

PERFORMANCE REPORT

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FEDERAL AID IN SPORT FISH RESTORATION ACT

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FEDERAL AID PROJECT F-30-R-32

STATEWIDE FRESHWATER FISHERIES MONITORING AND MANAGEMENT PROGRAM

2006 Survey Report

**Palo Duro Reservoir**

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## SURVEY AND MANAGEMENT SUMMARY

Fish Populations in Palo Duro Reservoir were surveyed in 2006 using electrofishing. Trap and gill net sampling was not conducted due to very low water levels. 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 100 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 have declined since 2000. The reservoir has two boat ramps which are currently above the water line. One temporary launch site is in place. There are no handicap specific facilities.
- **Management History:** Important sport fish include walleye, white bass, largemouth bass, white crappie, and catfish. White crappie are overabundant in the system and have poor growth. Walleye stocking has been 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. Electrofishing catch of bluegills was low with no quality-length fish collected in 2006.
  - **Catfishes:** Blue catfish and channel catfish were abundant in the reservoir and provide a quality fishery. Flathead catfish were present in the reservoir in low numbers.
  - **White bass:** White bass were collected in gill nets for the first time in 2005 and were present in very low numbers. It is unknown if these fish were present in stock tanks in the watershed and washed into the reservoir or if they were deliberately stocked by anglers.
  - **Largemouth bass:** Largemouth bass were present in low numbers. Size structure was poor.
  - **White crappie:** White crappie were abundant in the reservoir but there were few legal-size fish.
  - **Walleye:** Walleye were present in the reservoir. Natural recruitment in the reservoir has been limited and is likely due to high predation by crappie.
- **Management Strategies:** Continue stocking program for walleye with larger fingerlings. Conduct electrofishing survey in 2008, gill net survey in 2009, and general monitoring with trap nets, gill nets, and electrofishing surveys in 2010-2011. Conduct aquatic vegetation surveys in 2010.

## 2 INTRODUCTION

This document is a summary of fisheries data collected from Palo Duro Reservoir in 2005-2006. 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 is presented with the current data for comparison.

### *Reservoir Description*

Palo Duro Reservoir is a 2,413-acre impoundment (current pool is approximately 100 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 (Figure 1). The reservoir has two boat ramps which are currently above the water line, however, two temporary launch sites were in place. 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 2003) included:

1. Control white crappie population through walleye predation.  
**Action:** Attempts were made in 2004 and 2005 to stock 4-inch walleye to improve stocking survival and build the walleye population. The number of walleye available appear to be insufficient to impact the crappie population.
2. Preservation of the natural northern largemouth bass genetic mark.  
**Action:** No stocking of largemouth bass has occurred since 1993. Poor water levels and catch rates have precluded obtaining an adequate genetic sample since 2000.

**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. No additional largemouth bass stocking has been conducted 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:** Palo Duro Reservoir had limited aquatic vegetation in 1997. Habitat was typified by nondescript eroded bank shoreline with flooded terrestrial vegetation (Munger 1998). No new habitat or vegetation surveys have been conducted due to extreme drought conditions since 2000.

## METHODS

Fishes were collected by electrofishing (0.8 h at 10 5-min stations), gill netting and trap netting were not conducted due to very low water levels. Only 10 electrofishing stations were sampled instead of 12 due to extreme low water levels. 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 2002).

Sampling statistics (CPUE for various length categories), structural indices [Proportional Stock Density (PSD), Relative Stock Density (RSD)], and condition indices [relative weight (Wr)] 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 and from the Palo Duro River Authority.

## 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.

**Prey species:** Electrofishing catch rates of gizzard shad and bluegill were 336.0/h and 1.2/h, respectively. Index of vulnerability for gizzard shad was good, indicating that 66% of gizzard shad were available to existing predators (Figure 2). The number of large gizzard shad (>10 inches) has been increasing since 2002 (Figure 2). Total CPUE of bluegill has remained very low since 2002 with no quality-size fish (Figure 3).

**Blue catfish:** The gill net catch rate of blue catfish was 16.2/nn in 2005 which was higher than catch rates in 2001 and 2003. The blue catfish population appeared to be increasing and had quality fish available to anglers (Figure 4).

**Channel catfish:** The gill net catch rate of channel catfish was 13.2/nn in 2005. This catch rate was similar to the catch rate in 2001 (18.2/nn) but much higher than 2003 (5.0/nn). The channel catfish population had good size distribution and a PSD >50 indicating a good proportion of quality-size fish (Figure 5).

**White bass:** The gill net catch rate of white bass was 0.6/nn in 2005 (Figure 6). This is the first year that white bass were documented in the reservoir. This species was not stocked by Texas Parks and Wildlife Department.

