

PERFORMANCE REPORT

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FEDERAL AID IN SPORT FISH RESTORATION ACT

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FEDERAL AID PROJECT F-221-M-4

INLAND FISHERIES DIVISION MONITORING AND MANAGEMENT PROGRAM

2013 Fisheries Management Survey Report

Lake Raven

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SURVEY AND MANAGEMENT SUMMARY

Fish populations in Lake Raven were surveyed in 2013 using electrofishing and trap netting and in 2014 using gill netting. Anglers were surveyed from March 2013 through May 2013 with a creel survey. Historical data are presented with the 2013-2014 data for comparison. This report summarizes the results of the surveys and contains a management plan for the reservoir based on those findings.

- **Reservoir Description:** Lake Raven is a 203-acre reservoir located in Huntsville State Park. The reservoir was repaired and re-impounded in 1956 by the Texas Parks & Wildlife Department for recreational use.
- **Management History:** Lake Raven has a history of producing trophy Largemouth Bass. The population has been managed with a catch-and-release regulation since September 1996. The regulation allows the angler to retain Largemouth Bass measuring ≥ 24 inches for weighing on a personal scale in the boat with subsequent release or, if weighing 13 pounds or more, donation into the Toyota ShareLunker Program. Lake Raven has been included in the Operation World Record (OWR) program, a project designed to compare growth of selectively-bred ShareLunker Largemouth Bass fingerlings to resident bass fingerlings.

Alligatorweed, hydrilla, giant salvinia and water hyacinth have all been problem exotic plants to varying degrees at different times. Aquathol, Galleon, Glyphosate, Diquat, and Stingray have all been used for chemical treatments. In addition, Grass Carp, hydrilla flies, and alligator weed flea beetles have been used as biological control agents. Mechanical control and manual removal have also been used as part of an integrated pest management approach.

- **Fish Community**
 - **Prey species:** The prey fish community at Lake Raven consisted primarily of Threadfin Shad, Bluegill, and Redear Sunfish. Gizzard Shad were also present but provided limited forage.
 - **Catfishes:** Blue and Channel Catfish were present in Lake Raven as a result of stocking but the populations have not maintained themselves through natural reproduction and recruitment.
 - **Largemouth Bass:** Largemouth Bass were abundant in Lake Raven and provided high quality angling opportunities. The lake has a history of producing trophy Largemouth Bass. Lake Raven has received periodic stockings of ShareLunker offspring as part of the OWR program.
 - **Crappies:** Crappies were present but not a significant component of the fishery at Lake Raven. Trap net catches in monitoring surveys have been low.
- **Management Strategies:** We will monitor the Largemouth Bass population every two years in the fall with electrofishing or as appropriate as part of the OWR program. Largemouth Bass genetics will be assessed, and additional ShareLunker Largemouth Bass fingerlings will be stocked as dictated by the OWR program. Crappie populations will also be monitored during electrofishing surveys. Catfish populations will be monitored every 4 years by gill nets with surplus catfish fingerlings requested for stocking when available. An access point creel survey will be conducted in the spring of 2017. We will continue to work with park personnel to assess exotic vegetation coverage and implement treatment strategies including native vegetation plantings and bio-control efforts as needed.

INTRODUCTION

This document is a summary of fisheries data collected from Lake Raven in 2013 through 2014. 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 fishes was collected, this report deals primarily with major sport fishes and important prey species. Historical data are presented with the 2013 through 2014 data for comparison.

Reservoir Description

Lake Raven is a 203-acre reservoir located within Huntsville State Park. Drainage area is approximately 1,556 square miles with rainfall in the watershed averaging 46.15 inches per year. The reservoir has a maximum depth of 28 feet, a mean depth of 6 feet, a shoreline length of 6.3 miles, and a shoreline development ratio of 2.3. Lake Raven lies within the Piney Woods Land Resource Area. Land use around the reservoir is recreational. Boat and bank access are excellent. Other descriptive characteristics from Lake Raven are found in Table 1.

Angler Access

Lake Raven is located entirely within Huntsville State Park and has one public boat ramp. The boat ramp was available to anglers throughout the period covered by this report. Additional boat ramp characteristics are presented in Table 2. Shoreline access is outstanding with the exception of times when overabundant nuisance aquatic vegetation limits casting from some areas of the shore. Two fishing piers located within campground areas are open to day use and are in good condition.

Management History

Previous management strategies and actions: Management strategies and actions from the previous survey report (Henson and Webb 2009) included:

1. Treat hydrilla in cooperation with Huntsville State Park personnel during the summer of 2010. Monitor hydrilla abundance annually and treat with herbicides as needed.
Action: Hydrilla has been surveyed annually at Lake Raven with herbicide treatments conducted by Inland Fisheries Staff whenever needed. 400 triploid Grass Carp were stocked into Lake Raven in fall of 2009 as part of the integrated pest management approach to hydrilla control.
2. Working with volunteers from Texas Black Bass Unlimited, manually remove giant salvinia and water hyacinth for disposal beginning in June 2010. Continue to closely monitor giant salvinia and water hyacinth.
Action: A volunteer exotic vegetation pick-up event was organized and instituted at Lake Raven with some success; however, giant salvinia and water hyacinth quickly spread beyond what volunteers could control with manual removal.
3. Assist Huntsville State Park personnel with an annual reservoir drawdown during January for vegetation control.
Action: Plans for an annual drawdown were never implemented due to concerns over drought conditions causing difficulty in refilling the reservoir.
4. Seek funding for enhancement of native aquatic vegetation population to provide both quality fish habitat and increased competition with exotic plant species.
Action: \$30,000 was received as part of a mitigation settlement from a fuel spill in Walker County. These funds were combined with TPWD's exotic vegetation control funds to institute native vegetation restoration as part of an integrated pest management approach to control nuisance aquatic vegetation at Lake Raven. A native aquatic

vegetation nursery has been constructed at the Snook Inland Fisheries Office to supply native aquatic plants for the project. Twelve species of plants are being raised at the nursery and planted into Lake Raven. An evaluation of the project is being conducted as a joint effort between TPWD and Texas A&M University.

5. Continue to manage the Largemouth Bass population under a catch-and-release regulation with the caveat that anglers may retain a bass 24 inches or greater for immediate weighing with a personal scale and release or donation to the ShareLunker Program (if qualifying).
Action: The Lake Raven Largemouth Bass population continues to be managed under the catch-and-release regulation.
6. Annually monitor the Largemouth Bass population relative abundance, size distribution, and condition with electrofishing.
Action: The Largemouth Bass population was monitored in the fall of 2010, 2012, and 2013. 2011 fall electrofishing was not conducted due to manpower constraints.
7. Continue to support Operation World Record (OWR) study.
Action: OWR Largemouth Bass fingerlings were stocked again in Lake Raven in 2013. District staff have assisted with subsequent sampling as part of the OWR evaluation.
8. Support efforts by Huntsville State Park personnel to obtain Largemouth Bass catch information through a volunteer creel.
Action: No volunteer creel survey is underway at Lake Raven. Implementation has not been logistically possible to date.
9. Conduct a spring creel survey from March through May 2014 to reassess angling effort.
Action: A spring creel survey was conducted in March through May 2013. Largemouth Bass were the most sought after species.
10. Work with Huntsville State Park Personnel to create a brochure highlighting all available fisheries. Include angling techniques and best areas to fish for different species.
Action: Although no specific angling brochure has been developed, Huntsville State Park has an updated park brochure including angling opportunities at Lake Raven.
11. Enhance fishing piers with lights and fish attracting structures to increase angler access to catfish and sunfish.
Action: Enhancements to fishing piers are still under consideration.
12. Monitor catfish populations with gill nets in the spring of 2014.
Action: Gill netting was conducted in the spring of 2014.
13. Monitor the sunfish populations by electrofishing in the fall of 2011 and 2013.
Action: Sunfish populations were monitored with electrofishing in fall of 2013. 2011 electrofishing was not conducted due to manpower constraints. 2012 electrofishing collected Largemouth Bass only.
14. Support Huntsville State Park personnel in developing paddling trails for angling and interpretation. Incorporate paddling trails into Park's "Saddles to Paddles" program bridging equestrian packages at their riding livery with canoe rentals.
Action: Paddling trails are still under consideration for Lake Raven.
15. Support Huntsville State Park staff in creating tackle packages for sale in the Park Store specific to different angling opportunities available at Lake Raven.
Action: This idea is still under consideration.
16. Work with Huntsville State Park personnel to develop fishing "hot spots" consisting of submersed brush and other fish attractors located around the reservoir in 10 to 15 feet of water.
Action: The "hot spot" fish attractor concept is still under consideration.
17. Assist Huntsville State Park personnel in selecting habitat enhancing materials such as large riprap for shoreline stabilization efforts.
Action: No shoreline stabilization projects have been conducted at Lake Raven during this report period.
18. Provide educational support and materials regarding zebra mussel infestation to Huntsville State Park personnel and visitors.

