PERFORMANCE REPORT

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FEDERAL AID IN SPORT FISH RESTORATION ACT

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FEDERAL AID PROJECT F-30-R-31

STATEWIDE FRESHWATER FISHERIES MONITORING AND MANAGEMENT PROGRAM

2005 Survey Report

O. H. Ivie Reservoir

Prepared by:

C. Craig Bonds
and
Mandy K. Scott

Inland Fisheries Division
District 1-C, San Angelo, Texas

Robert L. Cook
Executive Director

Phil Durocher
Director, Inland Fisheries

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SURVEY AND MANAGEMENT SUMMARY

Fish populations in O. H. Ivie Reservoir were surveyed in 2005 using electrofishing and trap nets, and in 2006 using gill nets. Anglers were interviewed from June 2005 to May 2006 during a creel survey. This report summarizes the results of the surveys and contains a management plan for the reservoir based on those findings.

- **Reservoir Description:** O. H. Ivie Reservoir is a 19,200-acre impoundment located on the Colorado and Concho rivers in Concho, Runnels, and Coleman counties, Texas, approximately 55 miles east of San Angelo. The water level declined 26 feet from May 1998 to November 2004, and increased over 14 feet from November 2004 to April 2005. In May 2006, reservoir surface area totaled 12,100 acres. Habitat features consisted of standing timber, rocks, flooded saltcedar, native submerged aquatic plants, and hydrilla.

- **Management History:** Important sport fish include largemouth bass, white bass, white crappie, and catfishes. The management plan from the 2001 survey report included annual electrofishing and creel surveys to evaluate the effectiveness of the 2001 largemouth bass length limit change (from 18-inch minimum length and 5-fish bag to a 5-fish bag, 2 of which may be <18 inches) and annual aquatic vegetation surveys primarily to monitor changes in hydrilla coverage. The purpose of the largemouth bass regulation change was to increase growth rates for 14- to 18-inch fish by reducing stockpiling through increased angler harvest. A variety of fish species have been stocked in the reservoir including threadfin shad; bluegill; channel, blue and flathead catfishes; Florida largemouth bass; smallmouth bass; white crappie; and walleye. Walleye stockings were discontinued after failing to produce a fishery.

- **Fish Community**
  - **Prey species:** Threadfin shad continued to be present in the reservoir. Electrofishing catch of gizzard shad was moderate, and approximately half were available as prey to most sport fish. Electrofishing catch of bluegills was moderate, and approximately one quarter of the adults were longer than 6 inches.

  - **Catfishes:** Blue catfish were stocked in the reservoir in the early 1990s, but contribute little to the total catfish fishery. The channel catfish population offered a broad size range, but low abundance, resulting in moderate angling success. Flathead catfish were present in the reservoir.

  - **White bass:** White bass were moderately abundant and the third most targeted fish by anglers. Angler effort, catch and harvest have increased in recent years.

  - **Largemouth bass:** Largemouth bass were abundant. Size structure was dominated by young fish (<2 years old) which benefited from water level rises in 2004 and 2005. Body condition of largemouth bass was good. The majority of anglers targeted largemouth bass, and angler catch rates were improved compared to recent years.

  - **Smallmouth bass:** No smallmouth bass have been sampled in the past year, but anglers reported catching low numbers in recent creel surveys.

  - **White crappie:** Abundance of catchable-size white crappie and angler catch rate has decreased over the past six years. However, crappie remained second to largemouth bass in angler directed effort.

- **Management Strategies:** Conduct annual creel, electrofishing, and aquatic vegetation surveys 2006-2010. Conduct trap net surveys in 2007 and 2009. Experiment with non-standard trap net surveys to increase sample size. Conduct gill net survey in 2010.

INTRODUCTION

This document is a summary of fisheries data collected from O. H. Ivie 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 2005-2006 data for comparison.

Reservoir Description

O. H. Ivie Reservoir is a 19,200-acre impoundment constructed in 1990 on the Colorado and Concho rivers. It is located in Concho, Runnels, and Coleman counties approximately 55 miles east of San Angelo and is operated and controlled by the Colorado River Municipal Water District (CRMWD). Primary water uses included municipal water supply and recreation. O. H. Ivie Reservoir was mesotrophic with a mean TSI chl-*a* of 45.1, which was higher than previous samples (Texas Commission on Environmental Quality 2005). Habitat at time of sampling consisted of rocks, flooded timber and saltcedar, and native and non-native submerged vegetation. Native aquatic plants present were sago and Illinois pondweeds. Hydrilla, a non-native, was first discovered in the reservoir in 1997. The water level remained near conservation pool elevation from impoundment in 1990 through 1998, but declined 26 feet from May 1998 to November 2004 (Figure 1). Water level increased over 14 feet from November 2004 to April 2005. In May 2006, reservoir surface area totaled 12,100 acres. Boat access consisted of three public boat ramps and several private boat ramps. Bank fishing access was restricted to CRMWD parks. Other descriptive characteristics for O. H. Ivie Reservoir are in Table 1.

Management History

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

1. Conduct annual creel and electrofishing surveys to monitor largemouth bass population trends following the 2001 length limit change.
   Action: Annual creel and electrofishing surveys were conducted from 2001 through 2006.
2. Conduct annual aquatic vegetation surveys and recommend treatment if necessary.
   Action: Aquatic vegetation surveys were conducted in August 2001 through 2005 to monitor coverage of hydrilla.

Harvest regulation history: Sportfishes in O. H. Ivie Reservoir are currently managed with statewide regulations with the exception of largemouth bass (Table 2). From 1990 to 2001, largemouth bass were managed with an 18-inch minimum length limit (MLL). The MLL was changed in 2001 to no length limit, but only two <18 inches could be kept per day. The latter was implemented to alleviate stockpiling and improve growth of largemouth bass measuring 14 to 18 inches.

Stocking history: Florida largemouth bass were stocked in 8 of 13 years between 1989 and 2001. Threadfin shad; blue, channel, and flathead catfish; bluegill; smallmouth bass; and white crappie were introduced in 1990. Walleye were stocked 3 times from 1991 to 1994, but failed to produce a fishery. The complete stocking history is in Table 3.

Vegetation/habitat history: O. H. Ivie Reservoir has supported a mix of aquatic vegetation species (Table 4). Native submerged aquatic vegetation has consisted primarily of sago pondweed and some Illinois pondweed. Hydrilla was first discovered in the reservoir in1997, and has remained in varied amounts since.

Dennis (2002) reported that most (56%) of the reservoir shoreline consisted of a mix of rock and gravel. Flooded trees were also prevalent (78%) along the shoreline.

METHODS

Fishes were collected by electrofishing (2.5 hours at 30, 5-min 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 (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 2005). Creel surveys were conducted during daylight hours and targeted pole-and-line anglers only. Microsatellite DNA analysis was used to determine largemouth bass genetic composition. Prior to 2005, genetic analysis was done by electrophoresis.

Sampling statistics (CPUE for various length categories), 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 (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. Ages were determined using otoliths for white bass and largemouth bass. All white bass collected were sacrificed for aging. We attempted to collect 200 largemouth bass >6 inches for aging. The sample was highly skewed toward ages 0 and 1. These ages were subsampled at 10 per 0.39 inches for inch groups 6 – 13. All largemouth bass collected >14 inches were sacrificed. White crappie sample size was too small for any meaningful age analysis. Source for water level data was the United States Geological Survey website.

RESULTS AND DISCUSSION

Habitat: O. H. Ivie Reservoir supported a mix of aquatic vegetation species (Table 4). Native submerged aquatic vegetation consisted primarily of sago pondweed and some Illinois pondweed. These aquatic plants combined to cover 6.8% of the reservoir. Hydrilla covered 13.6% of the reservoir in 2005.

Since the previous report (Dennis 2002), much (82%) of the reservoir's shoreline has been invaded by non-native saltcedar. Although flooded saltcedar offer limited fish habitat, they can exacerbate evaporative water loss from the reservoir and can increase water salinity through the excretion of salt (DeLoach 1991).

Creel: Directed fishing effort by anglers was highest for largemouth bass (54%), followed by anglers fishing for white crappie (23%), and white bass (9%) (Table 5). Total fishing effort for all species at O. H. Ivie Reservoir was 77,389 h from June 2005 to May 2006, and anglers spent an estimated $551,447 on direct expenditures. Total angler effort and direct expenditures have decreased by approximately half since 2001.

Prey species: Electrofishing catch rates of gizzard shad and bluegill were 126.0/h and 120.8/h, respectively. IOV for gizzard shad was 51, indicating that approximately half were available to existing predators; this was fairly consistent with previous years (Figures 2, 3). Total CPUE of gizzard shad was similar to 2004, and within the range (67.0–292.2/h) for surveys 2000–2003 (Figures 2, 3). Total CPUE of bluegill in 2005 was within the range (78.3–177.8/h) from surveys 2000–2004 (Figures 4, 5). Bluegill size structure in 2005 was consistent with previous years with roughly 25% of adult fish $\geq$6 inches (Figures 4, 5). Directed angler effort for bluegill steadily declined from over 2,000 h in the 2002/2003 creel survey to 0 h from June 2005 through May 2006 (Table 7).

Blue catfish: Blue catfish were stocked in 1990 and 1991 to take advantage of this reservoir's larger (>8 inches) gizzard shad, as well as to diversify angling opportunities. Although blue catfish have developed a

self-sustaining population, it can be characterized as one of low abundance (Figure 8). The gill net catch rate in 2006 (0.3/nn) was similar to previous years (2002 = 0.3/nn; 1999 = 0.1/nn). Fish measuring up to 35 inches in length have been sampled in recent surveys. Few pole-and-line anglers targeted blue catfish, precluding any meaningful creel statistics for this species.

Channel catfish: The gill net catch rate (1.2/nn) of channel catfish in 2005 was consistent with recent years (2002 = 0.5/nn; 1999 = 1.1/nn) (Figure 9). W_r values were generally above 100 and typically increased with size. Limited recruitment of young fish to adult sizes likely limits abundance and angler catch. Directed fishing effort, catch per hour, and total harvest for channel catfish showed a minimal catfish fishery (Table 8). Observed harvest showed 100% angler compliance with the 12-inch minimum length limit, and fish ranged up to 24 inches (Figures 10, 11).

Flathead catfish: Flathead catfish were present in low (0.1/nn) numbers (Figure 12). Few pole-and-line anglers targeted flathead catfish, precluding any meaningful creel statistics for this species.

White bass: The gill net catch rate of white bass was 3.1/nn in 2005 which was lower than in 2002 (7.3/nn), but similar to 1999 (3.7/nn) (Figure 13). Directed fishing effort and total estimated harvest for white bass was 6,822 h and 20,054 fish, respectively, from June 2005 through May 2006, and represented an increasing trend since June 2003 (Table 9). Angler catch rate was 1.27/h, which was lower than the previous year (2.07/h), but similar to June 2003 through May 2004 (1.21/h). Approximately 10% of legal-size white bass caught by anglers were released over the last two creel years. However, proportionally more were released in previous years. Observed harvest from June 2005 to May 2006 showed good angler compliance, and harvested fish ranged in length from 10 to 16 inches (Figure 14). Few white bass reached legal size (10 inches) by age 1 and all were 10 inches by age 2 (Figure 16).

Largemouth bass: The electrofishing catch rate of stock-length ($\geq$ 8 inches) largemouth bass was 47.6/h in 2005, the highest observed since 2000 (40.2/h). Electrofishing catch rates have increased dramatically since the reservoir water level was at its lowest level in 2003 (Figures 17, 18). Size structure was not adequate (PSD = 33), but should improve as abundant year classes produced in 2004 and 2005 recruit to larger size categories.

Slow growth in older (>age 3) largemouth bass has resulted in stockpiling between 14 and 18 inches in past years (Farquhar and Dennis 2000, Dennis 2002) which led to the liberalization of harvest restrictions in 2001. Age-1 largemouth bass averaged 11.3 inches in length (RSE = 1.3, N = 69) in 2005. Mean length at ages 2 and older were not reliable due to low sample sizes. Age data suggest male bass were more susceptible to stockpiling than females (Figure 21). Body condition in 2005 was improved (W_r >90) for larger fish (>12 inches) compared to previous surveys (Figures 17, 18; Table 12), a further indication stockpiling was not occurring.

Despite anglers catching largemouth bass double the rate (0.78/h) of the previous three years ($\leq$0.32/h), directed effort (3.4h/acre) continued to decrease (Table 10). Although anglers removed approximately 1,000 – 2,000 largemouth bass (excluding tournament-held fish) during each of the past four creel years, harvest per acre (<0.23) was still low. Most legal-size largemouth bass caught by anglers were released, up to 96% from June 2005 to May 2006 (Table 10).

Florida largemouth bass influence (Table 11) remained high in both Florida alleles (76%) and Florida genotype (24%).

Smallmouth bass: Smallmouth bass were stocked in 1990. None were collected during electrofishing surveys since 2004 (3.8/h), but anglers reported catching a few (estimated N = 148, RSE = 396) in the most recent creel survey.

White crappie: The trap net catch rate of white crappie was 10.7/nn in 2005, higher than in 2003 (7.5/nn)

and 2001 (7.3/nn). However, the 2005 sample was dominated (93%) by sub-stock-length (<5 inches) fish (Figure 22). Trap net catch rates for stock-length and longer crappie have declined (2001 = 4.8/nn, 2003 = 2.3/nn, 2006 = 0.8/nn).

