

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

Lake Corpus Christi

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SURVEY AND MANAGEMENT SUMMARY

Fish populations in Lake Corpus Christi were surveyed in 2006 using trap nets and electrofishing, and in 2007 using gill nets. This report summarizes the results of the surveys and contains a management plan for the reservoir based on those findings.

- **Reservoir Description:** Lake Corpus Christi is located on the Nueces River approximately 20 miles northwest of Corpus Christi, Texas. The reservoir was built by the Lower Nueces Water Supply District in 1958 to provide water for Corpus Christi and other coastal bend communities. Boat access is correlated with water level. Shoreline and handicap access are limited to a few public areas around the lake. Water is typically turbid, but clears during the summer in the lower reservoir and small creek arms. The substrate is composed primarily of silt, sand, clay, and some gravel/rock. Littoral habitat consists of native aquatic vegetation, periodically flooded live and dead terrestrial vegetation, standing timber, and seasonally abundant water hyacinth.
- **Management History:** Important sport fish include blue catfish, white bass, largemouth bass, and white crappie. The management focus has been on controlling nuisance aquatic vegetation and creating additional habitat. The district worked with the City of Corpus Christi to develop and implement a water hyacinth control program. District staff created additional habitat in the form of five brush piles. In an effort to increase angling effort, maps with GPS coordinates of all brush piles were distributed at local marinas, bait stands, and Lake Corpus Christi State Park.
- **Fish Community**
 - **Prey species:** Gizzard shad and bluegill continued to be the predominant prey in the reservoir. Availability of gizzard shad as prey for sport fish increased from 2002 to 2006. The majority of bluegill were greater than 4 inches.
 - **Catfishes:** Blue and channel catfish were present in the reservoir with blue catfish being more abundant. The majority of channel catfish sampled were less than the 12 inch minimum length limit, whereas most of the blue catfish were greater than legal size (12 inches).
 - **Temperate basses:** White bass were present in the reservoir, and population abundance has been relatively stable. Striped bass and palmetto bass have previously been stocked but have not been captured in sampling gears. White bass attained legal size (10 inches) between ages 1 and 2.
 - **Largemouth bass:** Largemouth bass had marginal body condition. Few fish were above legal size limit. The population size structure was poor. The majority of fish were collected from the lower half of the reservoir during the 2006 electrofishing survey.
 - **Crappie:** Trap net catch rates and overall body condition of white crappie remain consistent during the survey period. The black crappie population contained few legally harvestable size fish. Overall body condition rose slightly, and trap net catch rates remained consistent during the survey period.
- **Management Strategies:** Continue to work with the City of Corpus Christi on the water hyacinth control program. Monitor for return of native vegetation.

INTRODUCTION

This document is a summary of fisheries data collected from Lake Corpus Christi in 2006-2007. 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 2006-2007 data for comparison.

Reservoir Description

Lake Corpus Christi is a 19,447-acre reservoir (averaged 12,830 acres in 2006-2007) located on the Nueces River approximately 20 miles northwest of Corpus Christi, Texas. The reservoir was built by the Lower Nueces Water Supply District in 1958 to provide water for Corpus Christi and other coastal bend communities. Water level in the reservoir can fluctuate 1-4 feet annually (Figure 1). Water levels were the lowest in twenty years between 2006 and 2007. The lake level rose in the spring of 2007 reaching approximately four feet below conservation pool. Boat access was dependent on water level, and shoreline and handicap access were limited to a few public areas around the lake. Water is typically turbid, but clears during the summer in the lower reservoir and small creek arms. The substrate is composed primarily of silt, sand, clay, and some gravel/rock. Littoral habitat consists of native aquatic vegetation, periodically flooded live and dead terrestrial vegetation, standing timber, and seasonally abundant water hyacinth. Water hyacinth often becomes so abundant that it inhibits boating, fishing and shoreline access. Water lettuce is also present in the reservoir but has yet to restrict recreational use. Less than one acre of water hyacinth and water lettuce were found during the 2006 vegetation survey. Other descriptive characteristics for Lake Corpus Christi are in Table 1.

Management History

Previous management strategies and actions: Management strategies and actions from the previous survey report (Findeisen 2002) included:

1. Work with the City of Corpus to develop and implement a water hyacinth control program.
Action: Annual meetings were held with the reservoir superintendent discussing the current status of water hyacinth and potential for harmful effects on the reservoir. Texas Parks and Wildlife Department (TPWD) and the City of Corpus Christi conducted a survey in 2005 estimating 2,500 acres of water hyacinth. TPWD and the City of Corpus have released no new biological agents to control water hyacinth.
2. Periodically sample grass carp to better determine the origin of these fish.
Action: Grass carp were collected during standard management survey and blood samples were collected to determine ploidy level. While grass carp have been observed, no fish have been collected since 2003.
3. Address low angler catch rates due to periods of low water.
Action: Press releases were prepared and distributed addressing the effects of the low water period and rebuilding fish populations. In 2005, approximately 150 Christmas trees were used to create brushpiles around Lake Corpus Christi State Park's two fishing piers. An additional 150 trees were distributed among five locations in the lower half of the reservoir. Maps of these five locations with GPS coordinates were prepared and distributed to local marinas.

Harvest regulation history: Sportfish in Lake Corpus Christi have historically and currently are managed with statewide regulations (Table 2).

Stocking history: Approximately 480,000 Florida largemouth bass fingerlings were stocked in 2002 at

Lake Corpus Christi. Prior to 2002, the most recent stocking of Florida largemouth bass was in 1998. The complete stocking history can be found in Table 3.

Vegetation/habitat history: Shoreline habitat in Lake Corpus Christi is dominated by nondescript shoreline and rocky gravel banks. The upper portion of the lake is characterized by large stands of flooded timber. Results of the 2006 habitat survey can be found in Table 4.

Water hyacinth, a non-native floating plant, has historically been a problem in the upper end of the reservoir, reducing access and negatively impacting fish and wildlife habitat. Water lettuce, another non-native floating plant, is also present in the reservoir but has yet to restrict recreational use. No native aquatic vegetation was observed during the survey.

METHODS

Fishes were collected by electrofishing (2.0 hours at 24 5-minute stations), trap nets (15 net nights at 15 stations), and gill nets (15 net nights at 15 stations). Catch per unit effort (CPUE) for electrofishing was recorded as the number of fish caught per hour (fish/h) of actual electrofishing. Trap and gill net CPUE was recorded as the number of fish caught in one net set overnight (fish/nn). Micro-satellite DNA analysis was not conducted in 2006 due to low sample size. Electrophoresis analysis was used in 2002 and 2004 to determine largemouth bass genetic composition. A littoral zone/physical habitat survey was conducted in August 2006. All survey sites were randomly selected and all surveys were conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2005).

Sampling statistics (CPUE for various length categories) and structural indices [Proportional Stock Density (PSD), Relative Stock Density (RSD)] 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 according to DiCenzo et. al. (1996). Relative standard error (RSE = 100 X SE of the estimate/estimate) was calculated for all CPUE statistics and SE was calculated for structural indices and IOV. White bass were aged using otoliths. Source for the water level data was the United States Geological Survey website.

RESULTS AND DISCUSSION

Habitat: Littoral zone habitat consisted primarily of nondescript shoreline and rocky gravel banks (Table 4). Exotic floating plants were present but coverage was less than one acre.