Action: Zebra mussel information has been provided to staff and in news releases and magazine articles in the Huntsville area. Zebra mussel information is posted at the Lake Raven boat ramp.

19. Install Portland Samplers under the courtesy pier at the Lake Raven boat ramp and under the boat house to monitor for possible zebra mussel infestations.

Action: In lieu of Portland Samplers, the Lake Raven boat ramp and shoreline are sampled for zebra mussel infestations on a regular basis.

Harvest regulation history: Largemouth Bass at Lake Raven have been managed under a catch-and-release regulation with the caveat that anglers may retain a bass 24 inches or greater for immediate weighing with a personal scale and release or donation to the ShareLunker Program (if qualifying) since 1996. Prior to that, the fishery was under a 14- to 21-inch slot-length limit. Other species have been managed under statewide regulations, except that Blue and Channel Catfish are managed under the special regulations applied to Community Fishing Lakes. Current regulations are found in Table 3.

Stocking history: Fish stockings began at Lake Raven in 1966 with the introduction of Channel Catfish. Periodic stockings of Channel Catfish continued over the next 40 years, but a self-sustaining population has never been created. Florida Largemouth Bass were first introduced in 1979 and have been stocked nine times for a total of over 57,000 fingerlings. In 2005, 2007, 2010, and 2013, a total of 38,190 ShareLunker advanced fingerling Largemouth Bass were stocked as part of Operation World Record, a research project designed to compare growth of selectively bred ShareLunker fingerlings to that of resident bass fingerlings. Both hybrid and triploid grass carp have been stocked for the control of aquatic vegetation. A complete stocking history is provided in Table 4.

Vegetation/habitat management history: The primary habitat in Lake Raven is aquatic vegetation, both native and exotic. Hydrilla has caused access problems in past years and has been controlled recently by stocking 400 triploid Grass Carp in 2009 and by herbicide treatments in 2009, 2010, 2012, and 2014. Water hyacinth, giant salvinia, and alligatorweed also persist as problem nuisance aquatic species. These species were treated chemically in 2009, 2010, 2012, and 2014. In addition, 6,000 alligator weed flea beetles were stocked in 2014 as part of an integrated pest management approach.

Water transfer: Lake Raven is a recreational reservoir contained completely within Huntsville State Park. No interbasin water transfers exist.

METHODS

Fishes were collected by electrofishing (1 hour at 12, 5-min stations), gill netting (5 net nights at 5 stations), and trap netting (5 net nights at 5 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 2011).

Structural shoreline habitat, vegetation, and boater access surveys were conducted in September 2013 according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2011). Additional exotic vegetation surveys were conducted annually.

A spring access-point creel survey was conducted from March through May 2013. Angler interviews were conducted on 5 weekend days and 4 weekdays to assess angler use and fish catch/harvest statistics in accordance with the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2011).

Sampling statistics (CPUE for various length categories), structural indices [Proportional Size Distribution (PSD), terminology modified by Guy et al. 2007], and condition indices [relative weight (W_r)] were calculated for target fishes according to Anderson and Neumann (1996). Index of vulnerability (IOV) was calculated for Gizzard Shad (DiCenzo et al. 1996). Standard error (SE) was calculated for structural indices and IOV. Relative standard error (RSE = 100 X SE of the estimate/estimate) was calculated for all CPUE and creel statistics.

RESULTS AND DISCUSSION

Habitat: Littoral zone structural habitat consisted primarily of bulkheads and natural shoreline (Table 5). At the time of the fall 2013 survey, native emergent and floating leaved species inhabited about 70% of the reservoir (144 acres). Native vegetation consisted primarily of American lotus and mixed emergents. Water hyacinth made up the majority of the nuisance aquatic vegetation covering about 27% of the reservoir (25 acres) (Table 6).

Creel: Directed fishing effort by anglers was highest for Largemouth Bass (87%), followed by anglers fishing for anything (8.0%) and crappie (3.4%) (Table 7). Total fishing effort and expenditures continued to increase across years. Effort increased from 17,403 hours in 2010 to 21,292 in 2013 with expenditures increasing from \$81,933 in 2010 to \$96,124 in 2013 (Table 8).

Prey species: Electrofishing catch rates of Threadfin Shad, Bluegill, and Redear Sunfish were 605/h, 352/h, and 279/h, respectively (Appendix A, Figure 2, and Figure 3). Catch rates were similar to those of 2009.

Catfishes: The gill net catch rate of Channel Catfish was 0.2/nn in 2013, much lower than it was in 2006 and 2010 (8.0/nn and 2.6/nn respectively). The gill net catch rate of Blue Catfish also declined with a catch rate of 8.2/nn in 2006, 10.0/nn in 2010, and 3.0/nn in 2014. The catfish populations are dependent on stockings. A total of 27,336 Channel Catfish have been stocked since 2010 with 5,157 Blue Catfish stocked in 2003 (Table 4).

Largemouth Bass: The electrofishing catch rate of Largemouth Bass was 109/h in 2013. This was down from 2012 (174/h) but similar to 2010 (107/h) (Figure 6). PSD was 77 in 2013 indicating a healthy size distribution with individuals captured out to 19 inches. Directed fishing effort increased over the last 3 creel surveys with estimates of 46.4 h/acre in 2005, 71.9 h/acre in 2010, and 90.5 h/acre in 2013. Catch rate was similar across the surveys with a rate of 0.30/h in 2005, 0.49/h in 2010, and 0.44/h in 2013. An estimated 8,028 Largemouth Bass were caught and released from Lake Raven during the March through May creel period in 2013 (6,740 were less than 4.0 lbs; 1,212 were 4.0 to 6.9 lbs; and 76 were over 7.0 lbs) (Table 10).

Crappie: One Black Crappie was captured in trap nets in 2013 with none captured during 2005 and 2009 (Figure 8). Similarly, two White Crappie were caught in trap nets in 2009 with none caught in 2005 or 2013 (Figure 7). Directed effort for crappie declined from 13.2 h/acre in 2005 to 3.6 h/acre in 2010 and 3.5 h/acre in 2013. Catch rate for anglers targeting crappie was only 0.11/h in 2013. Harvest also declined from an estimated 315 White Crappie in 2005 to 12 in 2013. No crappie were caught or harvested in 2010, and no Black Crappie were recorded in the creel (Table 11 and Figure 9).

Fisheries management plan for Lake Raven, Texas

Prepared – July 2014.

ISSUE 1: Largemouth Bass continue to be a popular sport fish at Lake Raven, providing an outstanding fishery.

MANAGEMENT STRATEGIES

1. Continue to support the Operation World Record program to improve the genetic makeup of the Lake Raven Largemouth Bass population.
2. Maintain the current catch-and-release-only regulation for Largemouth Bass.
3. Continue to promote the Largemouth Bass fishery through available media resources.