Angler catch rates have steadily declined from 2002/2003 (1.02/h) to 2005/2006 (0.54/h). Directed angler effort (1.49h/acre) was similar to 2002/2003, but higher than the previous two surveys (Table 12). Size of harvested white crappie from June 2005 through May 2006 was excellent and ranged from 10 to 16 inches in total length (Figure 23).

Fisheries management plan for O. H. Ivie Reservoir, Texas

Prepared – July 2006.

ISSUE 1: Largemouth bass population characteristics have been dynamic since reservoir impoundment. The 18-inch minimum length limit was adjusted in 2001 to no minimum length limit, but 2 fish less than 18 inches could be harvested per day. This strategy was implemented to address poor growth, body condition, and stockpiling in older (> age 3) fish. Assessing the impacts of this regulation on the largemouth bass population has been challenging due to confounding factors (i.e., water level fluctuations and low representation from >age 2 fish in age samples) since the new length limit was enacted.

MANAGEMENT STRATEGIES

1. Conduct annual electrofishing surveys through 2009.
2. Conduct Category 4 largemouth bass age collection in 2009 to facilitate population modeling.

ISSUE 2: The exotic aquatic plant hydrilla and the native sago pondweed have been present in the reservoir since 1997, and their coverage within the reservoir has fluctuated. Changes in aquatic plant coverage can influence fish population characteristics. These plants also are capable of inhibiting public access if coverage increases greatly.

MANAGEMENT STRATEGY

1. Conduct annual aquatic vegetation surveys through 2009.

ISSUE 3: As reservoir water levels fell from the late 1990s through 2003, angler effort, angler direct expenditures, and angler catch rates for many species (including largemouth bass which generates the greatest economic impact) experienced a concurrent decline. Following water level increases in 2004 and 2005, angler catch rates improved (largemouth bass) and effort increased (white crappie and white bass). As demands for municipal water continue to rise, maintaining a long-term database cataloging angler success, effort, and expenditures may prove valuable when decisions concerning future water allocation and watershed water conservation practices will be made.

MANAGEMENT STRATEGY

1. Continue annual creel through 2009.

SAMPLING SCHEDULE JUSTIFICATION:

The proposed sampling schedule includes additional electrofishing in 2006, 2007, 2008, additional trap net sampling in 2007, and mandatory monitoring in 2009/2010 (Table 13). Additional electrofishing surveys are necessary on this heavily used largemouth bass fishery. Additional trap net sampling in 2007 is necessary to monitor an apparent decline in white crappie population. Gill net surveys are only necessary every four years at this point to ensure presence or absence of blue catfish, channel catfish, flathead catfish, and white bass. Annual creel surveys are needed to maintain consistent data for trend information on angler effort, catch and harvest rates, and direct expenditures.

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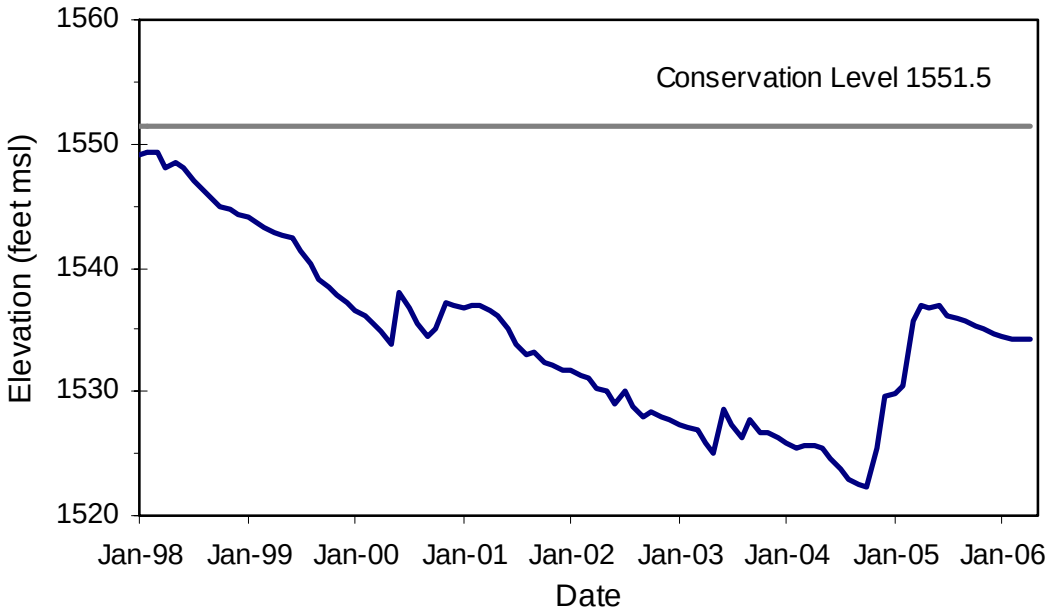


Figure 1. Monthly water level elevations in feet above mean sea level (MSL) recorded for O. H. Ivie Reservoir, Texas.

Table 1. Characteristics of O. H. Ivie Reservoir, Texas.

Characteristic	Description
Year constructed	1990
Controlling authority	Colorado River Municipal Water District
Counties	Concho, Runnels, and Coleman
Reservoir type	Mainstream
Shoreline Development Index	10.6
Conductivity	2,000 umhos/cm

Table 2. Harvest regulations for O. H. Ivie 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, smallmouth	5	14 - No Limit
Bass: largemouth	5	No limit (2 may be < 18 inches)
Crappie: white and black crappie, their hybrids and subspecies	25 (in any combination)	10 - No Limit

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

Year	Number	Size
	Threadfin shad	
1990	300	ADL
	Blue catfish	
1990	194,510	FGL
1991	192,381	FGL
Species Total	386,891	
	Channel catfish	
1990	195,561	FGL
1991	194,875	FGL
1996	250	ADL
1999	250	ADL
Species Total	390,936	
	Flathead catfish	
1990	3,013	FRY
	Bluegill	
1991	103,335	FGL
	Smallmouth bass	
1990	120,802	FGL
	White crappie	
1990	122,638	FGL
1991	183,661	FGL
Species Total	306,299	

Year	Number	Size
	Florida largemouth bass	
1989	3,610	FGL
1990	495,845	FRY
1991	1,920,593	FGL
1991	633	ADL
1992	50	ADL
1999	31,496	FGL
1999	250	ADL
2001	19,968	FGL
Species Total	2,472,445	
	Walleye	
1991	2,495,000	FRY
1992	860,000	FRY
1994	400,000	FRY
Species Total	3,755,000	
	Coppernose bluegill	
1990	332,548	FGL

Table 4. Survey of littoral zone and physical habitat types, O. H. Ivie Reservoir, Texas, 2005. A linear shoreline distance (miles) was recorded for each habitat type found. Surface area (acres) and percent of reservoir surface area was determined for each type of aquatic vegetation found. Native submerged vegetation consisted primarily of sago and Illinois pondweeds. Flooded live terrestrial consisted primarily of saltcedar.

Littoral habitat type	Shoreline Distance		Surface Area	
	Miles	Percent of total	Acres	Percent of reservoir surface area
Non-descript/native submerged vegetation	4.3	3.0		
Boulder	2.0	1.4		
Concrete	1.5	1.1		
Rocky shore	0.4	0.3		
Flooded live terrestrial/native submerged vegetation	17.5	12.7		
Flooded live terrestrial/hydrilla	24.0	17.4		
Flooded live terrestrial	71.0	51.4		
Dead trees	14.9	10.8		
Rock bluff	2.7	2.0		
Native submerged vegetation			1,233	6.8
Hydrilla			2,468	13.6

Table 5. Percent directed angler effort by species for O. H. Ivie Reservoir, Texas, June 2002 – May 2006.

Species	Year			
	2002/2003	2003/2004	2004/2005	2005/2006
Common carp	1.2	0.0	0.0	0.0
Blue catfish	0.1	0.0	0.0	0.3
Channel catfish	2.4	1.5	4.7	3.5
White bass	5.1	2.2	4.8	8.8
Sunfishes	1.6	0.7	0.1	0.0
Smallmouth bass	0.2	1.0	0.0	0.0
Largemouth bass	71.1	77.7	65.9	53.5
White Crappie	11.7	9.1	13.0	23.4
Anything	6.6	7.8	11.5	10.5

Table 6. Total fishing effort (h) for all species and total directed expenditures at O. H. Ivie Reservoir, Texas, June 2002 to May 2003, June 2003 to May 2004, June 2004 to May 2005, and June 2005 to May 2006.

Creel Statistic	Year			
	2002/2003	2003/2004	2004/2005	2005/2006
Total fishing effort	137,430	105,518	76,705	77,389
Total directed expenditures	$1,024,769	$984,349	$704,160	$551,447

Gizzard Shad

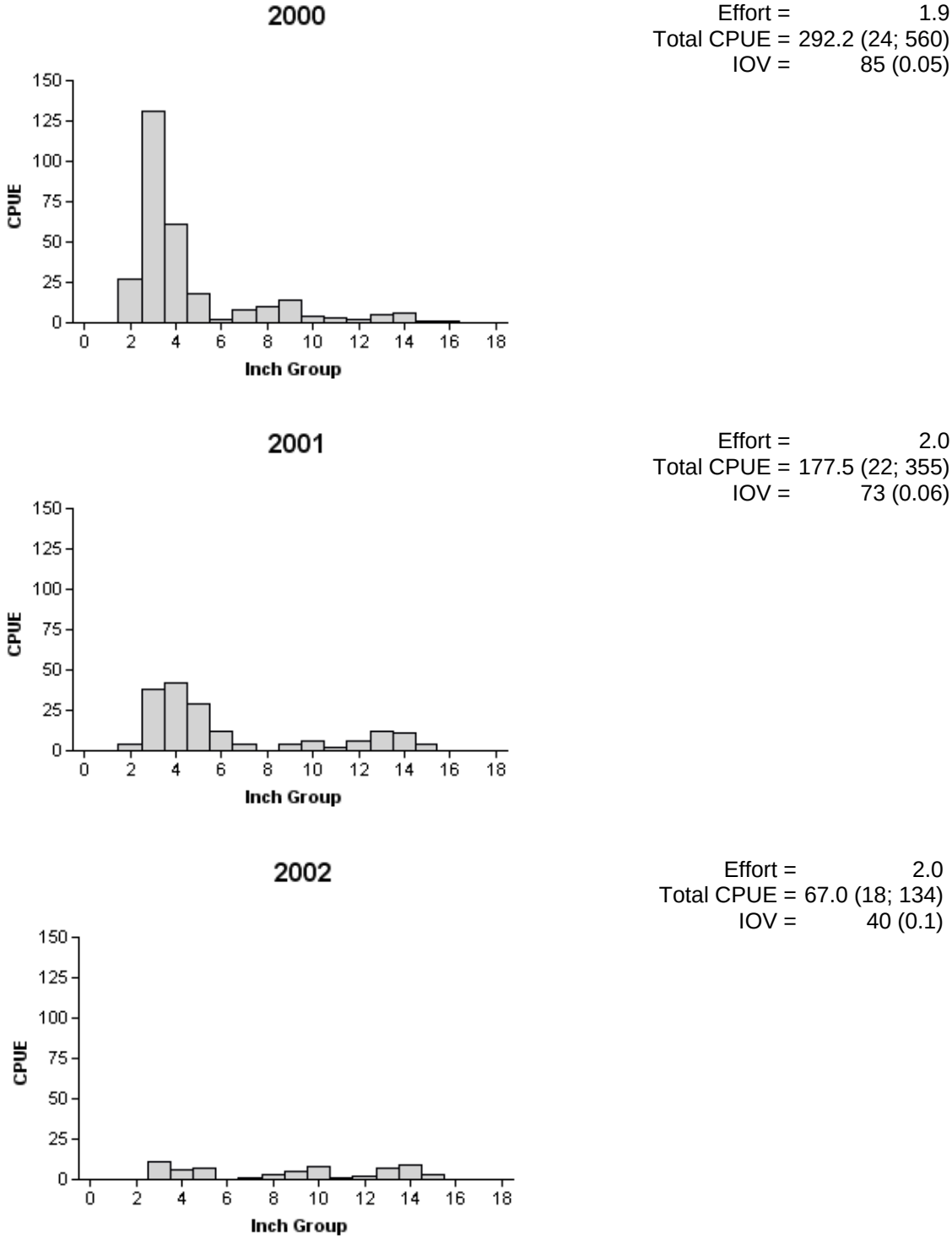


Figure 2. Number of gizzard shad caught per hour (CPUE) and population indices (RSE and N are in parentheses) for fall electrofishing surveys, O. H. Ivie Reservoir, Texas, 2000, 2001, and 2002.

