

PERFORMANCE REPORT

As Required by

FEDERAL AID IN SPORT FISH RESTORATION ACT

TEXAS

FEDERAL AID PROJECT F-221-M-1

INLAND FISHERIES DIVISION MONITORING AND MANAGEMENT PROGRAM

2010 Survey Report

Palo Duro Reservoir

Prepared by:

Charles Munger and John Clayton
Inland Fisheries Division
District 1-A, Canyon, Texas



Life's better outside.®



Carter Smith
Executive Director

Gary Saul
Director, Inland Fisheries

July 31, 2011

TABLE OF CONTENTS

Survey and management summary.....	1
Introduction	2
Reservoir description	2
Management history	2
Methods	3
Results and discussion	3
Fisheries management plan	5
Literature cited	6
Figures and tables	7-18
Water level (Figure 1)	7
Reservoir characteristics (Table 1)	7
Harvest regulations (Table 2)	8
Stocking history (Table 3)	9
Gizzard shad (Figure 2)	10
Bluegill (Figure 3).....	11
Blue catfish (Figure 4).....	12
Channel catfish (Figure 5)	13
White bass (Figure 6)	14
Largemouth bass (Figure 7)	15
White crappie (Figure 8)	16
Walleye (Figure 9)	17
Proposed sampling schedule (Table 4)	18
Appendix A	
Catch rates for all species from all gear types.....	19
Appendix B	
Map of 2010-2011 sampling locations.....	20

SURVEY AND MANAGEMENT SUMMARY

Fish Populations in Palo Duro Reservoir were surveyed in 2010 with electrofishing and trap nets and 2011 with gill nets. This report summarizes the results of the surveys and contains a management plan for the reservoir based on those findings.

- **Reservoir Description:** Palo Duro Reservoir is a 2,413-acre (current pool is approximately 815 acres) impoundment on Palo Duro Creek approximately 13 miles north of Spearman in Hansford County, Texas. The reservoir is owned and operated by the Palo Duro River Authority for municipal water supply. Water levels declined from 2000 until July, 2010 when a single storm resulted in a 46 foot water level rise. The reservoir has since lost about 15 feet of elevation. The reservoir has two boat ramps which are currently out of the water. One temporary launch site is in place. There are no handicap-specific facilities.
- **Management History:** Important sport fish include white bass, white crappie, and blue catfish. White crappie have a history of overabundance in the system and poor growth. Walleye stocking was attempted to mitigate the crappie problem. Florida largemouth bass were stocked in 1991 and 1993.
- **Fish Community**
 - **Prey species:** Electrofishing catch of gizzard shad was very high with good availability as prey to most sport fish. No bluegills were caught by electrofishing in 2010.
 - **Catfishes:** Blue catfish were abundant in the reservoir and provide a quality fishery. Channel catfish abundance has declined during the low water conditions.
 - **White bass:** White bass were collected in gill nets for the first time in 2005 and have increased in abundance. White bass were introduced from an unknown source.
 - **Largemouth bass:** No largemouth bass were collected by electrofishing in 2010. Their abundance has historically been low.
 - **White crappie:** White crappie were abundant in the reservoir, but there were few legal-size fish.
 - **Walleye:** No walleye were collected by any method in 2010 or 2011. Natural recruitment in the reservoir has been limited.
- **Management Strategies:** Continue stocking program for walleye to establish a population. Conduct electrofishing survey in 2012, gill net survey in 2013, and general monitoring with trap nets, gill nets, and electrofishing surveys in 2014-2015. Conduct habitat surveys in 2012.

2
INTRODUCTION

This document is a summary of fisheries data collected from Palo Duro Reservoir in 2010-2011. 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. Historical data are presented with the current data for comparison.

Reservoir Description

Palo Duro Reservoir is a 2,413-acre impoundment (current pool is approximately 815 acres) on Palo Duro Creek approximately 13 miles north of Spearman in Hansford County, Texas. The reservoir is owned and operated by the Palo Duro River Authority for municipal water supply. The dam was completed and the reservoir began filling in 1991. The reservoir drainage area has experienced a drought of record since 2000 resulting in extremely low water levels until July, 2010 when a single storm increased water levels by 46 feet (Figure 1). The reservoir has lost about 15 feet of elevation since that time. The reservoir has two boat ramps which are currently out of the water; however, there is one temporary launch. There were no handicap-specific facilities. Most of the shoreline was accessible to anglers fishing from the bank. Other descriptive characteristics for Palo Duro Reservoir are in Table 1.

Management History

Previous management strategies and actions: Management strategies and actions from the previous survey report (Munger and Henegar 2007) included:

1. Stock walleye to help reduce the overabundant white crappie population and provide an additional sport fish species.
Action: The reservoir had a significant water level increase in 2010 and walleye were stocked in 2011. Gill net surveys have been conducted to monitor for natural walleye reproduction.
2. White bass have been recently introduced into the reservoir from an unknown source.
Action: Gill net surveys were conducted to monitor the development of the white bass population.
3. Preservation of the natural northern largemouth bass genetic mark.
Action: Drought conditions have essentially eliminated the largemouth bass population in the reservoir. Largemouth bass were stocked in 2011 to re-establish the species.

Harvest regulation history: Sport fish in Palo Duro Reservoir have been managed with statewide regulations since the reservoir was impounded in 1991 (Table 2).

Stocking history: Palo Duro Reservoir was stocked with multiple species the first few years after it was impounded in 1991 to establish a fish community. Genetic analysis of largemouth bass in 1997 indicated that northern largemouth bass in the reservoir had a unique genetic mark. Largemouth bass stocking had been halted from 1993 to 2011 in order to preserve the genetic mark. Walleye have been stocked to increase the probability of successful reproduction and to increase predation on the abundant white crappie population. The complete stocking history is in Table 3.