ISSUE 2: Lake Raven is subject to an over-abundance of hydrilla, giant salvinia, water hyacinth, and alligator weed, but lacks a diverse native aquatic plant population.

MANAGEMENT STRATEGIES

1. Continue controlling nuisance aquatic vegetation through an integrated pest management approach including herbicide, grass carp, alligator weed flea beetles, and manual removal of nuisance plants when appropriate.
2. Plant diverse native aquatic vegetation in protective enclosures to increase both number of species and relative coverage of emergent, submersed, and floating leaved plants.

ISSUE 3: Channel Catfish and Blue Catfish are maintained as low density populations by occasional stocking.

MANAGEMENT STRATEGIES

1. Place catfish spawning structures into Lake Raven to see if increased natural spawning will help establish a self sustaining catfish fishery.
2. Continue to request surplus Channel Catfish or Blue Catfish fingerlings when available to maintain catfish populations at whatever level logistically possible.
3. Conduct gillnetting in spring of 2018 to monitor catfish populations.

ISSUE 4: Many invasive species threaten aquatic habitats and organisms in Texas and can adversely affect the state ecologically, environmentally, and economically. For example, zebra mussels can multiply rapidly and attach themselves to any available hard structure, restricting water flow in pipes, fouling swimming beaches, and plugging engine cooling systems. Giant salvinia and other invasive vegetation species can form dense mats, interfering with recreational activities like fishing, boating, skiing, and swimming. The financial costs of controlling and/or eradicating these types of invasive species are significant. Additionally, the potential for invasive species to spread to other river drainages and reservoirs via watercraft and other means is a serious threat to all public waters of the state.

MANAGEMENT STRATEGIES

1. Cooperate with the controlling authority to post appropriate signage at access points around the reservoir.
2. Contact and educate marina owners about invasive species and provide them with posters, literature, etc so that they can in turn educate their customers.
3. Educate the public about invasive species through the use of media and the internet.
4. Make a speaking point about invasive species when presenting to constituent and user groups.

5. Keep track of (i.e., map) existing and future inter-basin water transfers to facilitate potential invasive species responses.

SAMPLING SCHEDULE JUSTIFICATION:

The proposed sampling schedule includes electrofishing in 2015 and 2017 to monitor the Largemouth Bass and forage fish populations and to document the presence or absence of crappie. Gill netting is scheduled for 2018 to monitor stocked Channel Catfish and Blue Catfish. Aquatic vegetation surveys are scheduled to be conducted annually to monitor changes in exotic and native vegetation. An access survey and a structural habitat survey are scheduled for 2017. A spring creel is scheduled for 2017 to monitor angling effort, catch, harvest, and expenditures (Table 12).

LITERATURE CITED

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Table 1. Characteristics of Lake Raven, Texas.

Characteristic	Description
Year constructed	1956
Controlling authority	Texas Parks and Wildlife Department
Counties	Walker (location of dam)
Reservoir type	State Park
Shoreline Development Index (SDI)	2.3
Conductivity	160 μ mhos/cm

Table 2. Boat ramp characteristics for Lake Raven, Texas, September, 2013. Reservoir elevation at time of survey was 284 feet above mean sea level.

Boat ramp	Latitude Longitude (dd)	Public	Parking capacity (N)	Elevation at end of boat ramp (ft)	Condition
Huntsville State Park	30.61044 -95.53413	Y	15	282	Excellent, no access issues

Table 3. Harvest regulations for Lake Raven, Texas.

Species	Bag Limit	Minimum-Maximum Length (inches)
Bass, Largemouth	0	Catch-and-release-only*
Catfish, Flathead	5	18 – No limit
Catfish, Channel and Blue Catfish, their hybrids and subspecies	5 (in any combination)	No limit
Crappie, White and Black Crappie, their hybrids and subspecies	25 (in any combination)	10 – No limit

* Catch and release only for Largemouth Bass except that any bass 24 inches or greater caught may be weighed on personal scales and then immediately released or donated to the ShareLunker Program.

Table 4. Stocking history of Lake Raven, Texas. FGL = fingerling; AFGL = advanced fingerling; ADL = adults.

Year	Number	Size	Year	Number	Size
<u>Northern Pike</u>			<u>Black Crappie</u>		
1974	1,160	FGL	1968	30	ADL
<u>Triploid Grass Carp</u>			1970	<u>4,120</u>	ADL
2005	400	ADL	Species Total	4,150	
2009	<u>400</u>	ADL	<u>Florida Largemouth Bass</u>		
Species Total	800	ADL	1979	10,800	FGL
<u>Grass Carp X Bighead</u>			1980	338	ADL
1989	3,083	ADL	1987	16,850	FGL
1990	<u>400</u>	ADL	1991	22,487	FGL
Species Total	3,483		1996	142	ADL
<u>N Pike X Muskellunge</u>			1998	<u>952</u>	AFGL
1976	2,100	FGL	Species Total	57,470	
<u>Blue Catfish</u>			<u>Sharelunker Largemouth Bass</u>		
2000	1,591	AFGL	2005	5,901	AFGL
2003	<u>5,157</u>	AFGL	2007	5,088	AFGL
Species Total	6,748		2010	2,375	AFGL
<u>Channel Catfish</u>			2013	<u>24,826</u>	AFGL
1966	9,900	AFGL	Species Total	32,289	
1971	52,000	AFGL	<u>Green X Redear</u>		
1972	57,400	AFGL	1968	13	ADL
1980	80	ADL	1972	<u>300</u>	FGL
1982	2,016	AFGL	Species Total	313	
1987	21,087	AFGL			
1992	5,252	AFGL			
1996	5,250	AFGL			
1998	5,256	AFGL			
1999	5,251	AFGL			
2000	3,672	AFGL			
2001	5,253	AFGL			
2002	5,237	AFGL			
2004	2,034	AFGL			
2005	12,084	AFGL			
2006	2,930	ADL			
2010	25,476	AFGL			
2012	<u>1,860</u>	ADL			
Species Total	222,038				

Table 5. Survey of structural habitat types, Lake Raven, Texas, 2013. Shoreline habitat type units are in miles.

Habitat type	Estimate	% of total
Bulkhead	0.4 miles	6.6
Natural	5.9 miles	93.4

Table 6. Survey of aquatic vegetation, Lake Raven, Texas, 2009 – 2013. Surface area (acres) is listed with percent of total reservoir surface area in parentheses.

Vegetation	2009	2010	2011	2012	2013
Native floating-leaved	20.1 (9.9)				87.2 (43.0)
Native emergent	60.1 (29.6)				57.2 (28.1)
Non-native					
Alligator weed (Tier II)*	3.28 (2)	26.84 (13)	18.77 (9)	24.51 (12)	4.2 (2.1)
Giant salvinia (Tier II)*	3.9 (2)	18.4 (9)	14.62 (7)	2.77 (1)	3.0 (1.5)
Hydrilla (Tier II)*	57.74 (28)	85.93 (42)	51.31 (25)	0.1 (0)	.34 (0.2)
Water hyacinth (Tier II)*	0.15 (0.1)	9.96 (5)	13.76 (7)	3.51 (2)	24.7 (26.9)

*Tier II is maintenance control status.

Table 7. Percent directed angler effort by species for Lake Raven, Texas, 2005 – 2013. Survey periods were from 1 March through 31 May.

Species	2005	2010	2013
Catfishes	0.0	2.4	0.0
Sunfishes	0.0	3.6	1.5
Largemouth Bass	69.2	83.9	87.1
Crappies	19.6	4.2	3.4
Anything	11.2	5.9	8.0

Table 8. Total fishing effort (h) for all species and total directed expenditures at Lake Raven, Texas, 2005 - 2013. Survey periods were from 1 March through 31 May. Relative standard error is in parentheses.