Gizzard Shad

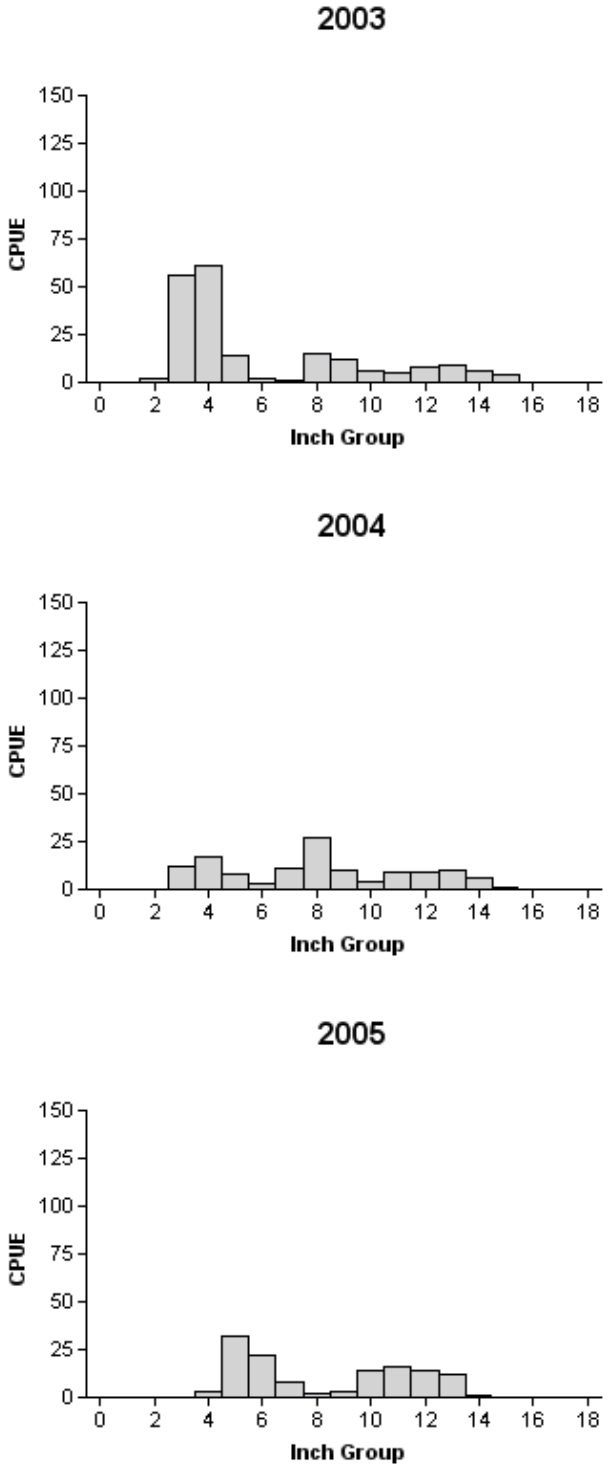
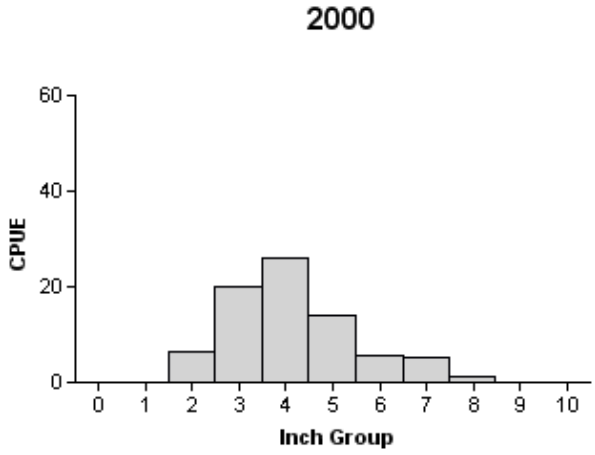
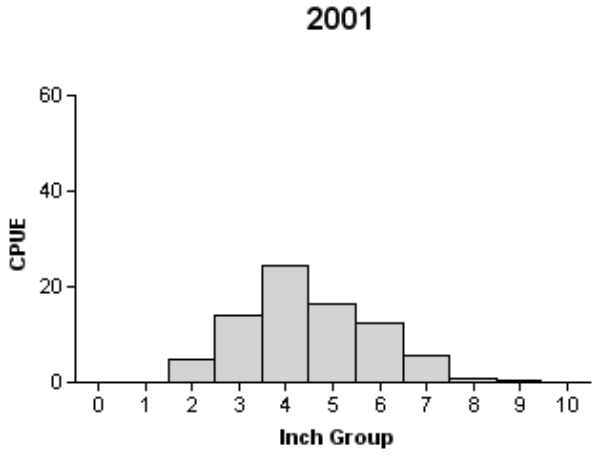


Figure 3. Number of gizzard shad caught per hour (CPUE) and population indices (RSE and N are in parentheses) for fall electrofishing surveys, O. H. Ivie Reservoir, Texas, 2003, 2004, and 2005.

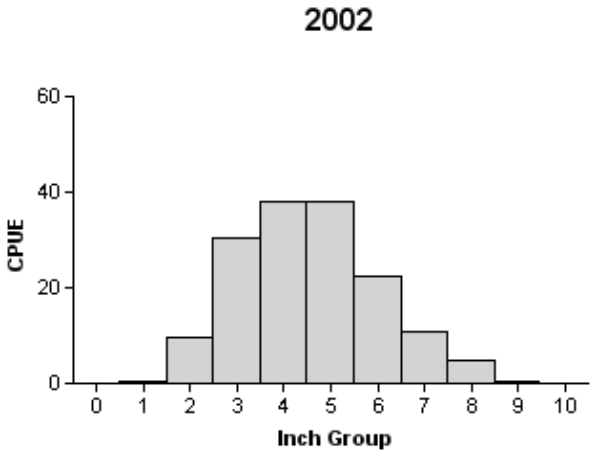
Bluegill



Effort = 1.9
Total CPUE = 78.3 (24; 150)
PSD = 17.0 (0.05)



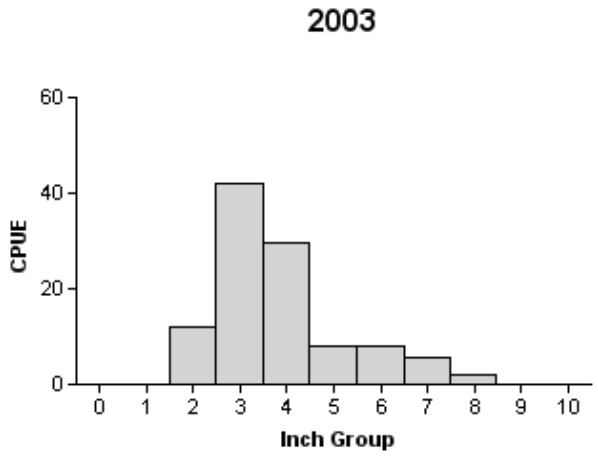
Effort = 2.0
Total CPUE = 79.5 (18; 159)
PSD = 26.0 (0.04)



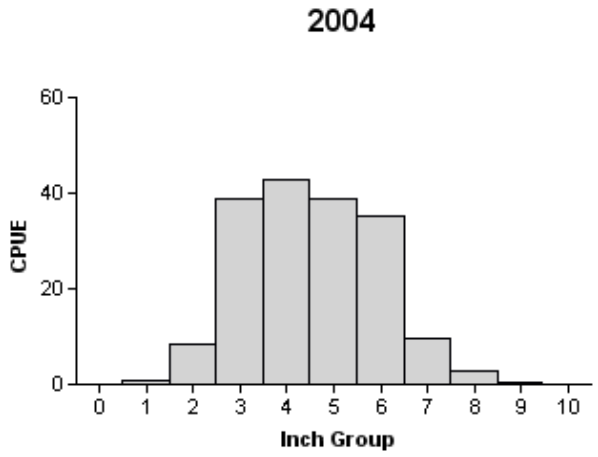
Effort = 2.0
Total CPUE = 155.5 (20; 311)
PSD = 27.0 (0.03)

Figure 4. Number of bluegill caught per hour (CPUE) and population indices (RSE and N are in parentheses) for fall electrofishing surveys, O. H. Ivie Reservoir, Texas, 2000, 2001, and 2002.

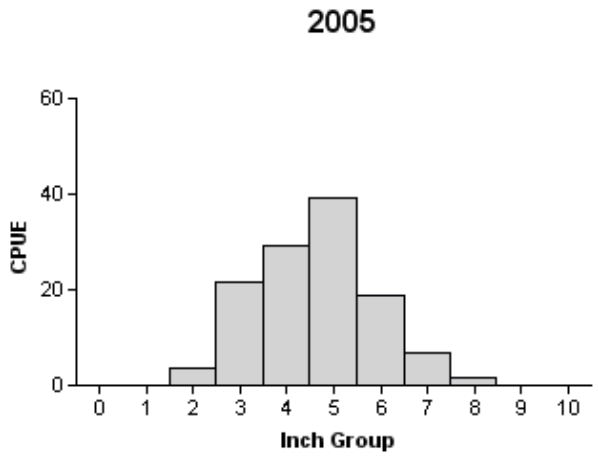
Bluegill



Effort = 2.0
Total CPUE = 107.0 (23; 214)
PSD = 16.0 (0.04)



Effort = 2.7
Total CPUE = 177.8 (12; 474)
PSD = 29.0 (0.04)



Effort = 2.5
Total CPUE = 120.8 (21; 302)
PSD = 23.0 (0.03)

Figure 5. Number of bluegill caught per hour (CPUE) and population indices (RSE and N are in parentheses) for fall electrofishing surveys, O. H. Ivie Reservoir, Texas, 2003, 2004, and 2005.

Bluegill

Table 7. Creel survey statistics for bluegill at O. H. Ivie Reservoir from June 2002 through May 2003, June 2003 through May 2004, June 2004 through May 2005, and June 2005 through May 2006, where total catch per hour is for anglers targeting bluegill and total harvest is the estimated number of bluegill harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel Survey Statistic	Year			
	2002/2003	2003/2004	2004/2005	2005/2006
Directed effort (h)	2,251.80 (52)	737.10 (86)	81.83 (66)	0 (NA)
Directed effort/acre	0.23 (52)	0.08 (86)	0.01 (66)	0 (NA)
Total catch per hour	1.07 (10)	1.56 (64)	0.00 (NA)	NA (NA)
Total harvest	2,022.39 (70)	1,073.65 (121)	786.07 (111)	0 (NA)
Harvest/acre	0.21 (70)	0.11 (121)	0.08 (111)	0 (NA)
Percent legal released	63.5	68.5	34.0	NA

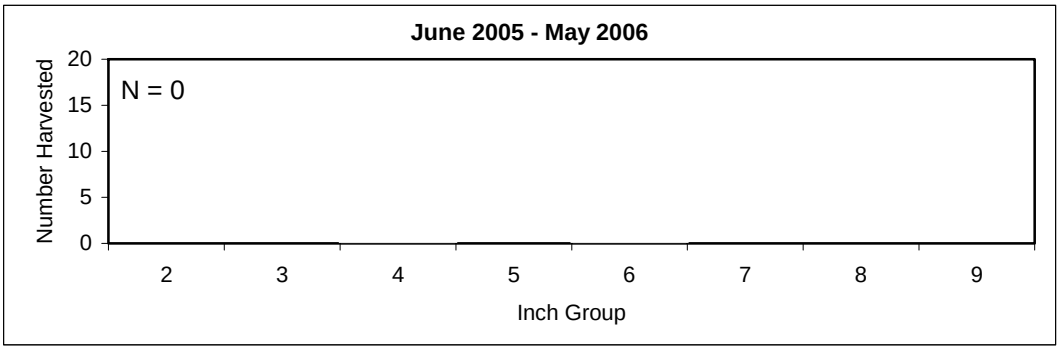


Figure 6. Length frequency of harvested bluegill observed during creel surveys at O. H. Ivie Reservoir, Texas, June 2005 through May 2006, all anglers combined. N is the number of harvested bluegill observed during creel surveys.