**Largemouth bass:** The electrofishing catch rate of largemouth bass was 2.4/h in 2006, and has declined from 10.0/h in 2002 and 6.0/h in 2004. Size structure of the sample was poor (Figure 7).

**White crappie:** The trap net catch rate of white crappie was 99.2/nn in 2005. The PSD was  $\leq 1$  indicating very poor size structure (Figure 8). Mean relative weight was 100 or over for all size classes 10 inches and greater for all samples, but was poor for all sizes under 10 inches.

**Walleye:** The gill net catch rate of walleye was low at 3.0/nn in 2005 and has been <10/nn since 2001 (Figure 9). The size structure in all samples indicated very little if any natural reproduction or survival of stocked fish. The high numbers of white crappie and low water levels have created a hostile environment for young-of-the-year walleye survival.

## Fisheries management plan for Palo Duro Reservoir, Texas

Prepared – July 2007.

**ISSUE 1:** The reservoir had an overabundant white crappie population with poor size structure.

### MANAGEMENT STRATEGY

1. Stock walleye fingerlings (50/acre) as soon as practical after a significant water level increase.
2. Schedule stocking to coincide with gill net survey years to monitor for natural walleye reproduction.

**ISSUE 2:** White bass have been recently introduced into the reservoir from an unknown source.

### MANAGEMENT STRATEGY

1. Monitor the development of the white bass population through bi-annual gill net sampling.

**ISSUE 3:** A percentage of northern largemouth bass in the reservoir have a unique genetic mark that may be useful in future stocking evaluations.

### MANAGEMENT STRATEGIES

1. Collect additional genetic samples when water levels increase and the largemouth bass population increases.

### SAMPLING SCHEDULE JUSTIFICATION:

The proposed sampling schedule includes electrofishing in fall 2008, gill netting in spring 2009, and all gear surveys except creel in 2010/2011 (Table 5). Electrofishing in 2008 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, 2<sup>nd</sup> 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.
- 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 Report F-30-R, Austin.

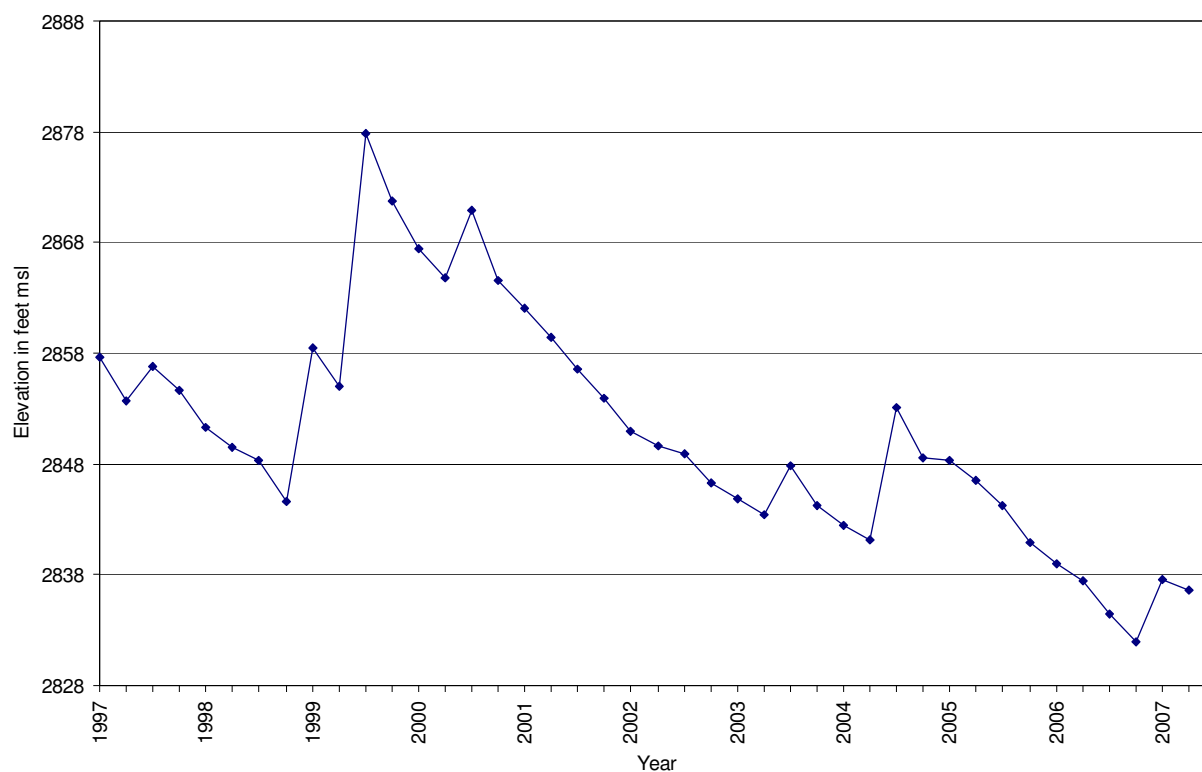


Figure 1. Quarterly water level elevations in feet above mean sea level (MSL) recorded for Palo Duro Reservoir, Texas. Conservation elevation is at 2892 MSL.