Creel statistic	2005	2010	2013
Total fishing effort	13,621(27)	17,403 (30)	21,292 (28)
Total directed expenditures	\$63,017 (78)	\$81,933 (61)	\$96,124 (57)

Gizzard Shad

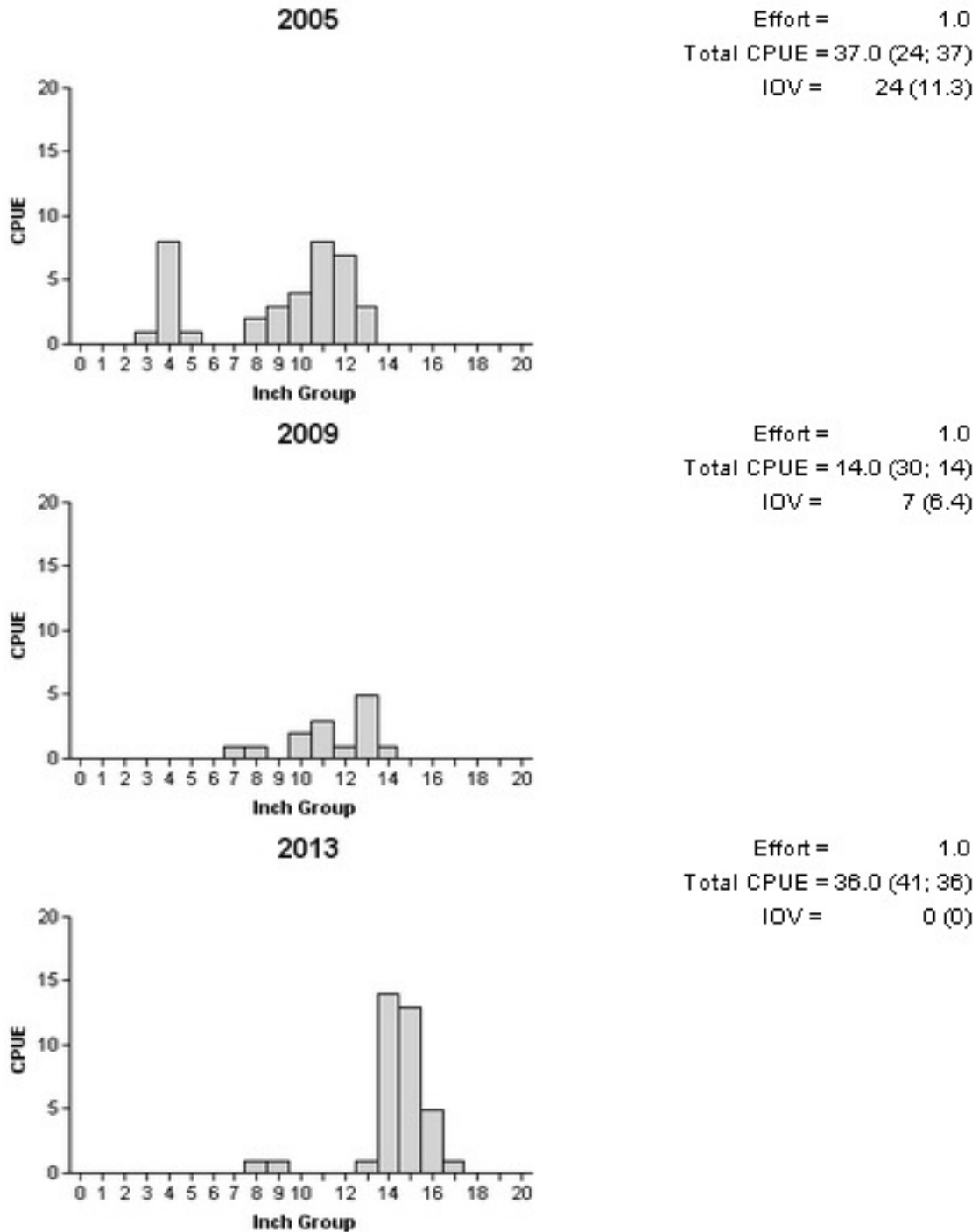
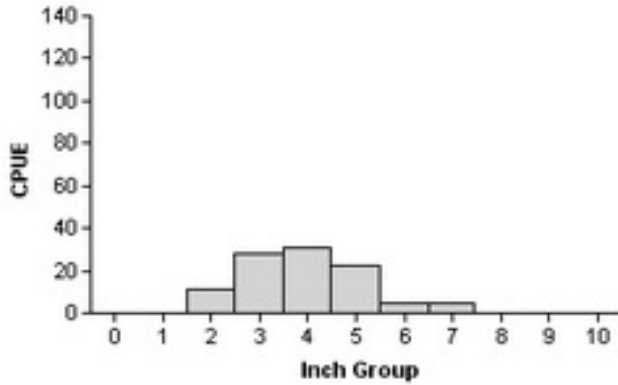


Figure 1. Number of Gizzard Shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Lake Raven, Texas, 2005, 2009, and 2013.

Bluegill

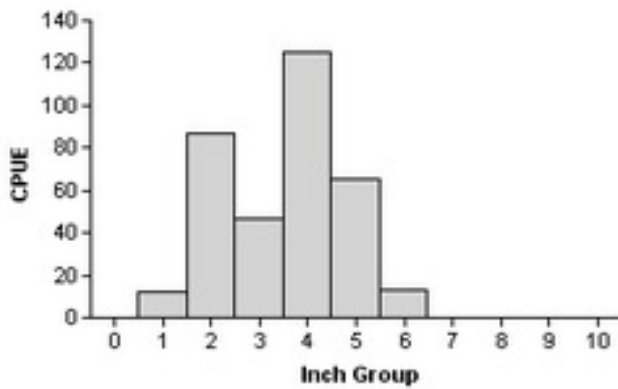
2005

Effort = 1.0
 Total CPUE = 102.0 (17; 102)
 PSD = 11 (5.9)



2009

Effort = 1.0
 Total CPUE = 349.0 (16; 349)
 PSD = 5 (1.7)



2013

Effort = 1.0
 Total CPUE = 352.0 (24; 352)
 PSD = 9 (2.8)

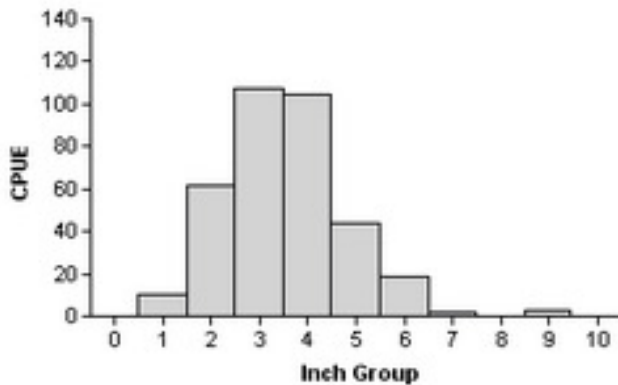


Figure 2. Number of Bluegill caught per hour (CPUE, bars) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Lake Raven, Texas, 2005, 2009, and 2013.