Vegetation/habitat history: Habitat in Palo Duro Reservoir was surveyed in 1997. Habitat was typified by nondescript eroded bank shoreline with flooded terrestrial vegetation and very little aquatic vegetation (Munger 1998). No new habitat or vegetation surveys have been conducted due to extreme drought conditions since 2000.

Water Transfer: Palo Duro Reservoir is scheduled to be used for municipal water supply for six member cities. Construction of transmission systems for delivering water to member cities is anticipated to be completed by 2030.

3
METHODS

Fishes were collected by electrofishing (1.0 h at 12 5-min stations), gill netting (5 net nights at 5 stations), and trap netting (7 net nights at 7 stations). Catch per unit effort (CPUE) for electrofishing was recorded as the number of fish caught per hour (fish/h) of actual electrofishing and, for gill and trap nets, as the number of fish per net night (fish/nn). All survey sites were randomly selected and all surveys were conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2008).

Sampling statistics (CPUE for various length categories), structural indices [Proportional Size Distribution (PSD)] as defined by Guy et al. (2007), and condition indices [relative weight (W_r)] were calculated for target fishes according to Anderson and Neumann (1996). Index of vulnerability (IOV) was calculated for gizzard shad (DiCenzo et al. 1996). Relative standard error (RSE = 100 X SE of the estimate/estimate) was calculated for all CPUE statistics and for creel statistics. Source for water level data was the United States Geological Survey (USGS) website http://waterdata.usgs.gov/tx/nwis/uv?cb_00062=on&format=html&period=7&site_no=07233550.

RESULTS AND DISCUSSION

Habitat: A habitat survey was last conducted in 1997 (Munger 1998). Rapidly declining water levels during the drought made accurate habitat surveys problematic. The 46-foot water level increase in summer 2010 has significantly impacted fish habitat by inundating over 1,500 acres of terrestrial vegetation.

Prey species: Electrofishing catch rates of gizzard shad and bluegill in 2010 were 1,450.0/h and 0.0/h, respectively. Index of vulnerability for gizzard shad was 100%, indicating that all the gizzard shad were available to existing predators (Figure 2). The extreme increase in CPUE of gizzard shad is due to a 46 foot water level increase during the summer that allowed for successful spawning when predator densities were greatly diminished. No bluegill were collected during electrofishing in 2010, but catch rates in 2006 and 2008 (Figure 3) were only around 1.0/h. Total CPUE of bluegill has historically been below 10.0/h except in 1997 and 2000 following large increases in water level (Munger; 1998, 2003). If this trend of increased catch rate following a large water rise continues, the electrofishing catch rate for bluegill should increase in 2012.

Blue catfish: The gill net catch rate of blue catfish was 12.2/nn in 2011 which was similar to the catch rate in 2005. The blue catfish population appeared to survive drought conditions and have maintained abundance and an average W_r of over 100 for all size classes (Figure 4).

Channel catfish: The gill net catch rate of channel catfish was 1.2/nn in 2011 and was lower than the catch rate of 13.2/nn in 2005. The channel catfish population appears to have been negatively impacted by drought conditions (Figure 5).

White bass: The gill net catch rate of white bass increased from 0.6/nn in 2005 to 4.4/nn in 2011 (Figure 6). Abundance appeared to be increasing and average W_r was over 120 for all size classes. This species was not stocked by Texas Parks and Wildlife Department.

Largemouth bass: No largemouth bass were collected during electrofishing surveys in 2010. Previous catch rates of 2.4/h in 2006 and 1.0/h in 2008 were during a period of extreme low water levels (Figure 7). The large water level increase in summer 2010 resulted in a dispersal of the already small drought-impacted population.

White crappie: The trap net catch rate of white crappie was 39.0/nn in 2010 (Figure 8). Relative weights for individual fish over 9 inches were all over 100.

Walleye: No walleye were collected by any sampling method in 2010 or 2011. The gill net catch rate of walleye was low at 3.0/nh in 2005 (Figure 9). The size structure in previous samples indicated very little if any natural reproduction or survival of stocked fish.

Fisheries management plan for Palo Duro Reservoir, Texas

Prepared – July 2011.

ISSUE 1: The reservoir has a history of white crappie becoming overabundant with poor growth and size structure. Once established, walleye may be an effective predator to control the abundance of white crappie.

MANAGEMENT STRATEGY

1. Stock walleye fingerlings (50/acre) or fry (2,000/acre) after a significant water level increase.
2. Once walleye are established, schedule stocking to alternate with gill net survey years to monitor for natural walleye reproduction.

ISSUE 2: Many invasive species threaten aquatic habitats and organisms in Texas and can adversely affect the state ecologically, environmentally, and economically. For example, zebra mussels (*Dreissena polymorpha*) can multiply rapidly and attach themselves to any available hard structure, restricting water flow in pipes, fouling swimming beaches and plugging engine cooling systems. The financial costs of controlling and/or eradicating these types of invasive species are significant. Additionally, the potential for invasive species to spread to other river drainages and reservoirs via watercraft and other means is a serious threat to all public waters of the state.

MANAGEMENT STRATEGIES

1. Cooperate with the controlling authority to post appropriate signage at access points around the reservoir.
2. Contact and educate marina owners about invasive species, and provide them with posters, literature, etc... so that they can in turn educate their customers.
3. Educate the public about invasive species through the use of media and the internet.
4. Make a speaking point about invasive species when presenting to constituent and user groups.
5. Keep track of (i.e., map) existing and future inter-basin water transfers to facilitate potential invasive species responses.

SAMPLING SCHEDULE JUSTIFICATION:

The proposed sampling schedule includes electrofishing in fall 2012, gill netting in spring 2013, and all gear surveys except creel in 2014/2015 (Table 5). Electrofishing in 2012 is used to evaluate walleye reproduction and survival of stocked fish. Gill net surveys are to monitor the catfish and walleye fisheries and to monitor the development of the introduced white bass population.