Table 1. Characteristics of Palo Duro Reservoir, Texas.

| Characteristic                    |                           | Description |
|-----------------------------------|---------------------------|-------------|
| Year constructed                  | 1991                      |             |
| Controlling authority             | Palo Duro River Authority |             |
| County                            | Hansford                  |             |
| Reservoir type                    | Main stream               |             |
| Shoreline development index (SDI) | 11.51                     |             |
| Conductivity                      | 2645 umhos/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<br>(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<br>(in any combination) | 10 – No Limit                       |
| Walleye   | 5                          | Only 2 fish allowed under 16 inches |

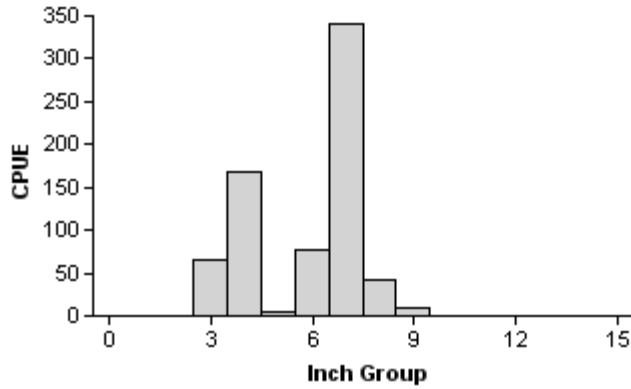


Table 3. Stocking history of Palo Duro Reservoir, Texas. Size categories are: FRY =<1 inch, FGL = 1-3 inches, and ADL = adults.

| 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  |
| Species Total              | 134,305 |      | 1993                           | 1,000,000 | FRY  |
| <u>Bluegill</u>            |         |      | 2000                           | 69,000    | FRY  |
| 1991                       | 165,344 | FGL  | 2001                           | 1,985,505 | FRY  |
| 1992                       | 74,084  | FGL  | 2002                           | 3,442,699 | FRY  |
| Species Total              | 239,428 |      | 2004                           | 15,693    | FGL  |
| <u>Coppernose bluegill</u> |         |      | 2005                           | 6,080     | FGL  |
| 1991                       | 82,293  | FGL  | Species Total                  | 6,653,617 |      |
| <u>Smallmouth bass</u>     |         |      |                                |           |      |
| 1993                       | 12,581  | FGL  |                                |           |      |
| <u>Largemouth bass</u>     |         |      |                                |           |      |
| 1992                       | 124,562 | FGL  |                                |           |      |

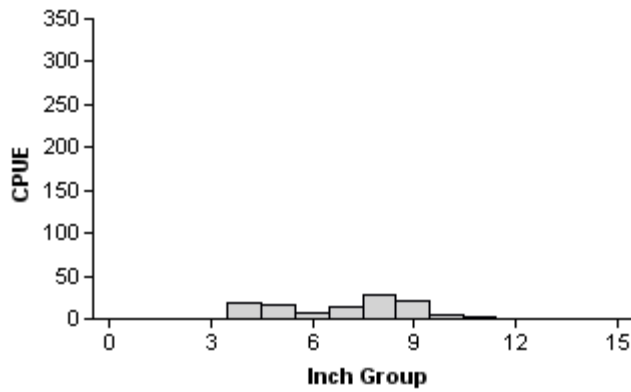
# Gizzard Shad

2002



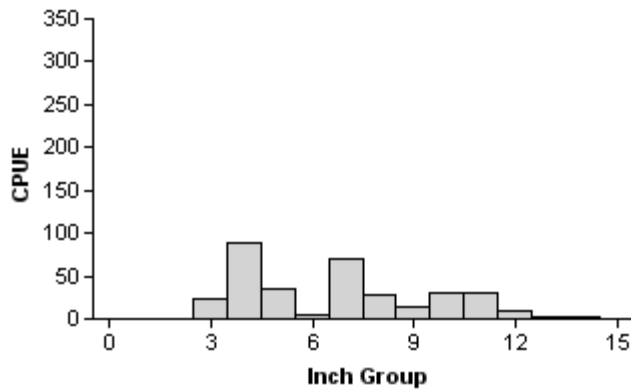
Effort = 1.0  
Total CPUE = 709.0 (38; 709)  
Stock CPUE = 392.0 (40; 392)  
IOV = 93 (1)