Redear Sunfish

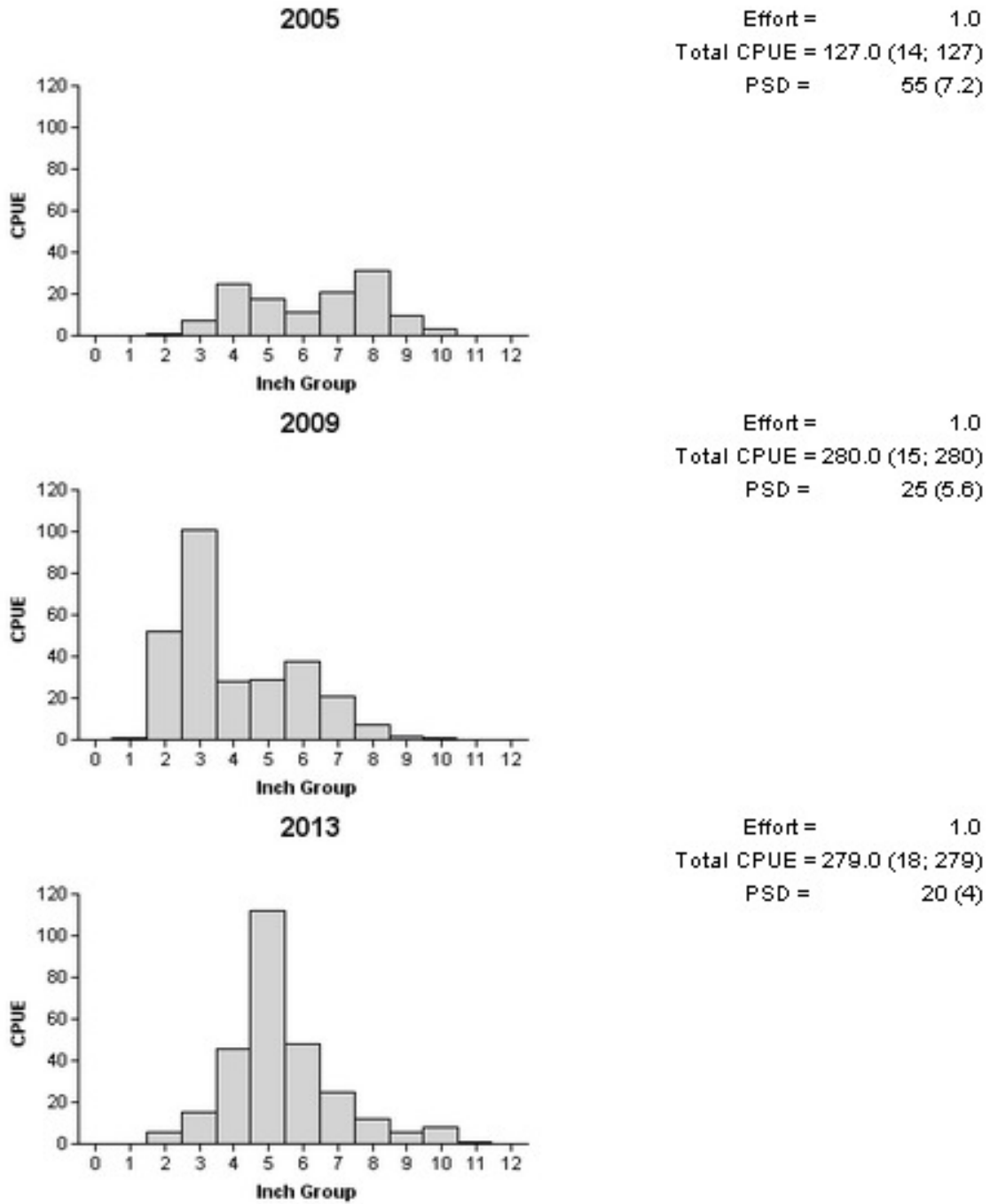


Figure 3. Number of Redear Sunfish caught per hour (CPUE, bars) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Lake Raven, Texas, 2005, 2009, and 2013.

Sunfish

Table 9. Creel survey statistics for all sunfish at Lake Raven from March 2005 through May 2005, March 2010 through May 2010, and March 2013 through May 2013. Total catch per hour is for anglers targeting sunfish and total harvest is the estimated number of sunfish harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel survey statistic	Year		
	2005	2010	2013
Directed effort (h)	0.0	626.6 (88)	637.4 (85)
Directed effort/acre	0.0	3.1 (88)	3.1 (85)
Total catch per hour	0.0	4.7 (185)	0.5 (233)
Total harvest	45.0 (224)	154.0 (100)	11.7 (100)
Harvest/acre	0.2 (224)	0.8 (100)	0.1 (233)

Channel Catfish

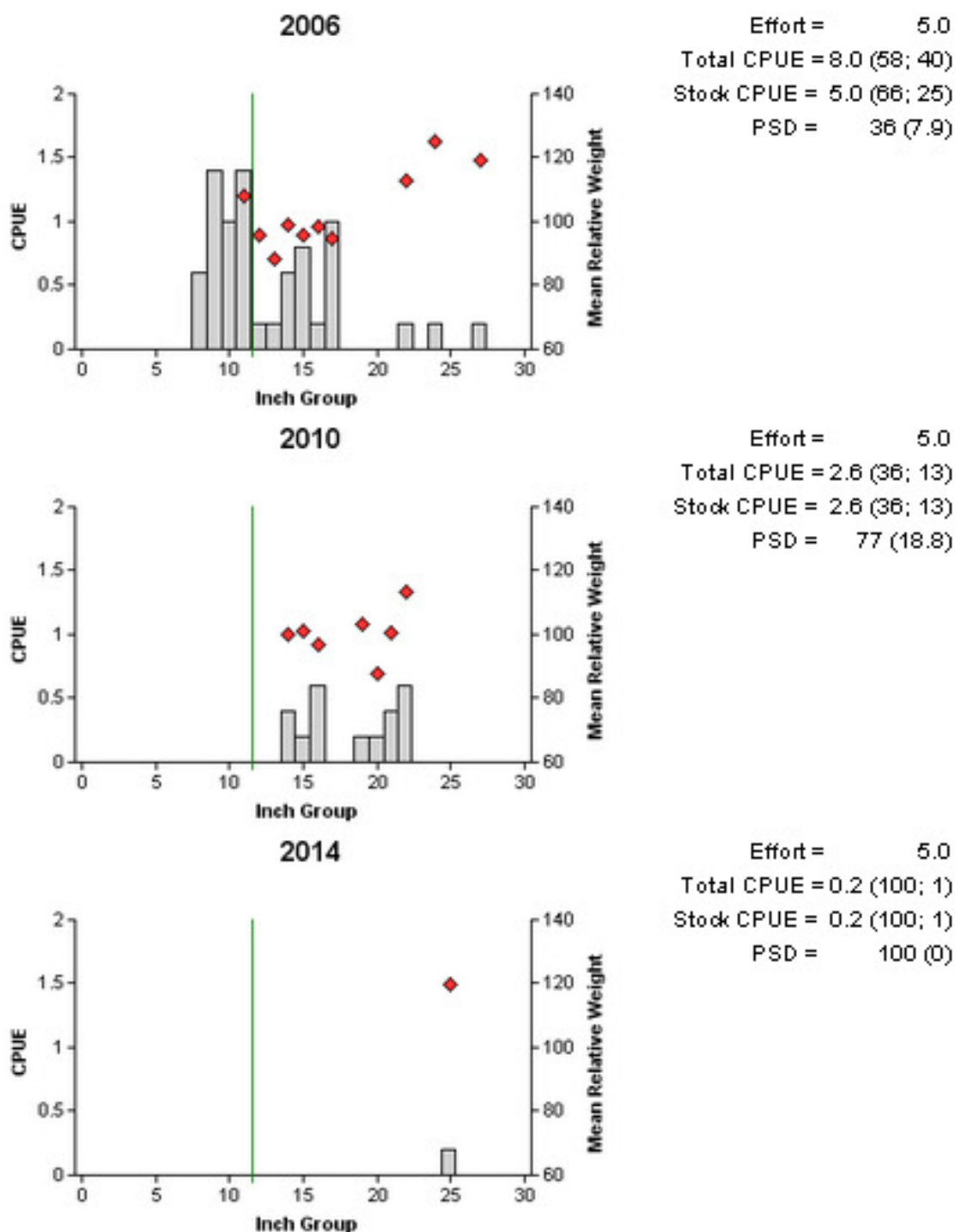


Figure 4. Number of Channel Catfish caught per net night (CPUE) and population indices (RSE and N are in parentheses) for spring gill net surveys, Lake Raven, Texas, 2006, 2010, and 2014.