Prey species: The 2006 electrofishing catch rate of gizzard shad was 284.5/h. This represents a doubling of abundance compared to 2004 (126.0/h) and nearly a 10 fold increase relative to 2002 (30.0/h) (Figure 2). The IOV steadily increased from 60 in 2002 to 98 in 2006; thus 98% of the gizzard shad population was less than 8 inches in length and available to existing predators. As gizzard shad catch rates increased, electrofishing catch rates of bluegill declined. Bluegill catch rates were 138.0/hr in 2002 and 42.5/hr in 2006 (Figure 3). Bluegill do not provide a fishery in this reservoir, as few fish reach quality size. Threadfin shad catch rates were 84.5/nn in the 2006 survey.

Blue catfish: The 2007 gill net catch rate for blue catfish was 26.7/nn, higher than 2003 (14.5/nn) and 2005 (17.9/nn) (Figure 4). The PSD for blue catfish remained consistent. Mean relative weight values per inch group have declined since 2003.

Channel catfish: The 2007 gill net catch rate for channel catfish was 0.6/nn, similar to previous surveys in 2003 (0.3/nn) and 2005 (0.8/nn) (Figure 5). Decreasing channel catfish catch rates may be the result of competition with blue catfish.

White bass: The 2007 gill net catch rate for white bass was 3.3/nn, similar to 2005 (2.9/nn) and less than in 2003 (5.6/nn) (Figure 6). White bass reached legal size (10-inches) between ages 1 and 2 (Figure 7).

White bass are a sought-after species based on upstream boat ramp usage and number of angler inquiries during the spawning season at Lake Corpus Christi.

Largemouth bass: The 2006 electrofishing catch rate for largemouth bass was 26.5/h, lower than both 2002 (45.0/h) and 2004 (32.5/h) (Figure 8). During the 2006 survey, the majority of largemouth bass were collected from the lower half of the reservoir. The lower half of the reservoir has more shoreline habitat in the form of rocky gravel and rip rap than the upper half, which is predominantly cut bank and nondescript shoreline. Lake Corpus Christi received a large amount of water between February and April 2007 restoring old and creating new structured habitat. Electrophoresis results from the 2004 survey indicated an 83% frequency of Florida largemouth bass alleles, with 50% of the population having Florida bass genotypes (Table 5).

White crappie: The 2006 trap net catch rate for white crappie was 2.9/nn, similar to both 2002 (2.3/nn) and 2004 (3.3/nn) (Figure 9). The 2006 PSD was equal to 2004 while the RSD-10 has increased slightly. Mean relative weights of white crappie, stock size and greater, averaged in the mid 90s.

Black crappie: The 2006 trap net catch rate for black crappie was 0.5/nn, was similar to both 2002 (1.1/nn) and 2004 (0.9/nn) (Figure 10).

Fisheries management plan for Lake Corpus Christi, Texas

Prepared – July 2007.

ISSUE 1: Largemouth bass catch rates in Lake Corpus Christi have decreased significantly during the survey period. At the same time, Lake Corpus Christi water levels were the lowest in twenty years from 2006 to 2007. The lake rose again in the spring of 2007 and is currently at conservation pool. This rise in water has restored old habitat and created new habitat.

MANAGEMENT STRATEGIES

1. Conduct a largemouth bass-only-electrofishing survey in the fall 2007 to monitor young-of-the-year year class strength and genetic composition.
2. Stock Florida largemouth bass in 2008 and 2009 or 2009 and 2010 (depending on year class strength and genetic composition) in response to water level rise at a rate of 25/acre.

ISSUE 2: Catch rates and size structure of blue catfish in Lake Corpus Christi have improved during the survey period. However, fishing effort directed for this species is believed to be low.

MANAGEMENT STRATEGIES

1. Publish press release on blue catfish angling opportunities in Lake Corpus Christi.

ISSUE 3: Native aquatic vegetation was scarce before water levels dropped in 2006. In addition, native vegetation was not observed during the most recent vegetation survey.

MANAGEMENT STRATEGIES

1. Introduce native aquatic vegetation.
2. Monitor planting sites for growth and expansion.

ISSUE 4: Exotic floating plants such as water hyacinth and water lettuce have historically been a severe problem in the upper end of the reservoir. These exotic plants restrict recreational use and the quality of fish and wildlife habitat by out competing native aquatic vegetation.

MANAGEMENT STRATEGIES

1. Monitor presence of water hyacinth in Lake Corpus Christi.
2. Revisit the water hyacinth control program with the City of Corpus Christi.

SAMPLING SCHEDULE JUSTIFICATION:

The proposed sampling schedule includes routine electrofishing, trap net, and gill net surveys in 2008/2009. Electrofishing, trap net, and gill net surveys will be conducted in 2010/2011, and a Federal Aid report will be prepared in 2011 (Table 6).

LITERATURE CITED

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- DiCenzo, V. J., M. J. Maceina, and M. R. Stimpert. 1996. Relationships between reservoir trophic state and gizzard shad population characteristics in Alabama reservoirs. *North American Journal of Fisheries Management* 16:888-895.
- Findeisen, J. 2003. Statewide freshwater fisheries monitoring and management program survey report for Lake Corpus Christi, 2002. Texas Parks and Wildlife Department, Federal Aid Report F-30-R, Austin.

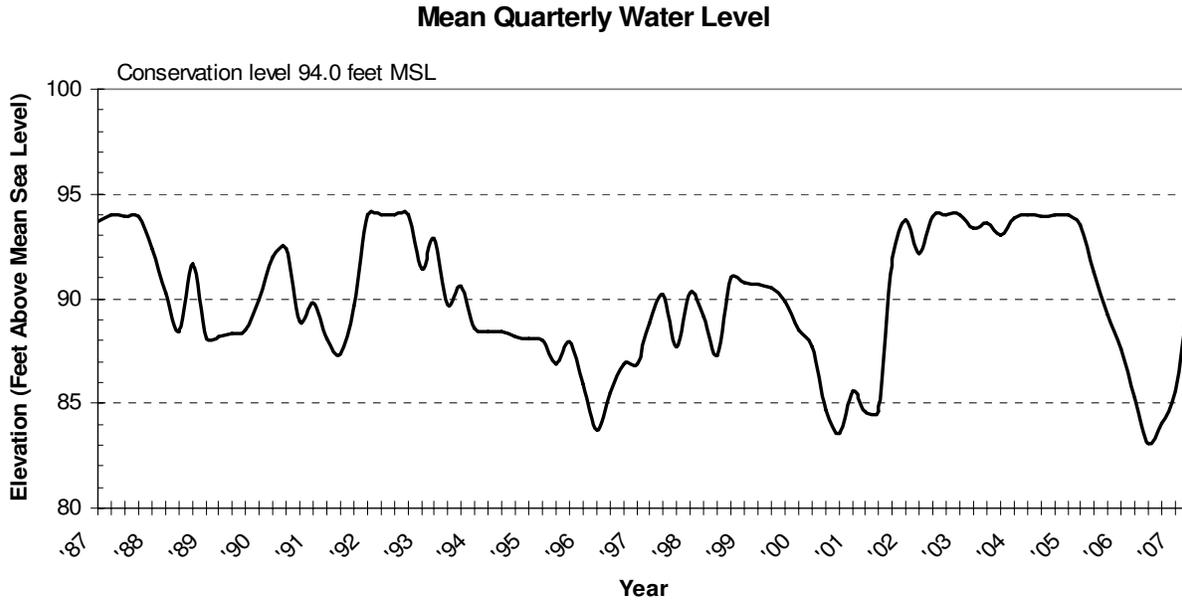


Figure 1. Quarterly water level elevations in feet above mean sea level (MSL) recorded for Lake Corpus Christi, Texas.

