

PERFORMANCE REPORT

As Required by

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

Inks Reservoir

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SURVEY AND MANAGEMENT SUMMARY

Fish populations in Inks Reservoir were surveyed in 2013 using electrofishing and in 2014 using gill netting. Historical data are presented with the 2013-2014 data for comparison. This report summarizes the results of the surveys and contains a fisheries management plan for the reservoir based on those findings.

- **Reservoir Description:** Inks Reservoir is a 768-acre impoundment of the Colorado River. It was constructed in 1938 by the Lower Colorado River Authority (LCRA) for purposes of hydroelectric power, recreation and water supply. The reservoir lies within the Edwards Plateau eco-region, and its shoreline length is 20.5 miles. Inks Lake State Park borders the reservoir and provides access to approximately 30 percent of the shoreline. The remaining shoreline has either been developed by private property owners or is under control by the LCRA.
- **Management History:** Important sport fish include Largemouth Bass, White Bass, and catfish species. Recent management plans have recommended continuing monitoring populations under existing regulations. The Florida subspecies of Largemouth Bass was stocked in the reservoir in the late 80s and early 90s to increase Florida Largemouth Bass genetic influence in the population. Channel Catfish have been stocked by the Inks Dam National Fish Hatchery through an agreement with the LCRA or when surplus fish become available.
- **Fish Community**
 - **Prey species:** Gizzard Shad, Threadfin Shad, Bluegill, and Redbreast Sunfish were the predominant sources of forage. Threadfin Shad abundance increased significantly to compensate for low Gizzard Shad vulnerability.
 - **Catfishes:** Channel and Blue Catfish were present in low-to-moderate density. Flathead Catfish were present in low abundance.
 - **Temperate basses:** White Bass abundance declined significantly since the last survey, when record highs were documented. Poor tributary flows, caused by drought conditions might be the main cause for this decline. Striped Bass and Sunshine Bass were present in low densities. Emigration from Lake Buchanan during flood releases is responsible for maintaining the Striped and Sunshine Bass population in Inks Reservoir.
 - **Black basses:** Largemouth Bass were available in moderate to high numbers. Total catch rates and catch rates for fish 14 inches and greater increased, respectively, from the previous survey. Largemouth Bass growth rate remained similar since the last survey. Presence of trophy-size individuals adds a quality component to the fishery. Inks Reservoir also contained Guadalupe Bass.
- **Management Strategies:** The reservoir should continue to be managed with existing fishing regulations. The Largemouth Bass, catfish and sunfish fisheries provide good opportunity for state park visitors. The Texas Parks and Wildlife Department (TPWD) Free Fishing in State Parks program is a great incentive to introduce new anglers to fishing. Efforts should be made to further promote fishing opportunities in this reservoir. General fish population monitoring with gill nets and electrofishing should be conducted in the 2017/2018 sampling season. An additional gill netting survey should be conducted in spring 2016 to monitor White Bass abundance, if no significant flows are reestablished by then.

INTRODUCTION

This document is a summary of fisheries data collected from Inks Reservoir in 2013 and 2014. The purpose of the document is to provide fisheries information and make fisheries 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 species and important prey species. Fisheries management strategies are included to address existing problems or opportunities. Historical data are presented with the 2013 and 2014 data for comparison.

Reservoir Description

Inks Reservoir is a 768-acre impoundment of the Colorado River. It was constructed in 1938 by the Lower Colorado River Authority (LCRA) for purposes of hydroelectric power, recreation, and water supply. Inks Reservoir is hypereutrophic with a mean TSI chl-a of 57.08, and a 10-year change of +10.4 (Texas Commission on Environmental Quality 2011). The reservoir lies within the Edwards Plateau eco-region, and its shoreline length is 20.5 miles. Structural habitat consisted of boulder, bulkhead/boat docks, rock bank, rock bluff, natural shoreline, and native emergent vegetation. Native aquatic emergent plants were present; while clusters of exotic floating vegetation were discovered in a couple of small areas along the shoreline. Inks Reservoir is maintained at full pool, 880.22 feet above mean sea level (msl).

Angler Access

Inks Reservoir has only one public boat ramp; however private residential access is available around the reservoir. The two-lane public ramp is located in the state park. Additional boat ramp characteristics are in Table 2. Inks Lake State Park borders the reservoir and provides access to approximately 30 percent of the shoreline. The remaining shoreline has been developed by private property owners or is under control by the LCRA. The state park has ample shoreline access and two improved fishing piers, open 24 hours daily to overnight guests.

Management History

Previous management strategies and actions: Management strategies and actions from the previous survey report (De Jesus and Magnelia 2010) included:

1. Conduct annual aquatic vegetation surveys in summer, provided Eurasian watermilfoil *Myriophyllum spicatum* was encountered during surveys.
Action: Aquatic vegetation surveys were conducted in summer 2010 and 2011. Eurasian watermilfoil was not found in 2011; ending the annual survey stipulation. A standard 4-year survey was conducted in 2013, in which the Eurasian watermilfoil remained absent.
2. Continue to promote Inks Lake State Park as great resource for bank fishing or pier fishing for beginning anglers or families that wish to try fishing for the first time.
Action: A press release was published to promote bank fishing and the enhanced fishing structures at the state park piers. A written article was published in the San Marcos Daily Record newspaper regarding these projects and it the effort was also posted in our district Facebook page. A scientific poster, revealing results of the enhanced pier structures was presented at the 2012 annual SEAFWA conference in Arkansas.
3. Coordinate a project with Inks Lake State Park management staff to establish fish attraction structures around the fishing piers at the state park. Several options should be considered for these structures.
Action: The north pier was enhanced by installing gravel bed structures and sunken brushpiles; while the south pier with underwater green lights. The elevated spotlights were refurbished to provide above-water timed lighting attraction. A second brushpile fish attractor project was completed out in open water, with partnered efforts with Troop 5 of the Boy Scouts of America and the state park.

4. Cooperate with the LCRA to properly promote the importance of checking for aquatic hitchhikers on boats and boat trailers. Contact them to discuss funding for signage to be placed at all boat ramps regarding these species. Contact and educate marina owners about aquatic invasive species awareness. Create a speaking point concerning the impact of invasive aquatic species when presenting to constituent groups.

Action: Partnered with LCRA in monitoring the Lower Colorado Chain of Lakes and promoting the zebra mussel awareness campaign. Signage was installed at the state park facilities. Press releases and public presentations were delivered to constituents. Zebra mussel awareness was promoted in our district Facebook page and in a written article for the San Marcos Daily Record.

Harvest regulation history: Sport fishes in Inks Reservoir are currently managed with statewide regulations (Table 3).

Stocking history: Inks Reservoir was last stocked in 2013 (Channel Catfish). The Inks Dam National Fish Hatchery provides surplus Channel Catfish stockings when available. Largemouth Bass were introduced in 1966 and Florida Largemouth Bass in 1989 and 1991 to increase Florida Largemouth Bass genetic influence. Blue Catfish were introduced in 1968. The complete stocking history is in Table 4.

Aquatic vegetation/habitat management history: Inks Reservoir has typically had very low aquatic vegetation coverage, predominantly native. In fall 2009, the first documented occurrence of submerged aquatic vegetation was identified as the exotic Eurasian watermilfoil. Monitoring efforts were taken until the plant disappeared by 2011.

Water transfer: No interbasin transfers are known to exist. A new regulation prohibiting the transport of lake water in boats was put into effect in spring 2014 within selected counties. Inks Reservoir was included in the regulation, which mandates the draining of boats and live wells before entering and exiting public reservoirs within these selected counties. This law was meant to prevent the spread of invasive species, particularly zebra mussels, by restricting water transfer from lake to lake by boaters.

METHODS

Fishes were collected by electrofishing (1.0 hour at 12, 5-minute stations) and gill 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 netting as the number of fish caught in one net set overnight (fish/nn). All survey sites were randomly selected and all surveys were conducted according to the Texas Parks and Wildlife Department Inland Fisheries Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2011).

Sampling statistics (CPUE for various length categories) and structural indices [Proportional Size Distribution (PSD); as defined by Guy et al. (2007)], and condition indices [relative weights (W_r)] were calculated for target fishes according to Anderson and Neumann (1996). The Index of Vulnerability (IOV) was used to determine the percentage of Gizzard Shad vulnerable to predation (DiCenzo et al. 1996). Standard error (SE) was calculated for structural indices and IOV. Ages were determined for LMB using otoliths from 13 fish between 13 and 15 inches (category 2 age analysis for 14-inch LMB; TPWD Procedures Manual 2011).

Aquatic vegetation surveys were conducted during peak growing season around the entire reservoir. Aquatic vegetation coverage was estimated by the use of Trimble® GPS unit in conjunction with sonar depth finder. Species identification was confirmed on samples collected with a modified aquatic rake.

Genetic analysis of Largemouth Bass was conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2011). Micro-satellite DNA analysis was used to determine genetic composition of individual fish from 2005 through 2012 and by electrophoresis for previous years.

RESULTS AND DISCUSSION

Habitat: Littoral zone structural habitat consisted primarily of natural shoreline and rocky shoreline, followed by bulkhead with docks and piers in 2013 (Table 5). Aquatic vegetation was present throughout the reservoir, but coverage was well below optimal levels for fish production (Durocher 1984 and Dibble 1996). Inks Reservoir has typically had very low aquatic vegetation coverage, as seen in 2013 (Table 6). Coverage consisted primarily of native emergent vegetation. Three native species of aquatic emergent vegetation (cattail *Typha* sp., American waterwillow *Justicia americana*, and bulrush *Scirpus* sp.) accounted for only 7.0 acres (< 1% coverage), similar to historic surveys. Submerged aquatic vegetation was first documented in fall 2009 when Eurasian watermilfoil became established in part of the reservoir. This species persisted through 2011, when it was no longer found during aquatic vegetation surveys. Small patches of water hyacinth *Eichhornia crassipes*, totaling less than one acre, were discovered along shoreline stretches. Inks Reservoir's water level is stable; therefore changes in structural habitat tend to be minimal. Pelagic structural habitat was available, mainly composed of standing timber and boulder fields.