Blue Catfish

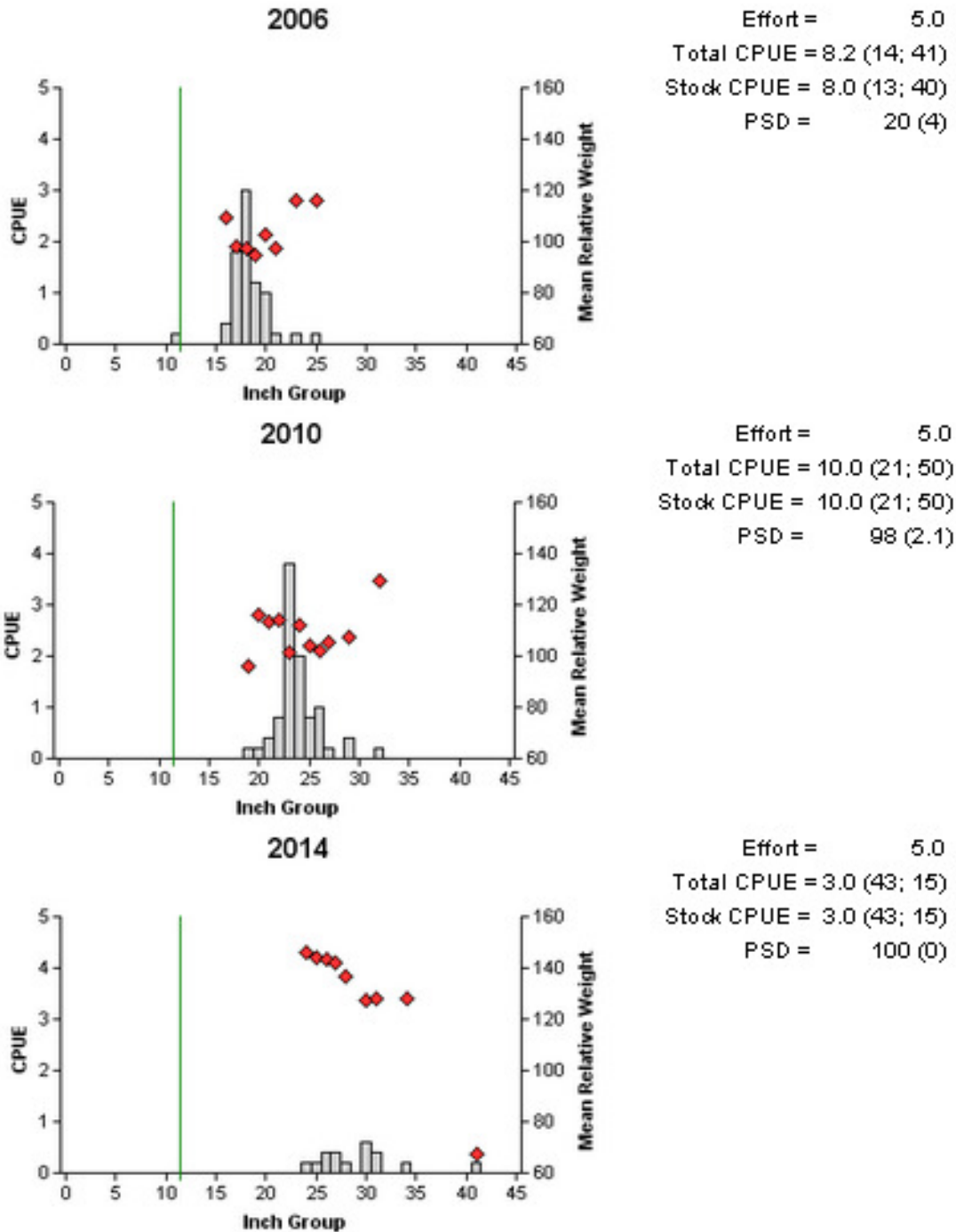


Figure 5. Number of Blue Catfish caught per net night (CPUE) and population indices (RSE and N are in parentheses) for spring gill net surveys, Lake Raven, Texas, 2006, 2010, and 2014.

Largemouth Bass

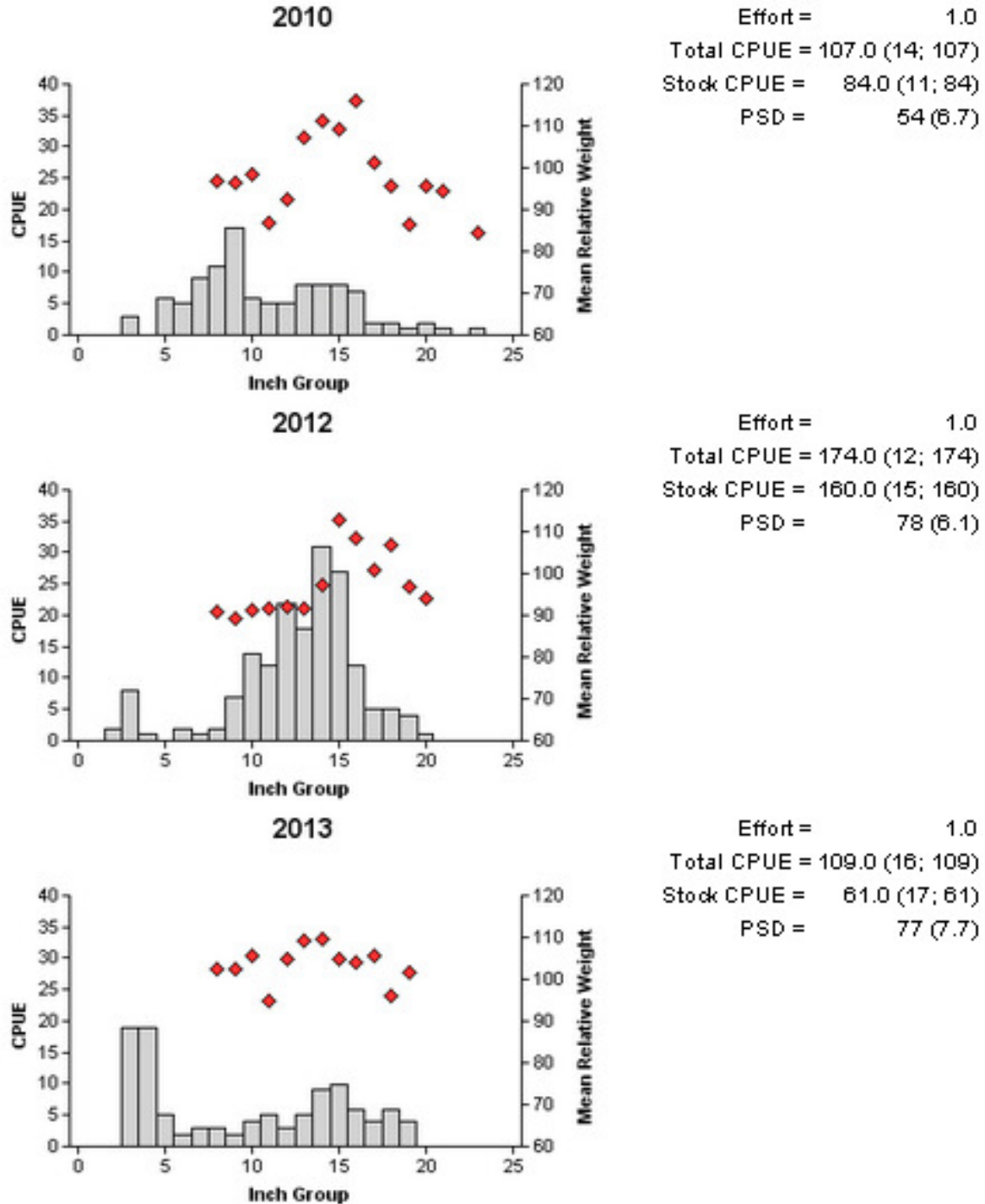


Figure 6. Number of Largemouth Bass caught per hour (CPUE, bars) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Lake Raven, Texas, 2010, 2012, and 2013.