Table 1. Characteristics of Lake Corpus Christi, Texas.

| Characteristics | Description |
|-----------------------------------|--|
| Year constructed | 1958 |
| Controlling authority | City of Corpus Christi, Lower Nueces Water Supply District |
| Counties | San Patricio and Live Oak |
| Reservoir type | Main stream |
| Shoreline Development Index (SDI) | 6.00 |
| Conductivity | 380 umhos/cm |

Table 2. Harvest regulations for Lake Corpus Christi, 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 |

Table 3. Stocking history of Lake Corpus Christi, Texas. Size categories are: FGL = 1-3 inches and ADL = adults.

| Species | Year | Number | Size |
|-------------------------|------|-----------|------|
| Channel catfish | 1972 | 10,000 | FGL |
| | | 10,000 | |
| Striped bass | 1981 | 109,600 | FGL |
| | 1983 | 220,096 | FGL |
| | 1988 | 220,432 | FGL |
| | 1989 | 459,686 | FGL |
| | 1990 | 237,745 | FGL |
| | | 1,247,559 | |
| Palmetto bass | 1979 | 88,456 | FGL |
| | 1980 | 219,991 | FGL |
| | 1981 | 85,170 | FGL |
| | 1986 | 220,358 | FGL |
| | 1991 | 220,900 | FGL |
| | 1992 | 319,700 | FGL |
| | 1993 | 166,324 | FGL |
| | 1994 | 533,172 | FGL |
| | 1995 | 330,400 | FGL |
| | | 2,184,471 | |
| Florida largemouth bass | 1980 | 247,909 | FGL |
| | 1998 | 422,269 | FGL |
| | 2002 | 483,240 | FGL |
| | | 1,153,418 | |
| Walleye | 1973 | 200,000 | FGL |
| | | 200,000 | |
| Rainbow trout * | 1993 | 2,002 | ADL |
| | 1994 | 2,005 | ADL |
| | 1995 | 1,929 | ADL |
| | 1997 | 1,008 | ADL |
| | 1998 | 1,010 | ADL |
| | 2000 | 1,500 | ADL |
| | 2001 | 1,381 | ADL |
| | 2002 | 2,500 | ADL |
| | 2003 | 2,583 | ADL |
| | 2004 | 2,079 | ADL |
| | 2005 | 1,500 | ADL |
| | 2006 | 1,509 | ADL |
| | 2007 | 1,502 | ADL |
| | | 22,508 | |

* Stocked behind a block net.

Table 4. Survey of littoral zone and physical habitat types, Lake Corpus Christi, Texas, 2006. A linear shoreline distance (miles) was recorded for each habitat type found.

| Shoreline habitat type | Shoreline Distance | |
|------------------------|--------------------|------------------|
| | Miles | Percent of total |
| Boulder | 0.3 | 0.3 |
| Bulkhead | < 0.1 | < 0.1 |
| Concrete | 0.5 | 0.4 |
| Cut bank | 9.5 | 8.8 |
| Nondescript | 85.0 | 78.6 |
| Rip rap | 0.4 | 0.4 |
| Rocky/gravel | 12.3 | 11.4 |
| Total | 108.1 | |

Gizzard Shad

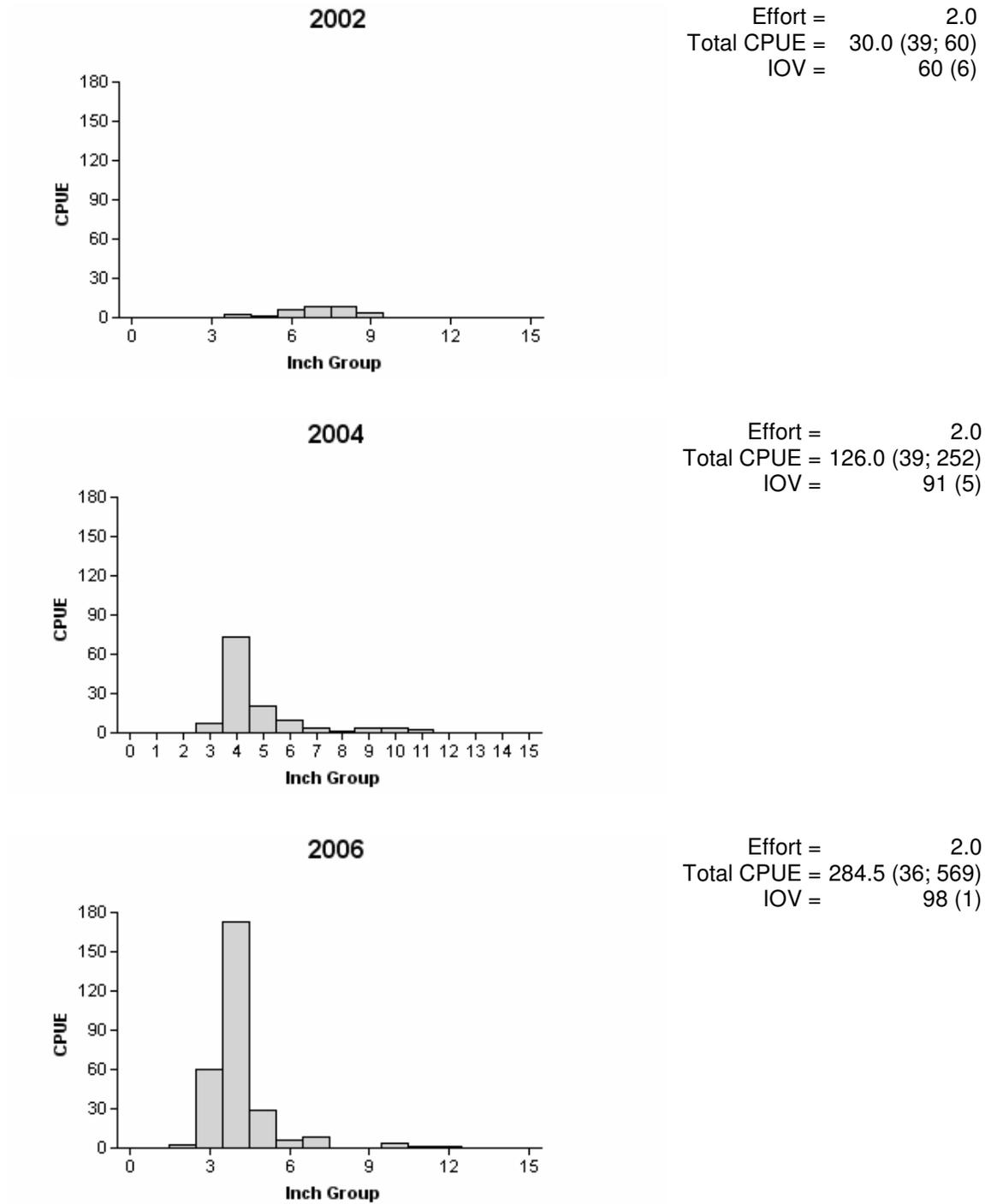
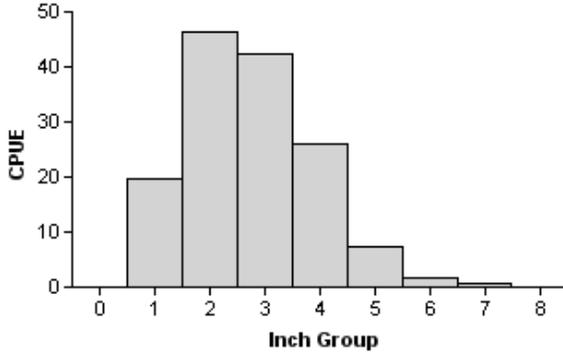


Figure 2. Number of gizzard shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Lake Corpus Christi, Texas 2002, 2004, and 2006.

