
	2002	162,993	FG
	2003	108,847	FG
	2004	100,438	FG
	Species total	5,183,200	
Largemouth bass	1968	1,471,600	UNK
	1970	2,204.000	UNK
	1988	502,897	UNK
	Species total	4,178,497	

Stocking history of Ray Hubbard Reservoir, Texas, continued. Fingerlings are noted as FG, adults are noted as AD, fry are noted as FRY, and unknown as UNK.

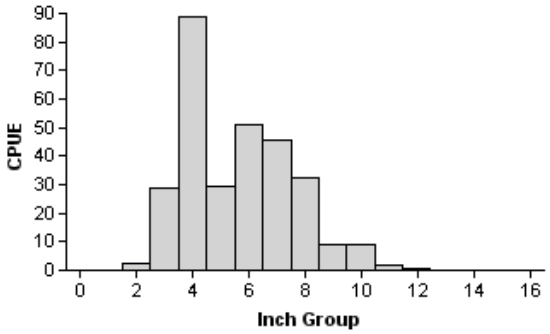
Species	Year	Number	Size
Florida largemouth bass	1988	64,872	FG
	1991	568,891	FG
	1996	549,328	FG
	2001	501,365	FG
	Species total	1,183,091	
Walleye	1976	230,000	UNK
	1981	19,237	UNK
	Species total	249,237	



Location of sampling sites, Ray Hubbard Reservoir, Texas, 2004 – 2005. Trap netting, gill netting, and electrofishing stations are indicated by T, G, and E, respectively. Boat ramps are indicated by B.

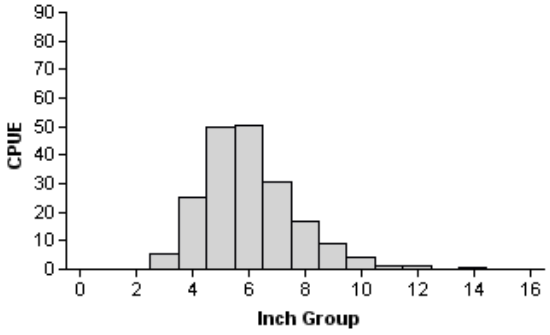
Gizzard Shad

1997



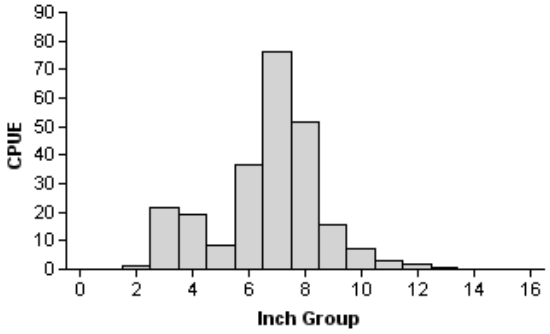
IOV =82 Effort = 2.00
Total CPUE = 299.50 CPUE Stock = 98.50
N = 599

2000



IOV =83 Effort = 1.83
Total CPUE = 193.64 CPUE Stock = 63.27
N = 355

2004

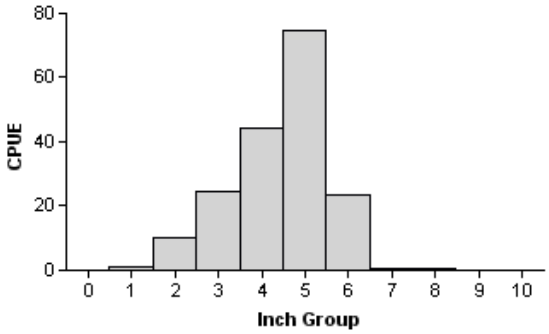


IOV =67 Effort = 2.00
Total CPUE = 243.00 CPUE Stock = 156.00
N = 486

Comparison of the number of gizzard shad caught per hour (CPUE, bars) and population indices for fall electrofishing surveys, Ray Hubbard Reservoir, Texas.

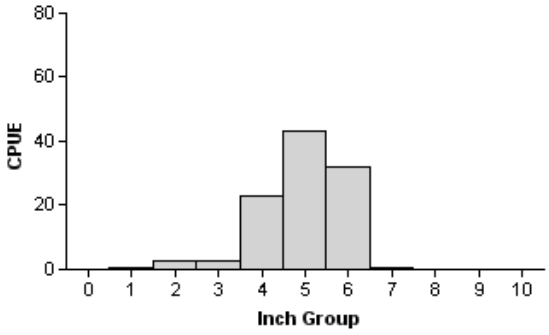
Bluegill

1997



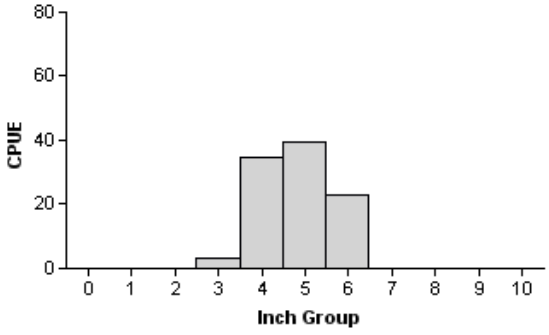
PSD = 15 Effort = 2.00
Total CPUE = 179.00 CPUE Stock = 168.00
N = 358