2004



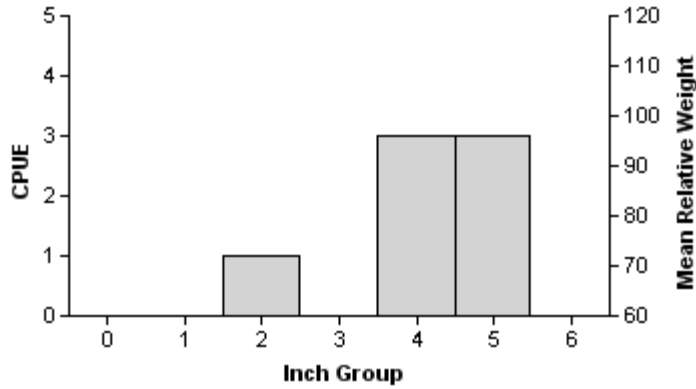
Effort = 1.0  
Total CPUE = 114.0 (17; 114)  
Stock CPUE = 70.0 (23; 70)  
IOV = 51 (9)

2006

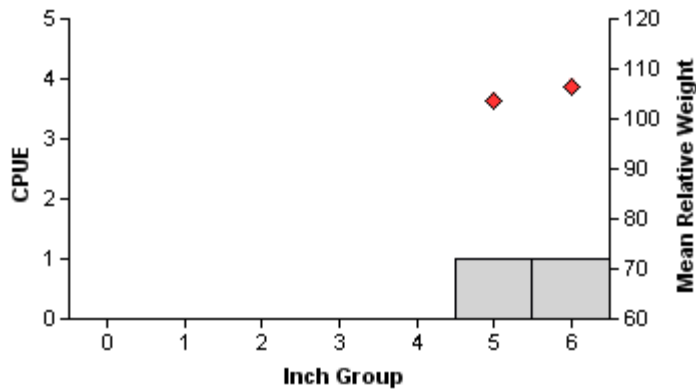


Effort = 0.8  
Total CPUE = 336.0 (29; 280)  
Stock CPUE = 184.8 (35; 154)  
IOV = 66 (4)

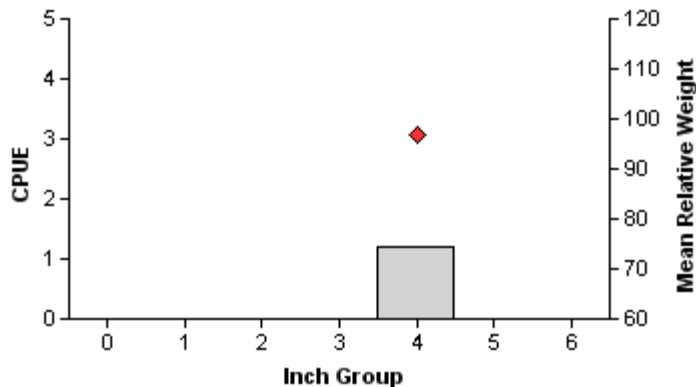
Figure 2. Number of gizzard shad caught per hour (CPUE) and population indices (RSE and N are in parentheses) for fall electrofishing surveys, Palo Duro Reservoir, Texas, 2002, 2004, and 2006. RSE is used for CPUE values and SE is used for IOV values.

**Bluegill****2002**

Effort = 1.0  
 Total CPUE = 7.0 (61; 7)  
 CPUE-6 = 0.0 (0; 0)  
 PSD = 0 (0)

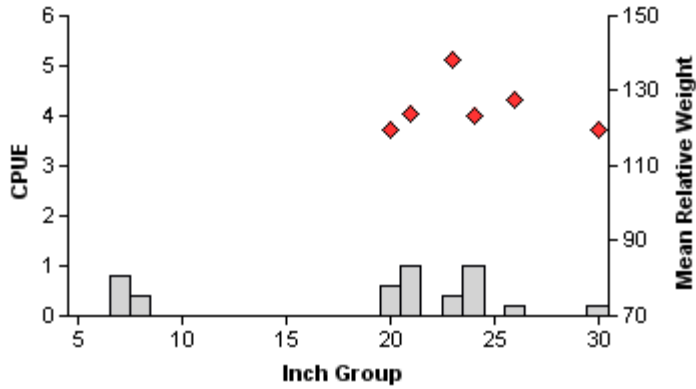
**2004**

Effort = 1.0  
 Total CPUE = 2.0 (67; 2)  
 CPUE-6 = 1.0 (100; 1)  
 PSD = 50 (37)