Bluegill

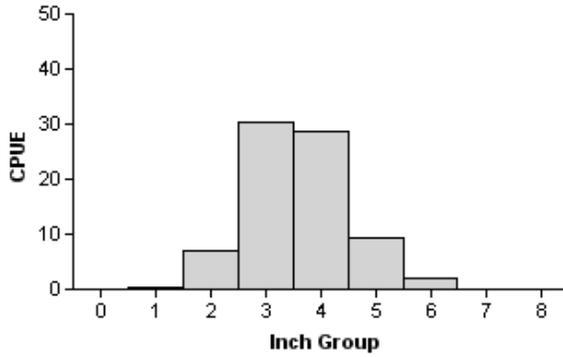
2002

Effort = 2.0
 Total CPUE = 138.0 (30; 276)
 PSD = 3 (1)



2004

Effort = 2.0
 Total CPUE = 78.0 (35; 156)
 PSD = 3 (2)



2006

Effort = 2.0
 Total CPUE = 42.5 (30; 85)
 PSD = 9 (3)

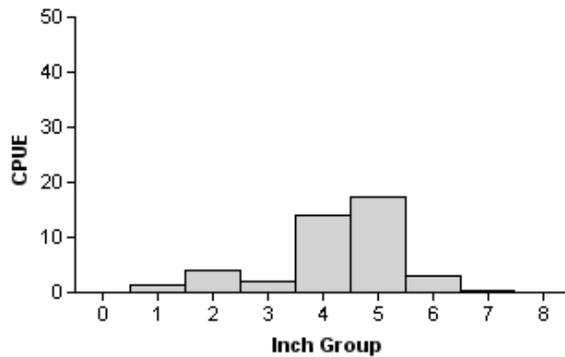


Figure 3. Number of bluegill caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Lake Corpus Christi, Texas 2002, 2004, and 2006.

Blue Catfish

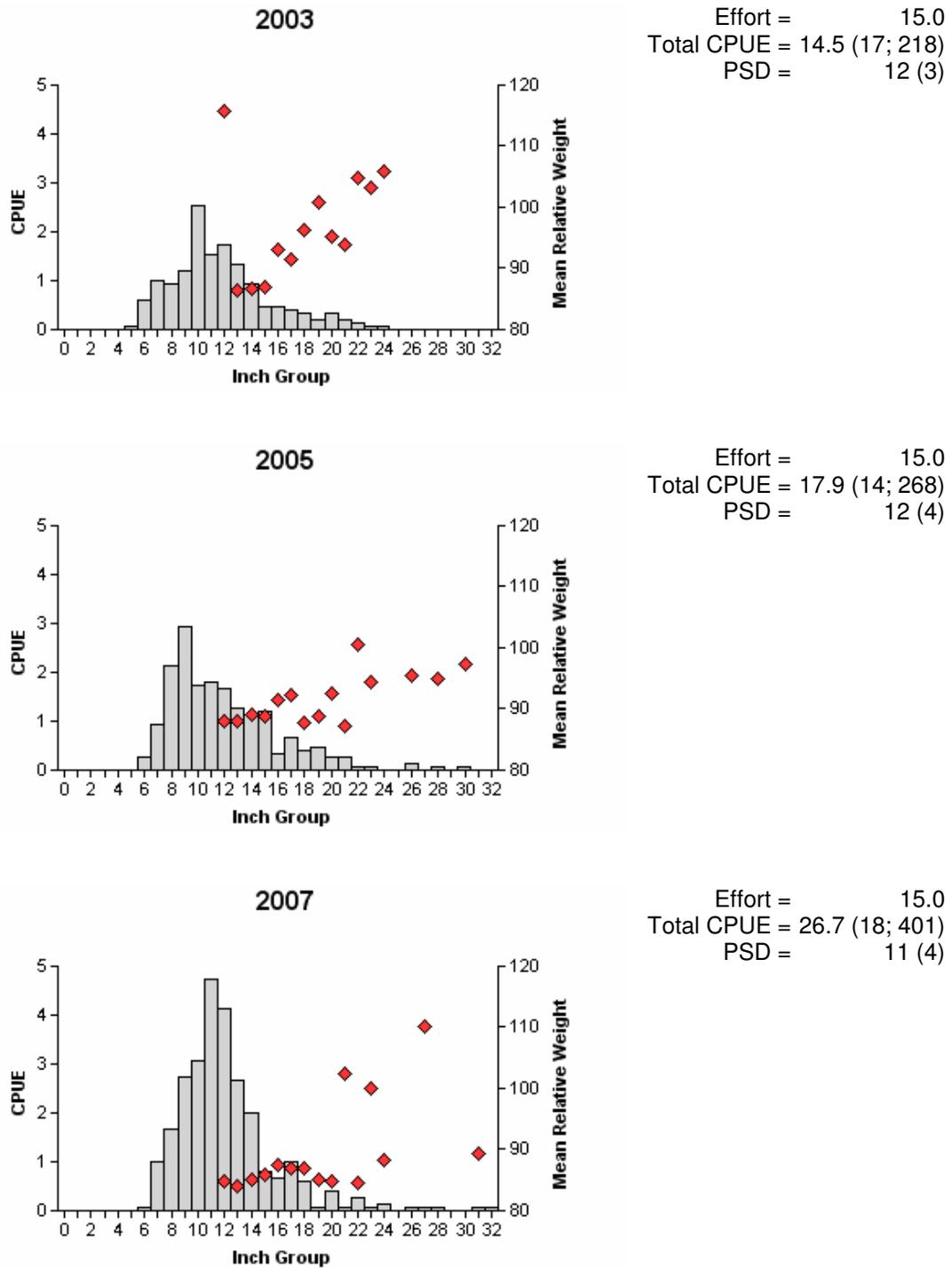
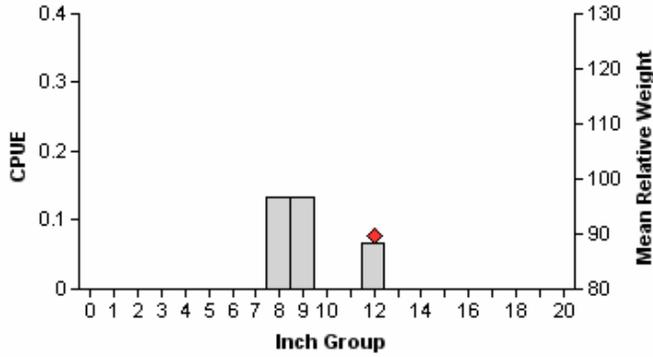


Figure 4. Number of blue catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Lake Corpus Christi, Texas 2003, 2005, and 2007.