Largemouth Bass

Table 10. Creel survey statistics for Largemouth Bass at Lake Raven from March through May 2005, 2010, and 2013. Catch rate is for all anglers targeting Largemouth Bass. The estimated number of fish released by weight category is for anglers targeting Largemouth Bass. Relative standard errors (RSE) are in parentheses.

Creel survey statistic	Year		
	2005	2010	2013
Directed angling effort (h)			
Non-tournament	9420 (33)	14603.0 (32)	18372.8 (72)
Angling effort/acre	46.4 (33)	71.9 (32)	90.5 (72)
Catch rate (number/h)	0.3 (70)	0.5 (35)	0.4 (60)
Release by weight	NA	NA	
<4.0 lbs			6740 (34)
4.0-6.9 lbs			1212.0 (46)
7.0-9.9 lbs			76.0 (139)
≥10 lbs			0

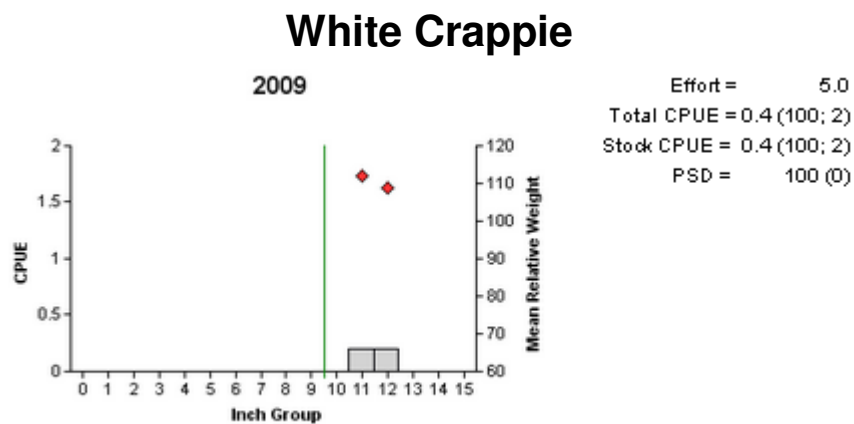


Figure 7. Number of White Crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap net surveys, Lake Raven, Texas, 2009. Vertical line indicates minimum-length limit.

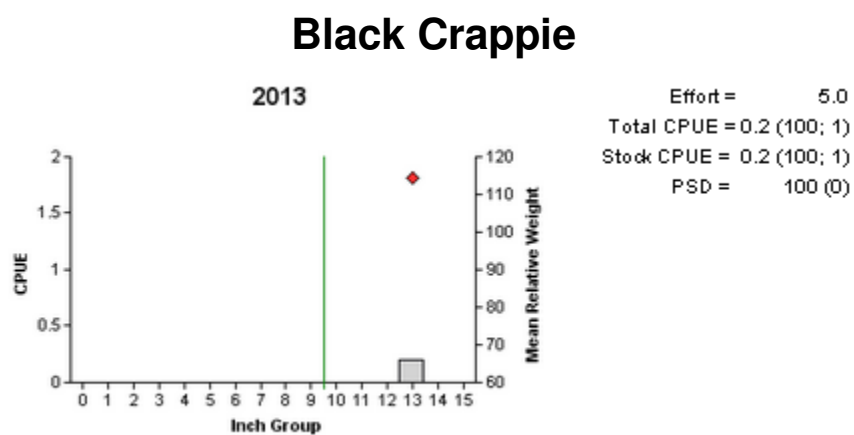


Figure 8. Number of Black Crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap net surveys, Lake Raven, Texas, 2013. Vertical line indicates minimum-length limit.

Crappie

Table 11. Creel survey statistics for crappie at Lake Raven from March through May 2005, 2010, and 2013. Total catch per hour is for anglers targeting crappie and total harvest is the estimated number of crappie harvested by all anglers. All observed crappie in 2005 were White Crappie and all observed crappie in 2013 were Black Crappie. No crappie were observed in 2010. Relative standard errors (RSE) are in parentheses.

Creel Survey Statistic	Year		
	2005	2010	2013
Directed effort (h)	2673.0 (61)	732.0 (83)	711.0 (85)
Directed effort/acre	13.2 (61)	3.6 (83)	3.5 (85)
Total catch per hour	0.3 (60)	0 (83)	0.1 (85)
Total harvest	315.0 (60)	0	11.7 (100)
Harvest/acre	1.6 (60)	0	0.4 (100)
Percent legal released	0	NA	0

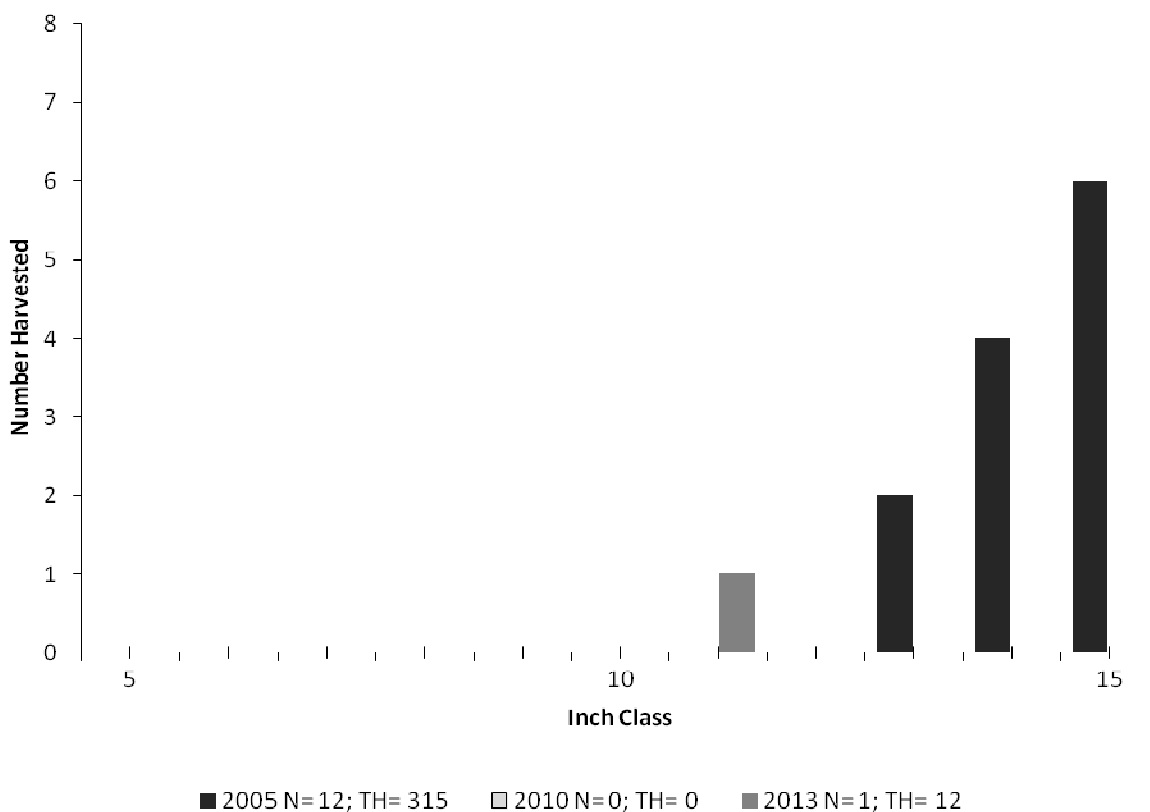


Figure 9. Length frequency of harvested crappie observed during creel surveys at Lake Raven, Texas, March through May 2005, 2010, and 2013 all anglers combined. N is the number of harvested crappie observed during creel surveys, and TH is the total estimated harvest for the creel period. All observed crappie in 2005 were White Crappie and all observed crappie in 2013 were Black Crappie. No Crappie were observed in 2010.