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. Stimert. 1996. Relations between reservoir trophic state and gizzard shad population characteristics in Alabama reservoirs. North American Journal of Fisheries Management 16:888-895.
- Guy, C. S., R. M. Neumann, D. W. Willis, and R. O. Anderson. 2007. Proportional size distribution (PSD): a further refinement of population size structure index terminology. Fisheries 32(7): 348.
- Munger, C. 1998. Statewide freshwater fisheries monitoring and management program survey report for: Palo Duro Reservoir, 1997. Texas Parks and Wildlife Department, Federal Aid In Sport Fish Restoration, Grant F-30-R, Performance Report, Austin.
- Munger, C. 2003. Statewide freshwater fisheries monitoring and management program survey report for: Palo Duro Reservoir, 2002. Texas Parks and Wildlife Department, Federal Aid In Sport Fish Restoration, Grant F-30-R, Performance Report, Austin.
- Munger, C., and J. Henegar. 2007. Statewide freshwater fisheries monitoring and management program survey report for Palo Duro Reservoir, 2006. Texas Parks and Wildlife Department, Federal Aid Report F-30-R, Austin.

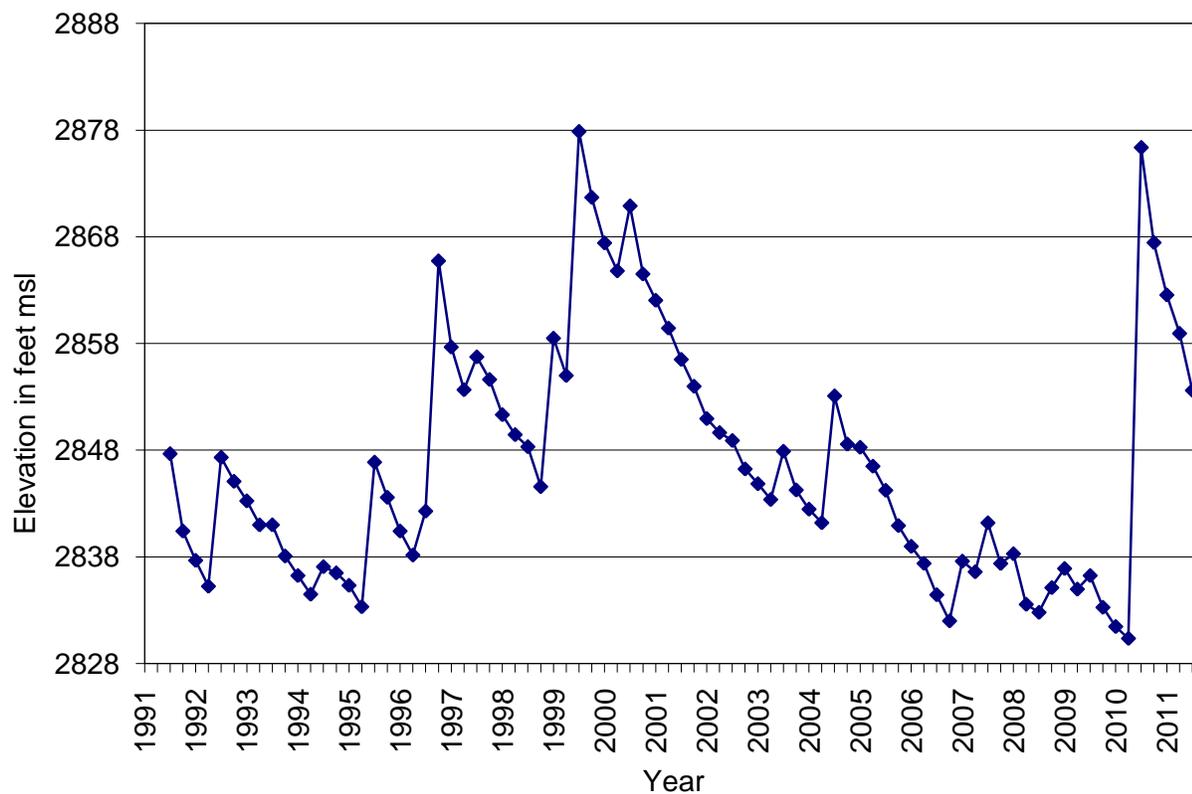


Figure 1. Quarterly water level elevations in feet above mean sea level (MSL) recorded for Palo Duro Reservoir, Texas. Conservation elevation is 2,892 MSL.

Table 1. Characteristics of Palo Duro Reservoir, Texas.

Characteristic	Description
Year constructed	1991
Controlling authority	Palo Duro River Authority
County	Hansford
Reservoir type	Mainstream
Shoreline development index (SDI)	11.51
Conductivity	2,645 μ mhos/cm

Table 2. Harvest regulations for Palo Duro Reservoir, Texas.

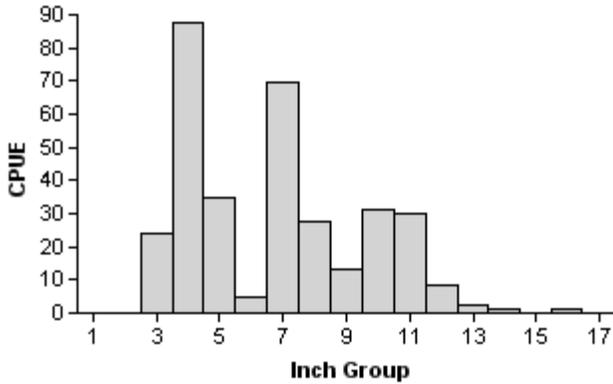
Species	Bag Limit	Minimum-Maximum Length (inches)
Catfish: channel and blue catfish, their hybrids and subspecies	25 (in any combination)	12 – No Limit
Catfish, flathead	5	18 – No Limit
Bass, white	25	10 – No Limit
Bass, largemouth	5	14 – No Limit
Crappie: white and black crappie, their hybrids and subspecies	25 (in any combination)	10 – No Limit
Walleye	5	Only 2 fish allowed under 16 inches

Table 3. Stocking history of Palo Duro Reservoir, Texas. Size categories are: FRY =<1 inch, FGL = 1-3 inches, and ADL = adults.