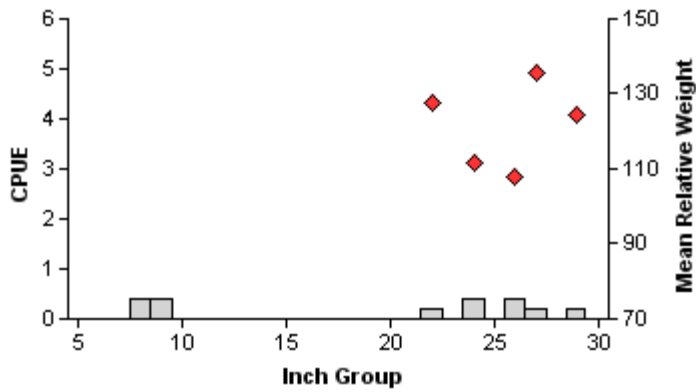
**2006**

Effort = 0.8  
 Total CPUE = 1.2 (100; 1)  
 CPUE-6 = 0.0 (0; 0)  
 PSD = 0 (0)

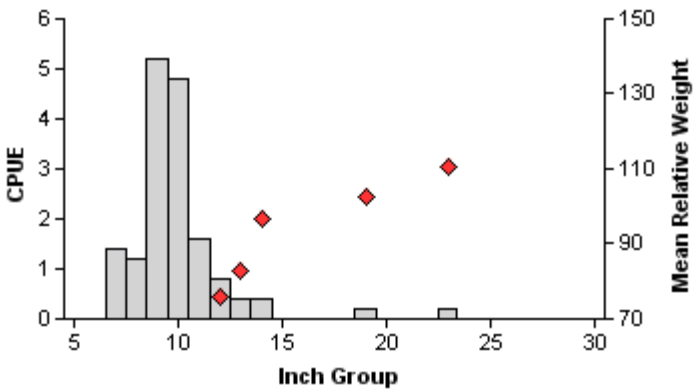
Figure 3. Number of bluegill caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N are in parentheses) for fall electrofishing surveys, Palo Duro Reservoir, Texas, 2002, 2004, and 2006. RSE is used for CPUE values and SE is used for RSD/PSD values.

**Blue Catfish****2001**

Effort = 5.0  
 Total CPUE = 4.6 (26; 23)  
 Stock CPUE = 3.4 (24; 17)  
 PSD = 100 (0)

**2003**

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

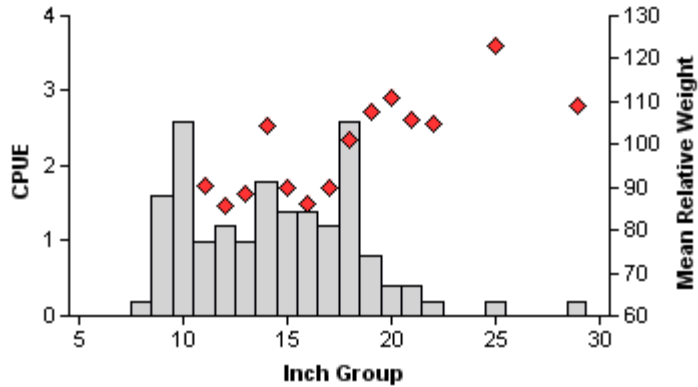
**2005**

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

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, 2001, 2003, and 2005. RSE is used for CPUE values and SE is used for PSD values.

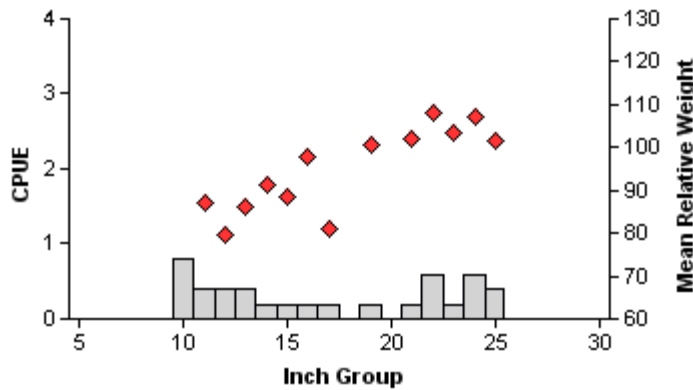
# Channel Catfish

2001



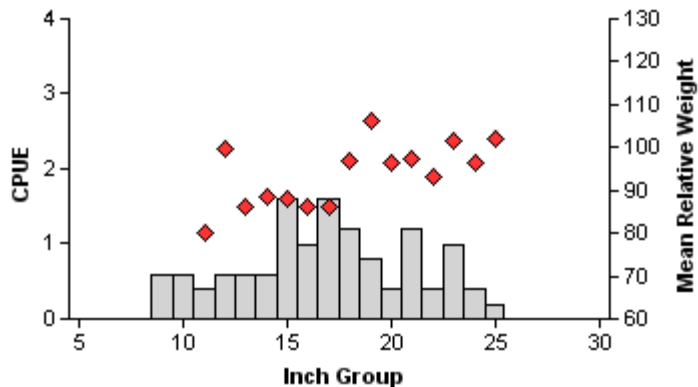
Effort = 5.0  
 Total CPUE = 18.2 (19; 91)  
 Stock CPUE = 13.8 (16; 69)  
 CPUE-20 = 1.4 (43; 7)  
 PSD = 54 (6)