Several habitat enhancement projects were performed since the last report cycle in efforts to enhance shoreline fishing opportunities at the state park and out in open water. Ten gravel bed structures surrounded by brushpiles were installed around the north pier at the state park in 2011. The purpose was to create a centrarchid spawning complex (Appendix C) around the pier to attract the large available sunfish and Largemouth Bass for bank anglers to target. In 2013, the south pier was enhanced with an underwater green light system (Appendix D) to attract fish for overnight anglers. The lights serve as habitat for planktonic species that start the food chain, eventually attracting predatory fish species. In fall 2013, a partnership was developed between Inland Fisheries, State Parks and the Boy Scouts of America to install four new brush fish attractor sites out in open water for boat anglers (Appendix E and F). These structures should provide habitat for cover-seeking species, as documented in an evaluation of the north pier structures using electrofishing and side-scan sonar mapping (Appendix G – J).

Prey species: Electrofishing catch rates of Gizzard Shad, Threadfin Shad, Redbreast Sunfish, and Bluegill were 141.5/h, 523.2/h, 221.9/h, and 188.0/h, respectively. Index of Vulnerability (IOV) for Gizzard Shad was poor, indicating that only 16% of Gizzard Shad were vulnerable to existing predators. This index improved from 3% since 2009 (Figure 1). The lack of vulnerable-size Gizzard Shad as forage was compensated by the increased abundance of Threadfin Shad from 40/h in 2009, and relatively high abundance of sunfish species. Total CPUE of Redbreast Sunfish in 2013 remained similar to the total CPUE from the 2009 survey (229.0/h); and, quality-size individuals (≥ 7 inches), which are a large enough to support a directed sport fishery, were present in moderate abundance during standard and non-standard surveys (Figure 2; Appendix G). Total CPUE of Bluegill in 2013 remained similar to catch rates in 2009 (210/h), with the population continued to be dominated by small individuals; however quality-size individuals were sampled in standard and non-standard surveys (Figure 3; Appendix H).

Catfishes: The gill net catch rate of Blue Catfish was 4.4/nn in 2014, increasing from 3.6/nn and 1.4/nn in 2010 and 2006, respectively (Figure 4). The Blue Catfish population continued to show moderate relative abundance, with a population structure dominated by fish larger than 15 inches; while average body condition was adequate ($W_r \geq 85$) at all lengths (Figure 4). The gill net catch rate of Channel Catfish was 2.0/nn in 2014, decreasing from the 5.4/nn in 2010 (Figure 5). The Channel Catfish population continued to show moderate relative abundance, with most individuals of harvestable size (≥ 12 inches); while their condition was good ($W_r \geq 85$) at all lengths (Figure 5). The gill net catch rate of Flathead Catfish was

0.8/n in 2014. The Flathead Catfish population continued to show low relative abundance, with a population structure dominated by large individuals.

Temperate basses: The gill net catch rate of White Bass was 0.6/n in 2014, decreasing significantly from the 7.4/n historic high surveyed in 2010 (Figure 6). Severe drought conditions since 2011 might have had a negative impact on subsequent year classes through the reduction of tributary spring-season flows. Inks Reservoir gets most of its water from Buchanan Reservoir releases, which now stands close to record-low water levels. Buchanan Reservoir releases have been reduced under recent drought conditions. Inks reservoir's water shed is relatively small, and with the lack of rain or flowing waters, White Bass reproduction up tributaries might have been impeded. Furthermore, the small reservoir lacks silted/gravel shorelines, which can serve as spawning areas for White Bass off windblown points (seen in other district lakes). Diconzo and Duval (2009) showed a strong correlation between high inflows and year class strength of White Bass. They also revealed poor or missing year classes were most common during years with low flow. These factors might be responsible for the significant decline in White Bass abundance after three dry spawning seasons. Body condition for the three fish sampled in 2014 was adequate (W_r just under 100%); however this small sample size might not be representative. Striped Bass and Sunshine Bass were present in low relative abundance, and were emigrants from upstream Lake Buchanan, which is stocked with these species.

Largemouth Bass: The electrofishing catch rate of stock-length Largemouth Bass was 67.8/h in 2013, an increase from 59.0/h in 2009 (Figure 7). Size structure in 2013 remained similar to the 2009 survey as PSD was 49, versus 56 recorded in 2009. Memorable- and Trophy-size individuals were recorded in standard and non-standard (Appendix I) electrofishing surveys; indicating the potential for trophy Largemouth Bass fishing opportunities. Body condition in 2013 was adequate (W_r exceeded 90) for most size classes of fish, and was similar to body condition in previous surveys (Figure 7). Growth of Largemouth Bass in Inks Reservoir was also good; average age at 14 inches of length was 2 years ($N = 11$; range = 1 – 3 years) (Figure 8). Florida Largemouth Bass influence declined from previous surveys, as Florida alleles have ranged from 26 to 75%. Florida genotype ranged from 10 to 16% during the same time span (Table 7).

Fisheries management plan for Inks Reservoir, Texas

Prepared - July 2014.

ISSUE 1: White Bass abundance dropped significantly after reaching historic highs during the previous survey. This decline has coincided with an extended drought pattern, which has minimized flow conditions required for strong year classes. Production of strong year classes every 3-4 years are required to sustain White Bass fisheries in reservoirs (Lovell and Maceina, NAJFM, 2002). The current drought has extended over three consecutive spawning seasons, and the lake lacks alternate wind-blown spawning habitat, as seen in other district lakes, to help sustain reproduction during low-flow conditions. Unless the watershed begins to experience significant rain events in the upcoming spring, a fourth consecutive unsuccessful spawning season may have more-serious detrimental effects on this population. Monitoring this issue will serve to compliment, by comparison, a White Bass year-class strength study being conducted on Lake Buchanan.

MANAGEMENT STRATEGIES

1. Conduct a supplemental gill net survey in 2016 to monitor White Bass abundance, if no significant flows are reestablished through Inks Reservoir from Buchanan releases or significant rain events in the next two years.
2. If year classes are determined lost, deliberate the option of requesting white bass fry stockings in 2017.

ISSUE 2: Excellent bank and good pier access for anglers is available within Inks Lake State Park. Elaborate habitat and pier enhancement projects were completed to improve angling opportunities at the reservoir. Electrofishing surveys revealed the effectiveness of these enhancements. With the TPWD free fishing program at state parks, we should promote these opportunities whenever possible.

MANAGEMENT STRATEGIES

1. Continue to promote Inks Lake State Park as great fishing destination.
2. Conduct a survey to evaluate the influence these structures have on park visitation.

ISSUE 3: Inks Reservoir has the potential to produce trophy-size largemouth bass individual, as confirmed by our survey results. Florida Largemouth Bass genetic influence within our samples has plummeted to 26% since previous surveys. With constant water levels, improved habitat, and high forage abundance, conditions are favorable for supplemental stockings of Florida Largemouth Bass to help increase the genetic growth potential within the population.

MANAGEMENT STRATEGY

1. Request Florida Bass fingerling stockings in 2015 at a rate of 25/acre.

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 (*Dreissena polymorpha*) can multiply rapidly and attach themselves to any available hard structure, restricting water flow in pipes, fouling swimming beaches and plugging engine cooling systems. Giant salvinia (*Salvinia molesta*) 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 will constitute standard sampling in 2017/2018 (Table 8). An additional gill netting survey may be conducted as stipulated in the management strategy for issue 1. Mandatory sampling every 4 years has been sufficient to monitor fish populations at Inks Reservoir.

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Table 1. Characteristics of Inks Reservoir, Texas

Characteristic	Description
Year constructed	1938
Controlling authority	LCRA
Counties	Burnet and Llano
Reservoir type	Mainstream river system: Colorado
Shoreline development index (SDI)	10.1
Conductivity	432 μ S/cm

Table 2. Boat ramp characteristics for Inks Reservoir, Texas, August, 2013. Reservoir elevation at time of survey was 887.17 feet above mean sea level.

Boat ramp	Latitude Longitude (dd)	Public	Parking capacity (N)	Elevation at end of boat ramp (ft)	Condition
Inks Lake State Park	30.74306 -98.36744	Y	18	882	Good

Table 3. Harvest regulations for Inks Reservoir, Texas.

Species	Bag limit	Length limit
Largemouth Bass:	5*	14-inch minimum
Guadalupe Bass:	5*	None
Striped Bass and their hybrids	5	18-inch minimum
White Bass	25	10-inch minimum
Flathead Catfish	5	18-inch minimum
Catfish: Channel and Blue Catfish	25 (in any combination)	12-inch minimum

*Five in any combination.

Table 4. Stocking history of Inks Reservoir, Texas. Life stages are fry (FRY), fingerlings (FGL), advanced fingerlings (AFGL), adults (ADL) and unknown (UNK). Life stages for each species are defined as having a mean length that falls within the given length range. For each year and life stage the species mean total length (Mean TL; in) is given. For years where there were multiple stocking events for a particular species and life stage the mean TL is an average for all stocking events combined.

Species	Year	Number	Life Stage	Mean TL (in)
Blue Catfish	1968	4,000	UNK	UNK
	Total	4,000		
Channel Catfish	1969	45,100	AFGL	7.9
	1971	28,000	AFGL	7.9
	1984	5,487	AFGL	11.0
	1986	12,448	AFGL	8.0
	1987	1,957	AFGL	11.0
	1994	3,080	ADL	14.0
	2000	1,250	ADL	13.0
	2006	111	ADL	24.0
	2011	363,109	FRY	0.8
	2013	12,469	AFGL	4.6
	Total	473,011		
Coho Salmon	1974	1,245		UNK
	Total	1,245		
Florida Largemouth Bass	1989	9,389	FGL	2.0
	1989	4,648	FRY	1.0
	1991	80,480	FGL	1.2
	Total	94,517		
Largemouth Bass	1969	200,000	UNK	UNK
	1988	25,000	FRY	1.0
	Total	225,000		
Muskellunge	1976	70		UNK
	Total	70		
Northern Pike	1974	4,212		UNK
	Total	4,212		
Palmetto Bass (Striped X White Bass hybrid)	1978	4,950	UNK	UNK
	1980	12,350	UNK	UNK
	1984	16,148	FGL	2.0
	1986	32,105	FRY	1.0
	Total	65,553		

Species	Year	Number	Life Stage	Mean TL (in)
Rainbow Trout	1974	4,293	UNK	UNK
	Total	4,293		
Striped Bass	1983	8,010	UNK	UNK
	1991	34,200	FGL	1.2
	1991	86,250	FRY	1.0
	Total	128,460		
Walleye	1976	10,000	FRY	0.2
	1978	4,067,000	FRY	0.2
	Total	4,077,000		

Table 5. Survey of structural habitat types, Inks Reservoir, Texas, 2013. Shoreline habitat type units are in miles and standing timber is acres.