Year	Number	Size	Year	Number	Size
	<u>Gizzard shad</u>			<u>Florida largemouth bass</u>	
1992	67	ADL	1991	40,030	FGL
	<u>Blue catfish</u>		1993	177	ADL
1991	25,607	FGL	Species Total	40,207	
1998	64,838	FGL		<u>White crappie</u>	
1999	81,500	FGL	1992	250	ADL
2002	102,951	FGL		<u>Yellow perch</u>	
Species Total	274,896		1991	4,094	FGL
	<u>Channel catfish</u>		1992	20,000	FGL
1991	34,414	FGL	Species Total	24,094	
1996	53,026	FGL		<u>Walleye</u>	
1999	46,865	FGL	1992	134,640	FRY
2010	204,014	FGL	1993	1,000,000	FRY
Species Total	338,319		2000	69,000	FRY
	<u>Bluegill</u>		2001	1,985,505	FRY
1991	165,344	FGL	2002	3,442,699	FRY
1992	74,084	FGL	2004	15,693	FGL
Species Total	239,428		2005	6,080	FGL
	<u>Coppernose bluegill</u>		2011	3,405,200	FRY
1991	82,293	FGL	Species Total	10,058,817	
	<u>Smallmouth bass</u>			<u>Largemouth bass</u>	
1993	12,581	FGL	1992	124,562	FGL
	<u>Largemouth bass</u>		2011	140,765	FGL
1992	124,562	FGL	Species Total	265,327	
2011	140,765	FGL			
Species Total	265,327				

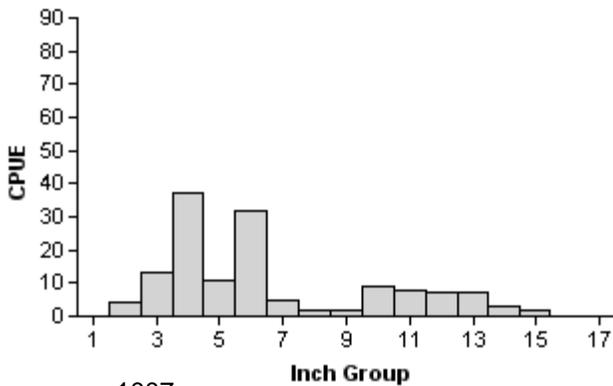
Gizzard Shad

2006



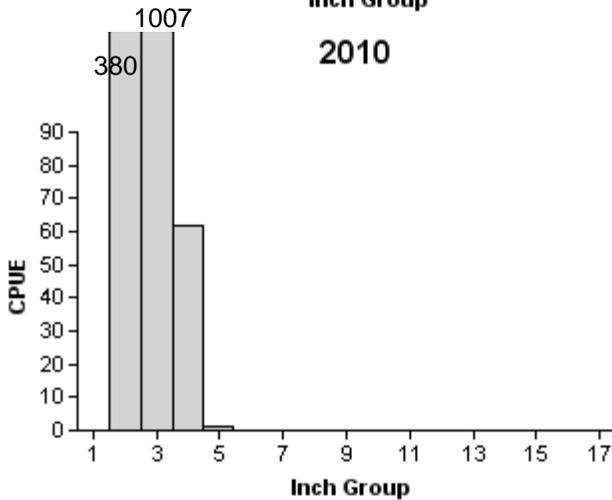
Effort = 0.8
 Total CPUE = 336.0 (29; 280)
 Stock CPUE = 184.8 (35; 154)
 PSD = 23 (4)
 IOV = 66 (4)

2008



Effort = 1.0
 Total CPUE = 142.0 (19; 142)
 Stock CPUE = 45.0 (37; 45)
 PSD = 60 (14)
 IOV = 72 (8)

2010



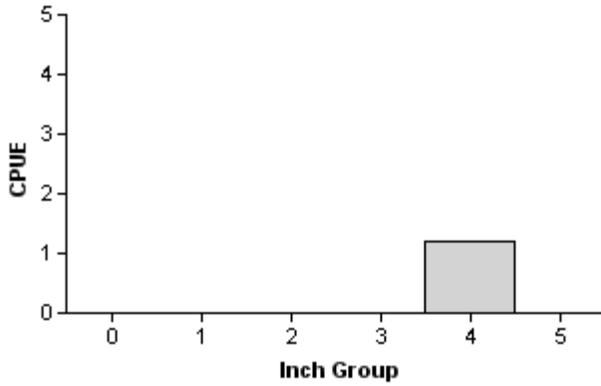
Effort = 1.0
 Total CPUE = 1,450.0 (32; 1450)
 Stock CPUE = 0.0 (0; 0)
 PSD = 0 (0)
 IOV = 100 (0)

Figure 2. Number of gizzard shad caught per hour (CPUE) and population indices (RSE and N are in parentheses) for fall electrofishing surveys, Palo Duro Reservoir, Texas, 2006, 2008, and 2010. RSE is used for CPUE values and SE is used for IOV values.