Bluegill

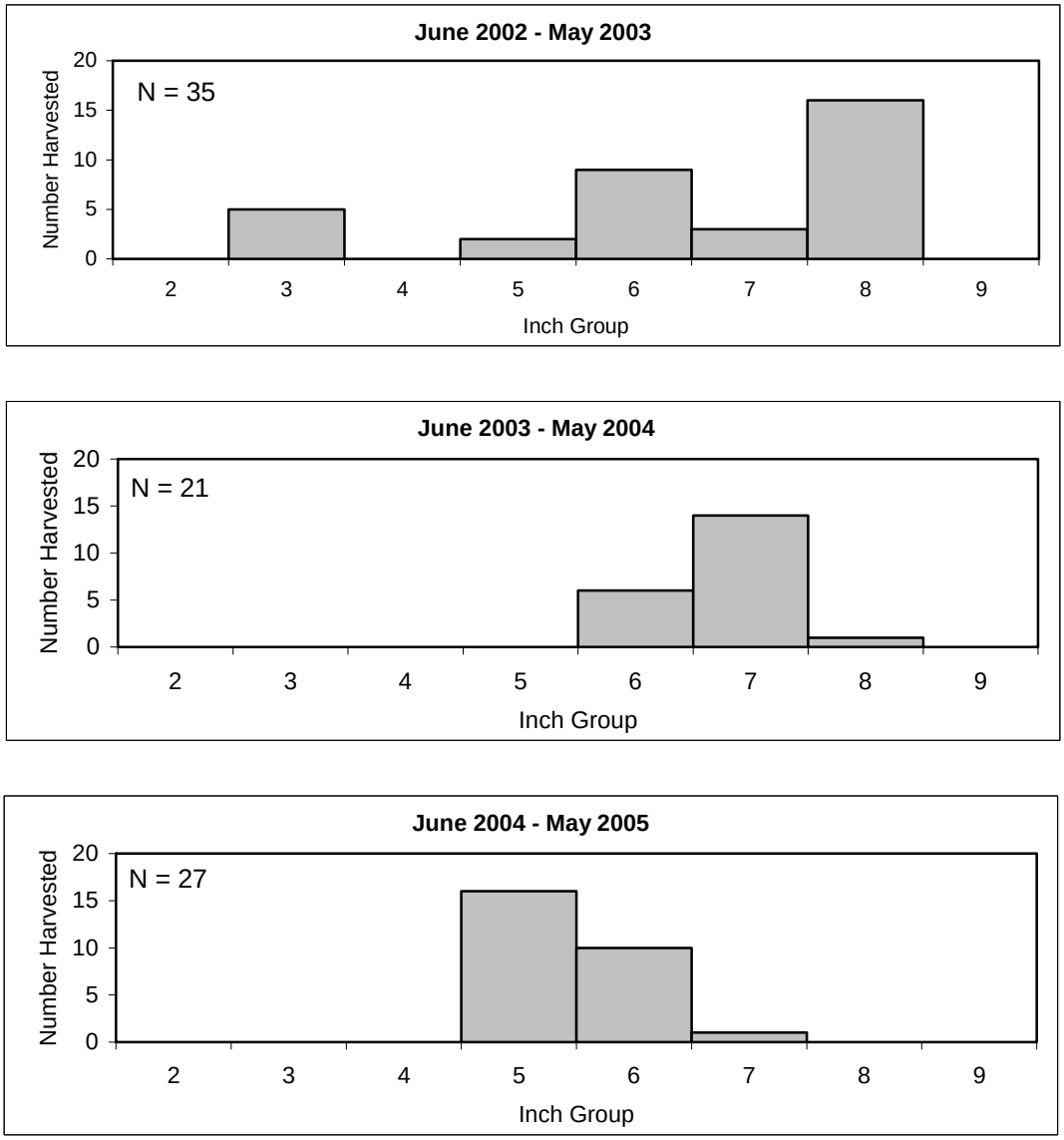


Figure 7. Length frequency of harvested bluegill observed during creel surveys at O. H. Ivie Reservoir, Texas, June 2002 through May 2003, June 2003 through May 2004, and June 2004 through May 2005, all anglers combined. N is the number of harvested bluegill observed during creel surveys.

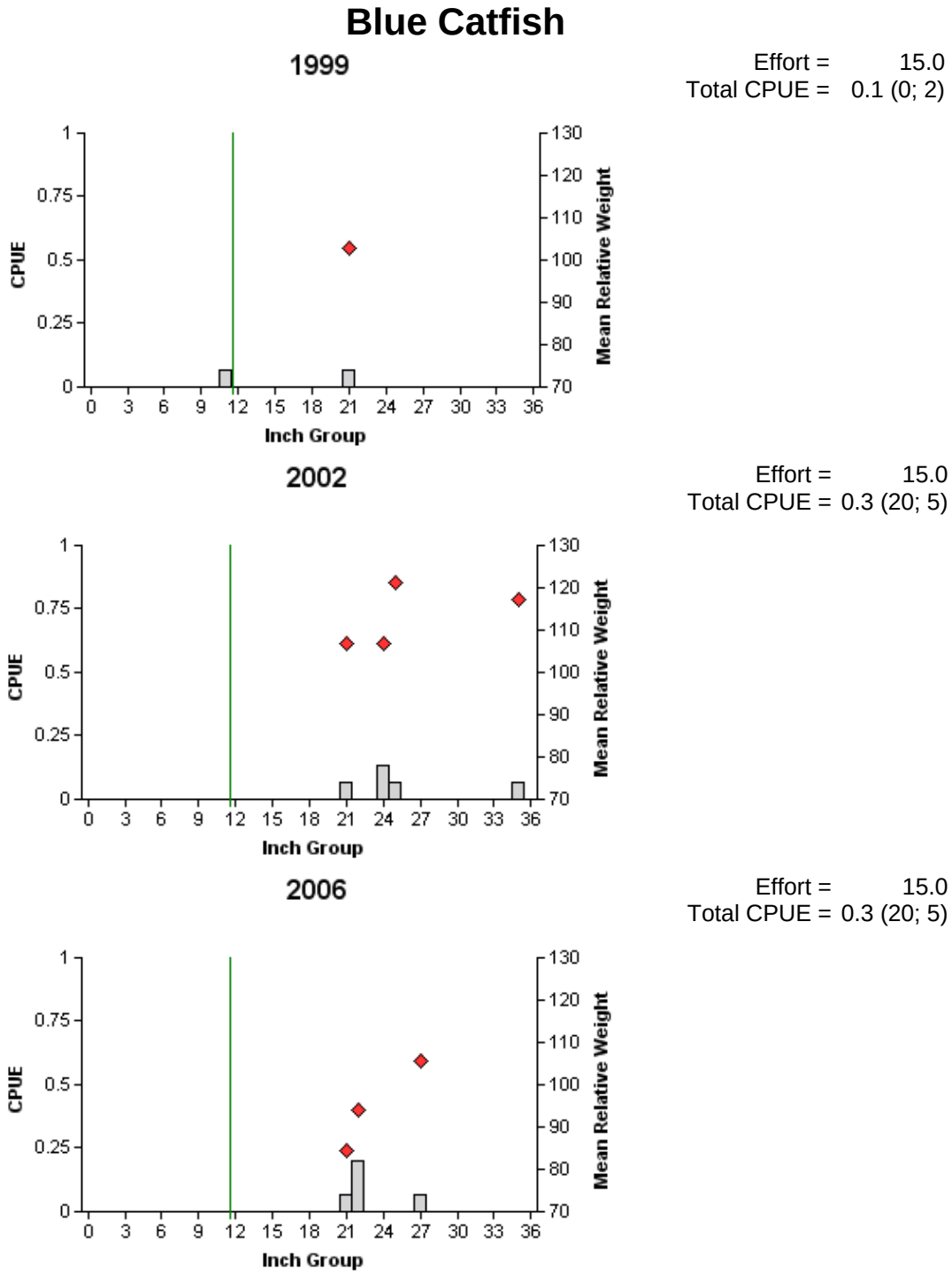


Figure 8. Number of blue catfish caught per net night (CPUE), mean relative weight (diamonds), and population indices (RSE and N are in parentheses) for spring gill net surveys, O. H. Ivie Reservoir, Texas, 1999, 2002, and 2006. Vertical line represents the minimum length limit.

Channel Catfish

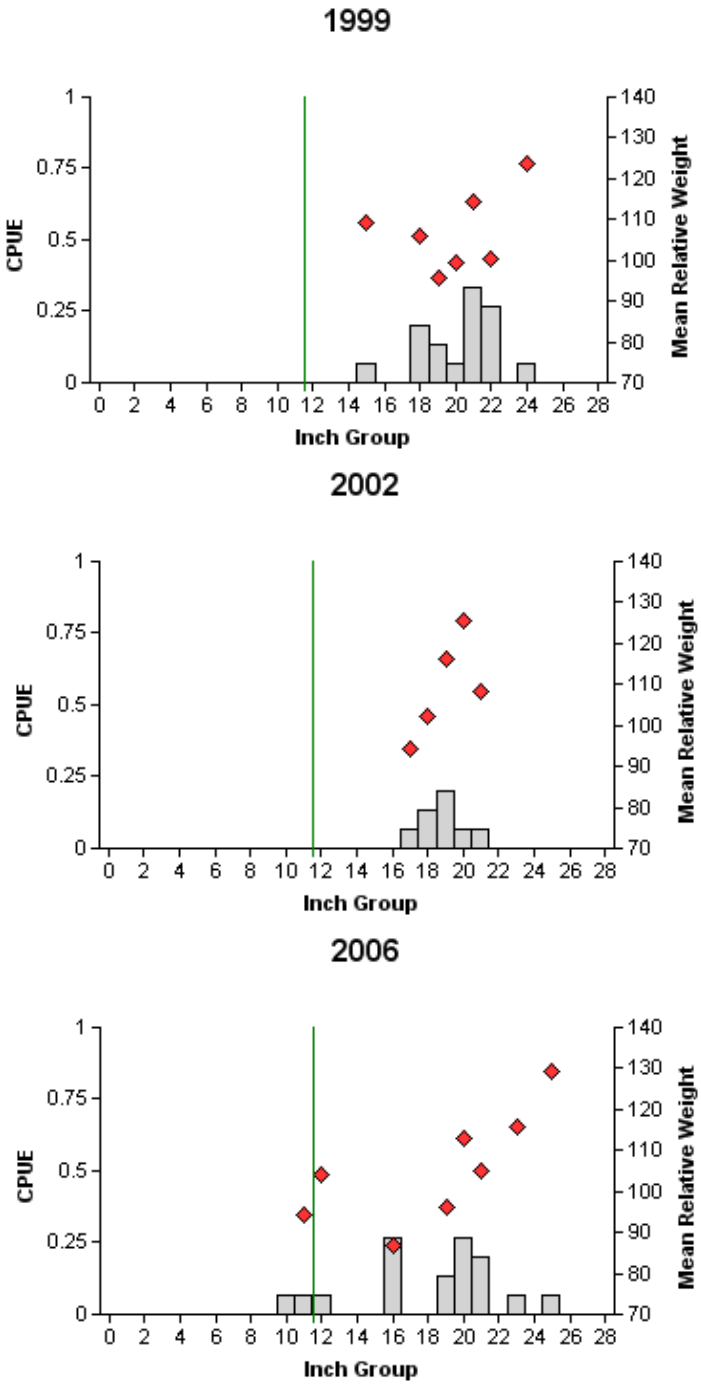


Figure 9. Number of channel catfish caught per net night (CPUE), mean relative weight (diamonds), and population indices (RSE and N are in parentheses) for spring gill net surveys, O. H. Ivie Reservoir, Texas, 1999, 2002, and 2006. Vertical line represents the minimum length limit.

Channel Catfish

Table 8. Creel survey statistics for channel catfish at O. H. Ivie Reservoir from June 2002 through May 2003, June 2003 through May 2004, June 2004 through May 2005, and June 2005 through May 2006, where total catch per hour is for anglers targeting channel catfish and total harvest is the estimated number of channel catfish harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel Survey Statistic	Year			
	2002/2003	2003/2004	2004/2005	2005/2006
Directed effort (h)	2,011.58 (47)	1,617.81 (60)	3,594.10 (30)	2,723.65 (40)
Directed effort/acre	0.21 (47)	0.17 (60)	0.39 (30)	0.23 (40)
Total catch per hour	0.16 (54)	0.79 (18)	0.60 (27)	0.28 (56)
Total harvest	232.40 (328)	474.65 (134)	3,752.28 (56)	1,279.66 (72)
Harvest/acre	0.02 (328)	0.05 (134)	0.40 (56)	0.11 (72)
Percent legal released	33.0	48.4	2.1	29.4

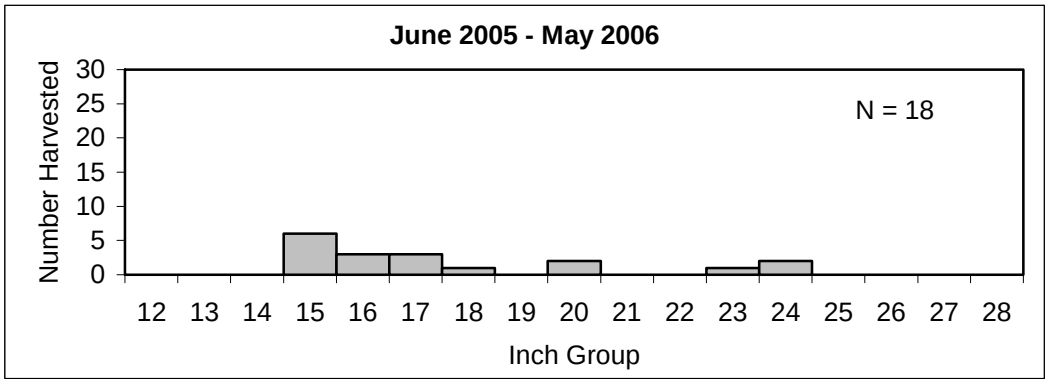
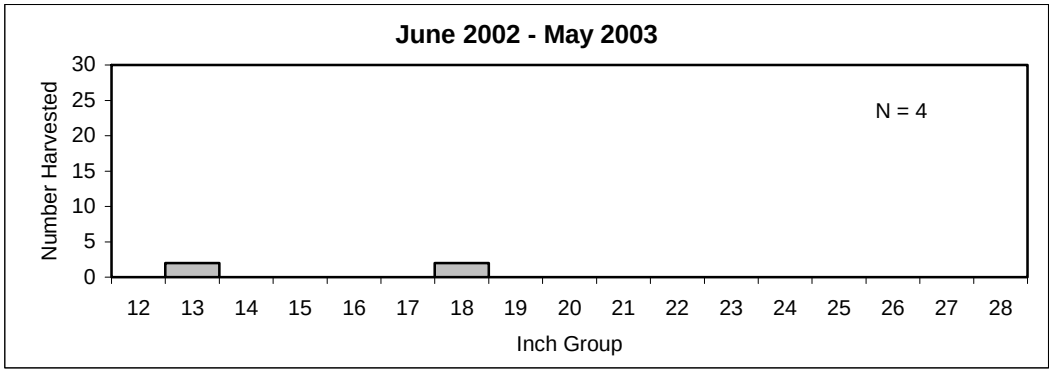
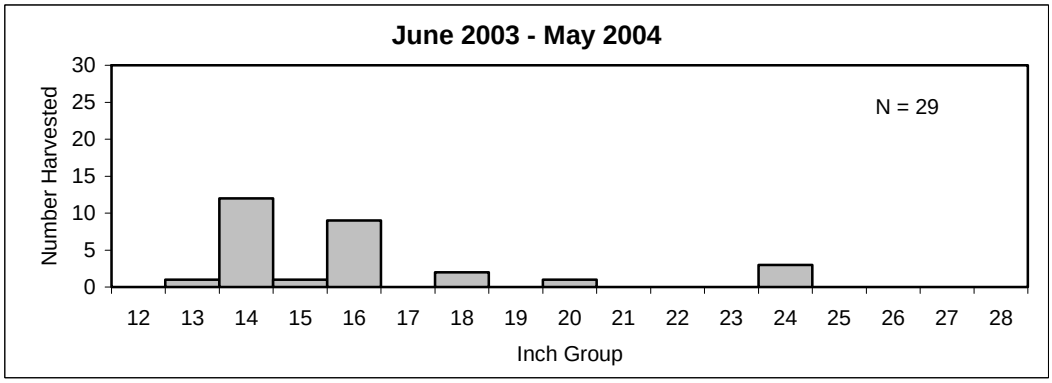


Figure 10. Length frequency of harvested channel catfish observed during creel surveys at O. H. Ivie Reservoir, Texas, June 2005 through May 2006, all anglers combined. N is the number of harvested channel catfish observed during creel surveys.