Habitat type	Estimate	% of total
Bulkhead	1.53	7
Bulkhead w/ docks and piers	4.59	21
Natural shoreline	8.90	41
Natural shoreline w/ docks and piers	0.24	1
Rocky shoreline	5.75	26

Table 6. Survey of aquatic vegetation, Inks Reservoir, Texas, 2010 – 2013. Surface area (acres) is listed with percent of total reservoir surface area in parentheses.

Vegetation	2010	2011	2012	2013
Native submersed	0.1 (< 1)	0.1 (< 1)		
Native emergent	13.0 (1.9)	26.7 (3.0)		7.0 (< 1)
Non-native				
Eurasian watermilfoil (Tier III)*	3.0 (< 1)			
Water hyacinth (Tier III)*				< 1 (< 1)

*Tier I is immediate Response, Tier III is Watch Status

Gizzard Shad

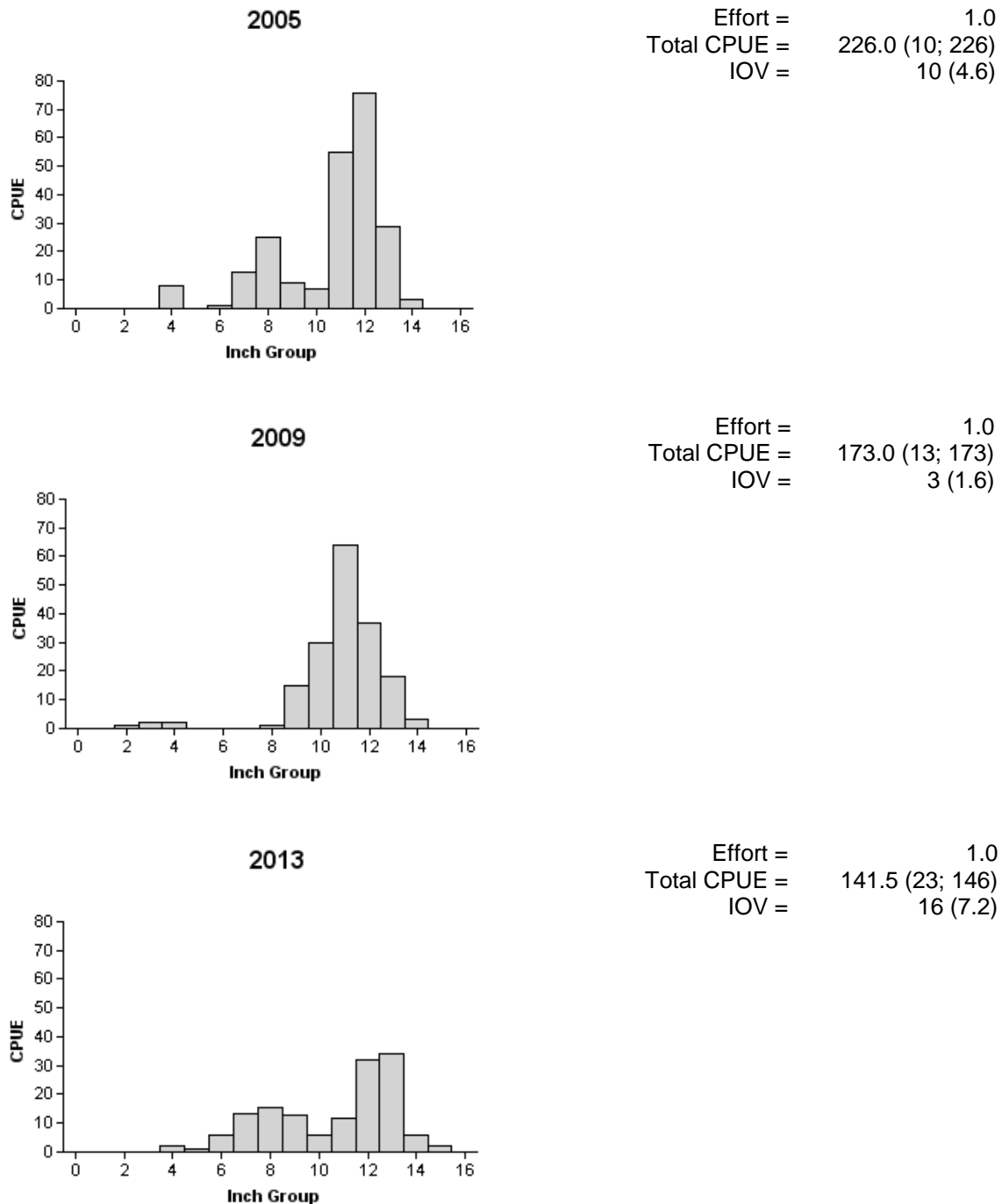
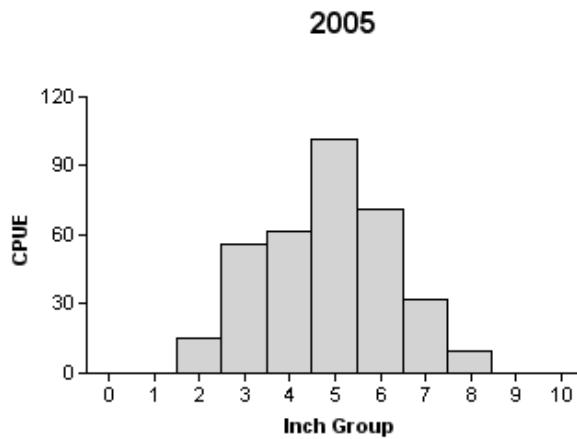
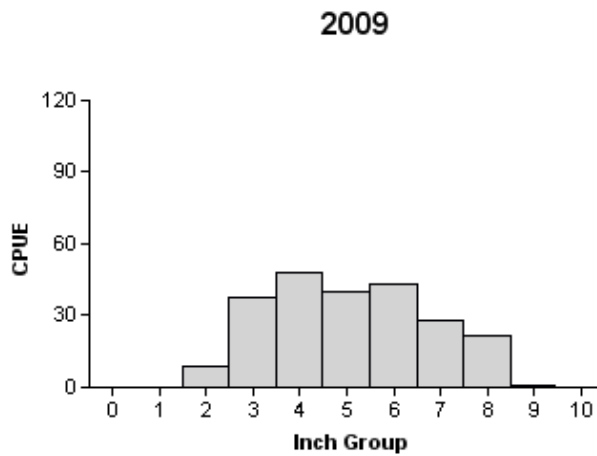


Figure 1. Number of Gizzard Shad caught per hour (CPUE, bars) population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Inks Reservoir, Texas, 2005, 2009 and 2013.

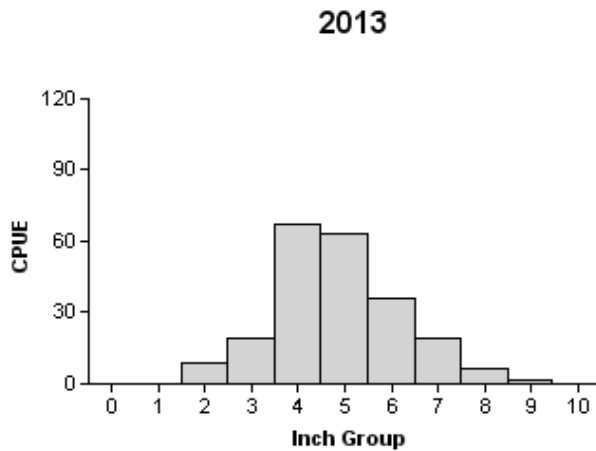
Redbreast Sunfish



Effort = 1.0
 Total CPUE = 348.0 (20; 348)
 CPUE-7 = 42.0 (25; 42)
 PSD = 34 (4.7)
 PSD-7 = 13 (2.9)



Effort = 1.0
 Total CPUE = 229.0 (20; 229)
 CPUE-7 = 51.0 (38; 51)
 PSD = 43 (3.8)
 PSD-7 = 23 (4.7)



Effort = 1.0
 Total CPUE = 221.9 (29; 229)
 CPUE-7 = 28.1 (36; 29)
 PSD = 30 (3.7)
 PSD-7 = 13 (2.6)