2000



PSD = 32 Effort = 1.83
Total CPUE = 104.73 CPUE Stock = 101.45
N = 192

2004

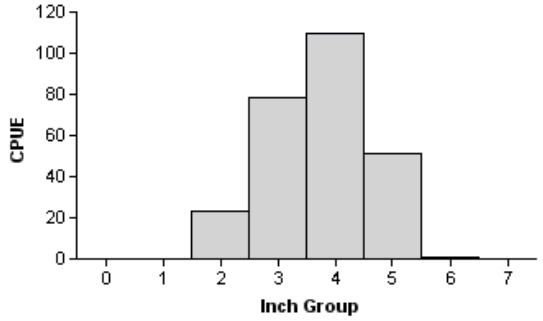


PSD = 23 Effort = 2.00
Total CPUE = 100.00 CPUE Stock = 100.00
N = 200

Comparison of the number of bluegill caught per hour (CPUE, bars) and population indices for fall electrofishing surveys, Ray Hubbard Reservoir, Texas.

Longear Sunfish

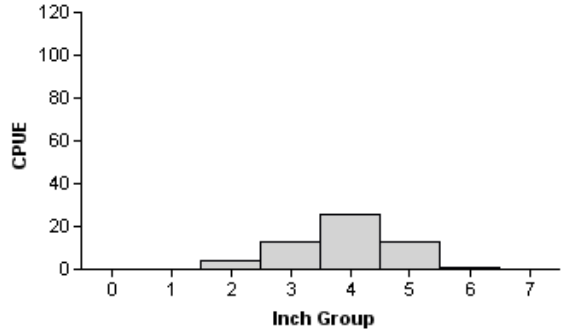
1997



Total CPUE = 263.50 Effort = 2.00

N = 527

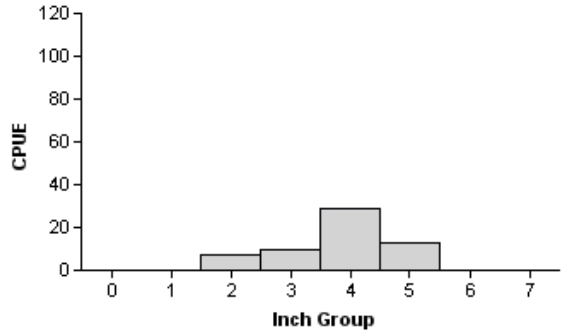
2000



Total CPUE = 56.73 Effort = 1.83

N = 104

2004



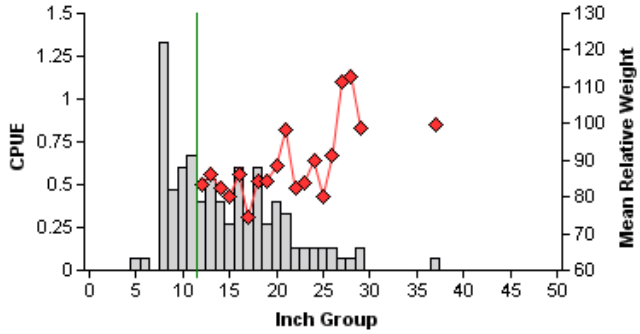
Total CPUE = 59.00 Effort = 2.00

N = 118

Comparison of the number of longear sunfish caught per hour (CPUE, bars) and population indices for fall electrofishing surveys, Ray Hubbard Reservoir, Texas.