2003



Effort = 5.0  
 Total CPUE = 5.0 (28; 25)  
 Stock CPUE = 4.2 (31; 21)  
 CPUE-20 = 2.0 (45; 10)  
 PSD = 62 (11)

2005



Effort = 5.0  
 Total CPUE = 13.2 (35; 66)  
 Stock CPUE = 12.0 (34; 60)  
 CPUE-20 = 3.6 (41; 18)  
 PSD = 68 (7)

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, 2001, 2003, and 2005. 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)  
CPUE-10 = 0.6 (67; 3)

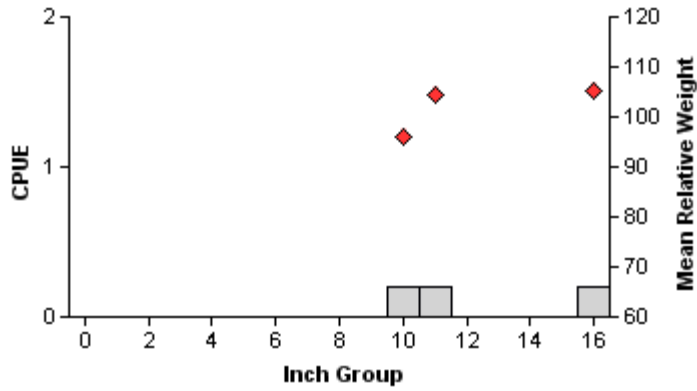
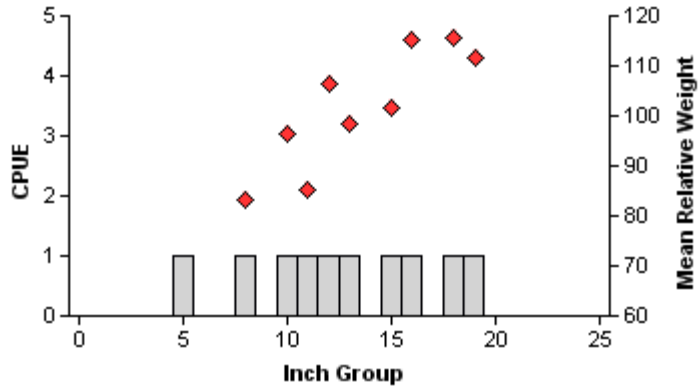


Figure 6. Number of white bass caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N are in parentheses) for spring gill net surveys, Palo Duro Reservoir, Texas, 2005. No white bass were collected prior to 2005. RSE is used for CPUE values and SE is used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

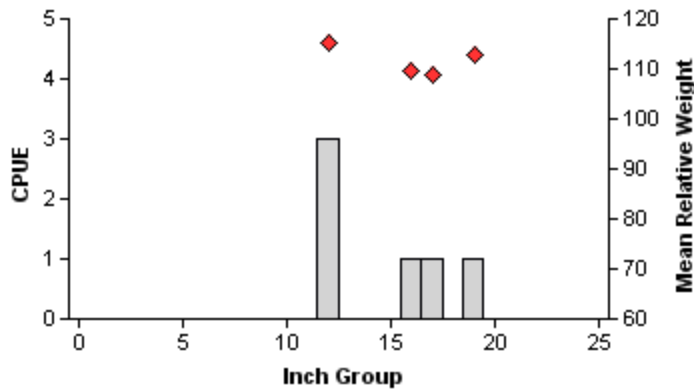
## Largemouth Bass

### 2002



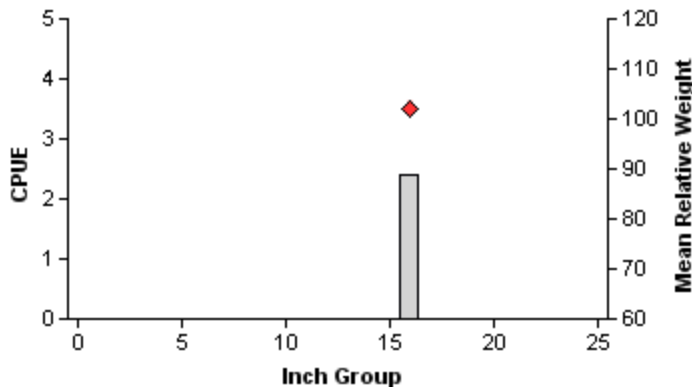
Effort = 1.0  
 Total CPUE = 10.0 (41; 10)  
 CPUE-14 = 4.0 (56; 4)  
 RSD-14 = 44 (15)