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

Bluegill

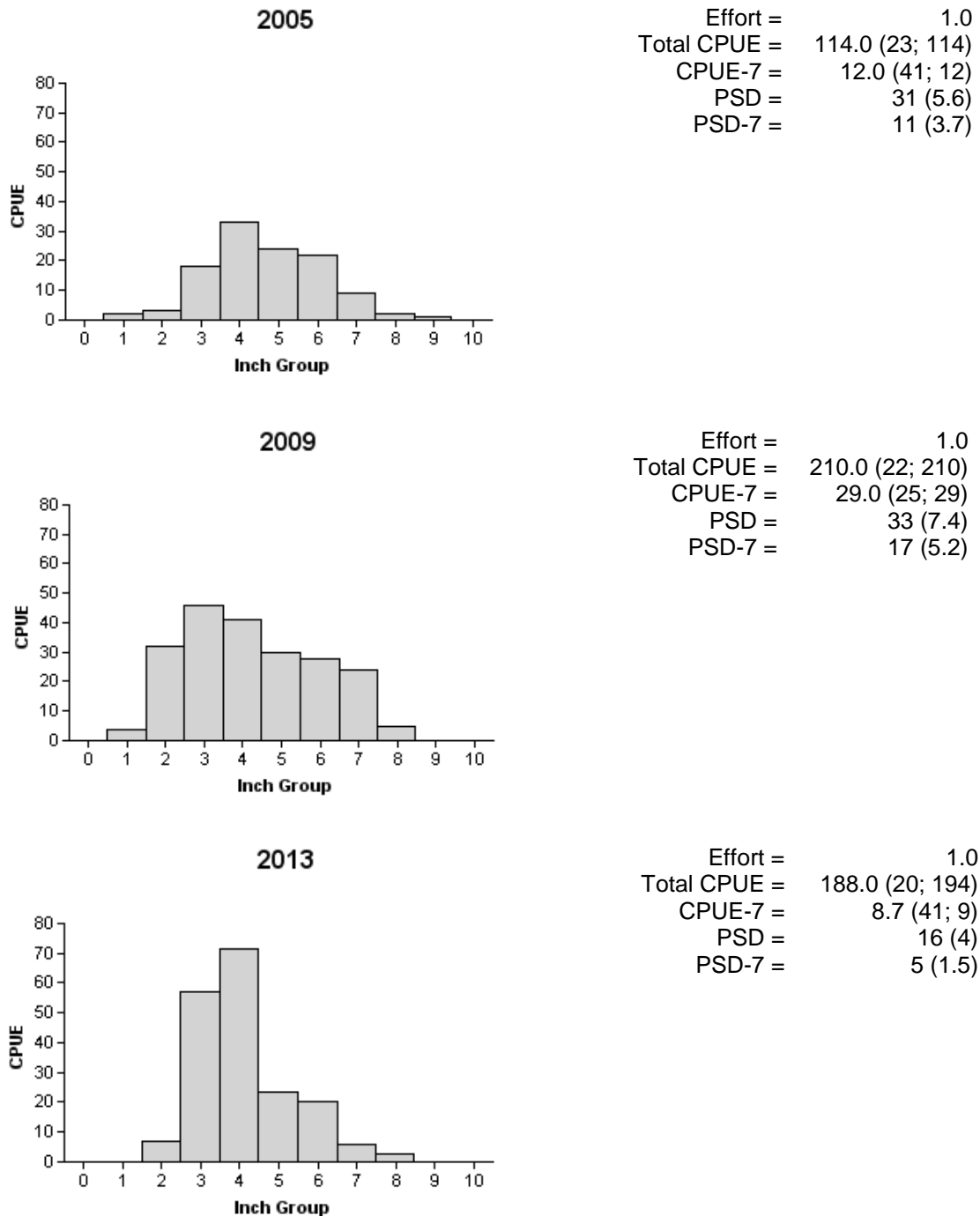


Figure 3. Number of Bluegill caught per hour (CPUE, bars) population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Inks Reservoir, Texas, 2005, 2009 and 2013.

Blue Catfish

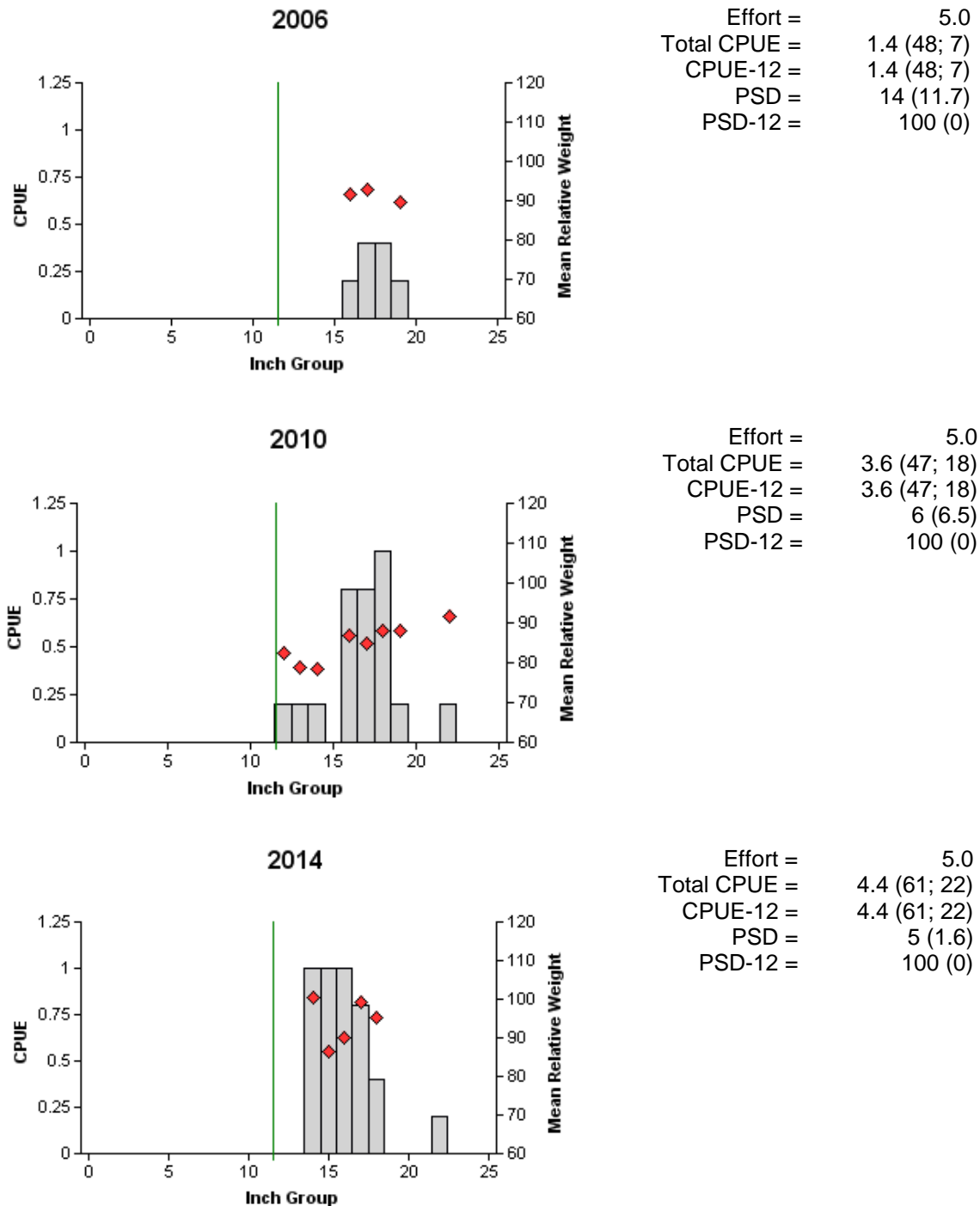


Figure 4. Number of Blue Catfish caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Inks Reservoir, Texas, 2006, 2010 and 2014. Vertical line represents minimum length limit at the time of sampling.

Channel Catfish

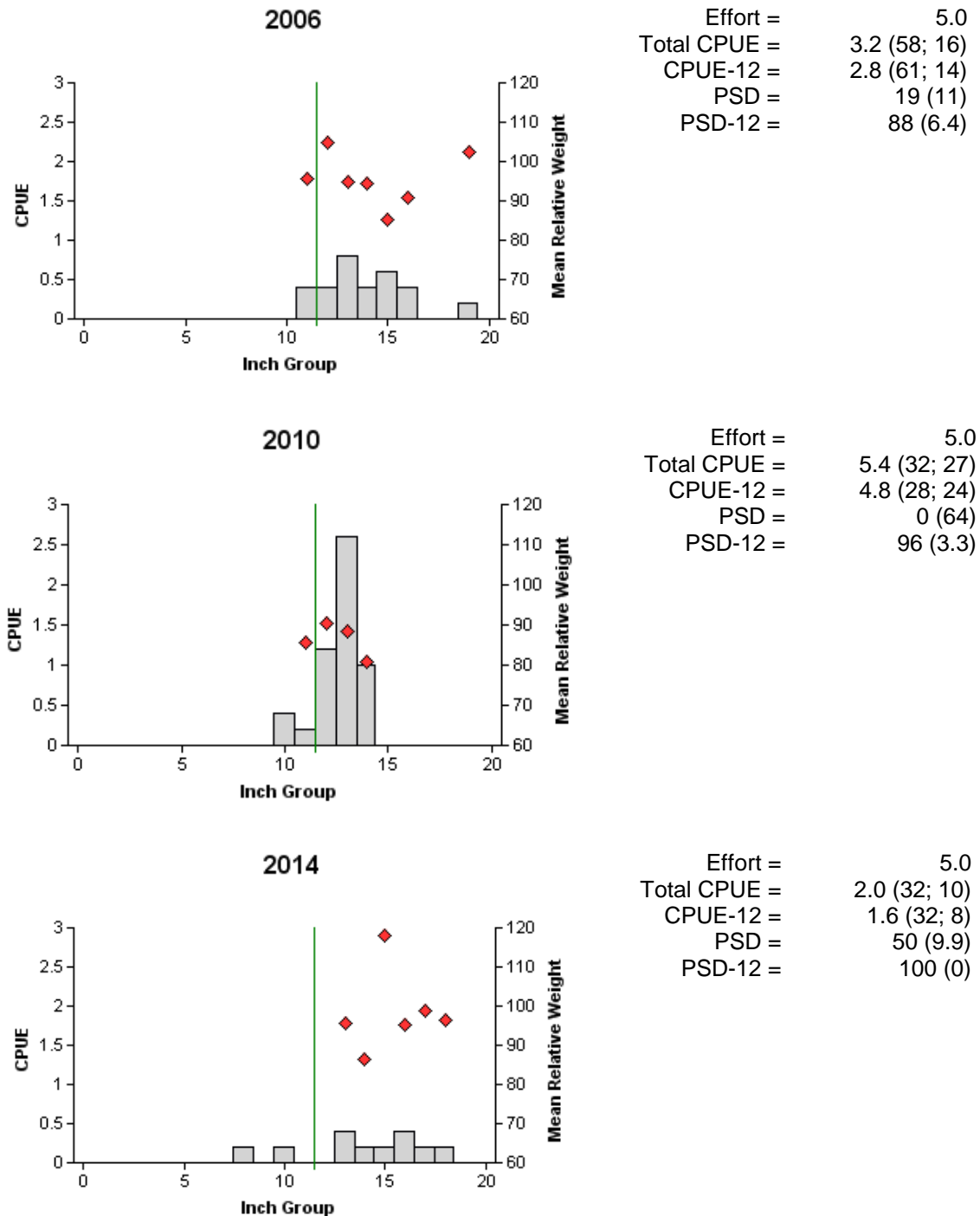


Figure 5. Number of Channel Catfish caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Inks Reservoir, Texas, 2006, 2010 and 2014. Vertical line represents minimum length limit at the time of sampling.