Bluegill

2006

Effort = 0.8
 Total CPUE = 1.2 (100; 1)
 Stock CPUE = 1.2 (100; 1)
 PSD = 0 (0)



2008

Effort = 1.0
 Total CPUE = 1.0 (100; 1)
 Stock CPUE = 1.0 (100; 1)
 PSD = 0 (0)

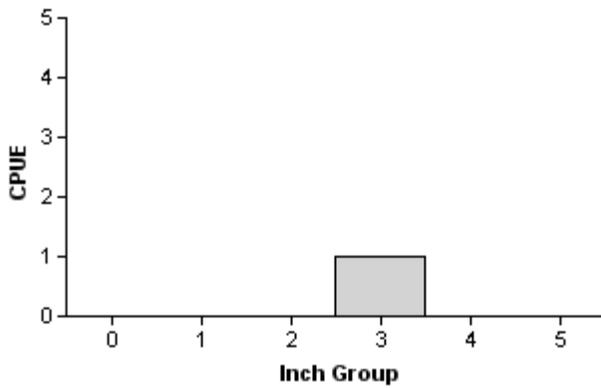
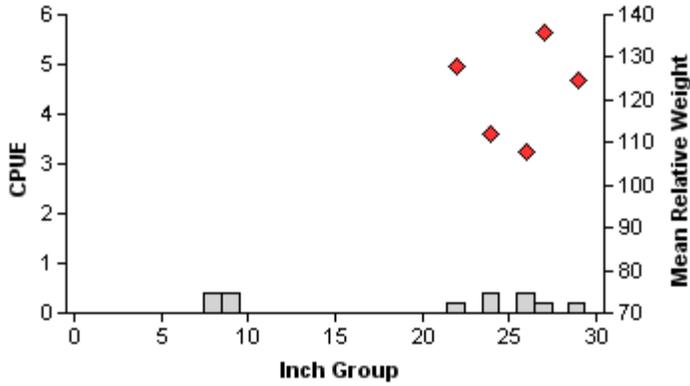


Figure 3. Number of bluegill caught per hour (CPUE, bars) and population indices (RSE and N are in parentheses) for fall electrofishing surveys, Palo Duro Reservoir, Texas, 2006 and 2008. No bluegill were collected in the 2010 survey. RSE is used for CPUE values and SE is used for RSD/PSD values.

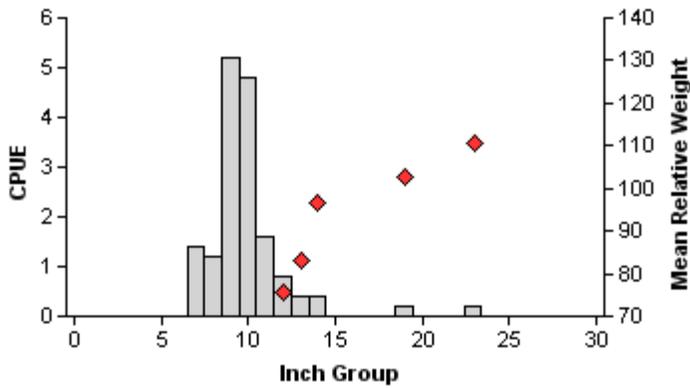
Blue Catfish

2003



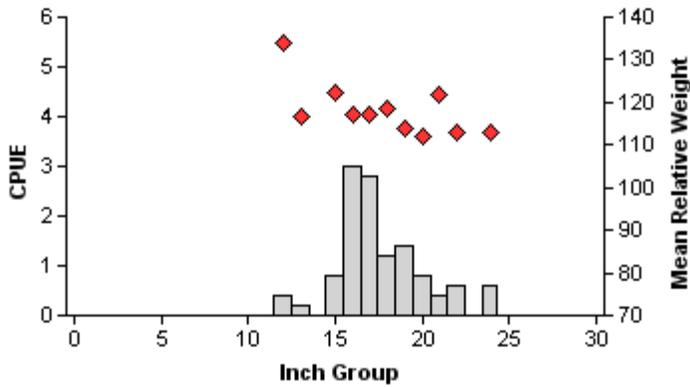
Effort = 5.0
 Total CPUE = 2.2 (36; 11)
 Stock CPUE = 1.4 (48; 7)
 PSD = 100 (0)
 PSD-P = 0 (0)

2005



Effort = 5.0
 Total CPUE = 16.2 (47; 81)
 Stock CPUE = 2.0 (39; 10)
 PSD = 10 (6)
 PSD-P = 0 (0)

2011

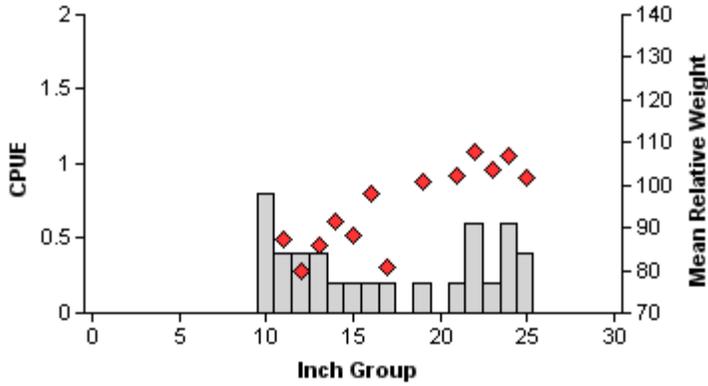


Effort = 5.0
 Total CPUE = 12.2 (22; 61)
 Stock CPUE = 12.2 (22; 61)
 PSD = 20 (5)
 PSD-P = 0 (0)

Figure 4. Number of blue catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N are in parentheses) for spring gill net surveys, Palo Duro Reservoir, Texas, 2003, 2005 and 2011. RSE is used for CPUE values and SE is used for PSD values.