Blue Catfish

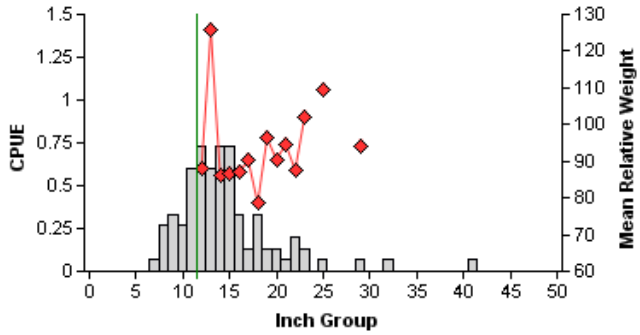
2001



PSD = 34
RSD-P = 1
Total CPUE = 8.33
N = 125

Effort = 15.00
CPUE Stock = 5.13

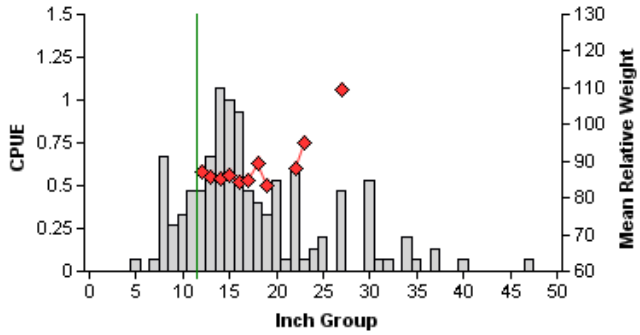
2003



PSD = 18
RSD-P = 3
Total CPUE = 6.07
N = 91

Effort = 15.00
CPUE Stock = 4.53

2005



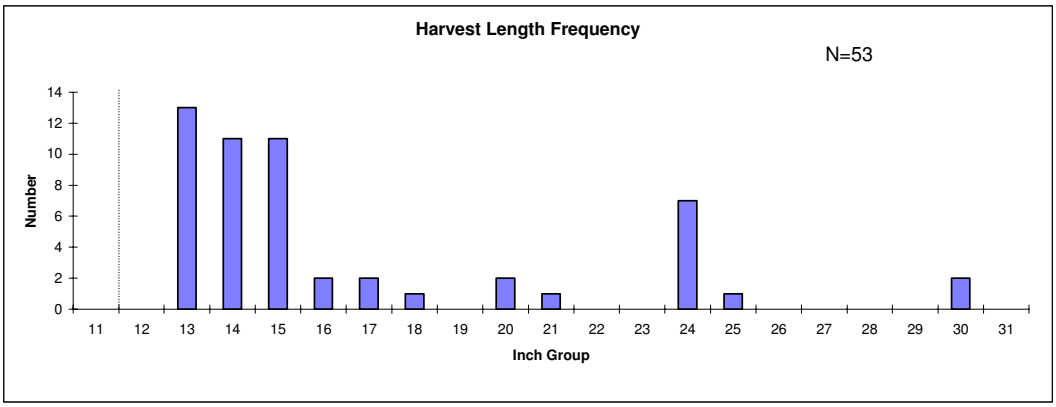
PSD = 38
RSD-P = 14
Total CPUE = 10.47
N = 157

Effort = 15.00
CPUE Stock = 8.60

Comparison of the number of blue catfish caught per net night (CPUE, bars), mean relative weight (lines), and population indices for spring gill netting surveys, Ray Hubbard Reservoir, Texas. Vertical line represents length limit at time of sampling

Annual creel survey statistics for anglers seeking blue catfish at Ray Hubbard Reservoir June 2004 – May 2005.

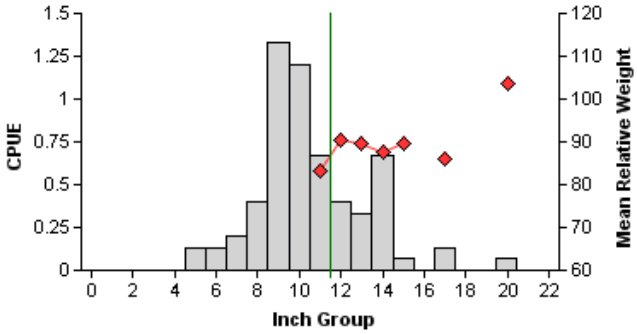
Effort (Anglers Hours/Acre)	% Directed Effort	Catch Rate (Number/Hour)	Harvest (Number/Hour)
0.47	4	1.38	1.16



Length frequency of blue catfish observed during creel surveys at Ray Hubbard Reservoir, Texas. June 2004 – May 2005. Dashed line represents length limit at time of survey.

Channel Catfish

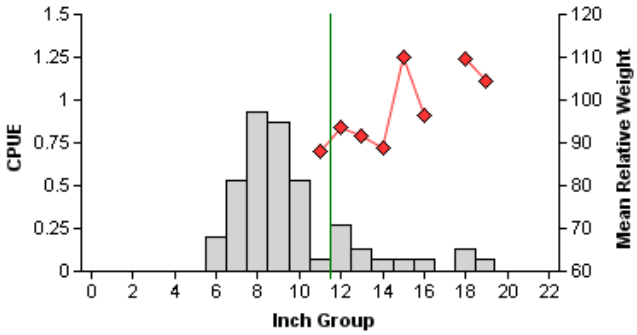
2001



PSD = 9
RSD-12 = 71
Total CPUE = 5.73
N = 86

Effort = 15.00
CPUE Stock = 2.33

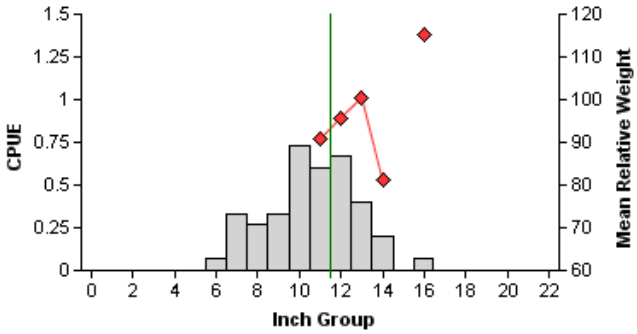
2003



PSD = 31
RSD-12 = 92
Total CPUE = 3.93
N = 59

Effort = 15.00
CPUE Stock = 0.87

2005



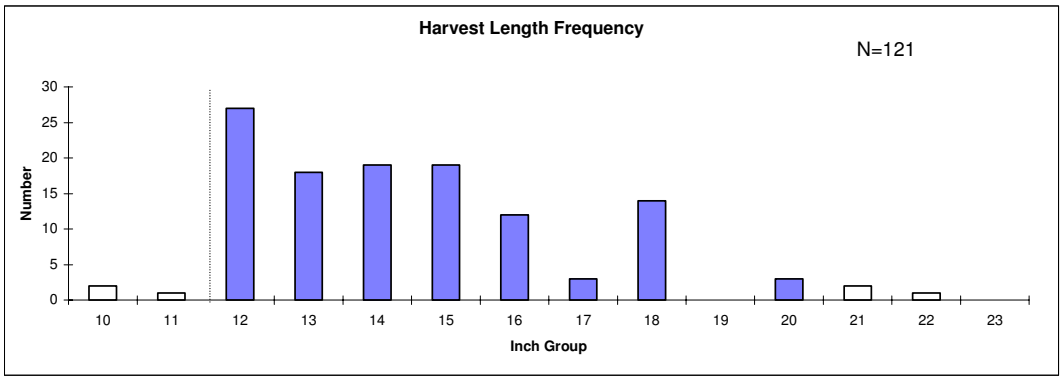
PSD = 3
RSD-12 = 69
Total CPUE = 3.67
N = 55