White Bass

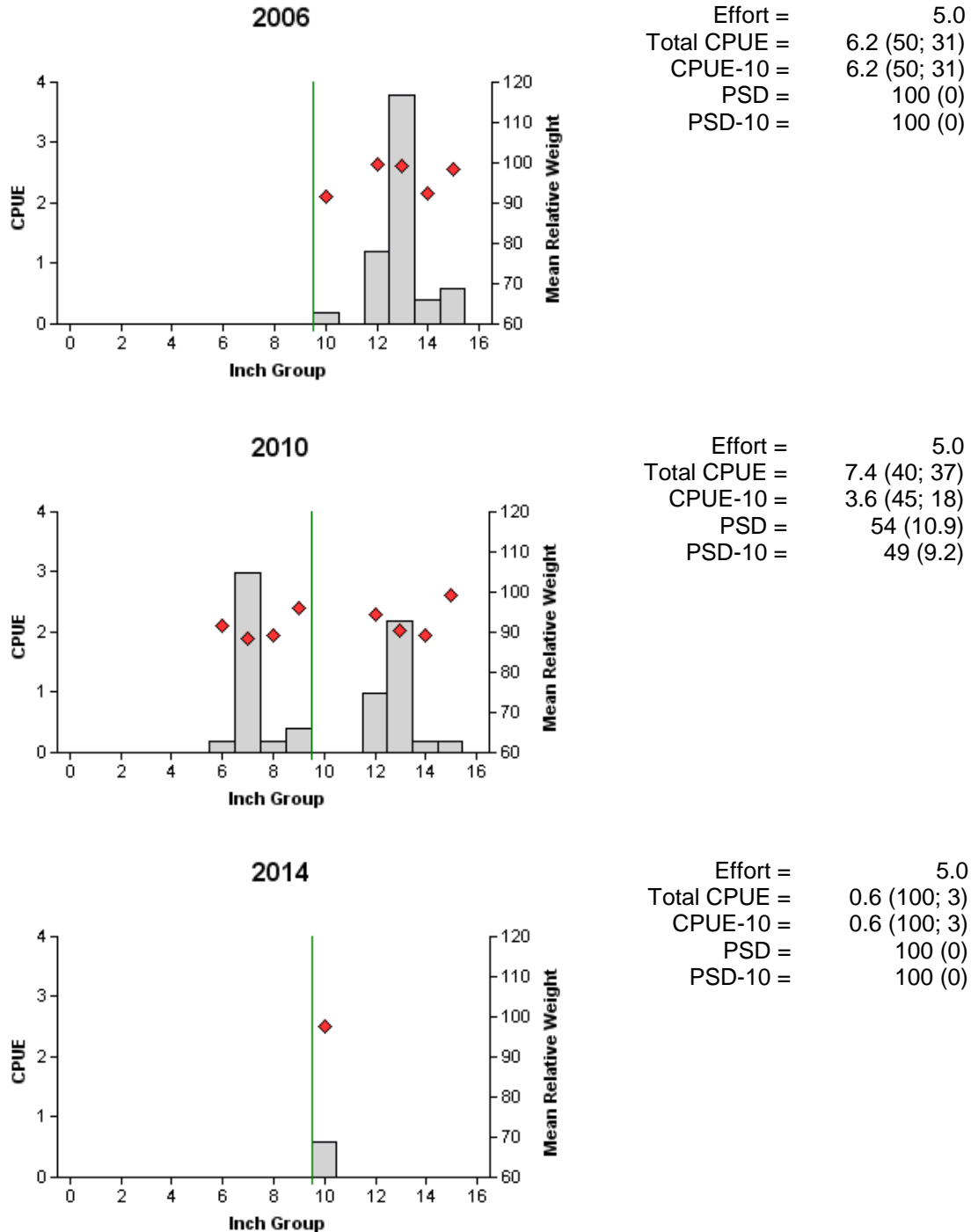


Figure 6. Number of White Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Inks Reservoir, Texas, 2006, 2010 and 2014. Vertical line represents minimum length limit at the time of sampling.

Largemouth Bass

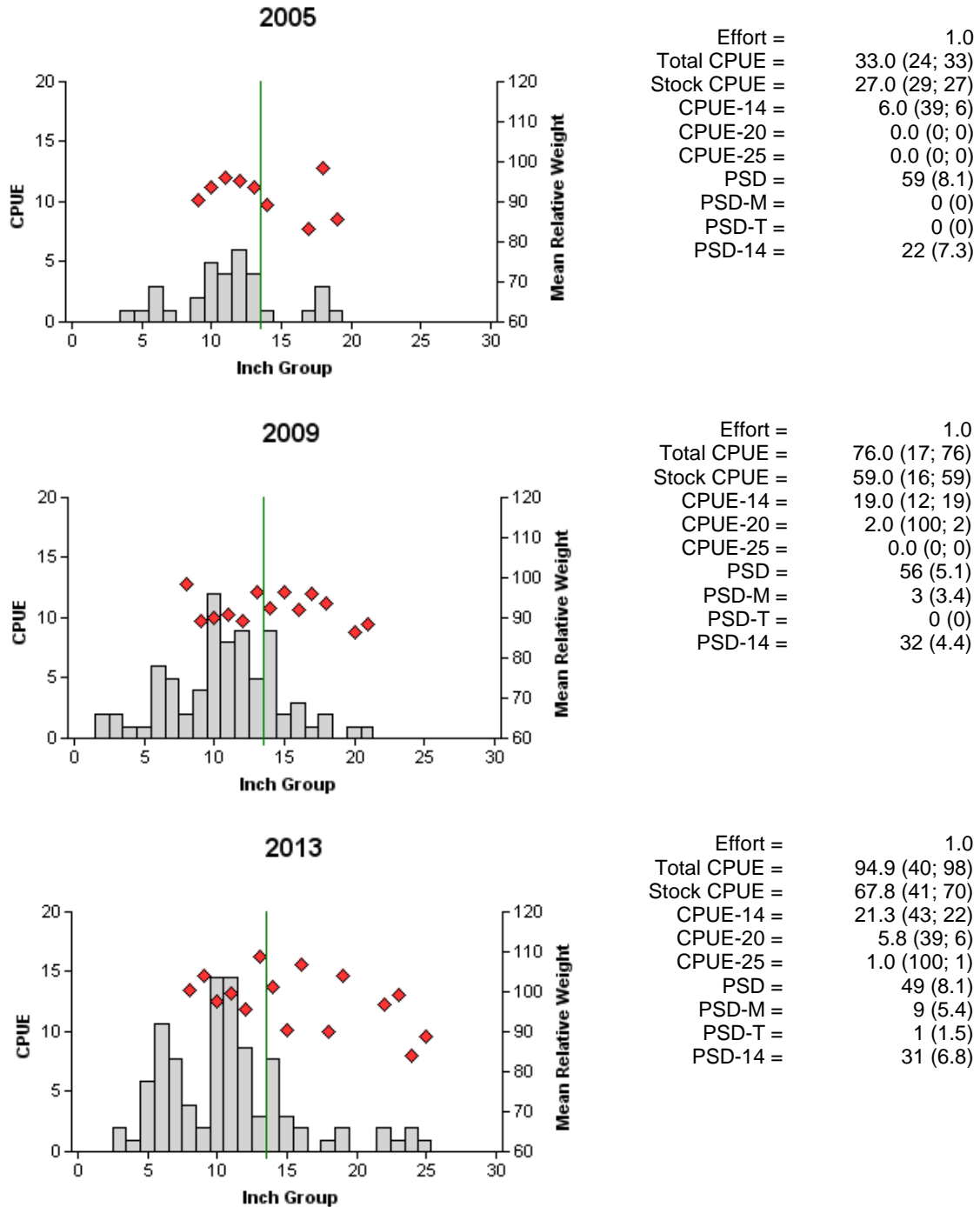


Figure 7. Number of Largemouth Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Inks Reservoir, Texas, 2005, 2009 and 2013. Vertical line represents minimum length limit at the time of sampling.

Largemouth Bass

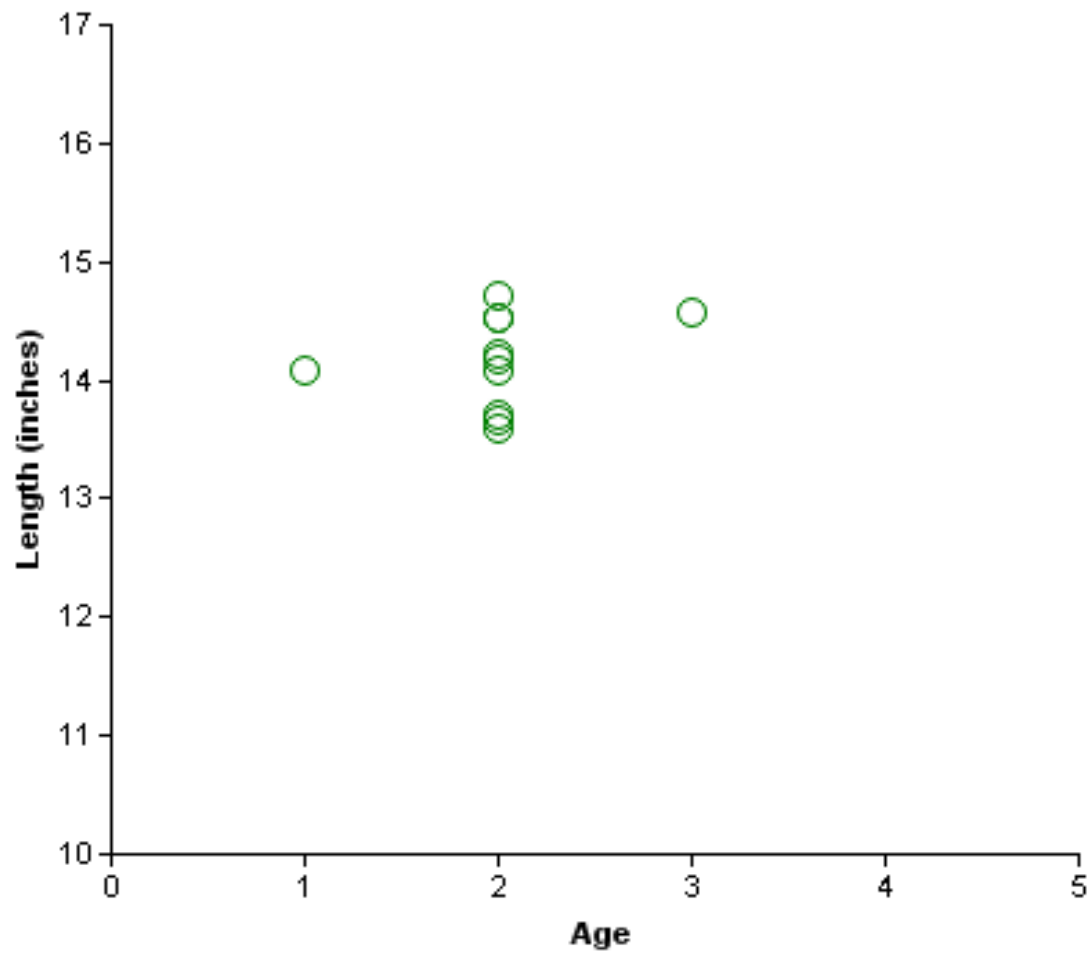


Figure 8. Length at age for Largemouth Bass collected by electrofishing at Inks Reservoir, Texas, October 2009 (N = 11).