Channel Catfish





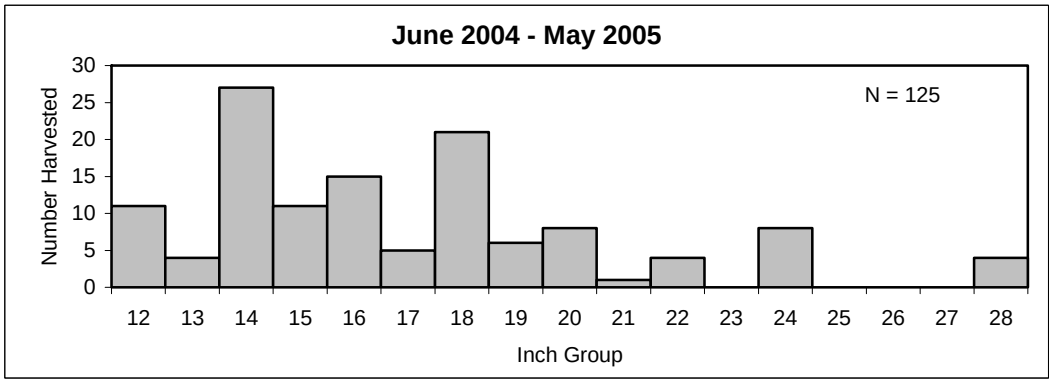


Figure 11. Length frequency of harvested channel catfish observed during creel surveys at O. H. Ivie Reservoir, Texas, June 2002 through May 2003, June 2003 through May 2004, and June 2004 through May 2005, all anglers combined. N is the number of harvested channel catfish observed during creel surveys.

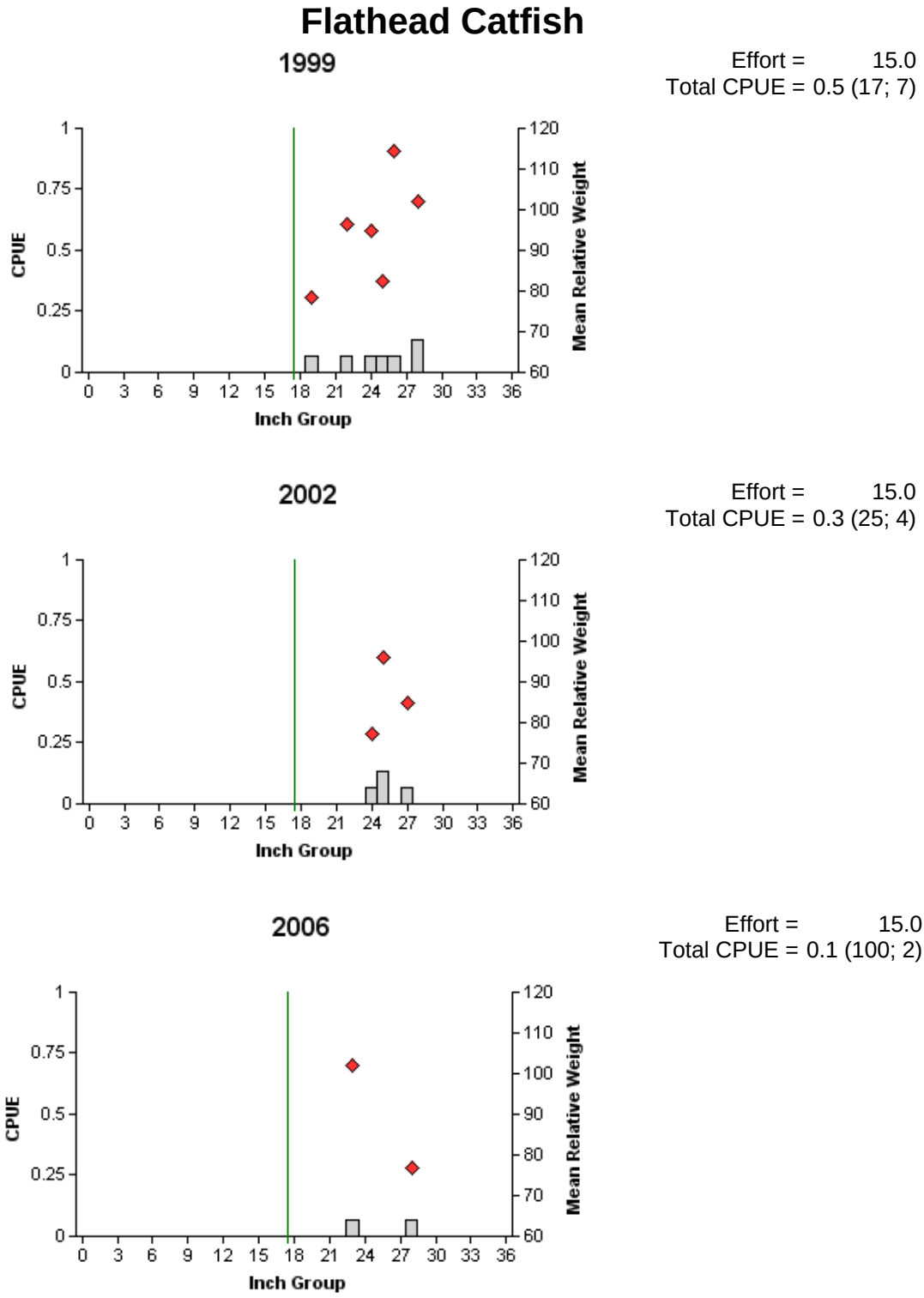


Figure 12. Number of flathead catfish caught per net night (CPUE), mean relative weight (diamonds), and population indices (RSE and N are in parentheses) for spring gill net surveys, O. H. Ivie Reservoir, Texas, 1999, 2002, and 2006. Vertical line represents the minimum length limit.

White Bass

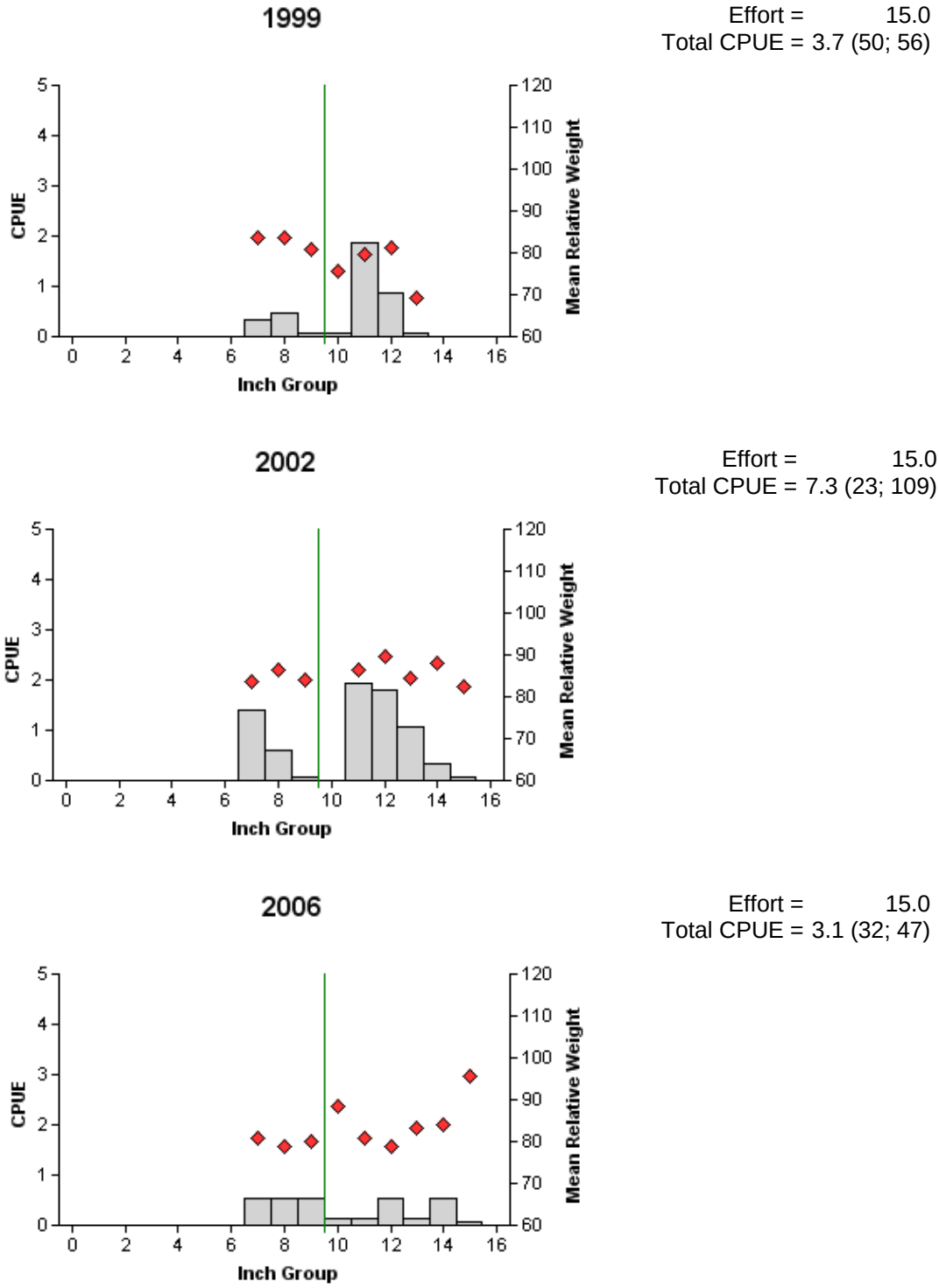


Figure 13. Number of white bass caught per net night (CPUE), mean relative weight (diamonds), and population indices (RSE and N are in parentheses) for spring gill net surveys, O. H. Ivie Reservoir, Texas, 1999, 2002, and 2006. Vertical line represents the minimum length limit.

White Bass

Table 9. Creel survey statistics for white bass at O. H. Ivie Reservoir from June 2002 through May 2003, June 2003 through May 2004, June 2004 through May 2005, and June 2005 through May 2006, where total catch per hour is for anglers targeting white bass and total harvest is the estimated number of white bass harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel Survey Statistic	Year			
	2002/2003	2003/2004	2004/2005	2005/2006
Directed effort (h)	7,027.44 (31)	2,271.03 (53)	3,664.00 (32)	6,821.50 (30)
Directed effort/acre	0.73 (31)	0.24 (53)	0.39 (32)	0.56 (30)
Total catch per hour	0.66 (39)	1.21 (30)	2.07 (28)	1.27 (33)
Total harvest	5,160.97(39)	1,112.94 (73)	9,429.33 (39)	20,054.15 (75)
Harvest/acre	0.53 (39)	0.11 (73)	1.01 (39)	1.66 (75)
Percent legal released	36.4	84.9	11.5	9.9

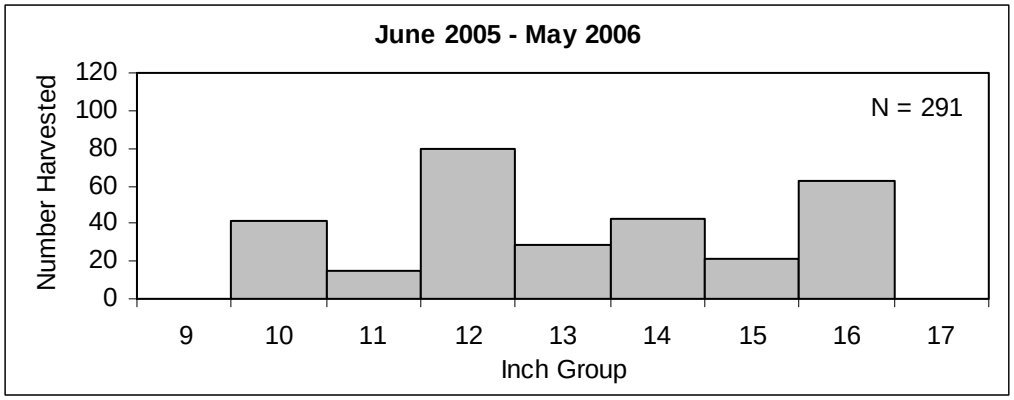


Figure 14. Length frequency of harvested white bass observed during creel surveys at O. H. Ivie Reservoir, Texas, June 2005 through May 2006, all anglers combined. N is the number of harvested white bass observed during creel surveys, and TH is the total estimated harvest for the creel period.