Effort = 15.00
CPUE Stock = 1.93

Comparison of the number of channel catfish caught per net night (CPUE, bars), mean relative weight (lines), and population indices for spring gill netting surveys, Ray Hubbard Reservoir, Texas. Vertical line represents length limit at time of sampling.

Annual creel survey statistics for anglers seeking channel catfish at Ray Hubbard Reservoir June 2004 – May 2005.

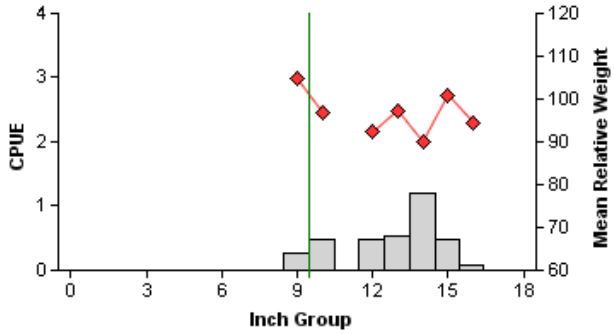
Effort (Anglers Hours/Acre)	% Directed Effort	Catch Rate (Number/Hour)	Harvest (Number/Hour)
1.77	16	0.76	0.43



Length frequency of channel catfish observed during creel surveys at Ray Hubbard Reservoir, Texas. June 2004 – May 2005. Dashed line represents length limit at time of survey.

White Bass

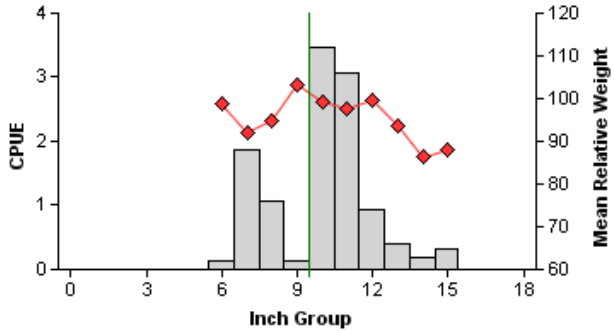
2001



PSD = 100
RSD-10 = 92
Total CPUE = 3.47
N = 52

Effort = 15.00
CPUE Stock = 3.47

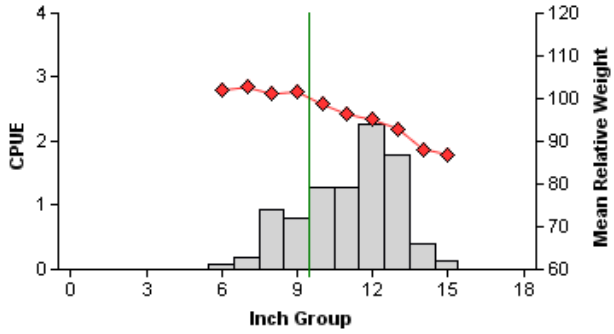
2003



PSD = 74
RSD-10 = 72
Total CPUE = 11.60
N = 174

Effort = 15.00
CPUE Stock = 11.60

2005



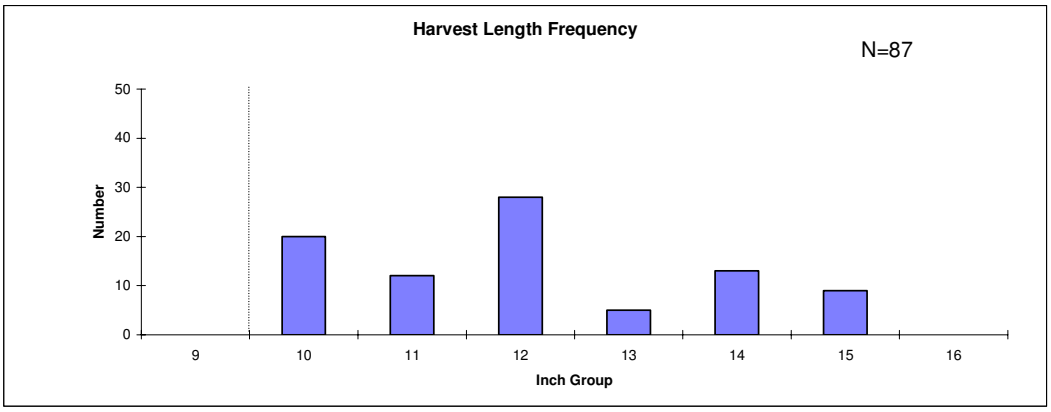
PSD = 87
RSD-10 = 78
Total CPUE = 9.13
N = 137

Effort = 15.00
CPUE Stock = 9.13

Comparison of the number of white bass caught per net night (CPUE, bars), mean relative weight (lines), and population indices for spring gillnetting surveys, Ray Hubbard Reservoir, Texas. Vertical line represents length limit at time of sampling.