Largemouth Bass

Table 7. Results of genetic analysis of Largemouth Bass collected by fall electrofishing, Inks Reservoir, Texas, 2001, 2005, and 2013. FLMB = Florida Largemouth Bass, NLMB = Northern Largemouth Bass, Intergrade = hybrid between a FLMB and a NLMB. Genetic composition was determined by electrophoresis prior to 2005 and with micro-satellite DNA analysis since 2005.

Year	Sample size	Number of fish			% FLMB alleles	% FLMB
		FLMB	Intergrade	NLMB		
2001	29	4	25	0	75.0	13.8
2005	13	2	11	0	66.6	16.0
2013	30	3	27	0	26.0	10.0

Table 8. Proposed sampling schedule for Inks Reservoir, Texas. Survey period is June through May. 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	Electrofishing Fall(Spring)	Trap net	Gill net	Habitat			Creel survey	Report
				Structural	Vegetation	Access		
2014-2015								
2015-2016			A					
2016-2017								
2017-2018	S		S		S	S		S

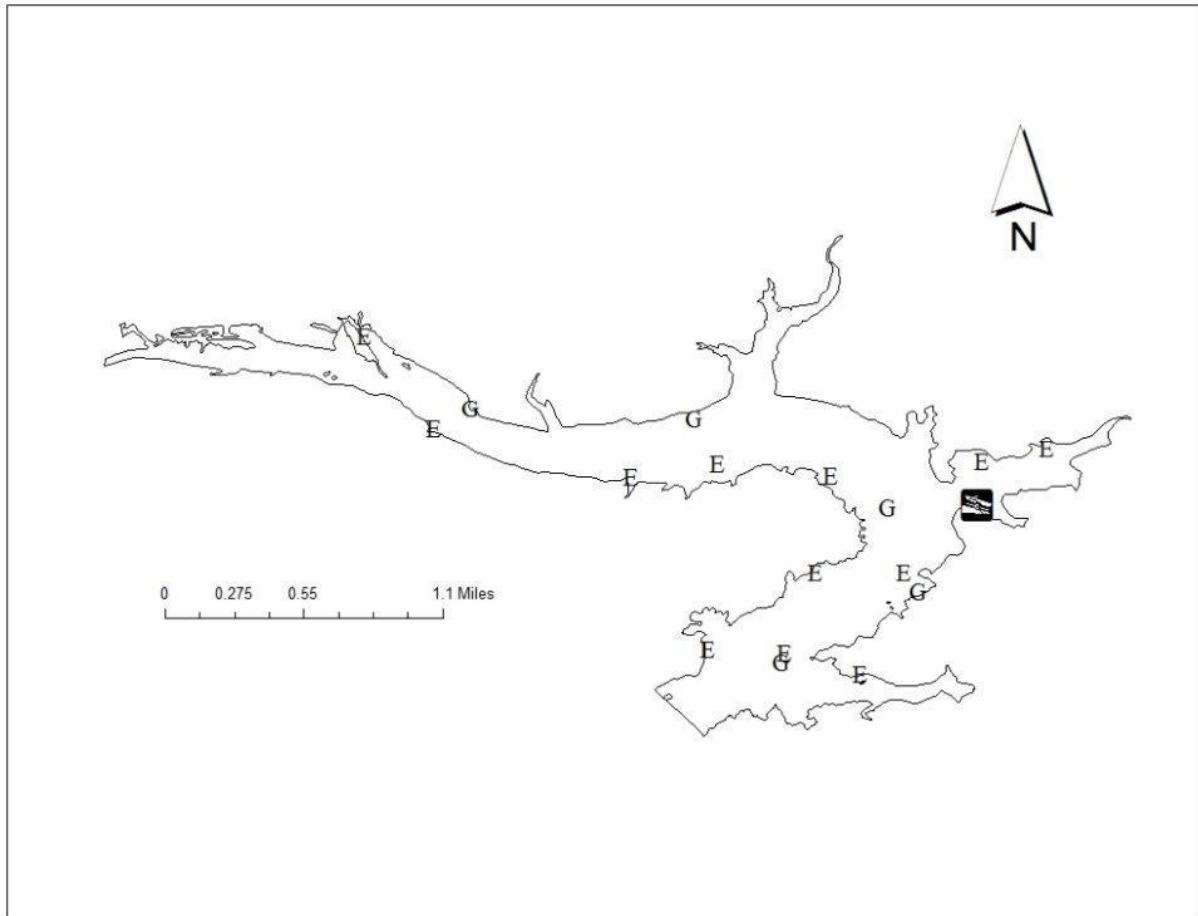
APPENDIX A

Number (N) and catch rate (CPUE) of all target species collected from all gear types from Inks Reservoir, Texas, 2013 and 2014. Sampling effort was 5 net nights for gill netting and 1.03 hour for electrofishing.

Species	Gill Netting		Electrofishing	
	N	CPUE	N	CPUE
Gizzard Shad			146	141.5
Threadfin Shad			540	523.2
Inland Silverside			1	1.0
Blacktail Shiner			28	27.1
Blue Catfish	22	4.4		
Channel Catfish	10	2.0		
Flathead Catfish	4	0.8		
White Bass	3	0.6		
Redbreast Sunfish			229	221.9
Green Sunfish			1	0.9
Bluegill			194	188.0
Longear Sunfish			16	15.5
Redear Sunfish			4	3.88
Largemouth Bass			98	95.0
Guadalupe Bass			12	11.6
Sunshine Bass	1	0.2		

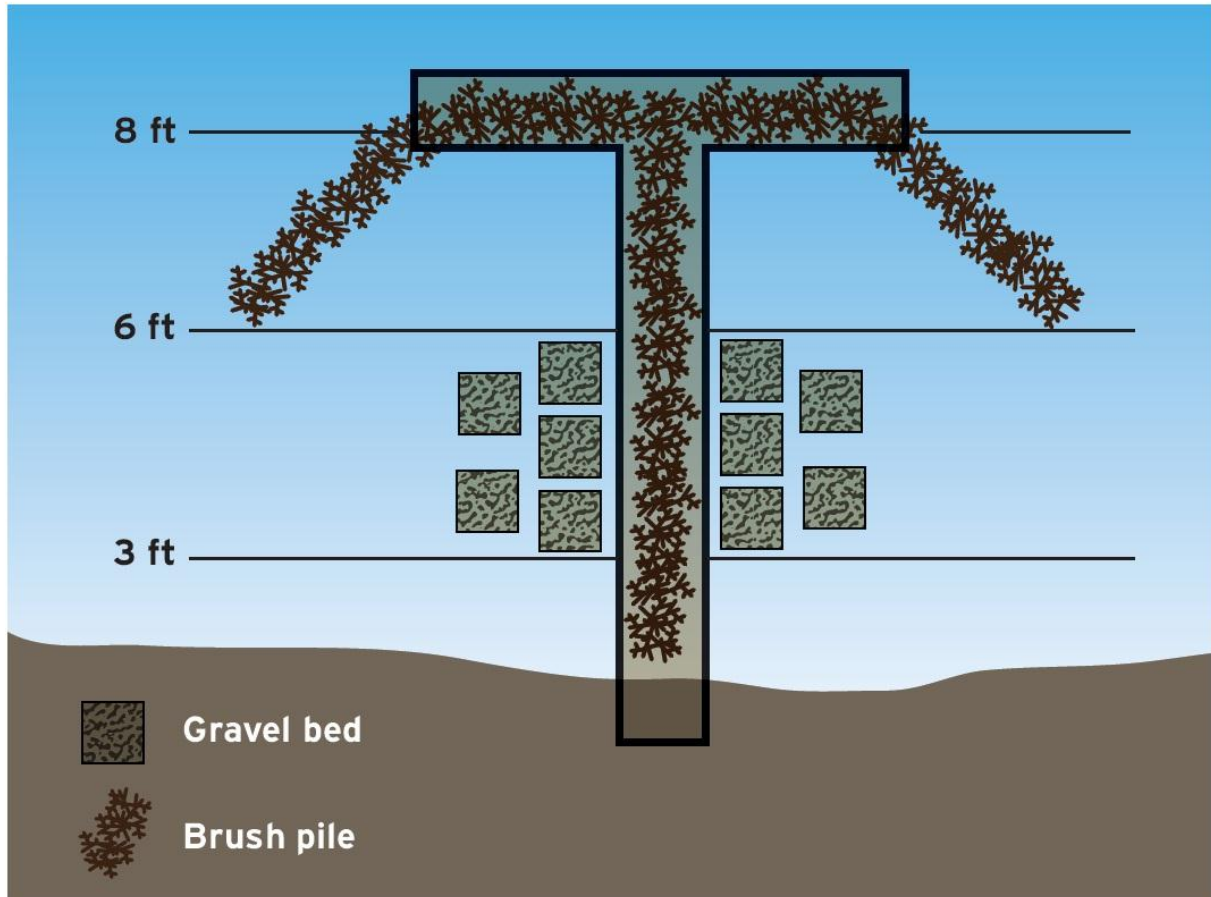
APPENDIX B

Location of sampling sites, Inks Reservoir, Texas, 2013-2014. Gill net and electrofishing stations are indicated by G and E, respectively.