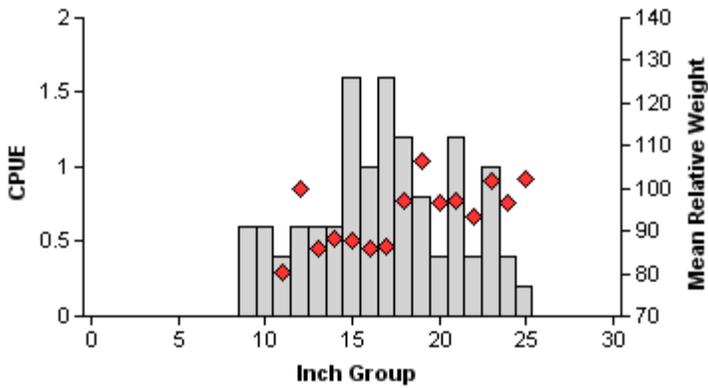
Channel Catfish

2003



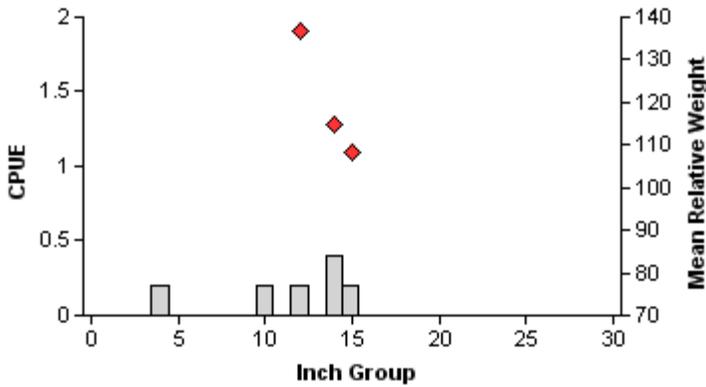
Effort = 5.0
 Total CPUE = 5.0 (28; 25)
 Stock CPUE = 4.2 (31; 21)
 PSD = 62 (11)
 PSD-P = 24 (8)

2005



Effort = 5.0
 Total CPUE = 13.2 (35; 66)
 Stock CPUE = 12.0 (34; 60)
 PSD = 68 (7)
 PSD-P = 5 (2)

2011

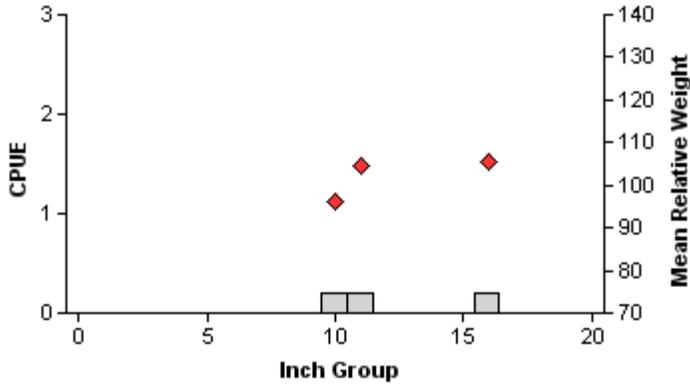


Effort = 5.0
 Total CPUE = 1.2 (31; 6)
 Stock CPUE = 0.8 (47; 4)
 PSD = 0 (0)
 PSD-P = 0 (0)

Figure 5. Number of channel catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N are in parentheses) for spring gill net surveys, Palo Duro Reservoir, Texas, 2003, 2005, and 2011. RSE is used for CPUE values and SE is used for PSD values.

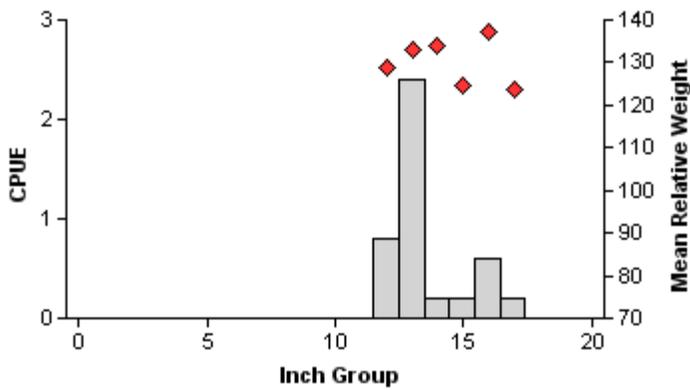
White Bass

2005



Effort = 5.0
 Total CPUE = 0.6 (67; 3)
 Stock CPUE = 0.6 (100; 3)
 PSD = 100 (0)
 PSD-P = 0 (0)

2011

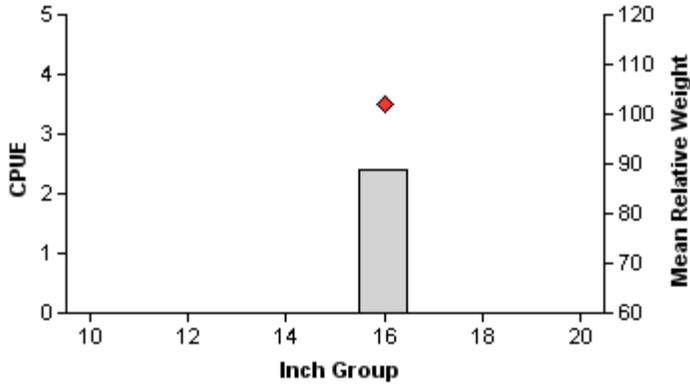


Effort = 5.0
 Total CPUE = 4.4 (68; 22)
 Stock CPUE = 4.4 (68; 22)
 PSD = 100 (0)
 PSD-P = 0 (0)

Figure 6. Number of white bass caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N are in parentheses) for spring gill net surveys, Palo Duro Reservoir, Texas, 2005 and 2011. No white bass were collected prior to 2005. RSE is used for CPUE values and SE is used for PSD values.