Annual creel survey statistics for anglers seeking white bass at Ray Hubbard Reservoir June 2004 – May 2005.

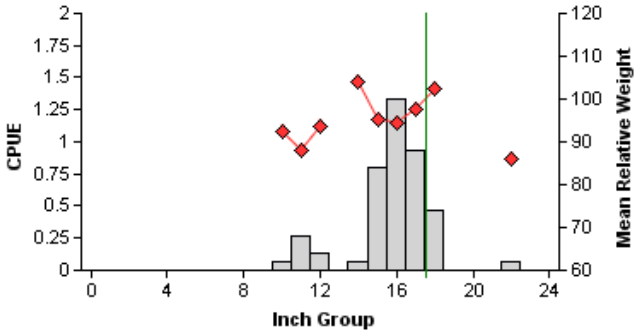
Effort (Anglers Hours/Acre)	% Directed Effort	Catch Rate (Number/Hour)	Harvest (Number/Hour)
1.25	11	2.17	0.70



Length frequency of white bass observed during creel surveys at Ray Hubbard Reservoir, Texas. June 2004 – May 2005. Dashed line represents length limit at time of survey.

Palmetto Bass

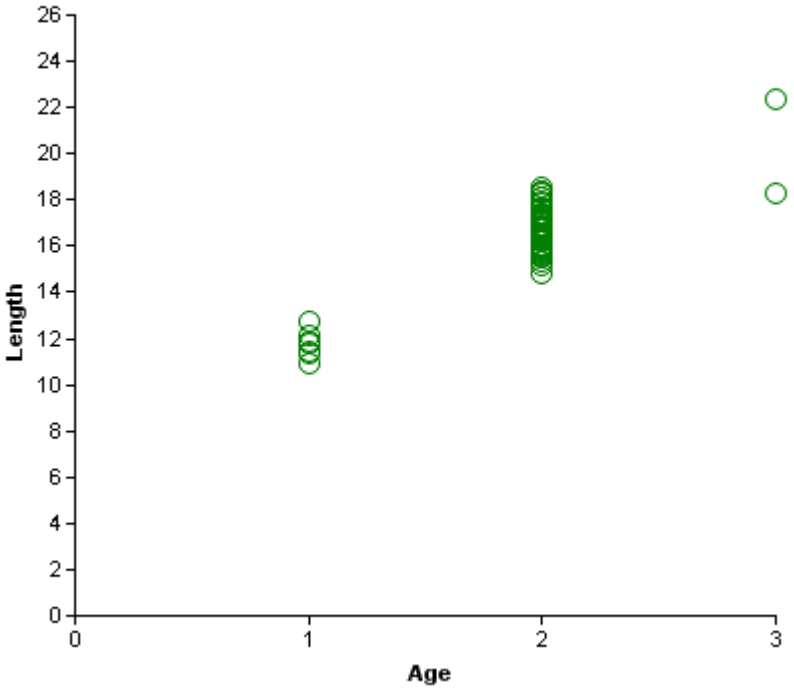
2005



PSD = 92
RSD-18 = 13
Total CPUE = 4.13
N = 62

Effort = 15.00
CPUE Stock = 4.13

Comparison of the number of palmetto bass caught per net night (CPUE, bars), mean relative weight (lines), and population indices for spring gillnetting surveys, Ray Hubbard Reservoir, Texas. Vertical line represents length limit at time of sampling.



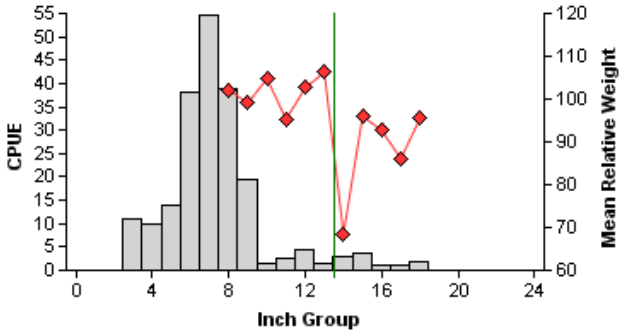
Length (inches) at age of capture for palmetto bass (sexes combined) caught during spring 2004 gill netting samples in Ray Hubbard Reservoir. . Ages were determined using otoliths. Sample sizes for age 1, 2, and, 3 were 7, 53, and, 2, respectively

Annual creel survey statistics for anglers seeking palmetto bass at Ray Hubbard Reservoir June 2004 – May 2005.