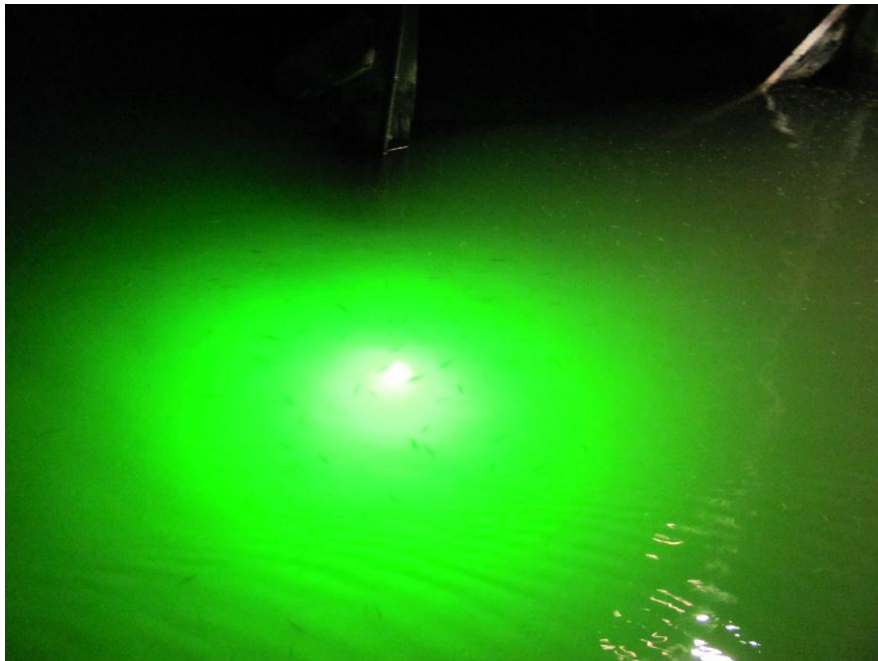
APPENDIX C

Inks Lake State Park North Pier fish attractor habitat complex layout, Inks Reservoir, Texas.



APPENDIX D

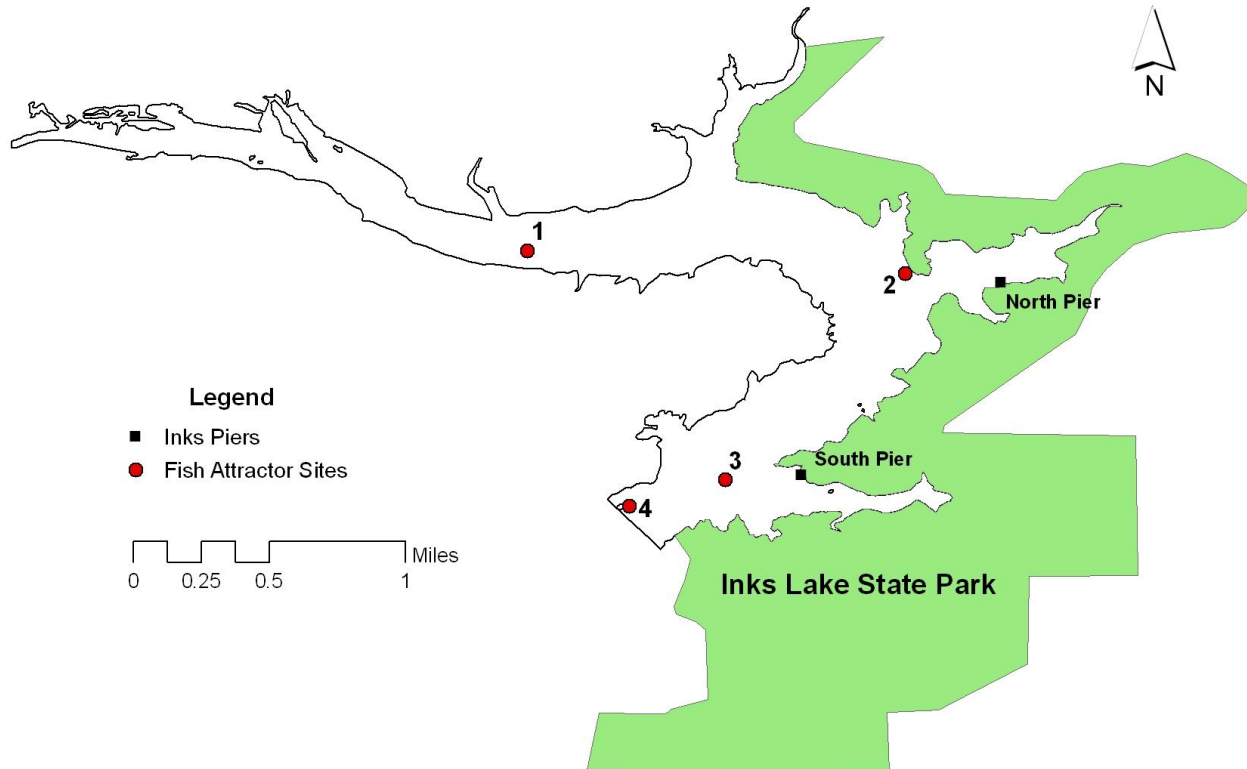
Inks Lake State Park South Pier underwater green light fish attractor, Inks Reservoir, Texas.



APPENDIX E

Fish attractor location map, Inks Reservoir, Texas.

Inks Lake Fishing Locations



Appendix F

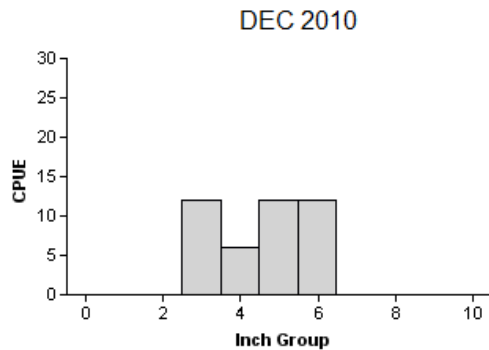
Fish attractor GPS coordinates, Inks Reservoir, Texas.

Inks Lake Fish Attractor Locations						
Updated September 23, 2013						
Site #	Lat/Long	Attractor Description			Installed	Last Supplemented
1	N 30°44.656'	North Pier in Inks Lake State Park (Gravel Beds, Cedar Trees)			2011	
	W -98°21.907'					
2	N 30°44.024'	South Pier in Inks Lake State Park (Underwater Green Lights)			2013	
	W -98°22.541'					
3	N 30°44.741'	Ledge off long point (Cedar Trees)			2013	
	W -98°23.417'					
4	N 30°44.667'	Rocky point drop off (Cedar Trees)			2013	
	W -98°22.211'					
5	N 30°44.008'	Hazzard area drop off (Cedar Trees)			2013	
	W -98°22.784'					
6	N 30°43.924'	Drop off on rock island by dam (Cedar Trees)			2013	
	W -98°23.092'					
GPS coordinates are in degree decimal minutes.						

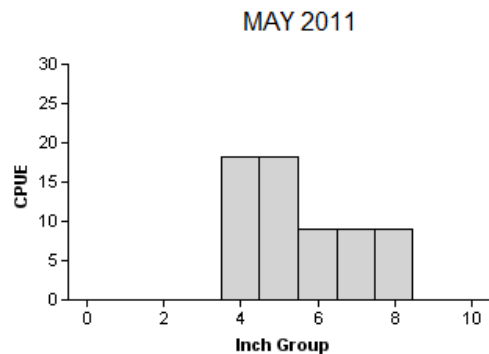
APPENDIX G

Number of Redbreast Sunfish caught per hour (CPUE, bars) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for non-standard electrofishing surveys at the north pier at Inks Lake State Park as part of the habitat enhancement evaluation in December 2010, May 2011, and November 2011, Inks Reservoir, Texas. Habitat enhancement was conducted in February 2011.

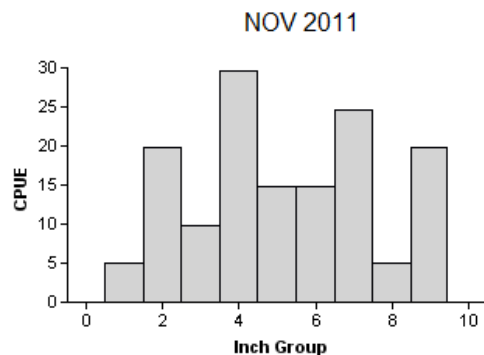
Redbreast Sunfish



Effort = 0.2
 Total CPUE = 42.0 (0; 7)
 CPUE-6 = 12.0 (0; 2)
 CPUE-8 = 0.0 (0; 0)
 PSD = 29 (-1)



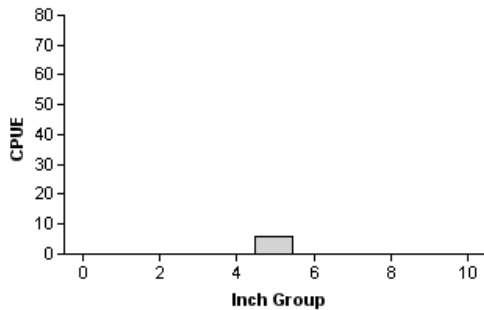
Effort = 0.2
 Total CPUE = 63.6 (0; 14)
 CPUE-6 = 27.3 (0; 6)
 CPUE-8 = 9.1 (0; 2)
 PSD = 0 (0.0)



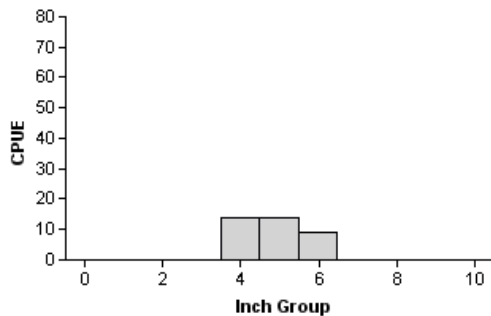
Effort = 0.2
 Total CPUE = 143.0 (0; 29)
 CPUE-6 = 64.1 (0; 13)
 CPUE-8 = 24.7 (0; 5)
 PSD = 54 (-1)

APPENDIX H

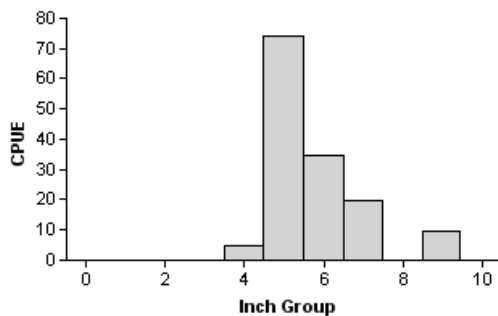
Number of Bluegill caught per hour (CPUE, bars) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for non-standard electrofishing surveys at the north pier at Inks Lake State Park as part of the habitat enhancement evaluation in December 2010, May 2011, and November 2011, Inks Reservoir, Texas. Habitat enhancement was conducted in February 2011.