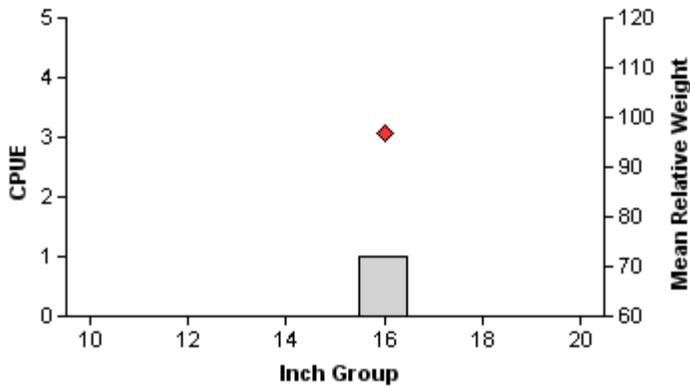
Largemouth Bass

2006



Effort = 0.8
 Total CPUE = 2.4 (100; 2)
 Stock CPUE = 2.4 (100; 2)
 PSD = 100 (0)
 PSD-14 = 100 (0)

2008

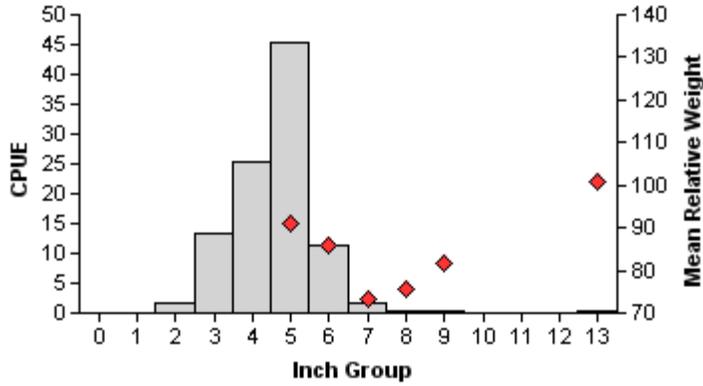


Effort = 1.0
 Total CPUE = 1.0 (100; 1)
 Stock CPUE = 1.0 (100; 1)
 PSD = 100 (0)
 PSD-14 = 100 (0)

Figure 7. Number of largemouth bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N are in parentheses) for fall electrofishing surveys, Palo Duro Reservoir, Texas, 2006 and 2008. No largemouth bass were collected in the 2010 survey. RSE is used for CPUE values and SE is used for RSD values.

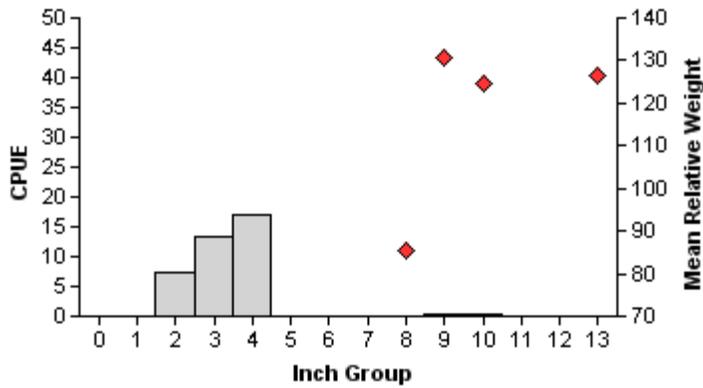
White Crappie

2005



Effort = 5.0
 Total CPUE = 99.2 (28; 496)
 Stock CPUE = 58.8 (21; 294)
 PSD = 1 (1)
 PSD-P = 0 (0)

2010

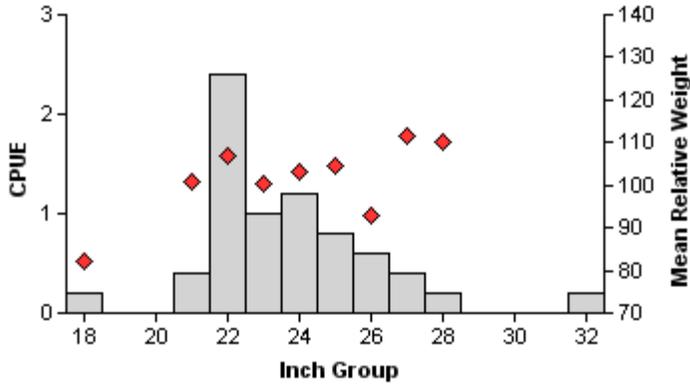


Effort = 7.0
 Total CPUE = 39.0 (59; 273)
 Stock CPUE = 1.1 (62; 8)
 PSD = 100 (0)
 PSD-P = 50 (25)

Figure 8. Number of white crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N are in parentheses) for fall trap net surveys, Palo Duro Reservoir, Texas, 2005, and 2010. RSE is used for CPUE values and SE is used for PSD values.

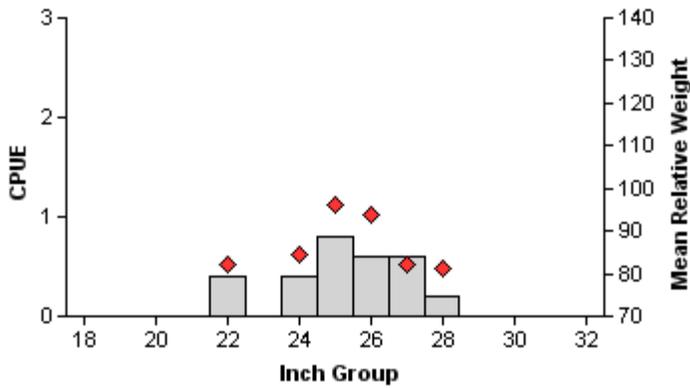
17
Walleye

2003



Effort = 5.0
 Total CPUE = 7.4 (65; 37)
 Stock CPUE = 7.4 (65; 37)
 PSD = 100 (0)
 PSD-P = 3 (4)

2005



Effort = 5.0
 Total CPUE = 3.0 (24; 15)
 Stock CPUE = 3.0 (24; 15)
 PSD = 100 (0)
 PSD-P = 0 (0)

Figure 9. Number of walleye caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N are in parentheses) for spring gill net surveys, Palo Duro Reservoir, Texas, 2003 and 2005. No walleye were collected in gill nets in 2011. RSE is used for CPUE values and SE is used for RSD values.