Effort (Anglers Hours/Acre)	% Directed Effort	Catch Rate (Number/Hour)	Harvest (Number/Hour)
0.17	2.0	0.0	0.0

Largemouth Bass

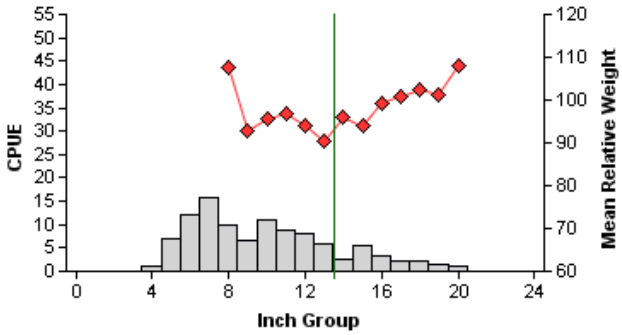
1997



PSD = 21
RSD-14 = 13
Total CPUE = 206.50
N = 413

Effort = 2.00
CPUE Stock = 79.00
FLMB Alleles = 30.9
% FLMB = 7

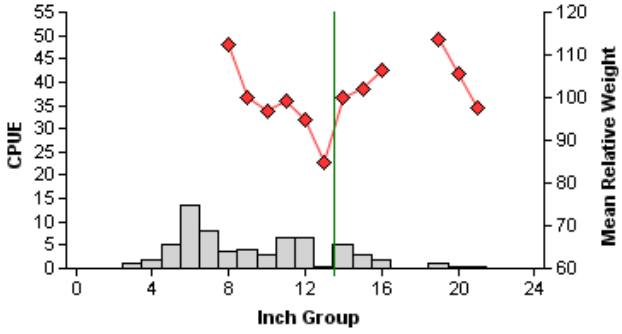
2000



PSD = 48
RSD-14 = 27
Total CPUE = 104.73
N = 192

Effort = 1.83
CPUE Stock = 68.73
FLMB Alleles =31.7
% FLMB =3.3

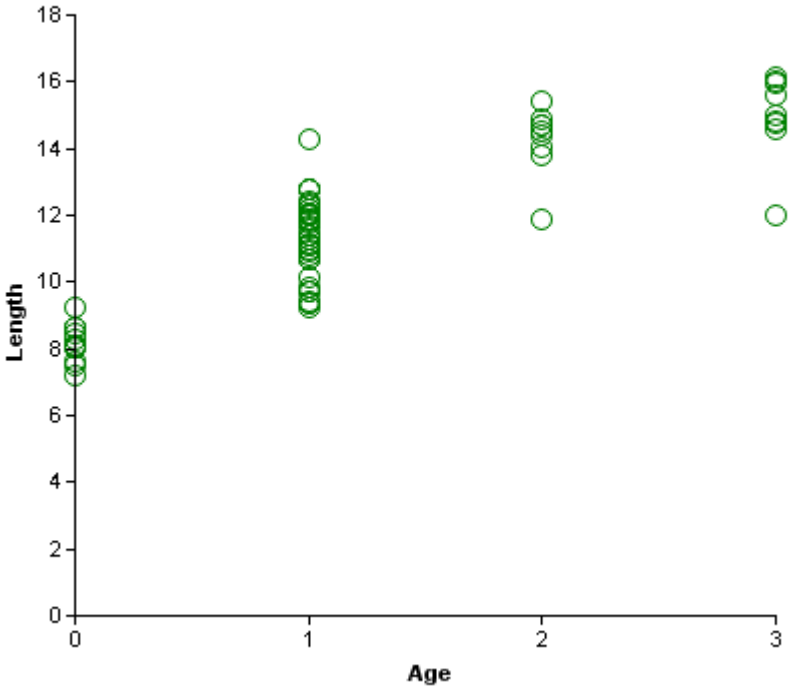
2004



PSD = 53
RSD-14 = 33
Total CPUE = 65.50
N = 131

Effort = 2.00
CPUE Stock = 36.00
FLMB Alleles = 50
% FLMB = 7.1

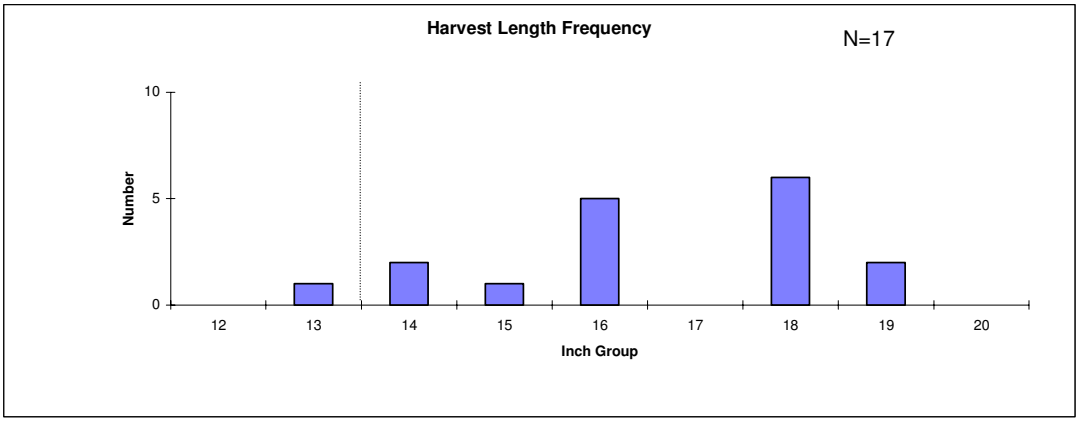
Comparison of the number of largemouth bass caught per hour (CPUE, bars), mean relative weight (lines), and population indices for fall electrofishing surveys, Ray Hubbard Reservoir, Texas. Vertical line represents length limit at time of sampling.



