

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

Toledo Bend Reservoir

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July 31, 2014

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SURVEY AND MANAGEMENT SUMMARY

Fish populations in Toledo Bend Reservoir were surveyed in 2013-2014 using electrofishing and gill netting. Anglers were surveyed from June 2013 to May 2014 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 Texas side of the reservoir.

- **Reservoir Description:** Toledo Bend Reservoir is a 181,600-acre (70,469 acres in Texas) impoundment of the Sabine River in Newton, Sabine, and Shelby counties in southeast Texas. Water level fluctuations average 3 feet annually. Aquatic habitat consisted of aquatic vegetation (primarily hydrilla and American lotus) and standing timber.
- **Management History:** Historically, the black bass fishery has been the most popular at Toledo Bend Reservoir. Typically, 65 to 80% of annual angling effort is directed at black basses. Approximately 15 to 20% of anglers target crappie. With the exception of 2006, TPWD has stocked Florida Largemouth Bass (FLMB) annually since 1990 to increase abundance of large bass (> 8 pounds). The Louisiana Department of Wildlife and Fisheries (LDWF) also stocks FLMB annually. Joint efforts with LDWF have resulted in standardization of all recreational harvest regulations. In 1998, giant salvinia was discovered in Toledo Bend Reservoir. Cold water temperatures during the winter of 2010 and low water levels in 2011 reduced overall coverage to only trace amounts, but plants remained scattered throughout the entire reservoir. In 2013, plant coverage reached the historic high (9,314 acres) and impeded angler access. Control methods have included annual herbicide treatments at access points, releases of salvinia weevils, and a water level drawdown.
- **Fish Community**
 - **Prey species:** Gizzard Shad, Threadfin Shad, and Bluegill were the most abundant prey species and provided ample forage for sport fish.
 - **Catfishes:** Blue Catfish abundance was relatively stable over the last three survey years, and high numbers of fish 12 to 30 inches were available to anglers. Channel Catfish numbers declined and a majority of fish were < 12 inches. Angling catch rate averaged 2.2/h. Blue Catfish and Flathead Catfish provided trophy opportunities for anglers.
 - **Temperate basses:** Historically, Striped Bass were periodically stocked by LDWF, but no fish have been collected since 2008. In 2012 and 2014, White Bass numbers increased. Few anglers target White Bass in the reservoir (< 1% of fishing effort), but during the spawning season (January – March) the fishery is popular in the Sabine River above the reservoir. A total of 6,531 White Bass and 11,829 Yellow Bass were harvested from the reservoir.
 - **Black basses:** Spotted Bass were present in low numbers. Largemouth Bass abundance was relatively high; size structure and fish condition were good. The black bass fishery was most popular (78% of fishing effort). Angling catch rate was high (1.1/h).
 - **Crappies:** White Crappie and Black Crappie were present in the reservoir. Angling catch (2.1/h) and total harvest (208,955 fish) reflected an abundant crappie population.
- **Management Strategies:** Stock FLMB annually to improve large fish potential. Monitor Largemouth Bass population biennially with electrofishing and creel surveys. Continue tournament-monitoring program to monitor large fish abundance. Survey giant salvinia coverage annually to monitor effects of control measures. Publish monthly articles in the *Lakecaster* highlighting TPWD activities.

INTRODUCTION

This document is a summary of fisheries data collected from the Texas side of Toledo Bend Reservoir in 2013-2014. 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 species of fishes was collected, this report deals primarily with major sport fishes and important prey species. Historical data are presented with the 2013-2014 data for comparison.

Reservoir Description

Toledo Bend Reservoir is an impoundment of the Sabine River in Newton, Sabine, and Shelby counties in southeast Texas. The Sabine River Authority (SRA) constructed the reservoir in 1966 for municipal, industrial, and agricultural water supply, generation of hydroelectric power, and recreational use. At conservation pool (172 feet above mean sea level), Toledo Bend Reservoir is 181,600 surface acres (70,469 acres in Texas), has a shoreline length of 1,200 miles, and a mean depth of 20 feet. Water level fluctuation averages 3 feet annually, but the historic low water level was observed in 2011 (159.6 feet MSL; Figure 1). The reservoir was eutrophic with a mean Carlson's Trophic State Index chl-*a* of 47.6 (Texas Commission on Environmental Quality 2011). Habitat at time of sampling consisted of aquatic vegetation (primarily hydrilla and American lotus) (Table 5) and standing timber. Most of the land around the reservoir is used for timber production, agriculture, and residential development. Other descriptive characteristics for Toledo Bend Reservoir are in Table 1.

Angler Access

Toledo Bend Reservoir has 32 public boat ramps on the Texas side. Several of the boat ramps in the upper reservoir were periodically unavailable during summer and fall of 2013 due to giant salvinia coverage. Additional boat ramp characteristics are in Table 2. Shoreline access is limited to public boat ramp areas.