### 2004



Effort = 1.0  
 Total CPUE = 6.0 (39; 6)  
 CPUE-14 = 3.0 (52; 3)  
 RSD-14 = 50 (17)

### 2006

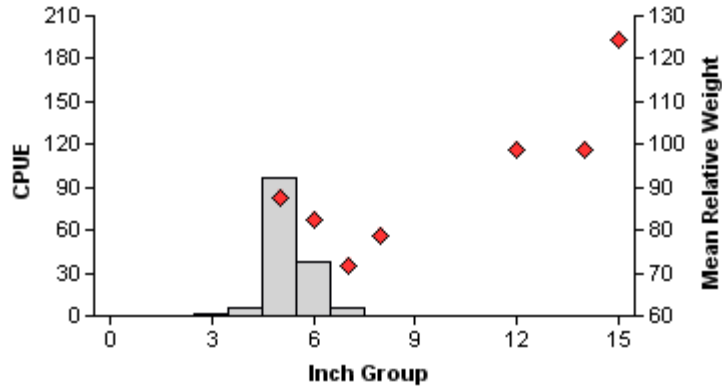


Effort = 0.8  
 Total CPUE = 2.4 (100; 2)  
 CPUE-14 = 2.4 (100; 2)  
 RSD-14 = 100 (0)

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, 2002, 2004, and 2006. RSE is used for CPUE values and SE is used for RSD values.

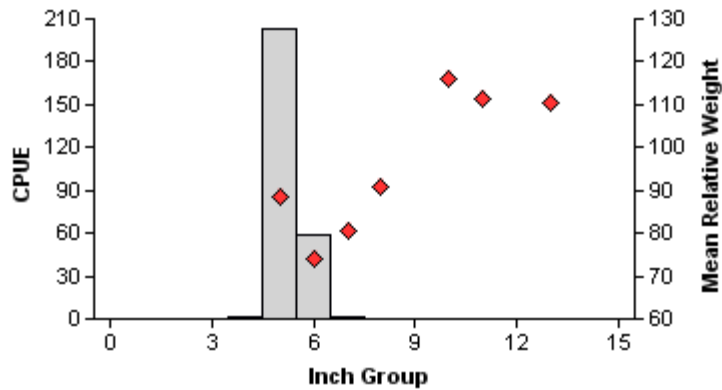
# White Crappie

2001



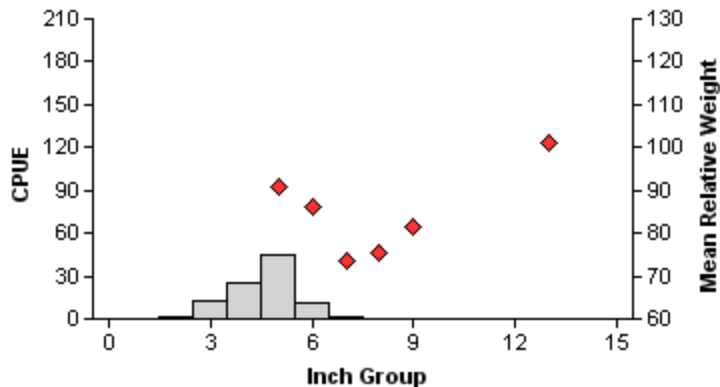
Effort = 8.0  
Total CPUE = 148.4 (23; 1187)  
Stock CPUE = 141.0 (23; 1128)  
PSD = 1 (0)

2002



Effort = 5.0  
Total CPUE = 264.4 (39; 1322)  
Stock CPUE = 263.6 (39; 1318)  
PSD = 0 (0)

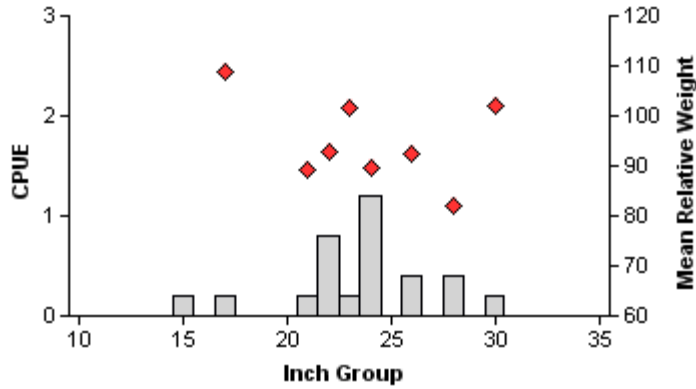
2005



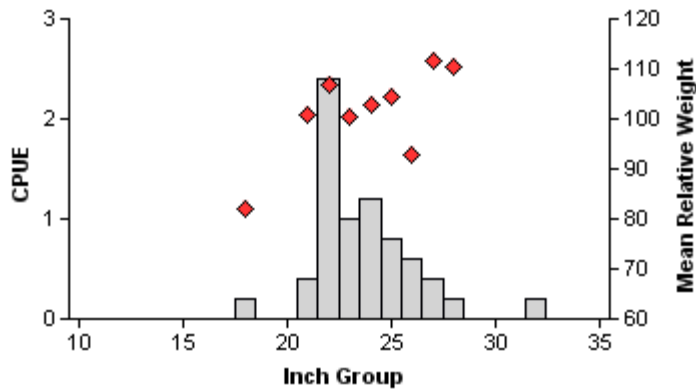
Effort = 5.0  
Total CPUE = 99.2 (28; 496)  
Stock CPUE = 58.8 (21; 294)  
PSD = 1 (1)