White Bass

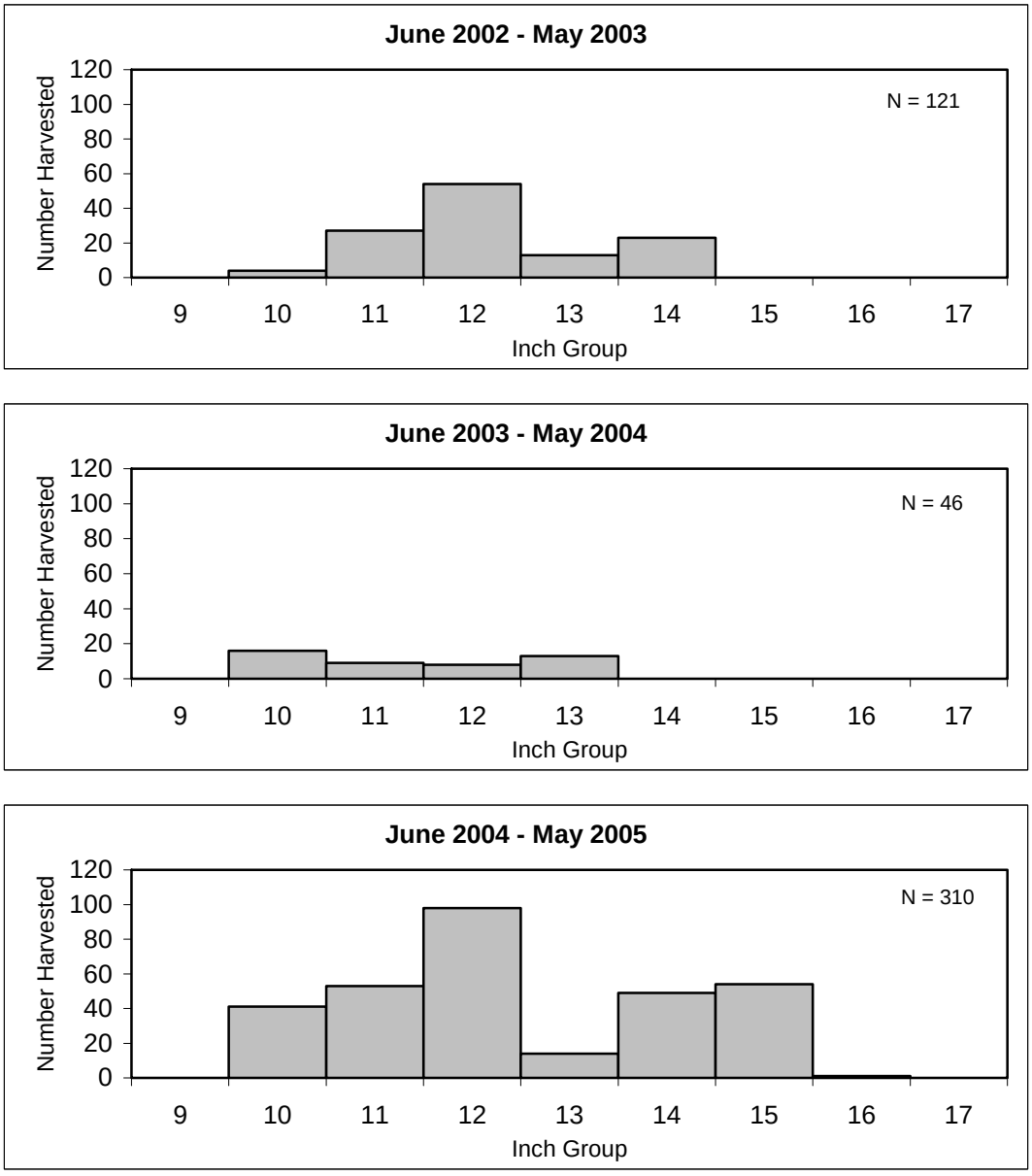


Figure 15. Length frequency of harvested white bass observed during creel surveys at O. H. Ivie Reservoir, Texas, June 2002 through May 2003, June 2003 through May 2004, and June 2004 through May 2005, all anglers combined. N is the number of harvested white bass observed during creel surveys.

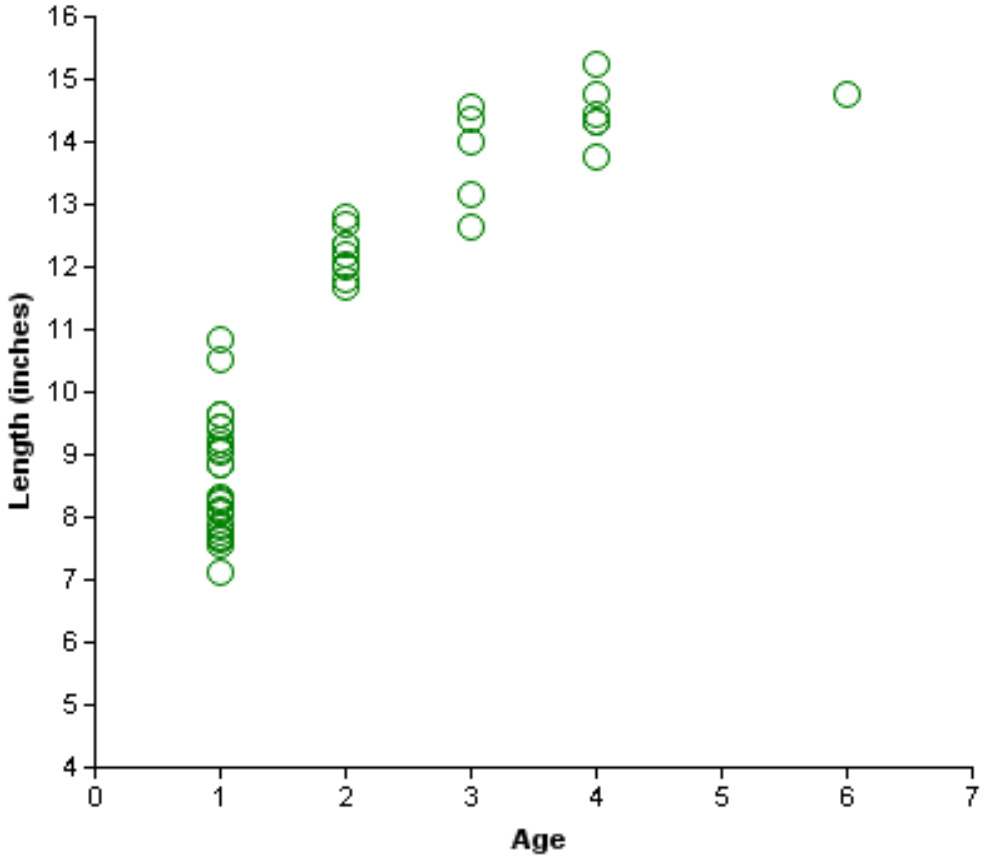
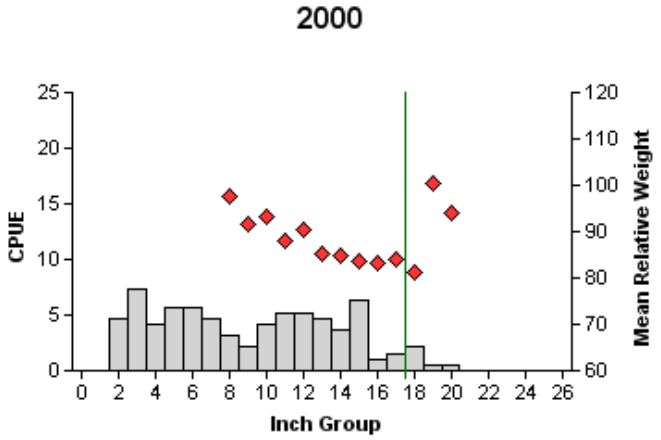
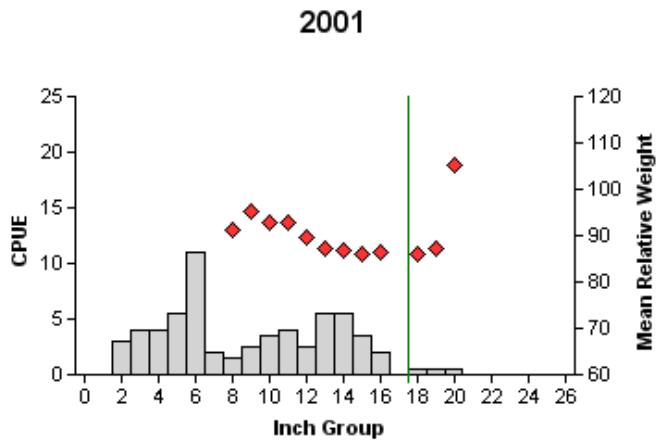


Figure 16. Length at age (years) for white bass collected by gill netting at O. H. Ivie Reservoir, Texas, April 2006.

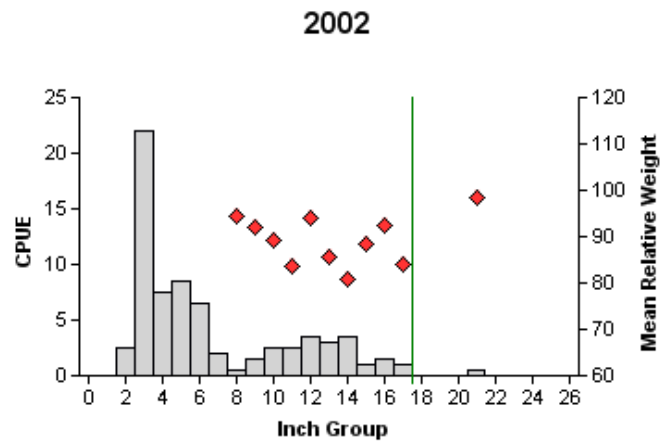
Largemouth Bass



Effort =	1.9
Total CPUE =	72.5 (17; 139)
Stock CPUE =	40.2 (17; 77)
CPUE-14 =	15.7 (19; 30)
CPUE-18 =	3.1 (35; 6)
PSD =	64.0 (0.07)
RSD-18 =	8.0 (0.03)



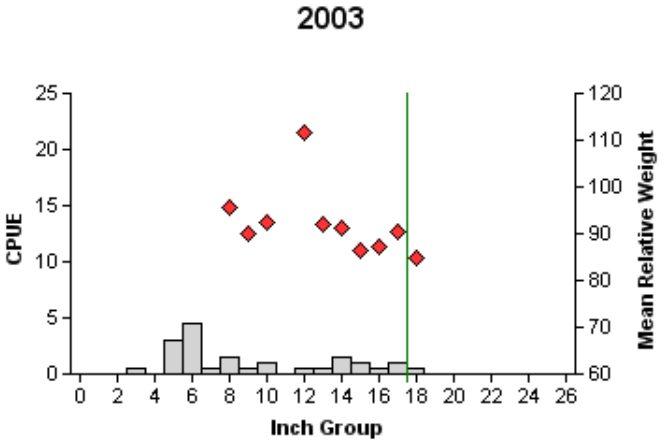
Effort =	2.0
Total CPUE =	61.5 (20; 123)
Stock CPUE =	32.0 (16; 64)
CPUE-14 =	12.5 (19; 25)
CPUE-18 =	1.5 (54; 3)
PSD =	64.0 (0.10)
RSD-18 =	5.0 (0.03)



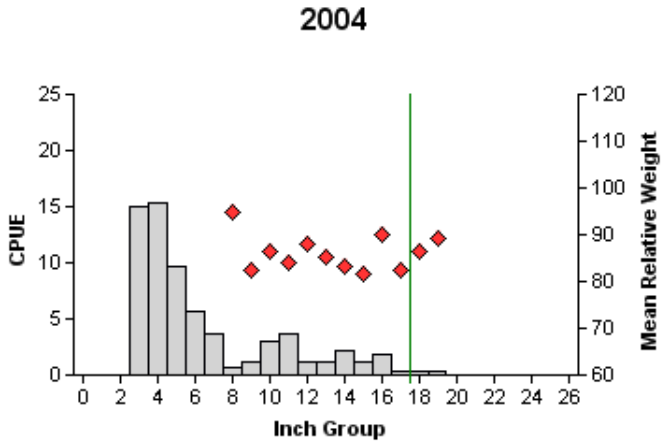
Effort =	2.0
Total CPUE =	70.0 (16; 140)
Stock CPUE =	21.0 (19; 42)
CPUE-14 =	7.5 (28; 15)
CPUE-18 =	0.5 (100; 1)
PSD =	67.0 (0.1)
RSD-18 =	2.0 (0.02)

Figure 17. Number of largemouth bass caught per hour (CPUE), mean relative weight (diamonds), and population indices (RSE and N are in parentheses) for fall electrofishing surveys, O. H. Ivie Reservoir, Texas, 2000, 2001, and 2002. Vertical line represents the length limit demarcation.