Bluegill**DEC 2010**

Effort = 0.2
 Total CPUE = 6.0 (0; 1)
 CPUE-6 = 0.0 (0; 0)
 CPUE-8 = 0.0 (0; 0)
 PSD = 0 (0.0)

MAY 2011

Effort = 0.2
 Total CPUE = 36.4 (0; 8)
 CPUE-6 = 9.1 (0; 2)
 CPUE-8 = 0.0 (0; 0)
 PSD = 0 (0.0)

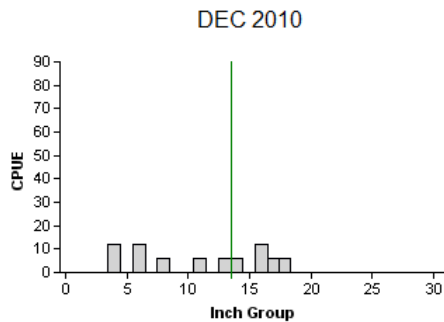
NOV 2011

Effort = 0.2
 Total CPUE = 143.0 (0; 29)
 CPUE-6 = 64.1 (0; 13)
 CPUE-8 = 9.9 (0; 2)
 PSD = 0 (0.0)

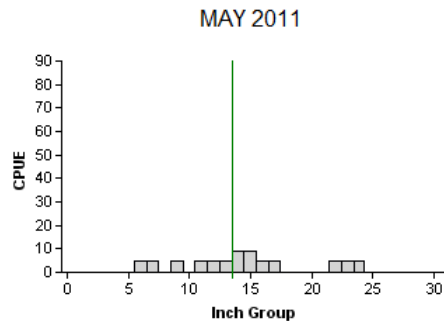
APPENDIX I

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 non-standard electrofishing surveys at the north pier at Inks Lake State Park as part of the habitat enhancement evaluation in December 2010, May 2011, and November 2011, Inks Reservoir, Texas. Vertical line represents minimum length limit at the time of sampling. Habitat enhancement was conducted in February 2011.

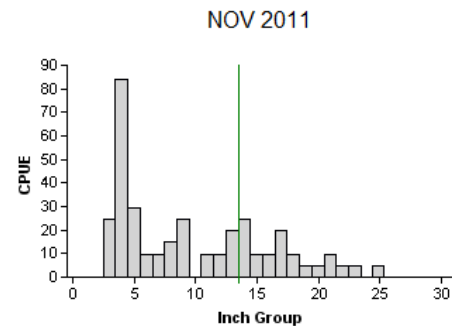
Largemouth Bass



Effort =	0.2
Total CPUE =	72.0 (0; 12)
Stock CPUE =	48.0 (0; 8)
CPUE-14 =	30.0 (0; 5)
CPUE-20 =	0.0 (0; 0)
CPUE-25 =	0.0 (0; 0)
PSD =	75 (-1)
PSD-M =	0 (-1)
PSD-T =	0 (-1)
PSD-14 =	62 (-1)



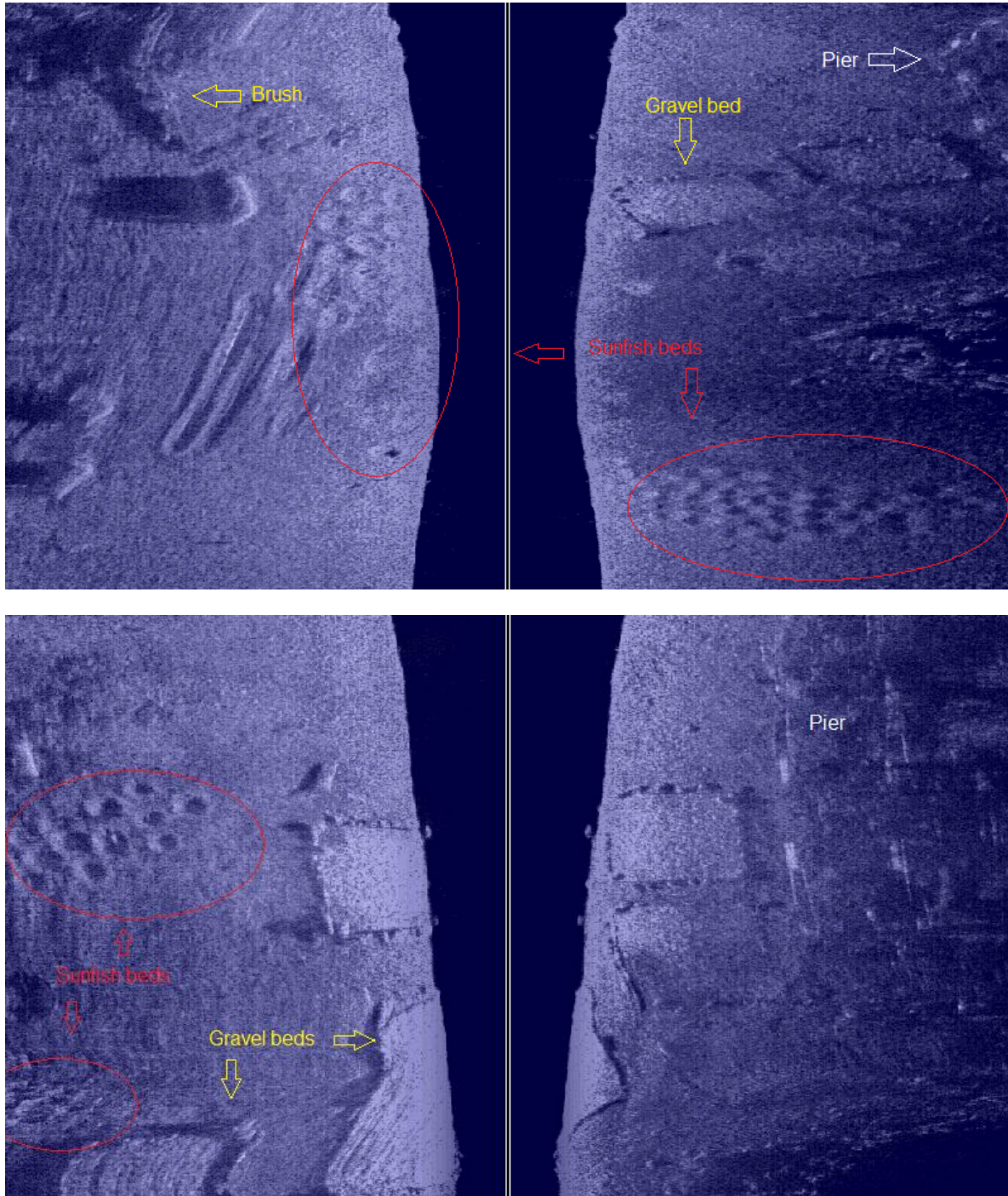
Effort =	0.2
Total CPUE =	68.2 (0; 15)
Stock CPUE =	59.1 (0; 13)
CPUE-14 =	40.9 (0; 9)
CPUE-20 =	13.6 (0; 3)
CPUE-25 =	0.0 (0; 0)
PSD =	85 (-1)
PSD-M =	23 (-1)
PSD-T =	0 (-1)
PSD-14 =	69 (-1)



Effort =	0.2
Total CPUE =	345.1 (0; 70)
Stock CPUE =	187.3 (0; 38)
CPUE-14 =	108.5 (0; 22)
CPUE-20 =	29.6 (0; 6)
CPUE-25 =	4.9 (0; 1)
PSD =	74 (-1)
PSD-M =	16 (-1)
PSD-T =	3 (-1)
PSD-14 =	58 (-1)

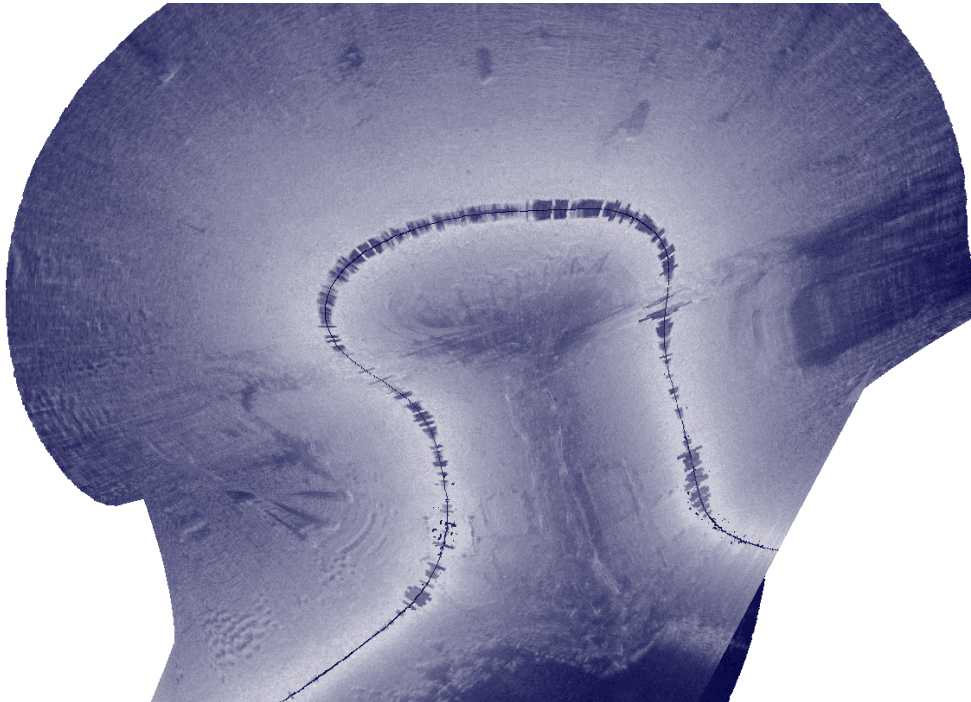
APPENDIX J

Side-scan sonar imagery of fish attractor structures installed around the north pier at Inks Lake State Park, Inks Reservoir, Texas, June 2012. Sunfish nesting colonies were detected within the enhancement area. Mapping conducted by Greg Cummings.



APPENDIX J (Cont.)

Compiled side-scan sonar imagery of fish attractor structures installed around the north pier at Inks Lake State Park, Inks Reservoir, Texas, June 2012. Sunfish nesting colonies were detected within the enhancement area. Mapping conducted by Greg Cummings.



APPENDIX K

Inks Lake State Park North Pier fish attractor project completion, Inks Reservoir, Texas, January 2011.



APPENDIX K (Cont.)

Inks Lake State Park North Pier fish attractor project completion, Inks Reservoir, Texas, January 2011.