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, 2001, 2002, and 2005. RSE is used for CPUE values and SE is used for PSD values.

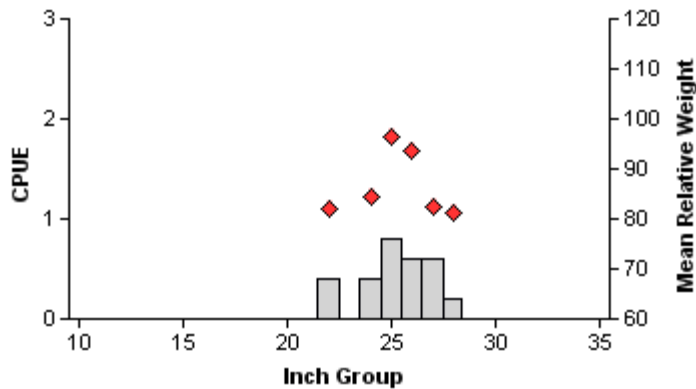


**Walleye****2001**

Effort = 5.0  
 Total CPUE = 3.8 (50; 19)  
 CPUE-16 = 3.6 (49; 18)  
 RSD-16 = 95 (4)

**2003**

Effort = 5.0  
 Total CPUE = 7.4 (65; 37)  
 CPUE-16 = 7.4 (65; 37)  
 RSD-16 = 100 (0)

**2005**

Effort = 5.0  
 Total CPUE = 3.0 (24; 15)  
 CPUE-16 = 3.0 (24; 15)  
 RSD-16 = 100 (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, 2001, 2003, and 2005. 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           | Electrofisher | Trap Net | Gill Net | Creel Survey | Report |
|-----------------------|---------------|----------|----------|--------------|--------|
| Fall 2007-Spring 2008 |               |          |          |              |        |
| Fall 2008-Spring 2009 | S             |          | S        |              |        |
| Fall 2009-Spring 2010 |               |          |          |              |        |
| Fall 2010-Spring 2011 | S             | S        | S        |              | S      |

**APPENDIX A**

Number (N) and catch rate (CPUE) of all species collected from all gear types from Palo Duro Reservoir, Texas, 2005-2006.

| Species               | 2005 Gill Nets |      | 2005 Trap Nets |      | 2006 Electrofishing |       |
|-----------------------|----------------|------|----------------|------|---------------------|-------|
|                       | N              | CPUE | N              | CPUE | N                   | CPUE  |
| Gizzard shad          | 310            | 62   | 1              | 0.2  | 280                 | 336.0 |
| Common carp           | 31             | 6.2  | 6              | 1.2  | 157                 | 189.6 |
| River carpsucker      | 1              | 0.2  |                |      |                     |       |
| Blue catfish          | 81             | 16.2 | 1              | 0.2  | 3                   | 3.6   |
| Black bullhead        | 1              | 0.2  | 1              | 0.2  |                     |       |
| Channel catfish       | 66             | 13.2 | 2              | 0.4  | 20                  | 24.0  |
| Flathead catfish      | 1              | 0.2  |                |      |                     |       |
| White bass            | 3              | 0.6  |                |      |                     |       |
| Green sunfish         | 1              | 0.2  |                |      |                     |       |
| Orangespotted sunfish |                |      | 8              | 1.6  |                     |       |
| Bluegill              | 1              | 0.2  | 25             | 5.0  | 1                   | 1.2   |
| Longear sunfish       |                |      | 10             | 2.0  | 2                   | 2.4   |
| Largemouth bass       | 3              | 0.6  |                |      | 2                   | 2.4   |
| White crappie         | 72             | 14.4 | 496            | 99.2 | 16                  | 19.2  |
| Walleye               | 15             | 3.0  | 1              | 0.2  | 2                   | 2.4   |

**APPENDIX B**

Location of sampling sites, Palo Duro Reservoir, Texas. Indicated gill net and trap net stations are for 2005 and electrofishing stations are for 2006. Trap net, gill net, and electrofishing stations are indicated by T, G, and E, respectively. The dark grey color indicates elevation during 2005 surveys. The white line indicates elevation during the 2006 survey.