Table 12. Proposed sampling schedule for Lake Raven, Texas. Survey period is June through May. Gill netting surveys are conducted in the spring while electrofishing surveys are conducted in the fall. Standard survey denoted by S and additional survey denoted by A.

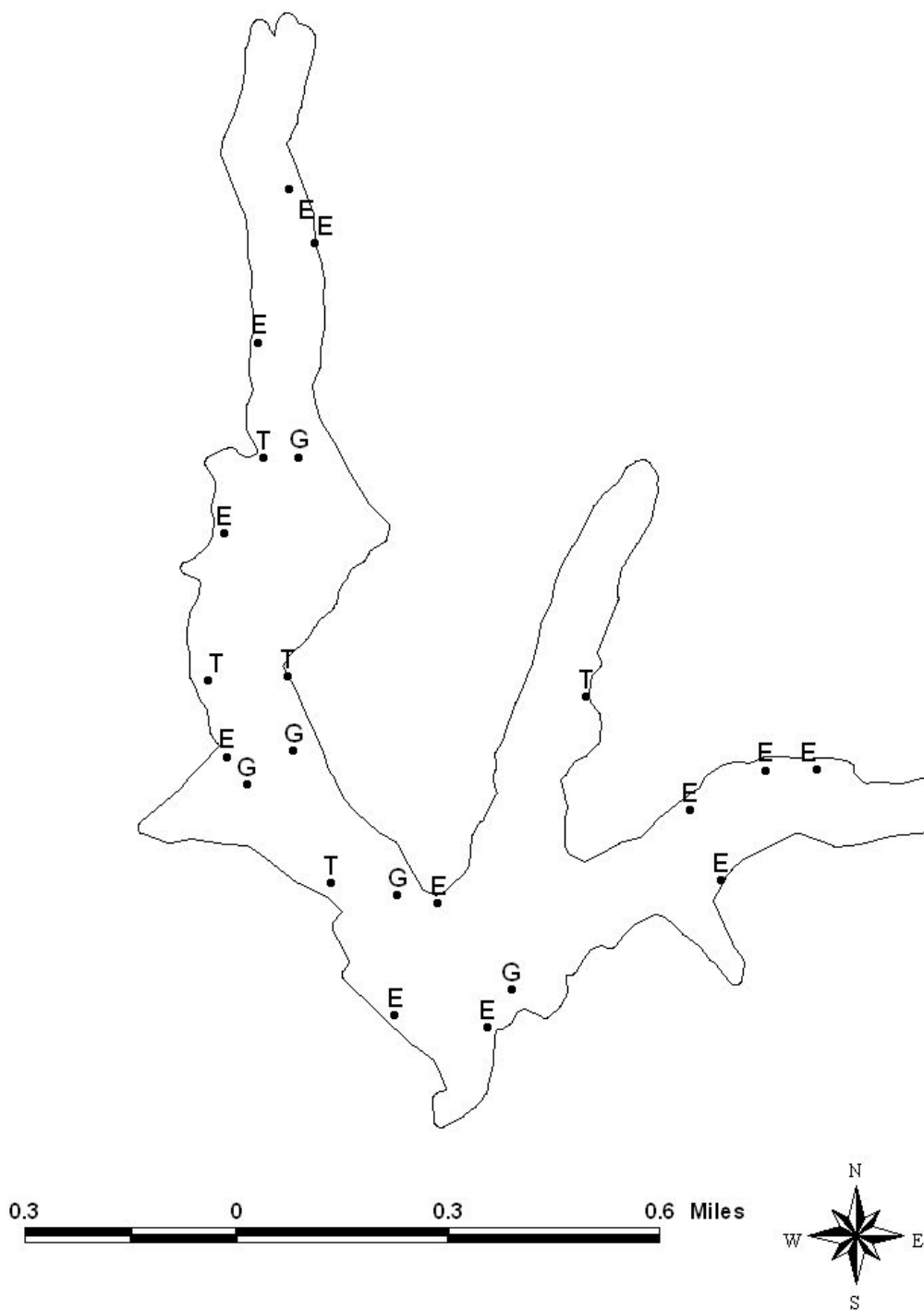
Survey year	Electrofishing	Gillnet	Habitat			Spring creel survey	Report
			Structural	Vegetation	Access		
2014-2015				A			
2015-2016	A			A			
2016-2017				A		A	
2017-2018	S	S	S	S	S		S

APPENDIX A

Number (N) and catch rate (CPUE) of all target species collected from all gear types from Lake Raven, Texas, 2013-2014. Sampling effort was 5 net nights for gill netting, 5 net nights for trap netting, and 1 hour for electrofishing.

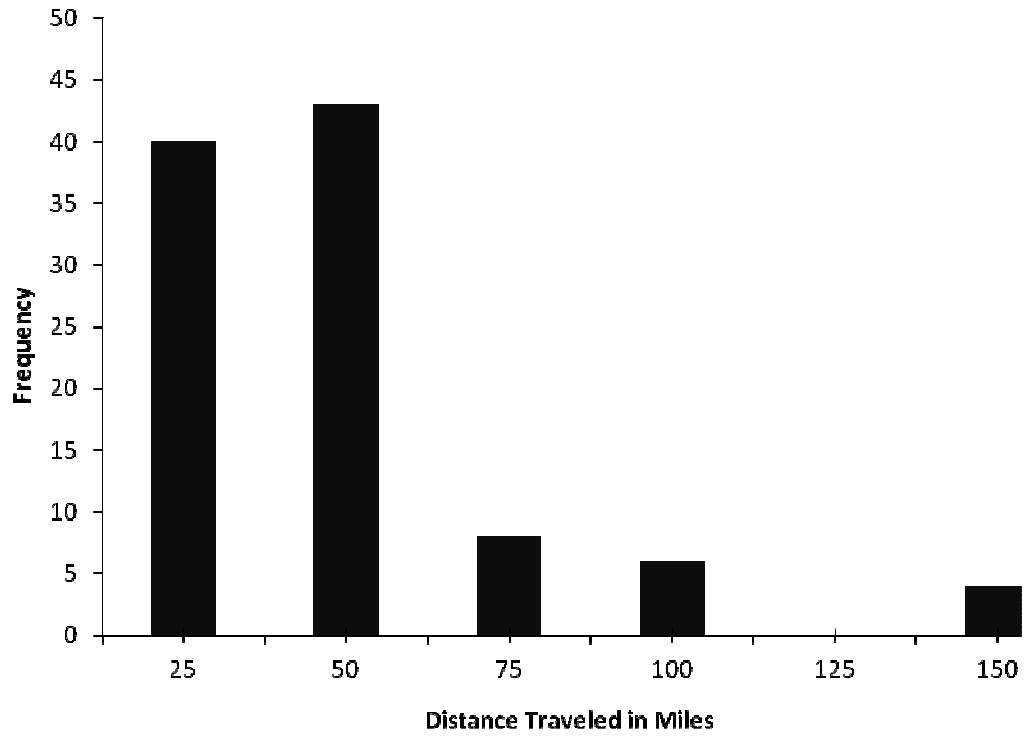
Species	Gill Netting		Trap Netting		Electrofishing	
	N	CPUE	N	CPUE	N	CPUE
Gizzard Shad					36	36.0
Threadfin Shad					605	605.0
Golden Shiner					6	6.0
Blue Catfish	15	3.0				
Channel Catfish	1	0.2				
Pirate Perch					4	4.0
Warmouth					12	12.0
Bluegill					352	352.0
Redear Sunfish					279	279.0
Largemouth Bass					109	109.0
Black Crappie			1	0.2		

APPENDIX B



Location of sampling sites, Lake Raven, Texas, 2013-2014. Trap net, gill net, and electrofishing stations are indicated by T, G, and E, respectively. Water level was near full pool at time of sampling.

APPENDIX C



Frequency of anglers that traveled various distances (miles) to Lake Raven, Texas, as determined from the March through May 2013 creel survey.