Channel Catfish

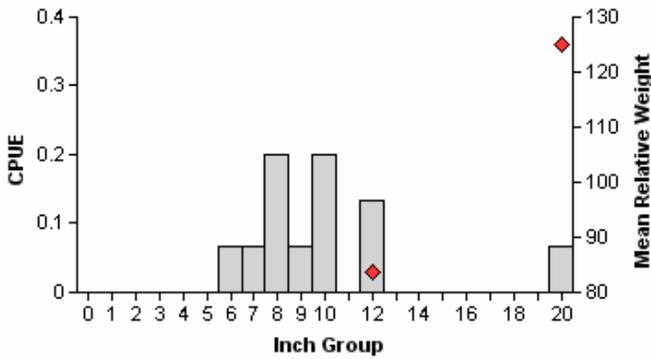
2003

Effort = 15.0
 Total CPUE = 0.3 (38; 5)
 PSD = 0 (232)



2005

Effort = 15.0
 Total CPUE = 0.8 (43; 12)
 PSD = 33 (28)



2007

Effort = 15.0
 Total CPUE = 0.6 (79; 9)
 PSD = 0 (377)

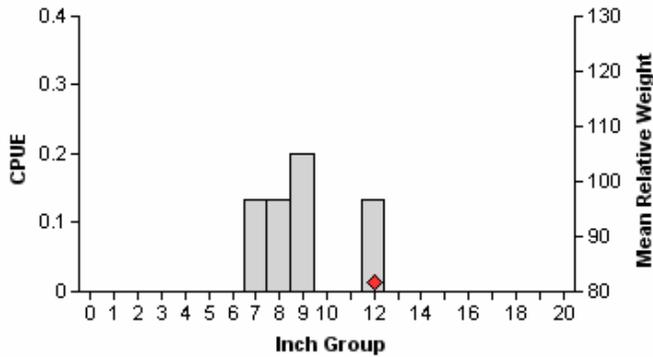


Figure 5. Number of channel catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure in parentheses) for spring gill net surveys, Lake Corpus Christi, Texas 2003, 2005, and 2007.

White Bass

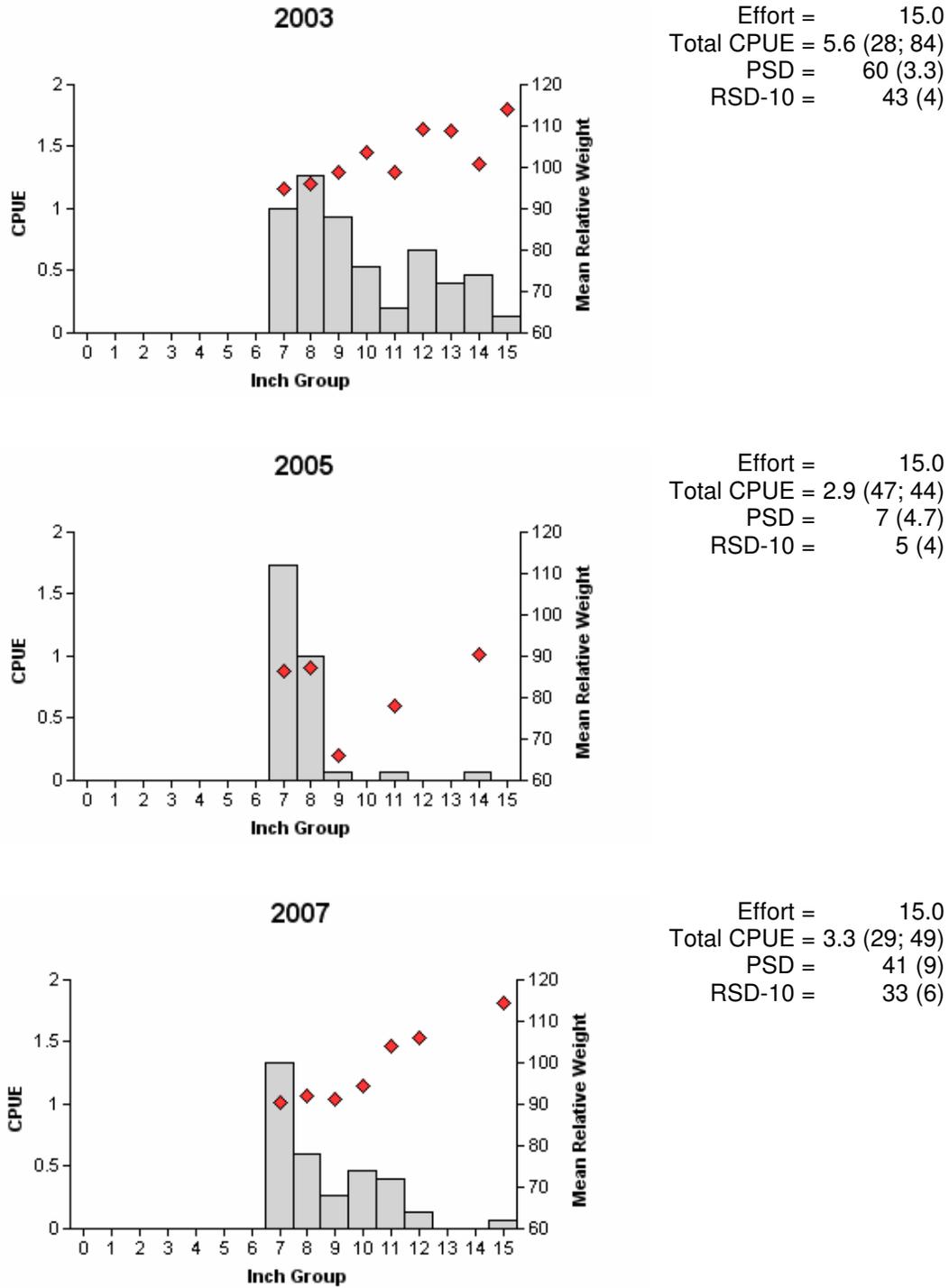


Figure 6. Number of white bass caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure in parentheses) for spring gill net surveys, Lake Corpus Christi, Texas 2003, 2005, and 2007.

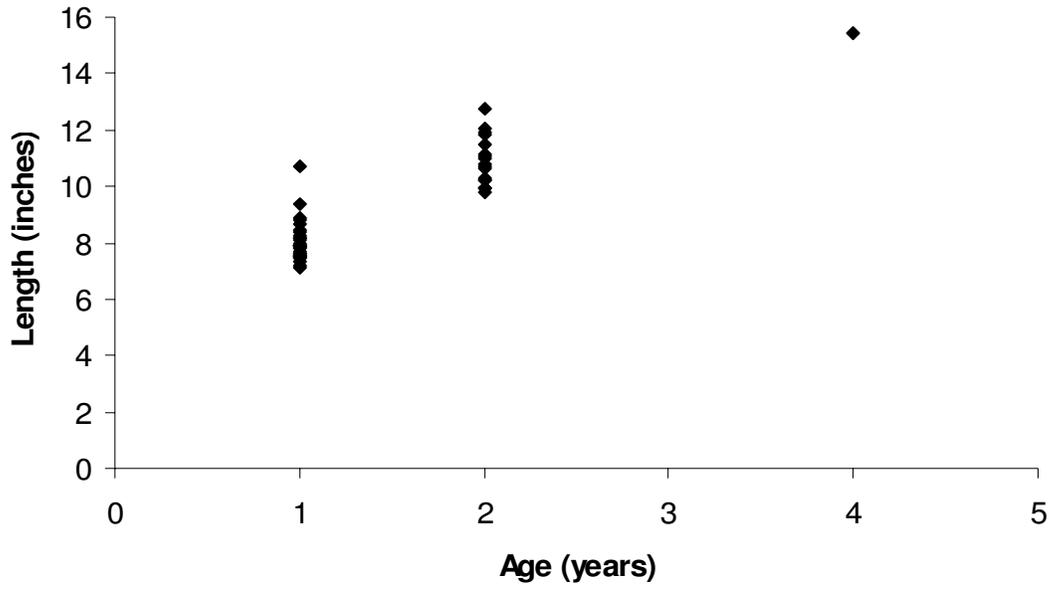


Figure 7. Length at age for white bass collected from gill nets at Lake Corpus Christi, Texas, January 2007 (N = 49).