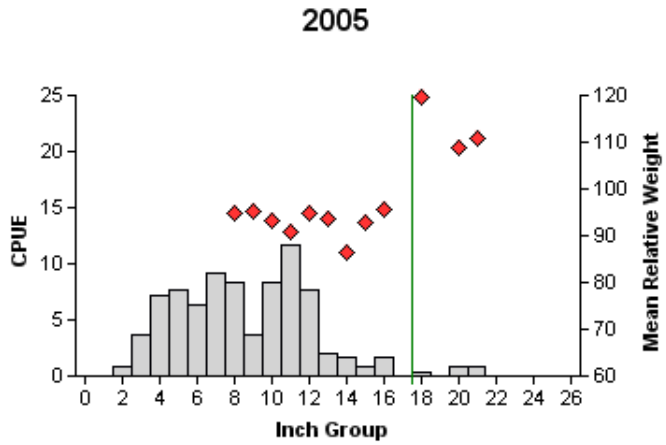
Largemouth Bass



Effort =	2.0
Total CPUE =	17.0 (22; 34)
Stock CPUE =	8.5 (29; 17)
CPUE-14 =	4.5 (29; 9)
CPUE-18 =	0.5 (100; 1)
PSD =	65.0 (0.11)
RSD-18 =	6.0 (0.06)



Effort =	2.7
Total CPUE =	66.7 (18; 178)
Stock CPUE =	17.3 (20; 46)
CPUE-14 =	6.4 (24; 17)
CPUE-18 =	0.8 (69; 2)
PSD =	50.0 (0.08)
RSD-18 =	4.0 (0.03)



Effort =	2.5
Total CPUE =	82.4 (12; 206)
Stock CPUE =	47.6 (16; 119)
CPUE-14 =	6.0 (25; 15)
CPUE-18 =	2.0 (40; 5)
PSD =	33.0 (0.05)
RSD-18 =	4.0 (0.01)

Figure 18. Number of largemouth bass caught per hour (CPUE), mean relative weight (diamonds), and population indices (RSE and N are in parentheses) for fall electrofishing surveys, O. H. Ivie Reservoir, Texas, 2003, 2004, and 2005. Vertical line represents the length limit demarcation.

Largemouth Bass

Table 10. Creel survey statistics for largemouth bass at O. H. Ivie Reservoir from June 2002 through May 2003, June 2003 through May 2004, June 2004 through May 2005, and June 2005 through May 2006, where total catch per hour is for anglers targeting largemouth bass and total harvest is the estimated number of largemouth bass harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel Survey Statistic	Year			
	2002/2003	2003/2004	2004/2005	2005/2006
Directed effort (h)	83,694.65 (19)	81,393.05 (26)	50,535.04 (17)	41,433.72 (40)
Directed effort/acre	8.65 (19)	8.73 (26)	5.42 (17)	3.42 (40)
Total catch per hour	0.32 (15)	0.24 (13)	0.30 (13)	0.78 (15)
Total harvest	8,745.52 (32)	4,687.76 (55)	7,180.80 (36)	1,230.17 (63)
Harvest/acre	0.90 (32)	0.48 (55)	0.77 (36)	0.10 (63)
Percent legal released	85.9	81.4	68.2	96.4

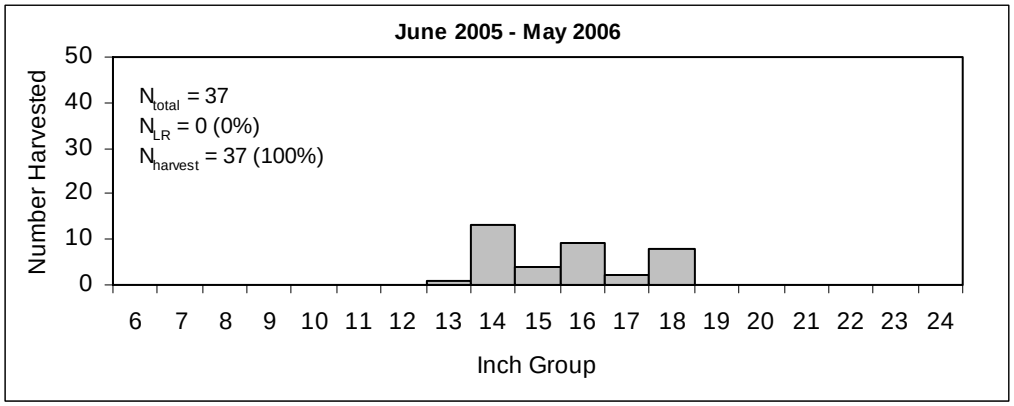


Figure 19. Length frequency of harvested largemouth bass observed during creel surveys at O. H. Ivie Reservoir, Texas, June 2005 through May 2006, all anglers combined. N_{total} is the total number of largemouth bass observed during the angler creel survey. N_{LR} is the number of largemouth bass observed during creel surveys in possession by tournament anglers and later released. $N_{harvest}$ is the number of harvested largemouth bass observed during creel surveys.

Largemouth Bass

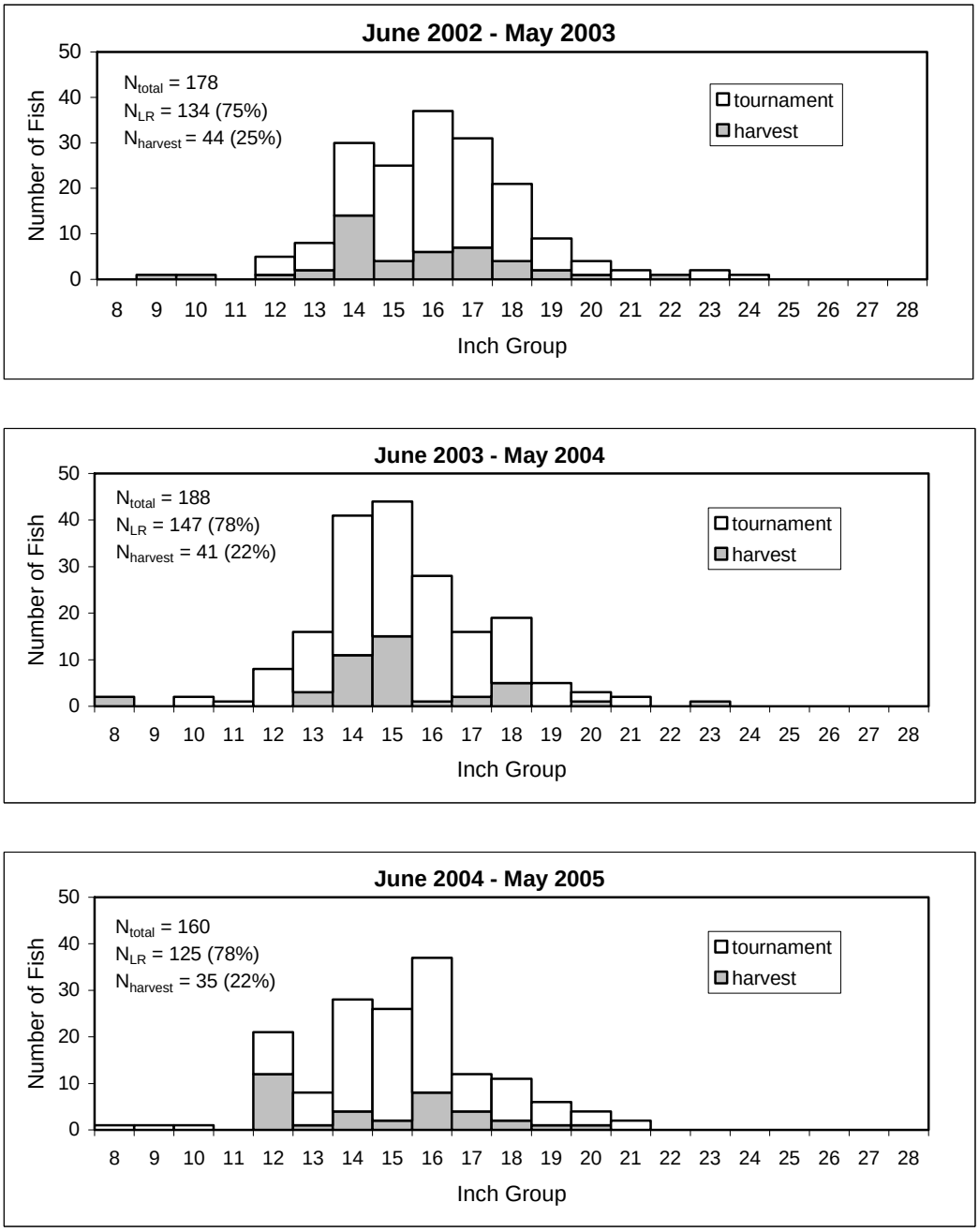


Figure 20. Length frequency of harvested largemouth bass observed during creel surveys at O. H. Ivie Reservoir, Texas, June 2002 through May 2003, June 2003 through May 2004, and June 2004 through May 2005, all anglers combined. N_{total} is the total number of largemouth bass observed during the angler creel survey. N_{LR} is the number of largemouth bass observed during creel surveys in possession by tournament anglers and later released. $N_{harvest}$ is the number of harvested largemouth bass observed during creel surveys.

Table 11. Results of genetic analysis of largemouth bass collected by fall electrofishing, O. H. Ivie Reservoir, Texas, 1996, 1999, 2002, 2004, and 2005. FLMB = Florida largemouth bass, NLMB = Northern largemouth bass, F1 = first generation hybrid between a FLMB and a NLMB, Fx = second or higher generation hybrid between a FLMB and a NLMB.

		Genotype					
Year	Sample size	FLMB	F1	Fx	NLMB	% FLMB alleles	% pure FLMB
1996	15	8	1	5	0	82.8	53.3
1999	30	7	6	15	2	60.8	23.3
2002	45	13	8	24	0	73.9	28.9
2004	30	17	1	11	0	85.6	58.6
2005	95	23	4	68	0	76.2	24.0

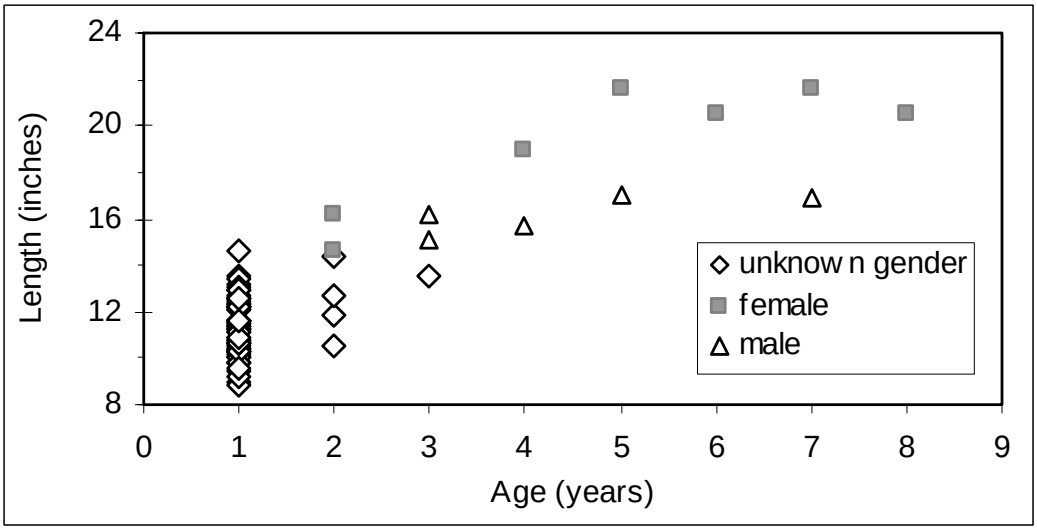


Figure 21. Length at age for largemouth bass collected by electrofishing at O. H. Ivie Reservoir, Texas, October 2005, by fish gender.

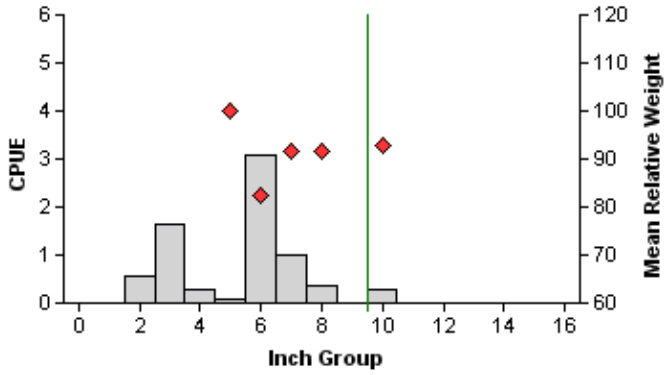
Table 12. Mean relative weight and sample size (N) or largemouth bass in size-classes (inches) collected from fall electrofishing surveys, O. H. Ivie Reservoir, Texas, 1999, 2000, and 2005. Years (1999 and 2000) prior to 2005 when stockpiling of largemouth bass between 14 and 18 inches was problematic (Farquhar and Dennis 2000) are included for comparison.