Table 4. Proposed sampling schedule for Palo Duro Reservoir, Texas. Gill netting surveys are conducted in the spring, while electrofishing and trap netting surveys are conducted in the fall. S denotes standard survey.

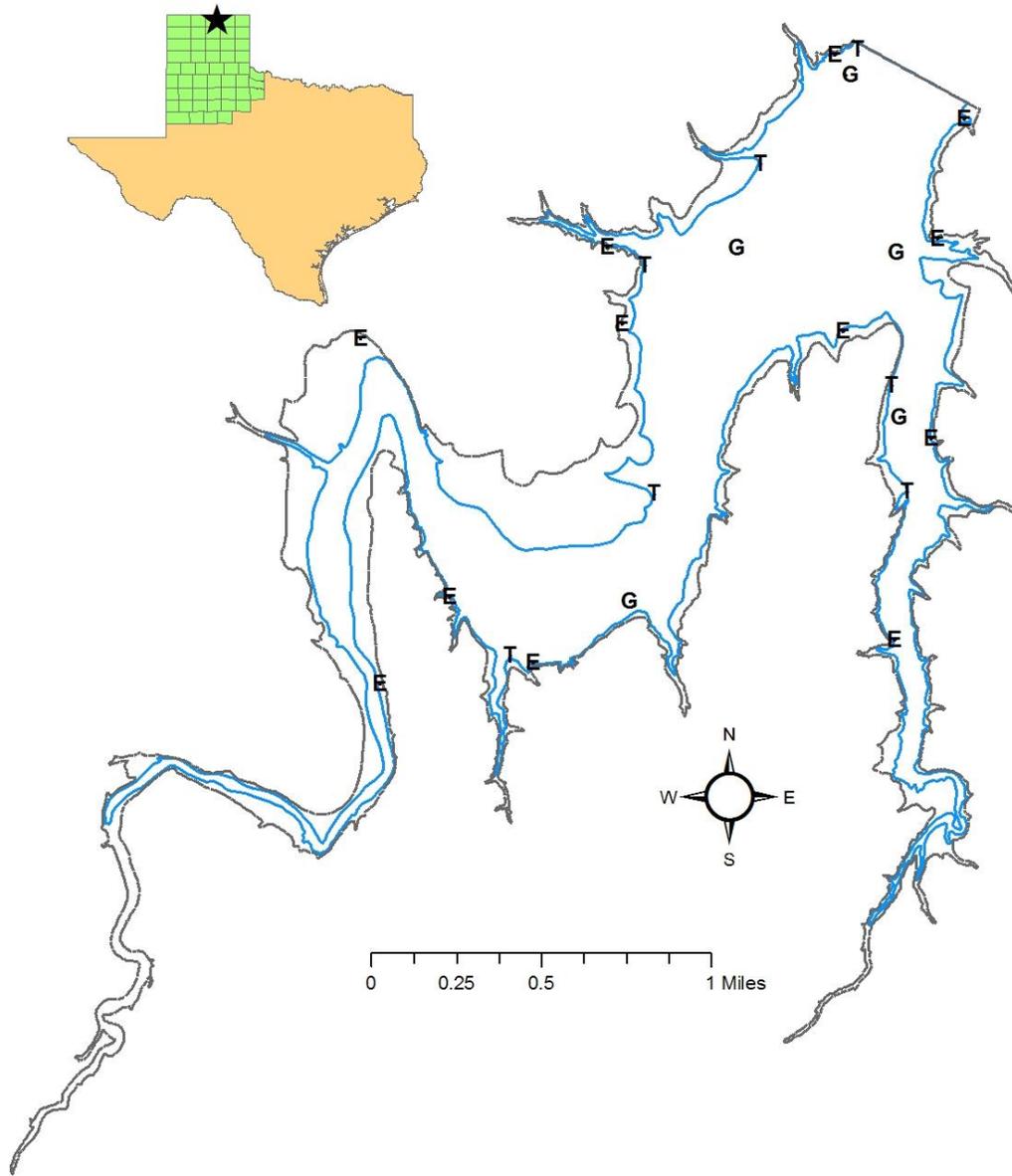
Survey Year	Electrofishing	Trap Net	Gill Net	Vegetation Survey	Access Survey	Report
Fall 2011-Spring 2012						
Fall 2012-Spring 2013	A		A	A		
Fall 2013-Spring 2014		A				
Fall 2014-Spring 2015	S	S	S	S	S	S

19
APPENDIX A

Number (N) and catch rate (CPUE) of all species collected from all gear types from Palo Duro Reservoir, Texas, 2010-2011. Effort was 1.0 hours for electrofishing, 7 net nights for trap nets and 5 net nights for gill nets.

Species	Electrofishing		Gill Netting		Trap Netting	
	CPUE	N	CPUE	N	CPUE	N
Gizzard shad	1,450.0	1,450	3.8	19		
Common carp	302.0	302	5.8	29	6.7	47
River carpsucker	1.0	1				
Blue catfish			12.2	61		
Black bullhead			0.4	2	1.7	12
Channel catfish	1.0	1	1.2	6	0.7	5
Flathead catfish			1.2	6		
White bass			4.4	22		
Green sunfish	3.0	3	0.2	1	0.1	1
White crappie	7.0	7	14.4	72	39.0	273

APPENDIX B



Location of sampling sites, Palo Duro Reservoir, Texas. Trap net, gill net, and electrofishing stations are indicated by T, G, and E, respectively. The elevation for electrofishing was 2,870 (gray line). The elevation for trap and gill netting was 2,855 (blue line).