Largemouth Bass

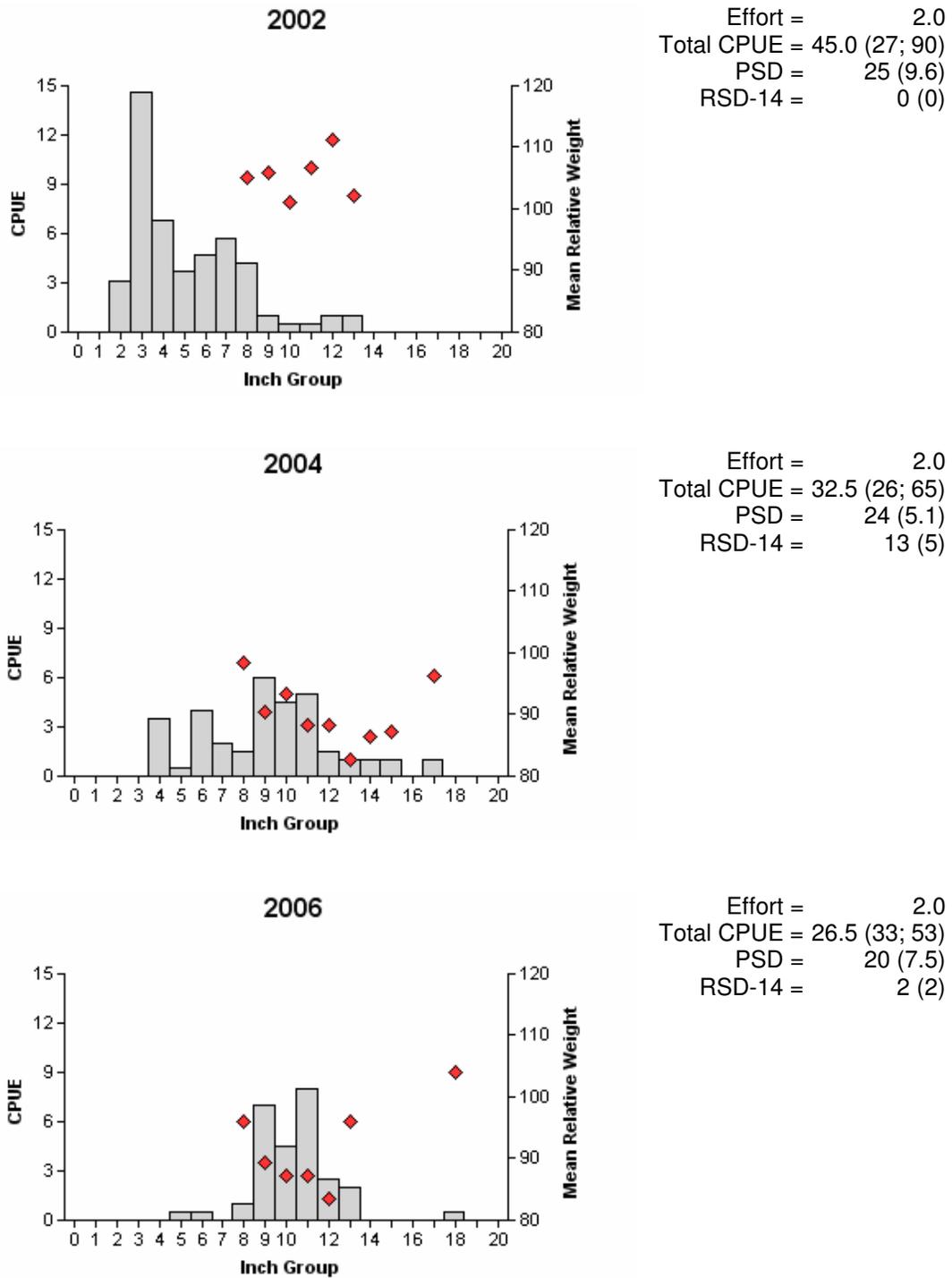


Figure 8. Number of largemouth bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parenthesis) for fall electrofishing surveys, Lake Corpus Christi, Texas, 2002, 2004, and 2006.

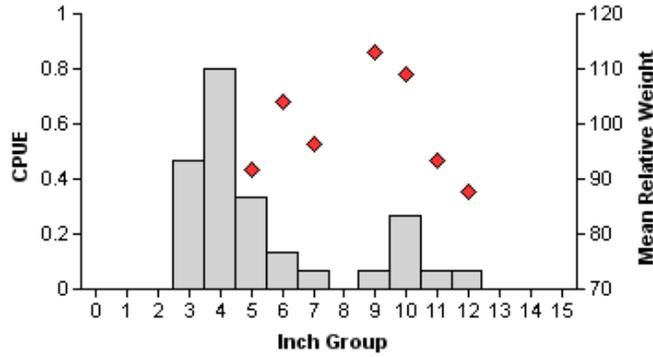
Largemouth Bass

Table 5. Results of genetic analysis of largemouth bass collected by fall electrofishing, Lake Corpus Christi, Texas 2002 and 2004. Electrophoresis analysis was used to determine genetic composition in 2002 and 2004. FLMB = Florida largemouth bass, NLMB = Northern largemouth bass, F1 = first generation intergrade between a FLMB and NLMB, Fx = second or higher generation intergrade between a FLMB and a NLMB.

| Year | Sample size | % Genotype | | | | % FLMB alleles |
|------|-------------|------------|------|------|------|----------------|
| | | FLMB | F1 | Fx | NLMB | |
| 2002 | 45 | 51.1 | 2.2 | 46.7 | 0 | 84.4 |
| 2004 | 30 | 50.0 | 10.0 | 36.7 | 3.3 | 82.5 |

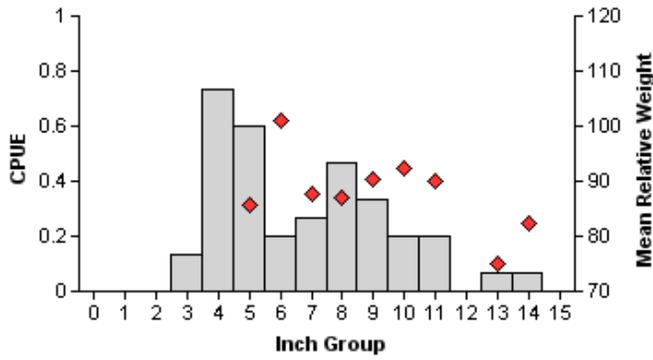
White Crappie

2002



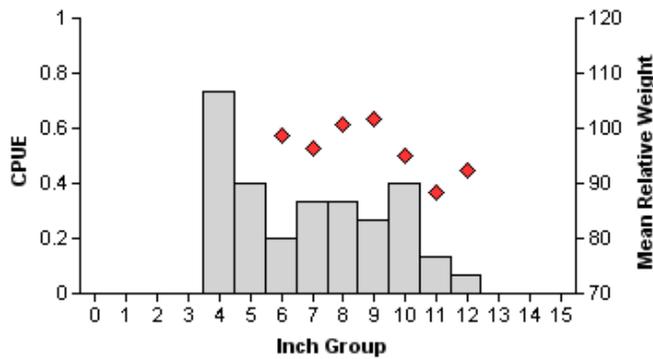
Effort = 15.0
 Total CPUE = 2.3 (16; 34)
 PSD = 47 (15.8)
 RSD-10 = 40 (16)

2004



Effort = 15.0
 Total CPUE = 3.3 (23; 49)
 PSD = 56 (10.8)
 RSD-10 = 22 (10)

2006



Effort = 15.0
 Total CPUE = 2.9 (36; 43)
 PSD = 56 (6.1)
 RSD-10 = 28 (9)

Figure 9. Number of white crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap net surveys, Lake Corpus Christi, Texas 2002, 2004, and 2006.