Length (inches) at age of capture for largemouth bass (sexes combined) caught during fall 2004 electrofishing sample in Ray Hubbard Reservoir. Ages were determined using otoliths. Sample sizes for ages 0, 1, 2, and 3 were 11, 36, 9, and 9, respectively.

Annual creel survey statistics for anglers seeking largemouth bass at Ray Hubbard Reservoir June 2004 – May 2005.

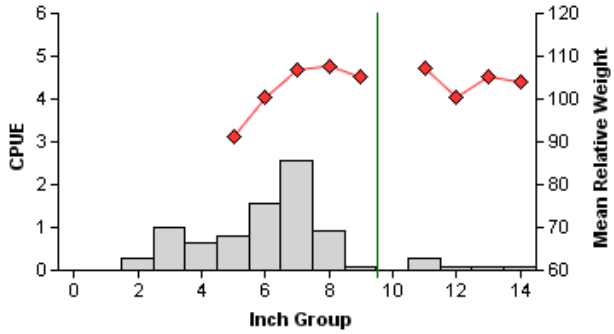
Effort (Anglers Hours/Acre)	% Directed Effort	Catch Rate (Number/Hour)	Harvest (Number/Hour)
2.07	18	0.33	0.01



Length frequency of largemouth bass observed during creel surveys at Ray Hubbard Reservoir, Texas. June 2004 – May 2005. Dashed line represents length limit at time of survey.

White Crappie

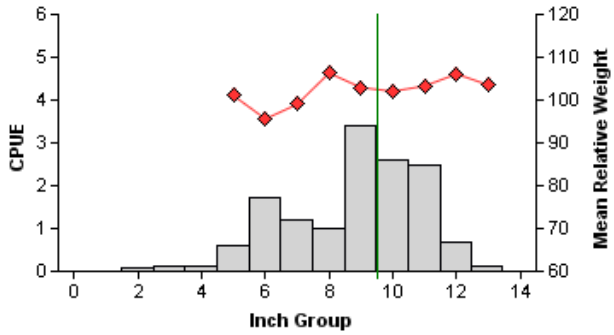
1997



PSD = 24
RSD-10 = 8
Total CPUE = 8.36
N = 92

Effort = 11.00
CPUE Stock = 6.45

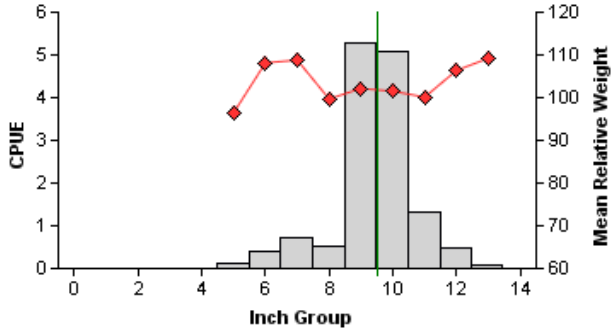
2000



PSD = 74
RSD-10 = 43
Total CPUE = 14.13
N = 212

Effort = 15.00
CPUE Stock = 13.80

2004



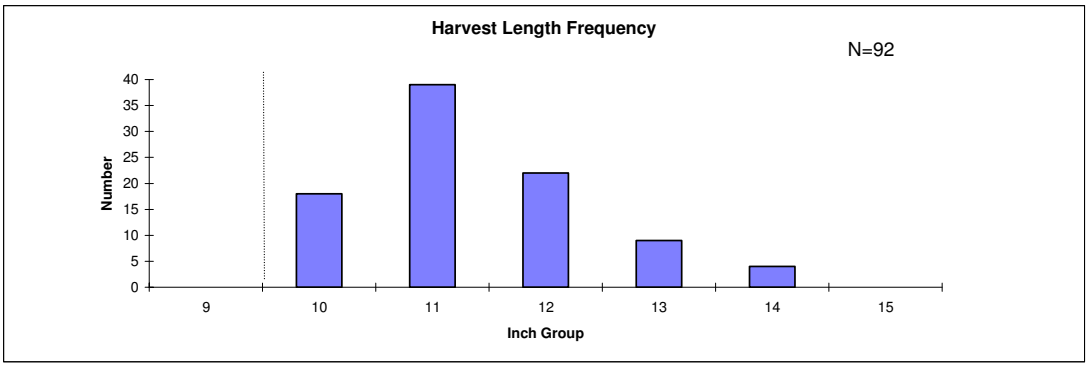
PSD = 91
RSD-10 = 50
Total CPUE = 14.00
N = 210

Gear = Trap Net
Effort = 15.00
CPUE Stock = 14.00

Comparison of the number of white crappie caught per net night (CPUE, bars), mean relative weight (lines), and population indices for fall trap netting surveys, Ray Hubbard Reservoir, Texas. Vertical line represents length limit at time of sampling.

Annual creel survey statistics for anglers seeking white crappie at Ray Hubbard Reservoir June 2004 – May 2005.