Year	Mean relative weight and number (N) in size-classes (inches)		
	8.0 – 11.9	12.0 – 14.9	15.0 – 20.0
1999	83.2 (N = 22)	75.8 (N = 26)	77.7 (N = 21)
2000	88.8 (N = 28)	86.1 (N = 26)	84.5 (N = 22)
2005	89.7 (N = 76)	92.0 (N = 28)	99.0 (N = 7)

White Crappie

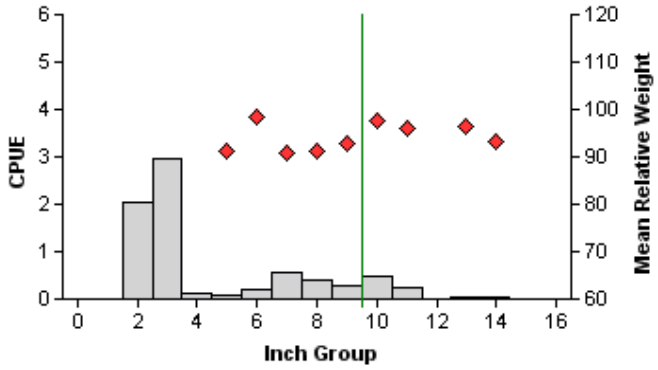
2001

Effort = 14.0
Total CPUE = 7.3 (37; 102)
Stock CPUE = 4.8 (60; 67)



2003

Effort = 22.0
Total CPUE = 7.5 (39; 164)
Stock CPUE = 2.3 (27; 51)



2005

Effort = 15.0
Total CPUE = 10.7 (80; 161)
Stock CPUE = .8 (49; 12)

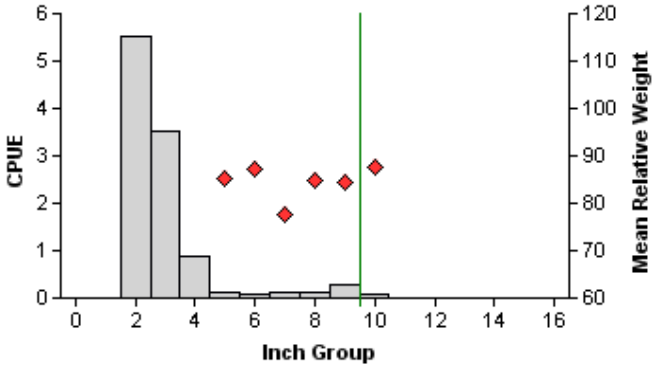


Figure 22. Number of white crappie caught per net night (CPUE), mean relative weight (diamonds), and population indices (RSE and N are in parentheses) for fall trap netting surveys, O. H. Ivie Reservoir, Texas, 2001, 2003, and 2005. Vertical line represents the minimum length limit.

White Crappie

Table 13. Creel survey statistics for white crappie at O. H. Ivie Reservoir from June 2002 through May 2003, June 2003 through May 2004, June 2004 through May 2005, and June 2005 through May 2006, where total catch per hour is for anglers targeting white crappie and total harvest is the estimated number of white crappie harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel Survey Statistic	Year			
	2002/2003	2003/2004	2004/2005	2005/2006
Directed effort (h)	15,265.74 (27)	9,550.14 (44)	10,000.97 (24)	18,085.54 (36)
Directed effort/acre	1.58 (27)	1.02 (44)	1.07 (24)	1.49 (36)
Total catch per hour	1.04 (36)	0.70 (49)	0.63 (33)	0.58 (35)
Total harvest	9,873.01 (45)	2,656.76 (70)	7,300.82 (40)	6,512.55 (52)
Harvest/acre	1.02 (45)	0.27 (70)	0.78 (40)	0.54 (52)
Percent legal released	7.0	46.2	16.9	16.5

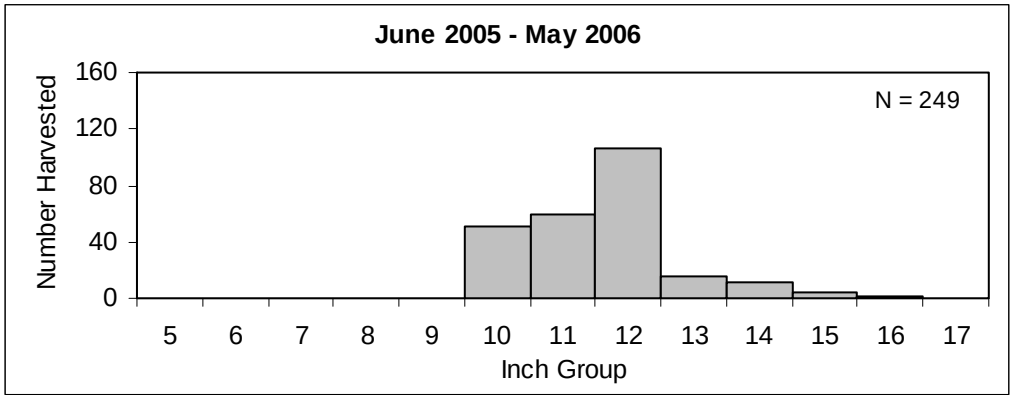


Figure 23. Length frequency of harvested white crappie observed during creel surveys at O. H. Ivie Reservoir, Texas, June 2005 through May 2006, all anglers combined. N is the number of harvested white crappie observed during creel surveys.

White Crappie

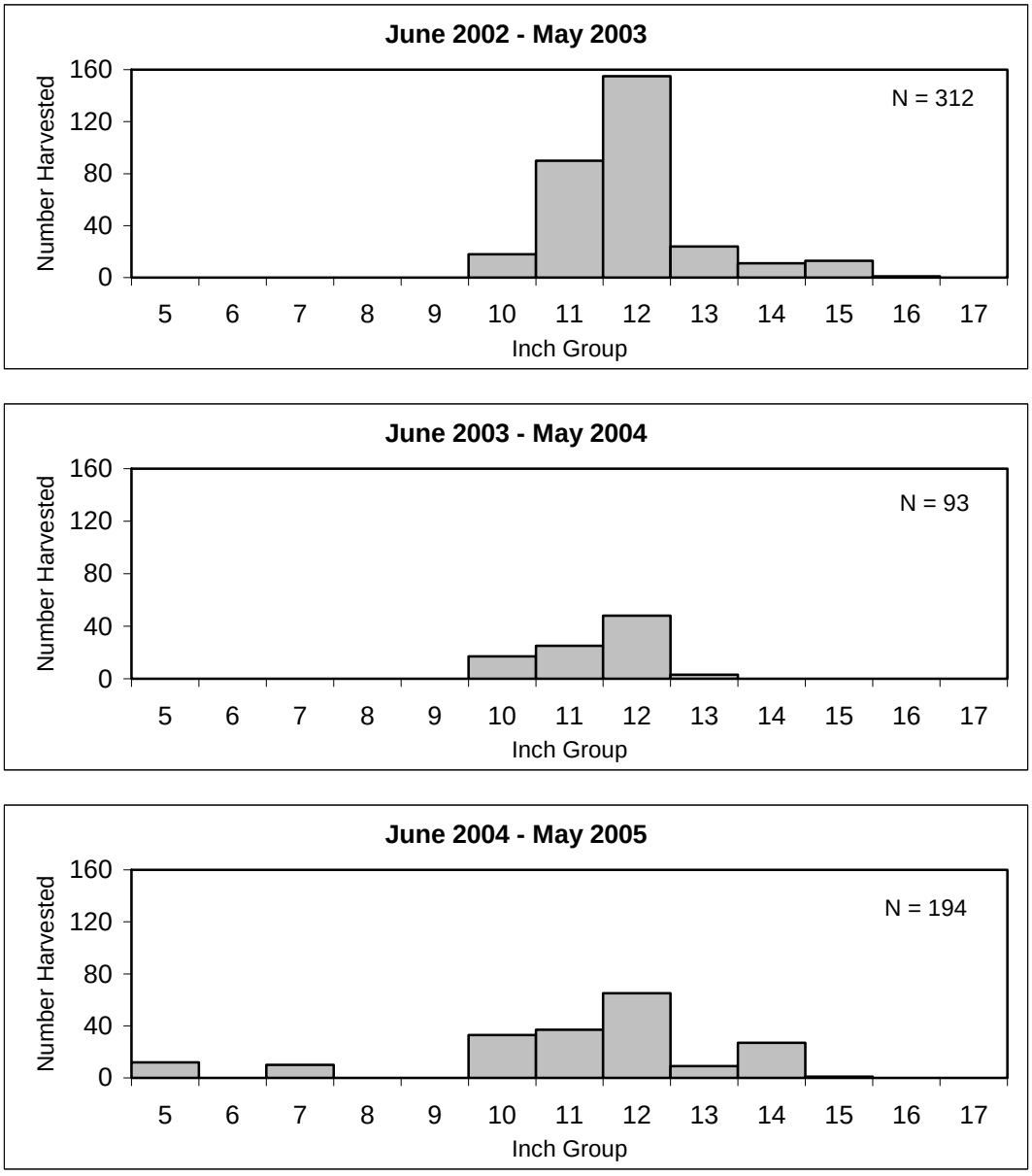


Figure 24. Length frequency of harvested white crappie observed during creel surveys at O. H. Ivie Reservoir, Texas, June 2002 through May 2003, June 2003 through May 2004, and June 2004 through May 2005, all anglers combined. N is the number of harvested white crappie observed during creel surveys.

Table 14. Proposed sampling schedule for O. H. Ivie Reservoir, Texas. Gill netting surveys are conducted in the spring, while electrofishing and trap netting surveys are conducted in the fall. Standard survey denoted by S and additional survey denoted by A.

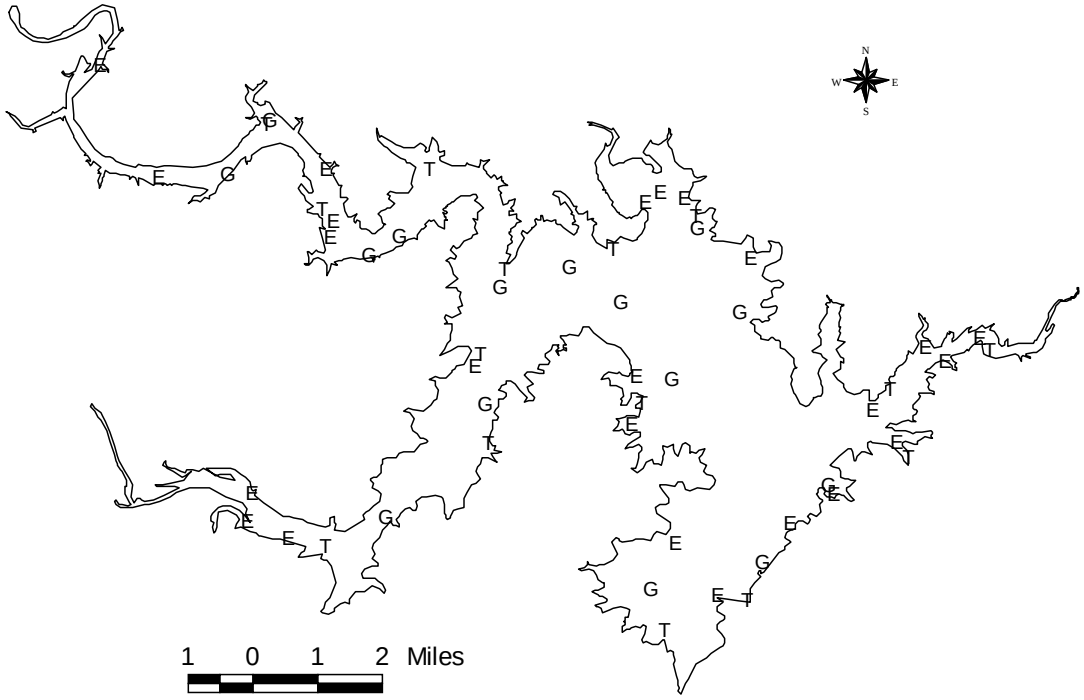
Survey Year	Electrofisher	Trap Net	Gill Net	Creel Survey	Report
Fall 2006-Spring 2007	S			S	
Fall 2007-Spring 2008	S	A		S	
Fall 2008-Spring 2009	S			S	
Fall 2009-Spring 2010	S	A	S	S	S

APPENDIX A

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

Species	Gill Netting		Trap Netting		Electrofishing	
	N	CPUE	N	CPUE	N	CPUE
Longnose gar	162	10.8				
Gizzard shad	537	35.8			315	126.0
Threadfin shad					12	4.8
Common carp	108	7.2				
River carpsucker	37	2.5				
Blue catfish	5	0.3				
Channel catfish	18	1.2	2	0.1		
Flathead catfish	2	0.1				
White bass	50	3.3			17	6.8
Green sunfish			3	0.2	2	0.8
Warmouth			1	0.1	15	6.0
Bluegill	7	0.5	195	13.0	302	120.8
Longear sunfish	1	0.1	26	1.7	15	6.0
Redear sunfish	2	0.1	11	0.7	16	6.4
Largemouth bass	53	3.5			206	82.4
White crappie	4	0.3	161	10.7	17	6.8
Freshwater drum	15	1.0			1	0.4

APPENDIX B



Location of sampling sites, O. H. Ivie Reservoir, Texas, 2005-2006. Trap net, gill net, and electrofishing stations are indicated by T, G, and E, respectively. Water level was approximately 17 feet below conservation pool at time of sampling.