Black Crappie

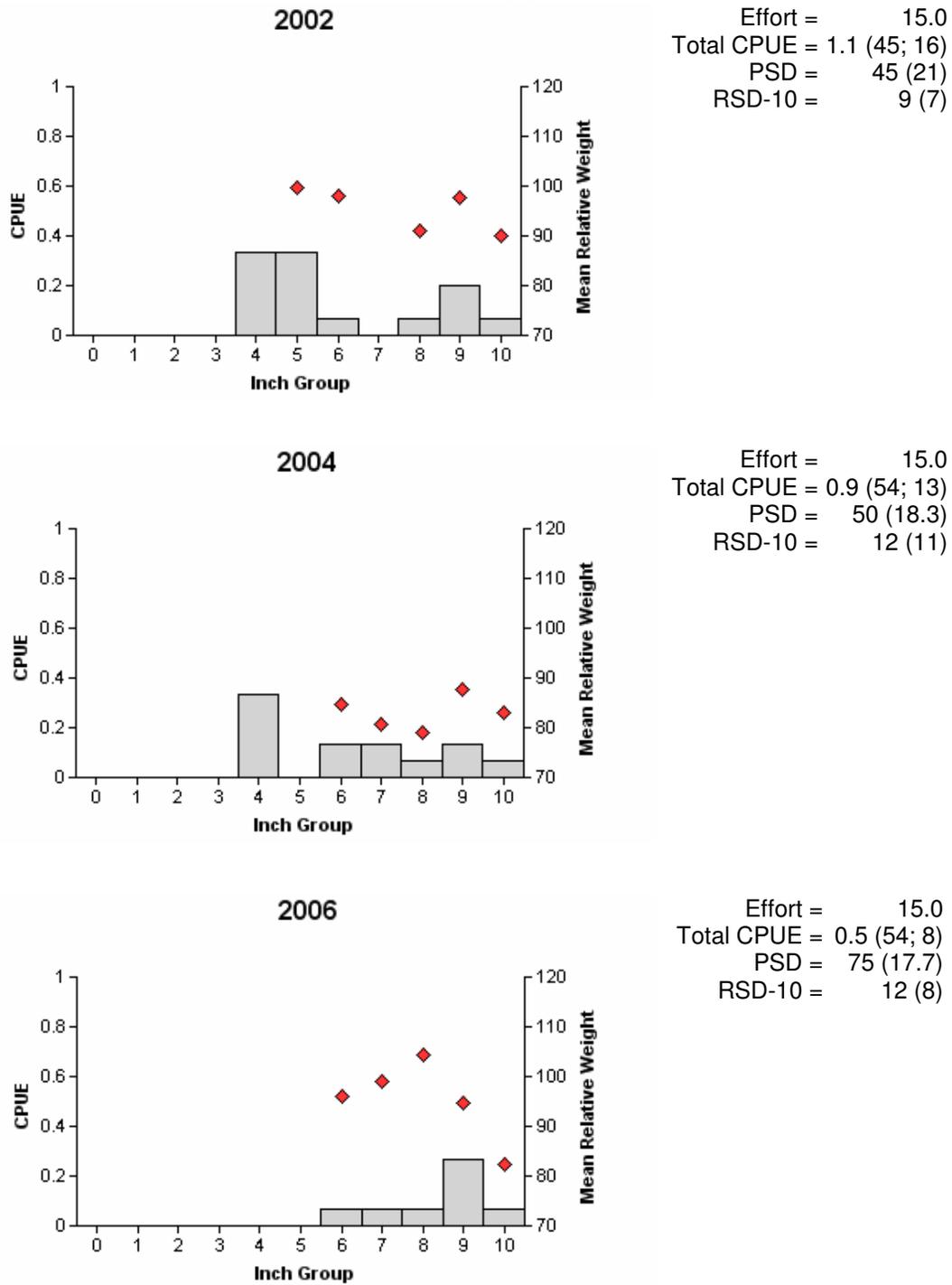


Figure 10. Number of black crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap net surveys, Lake Corpus Christi, Texas 2002, 2004, and 2006.

Table 6. Proposed survey schedule for Lake Corpus Christi, Texas. Trap net and electrofishing surveys are conducted in the fall and the gill net survey is conducted in the spring. "S" denotes the years standard sampling is conducted and Federal Aid Report is submitted, and "A" denotes years additional surveys will be conducted.

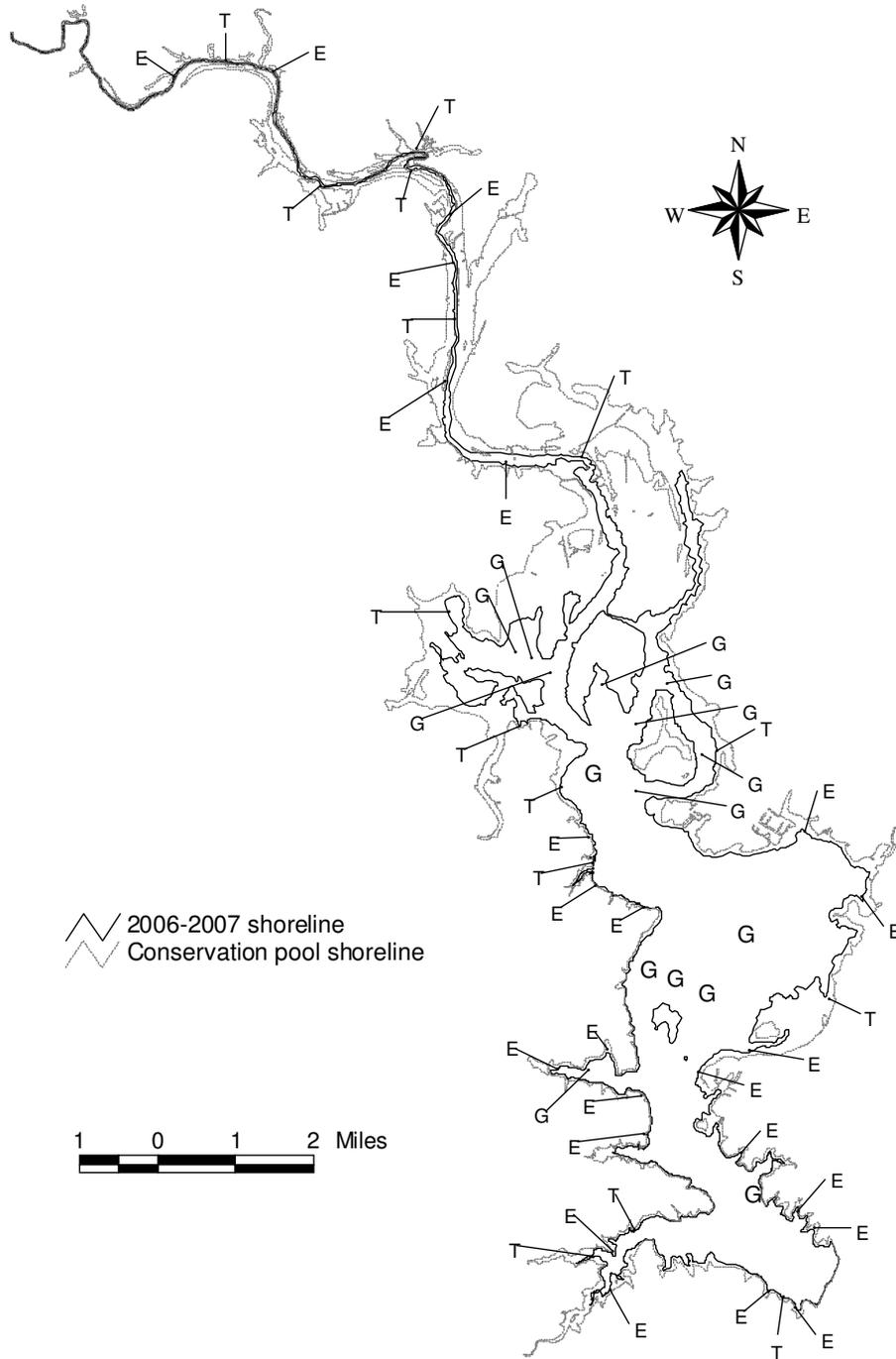
| Survey year | Electrofishing | Trap Netting | Gill Netting | Report |
|-------------------------|----------------|--------------|--------------|--------|
| Fall 2007 – Spring 2008 | | | | |
| Fall 2008 – Spring 2009 | S | S | S | |
| Fall 2009 – Spring 2010 | | | | |
| Fall 2010 – Spring 2011 | S | S | S | S |