Effort (Anglers Hours/Acre)	% Directed Effort	Catch Rate (Number/Hour)	Harvest (Number/Hour)
1.38	12	1.17	0.58



Length frequency of white crappie observed during creel surveys at Ray Hubbard Reservoir, Texas. June 2004 – May 2005. Dashed line represents length limit at time of survey.

Fisheries Management Plan
Ray Hubbard Reservoir, Texas

Prepared – July 2005.

ISSUE 1 Maintain the palmetto bass population on Ray Hubbard Reservoir.

Management strategies

1. Continue stocking of palmetto bass on an annual basis at a rate of 10 or 5 fish/acre as long as forage base is adequate.

2. Monitor the palmetto bass population by gillnetting every other year with the next sample being collected in 2007.

ISSUE 2 Ray Hubbard Reservoir has a quality blue catfish population which is under utilized.

Management strategies

1. Monitor the blue catfish population by gillnetting every other year with the next sample being collected in 2007.

2. Promote blue catfish population to the public through news releases and local media.

ISSUE 3 Ray Hubbard Reservoir has a history of producing trophy sized largemouth bass. Recent electrofishing surveys have revealed below average catch rates.

Management strategies

1. Monitor the largemouth bass population by conducting annual electrofishing.

2. Request florida largemouth bass for stocking at a rate of 25/acre to improve the trophy potential of the largemouth bass population.

ISSUE 3 Public boat ramps do not have courtesy docks, which causes boat launching and boat loading problems.

Management strategy

1. Contact the Cities of Dallas, Garland, and Rockwall to discuss the purchase of courtesy docks at public boat ramps.

Appendix A

Number (N) of fish caught per unit effort (CPUE) by gill netting, trap netting, and electrofishing from Ray Hubbard Reservoir, Texas, during 2004–2005 sampling season. Sampling effort was 15 net nights for gill netting and trap netting and 2.0 hours for electrofishing.

	Gill Netting		Trap Netting		Electrofishing	
Species	N	CPUE	N	CPUE	N	CPUE
Gizzard shad	293	19.5			486	243.0
Threadfin shad					433	216.5
Common carp	9	0.6				
Smallmouth buffalo	12	0.8				
Channel catfish	55	3.7				
Blue catfish	157	10.5				
White bass	137	9.1				
Palmetto bass	62	4.1				
Bluegill					200	100.0
Longear sunfish					118	59.0
Largemouth bass					131	65.5
White crappie			210	14.0		
Black crappie			14	0.9		

Appendix B

Summary of electrophoretic analysis of 29 young-of-the-year largemouth bass collected during electrofishing at Ray Hubbard Reservoir, Texas, fall 2004.

	Number	Percentage of Sample
F_L (Florida largemouth bass)	2	7.1
F_1 hybrid	8	29
F_x hybrid	14	46
Northern largemouth bass	5	18
Total Number (N)	29	
% Florida largemouth alleles		50

Appendix C

The directed effort (angler hours/acre) percentage of directed effort (angler hours) and catch rate (number/angling hour), for each survey quarter for Ray Hubbard Reservoir 2004-2005.

Analysis Variable	Largemouth Bass	White Crappie	White Bass	Blue Catfish	Channel Catfish	Catfishes	Palmetto Bass
Summer Effort	0.08	0.04	0.05	0.01	0.14	0.02	0.01
% Summer Quarter Effort	16	8	10	2	28	4	2
Summer Quarter Catch Rate	0.28	1.80	2.59	3.67	0.95	0.57	0.0
Fall Effort	0.03	0.01	0.01	0.01	0.03	0.0	0.0
% Fall Quarter Effort	17	7	8	5	24	0	0
Fall Quarter Catch Rate	0.65	2.12	1.85	2.75	0.14	0.0	0.0
Winter Effort	0.03	0.01	0.0	0.03	0.0	0.03	0.002

Appendix C continued

The directed effort (angler hours/acre) percentage of directed effort (angler hours) and catch rate (number/angling hour), for each survey quarter for Ray Hubbard Reservoir 2004-2005.

Analysis Variable	Largemouth Bass	White Crappie	White Bass	Blue Catfish	Channel Catfish	Catfishes	Palmetto Bass
% Winter Quarter Effort	27	10	0	24	0	25	2
Winter Quarter Catch Rate	0.19	0.41	0.0	0.31	0.0	0.16	0.0
Spring Effort	0.07	0.07	0.06	0.0	0.004	0.07	0.003
% Spring Quarter Effort	19	21	17	0	1	19	1
Spring Quarter Catch Rate	0.35	0.82	1.88	0.0	0.38	0.30	0.0
Overall Effort	2.07	1.38	1.25	0.47	1.77	1.21	0.17
% Overall Effort	18	12	11	4	16	11	2

Appendix C continued

The directed effort (angler hours/acre) percentage of directed effort (angler hours) and catch rate (number/angling hour), for each survey quarter for Ray Hubbard Reservoir 2004-2005.

Analysis Variable	Largemouth Bass	White Crappie	White Bass	Blue Catfish	Channel Catfish	Catfishes	Palmetto Bass
Overall Catch Rate	0.33	1.17	2.17	1.38	0.76	0.31	0.0

Appendix D

Mean water level elevation of each month for Ray Hubbard Reservoir, 2001–2005. Dashed line represents conservation pool (435.5 msl).