APPENDIX A

Number and catch rate (CPUE) of all species collected from all gear types from Lake Corpus Christi, Texas, 2006-2007.

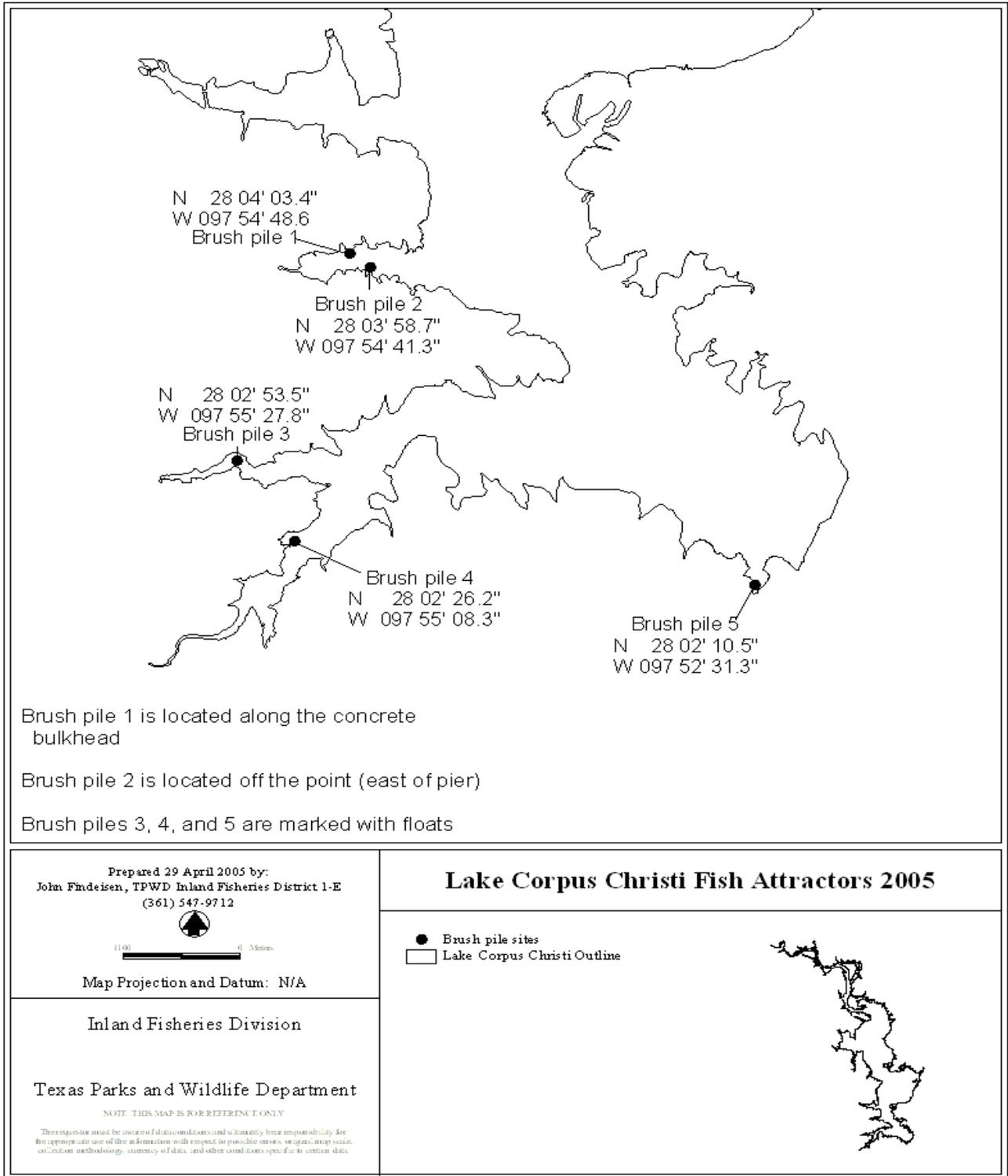
| Species | Electrofishing | | Trap Netting | | Gill Netting | |
|--------------------|----------------|-------|--------------|------|--------------|------|
| | N | CPUE | N | CPUE | N | CPUE |
| Spotted gar | | | | | 6 | 0.4 |
| Longnose gar | | | | | 38 | 2.5 |
| Alligator gar | | | | | 2 | 0.1 |
| Gizzard shad | 569 | 284.5 | 2 | 0.1 | 144 | 9.6 |
| Threadfin shad | 169 | 84.5 | 12 | 0.8 | | |
| Bullhead minnow | 24 | 12.0 | | | | |
| Inland silverside | 13 | 6.5 | | | | |
| Smallmouth buffalo | | | 6 | 0.4 | 164 | 10.9 |
| Blue catfish | | | 4 | 0.3 | 401 | 26.8 |
| Black bullhead | | | | | 1 | 0.1 |
| Channel catfish | 3 | 1.5 | | | 9 | 0.6 |
| Flathead catfish | | | | | 2 | 0.1 |
| White bass | 28 | 14.0 | 1 | 0.1 | 49 | 3.3 |
| Bluegill | 85 | 42.5 | 5 | 0.3 | | |
| Longear sunfish | 7 | 3.5 | | | | |
| Redear sunfish | 47 | 23.5 | | | | |
| Largemouth bass | 53 | 26.5 | | | | |
| White crappie | 3 | 1.5 | 43 | 2.9 | 72 | 4.8 |
| Black crappie | 5 | 2.5 | 8 | 0.5 | 1 | 0.1 |
| Freshwater drum | 20 | 10.0 | 14 | 0.9 | 129 | 8.6 |
| Rio Grande cichlid | 1 | 0.50 | 2 | 0.1 | | |

APPENDIX B



Location of sampling sites, Lake Corpus Christi, Texas, 2006-2007. Trap netting, gill netting, and electrofishing stations are indicated by T, G, and E, respectively.

APPENDIX C



Location of fish attractors created in the lower half of Lake Corpus Christi, Texas.