Management History

Previous management strategies and actions: Management strategies and actions from the previous survey report (Driscoll and Ashe 2012) included:

1. Stock Florida Largemouth Bass (FLMB) annually ($\geq 500,000$ fingerlings) to maintain and improve large fish potential.
Action: FLMB were stocked in 2012 and 2013.
2. Conduct annual electrofishing (fall and spring) and biennial creel surveys to monitor status of Largemouth Bass population.
Action: Fall electrofishing surveys were conducted in 2012 and 2013, spring electrofishing surveys were conducted in 2013 and 2014, and a creel survey was conducted from June 2013 through May 2014.
3. Continue black bass tournament-monitoring program to increase information on relative abundance of large fish (> 20 inches).
Action: Since 2009, data from 64 tournaments have been included and summarized in Appendix C.
4. As part of the reservoir-wide standardization of sportfish harvest regulations in 2011, Blue and Channel Catfish regulations were changed to a no minimum length limit, 50-fish daily bag in aggregate, with only 5 Blue or Channel Catfish ≥ 20 inches retained each day. Passive gear anglers expressed discontent, as a majority of their catch exceeded 20 inches. Collect catch and harvest data from passive gear catfish anglers to determine length-frequency of catch, proportion of catch ≥ 20 inches in length, and the most appropriate length at which to restrict harvest. Solicit angler opinion regarding a potential change of the harvestable length.

Action: Biological and social data supported a change to a no minimum length limit, 50-fish daily bag in aggregate, with only 5 Blue or Channel Catfish \geq 30 inches retained each day. In conjunction with LDWF, this regulation change will be implemented reservoir-wide on September 1, 2014.

5. Conduct annual vegetation surveys to monitor giant salvinia and hydrilla abundance and recommend management strategies.

Action: Annual vegetation surveys have been conducted since 1998. Aerial flights have been conducted since 2006. Giant salvinia is distributed reservoir-wide and reached the historic high of 9,314 acres in 2013 (Table 5). Herbicide treatments have targeted access points to maintain angler access and reduce potential transfer to other waters. High emphasis has been placed on public education via media events, press releases, and signage at all public Toledo Bend-Texas boat ramps. Reservoir-wide management and control options discussed with SRA included boom placement at boat ramps to contain trailer introductions and prevent plant transfer, annual salvinia weevil releases, and a water level drawdown.

6. Conduct gillnetting surveys every two years to monitor the status of catfish populations.

Action: Surveys were conducted in 2012 and 2014.

7. Publish monthly popular articles in the *Lakecaster*, a newsletter distributed to 30 counties in Texas and Louisiana.

Action: Articles highlighting TPWD activities at Toledo Bend Reservoir have been published monthly since 2000.

Harvest regulation history: Due to harvest regulation standardization efforts with LDWF, no sport fish in Toledo Bend Reservoir are managed with TPWD statewide regulations (Table 3), but regulations are standardized reservoir-wide. In 2011, recreational harvest regulations for Texas and Louisiana were standardized for crappies (no minimum length limit, 25-fish daily bag limit), Blue and Channel Catfish (no minimum length limit, 50-fish bag limit in aggregate, no more than 5 fish \geq 20 inches in length may be retained daily), and Flathead Catfish (18-inch minimum length limit, 10-fish daily bag limit). On September 1, 2014, the harvestable-length portion of the Blue and Channel Catfish regulation will be changed to 30 inches.

Stocking history: Since 1990, Toledo Bend Reservoir has received annual stockings of FLMB every year but 2006 (Table 4). From 1992 to 2009, Striped Bass were stocked annually by LDWF. TPWD stocked surplus Striped Bass fingerlings in 2002.

Vegetation/habitat management history: Historically, nuisance exotic species include water hyacinth and giant salvinia. Water hyacinth has remained problematic, requiring periodic herbicide treatments. However, giant salvinia is by far the most problematic aquatic vegetation species. From 1998 to 2004, herbicide treatments conducted by the Aquatic Habitat Enhancement (AHE) staff, coupled with annual water level drawdowns each fall, limited giant salvinia coverage to < 500 acres. The cessation of fall drawdowns in the mid-2000s was accompanied by significant increases in giant salvinia acreage. Subsequent herbicide treatments have utilized certified commercial applicators with focus on access points to maintain recreational access and minimize plant transport to other waters.

Salvinia weevils were first introduced in 2004 as a biological control for giant salvinia. Additional weevil stockings have occurred every year since, but the numbers of insects and the locations have varied. Salvinia weevils are not cold tolerant, however, and mortality during the colder months has been the biggest obstacle to establishing populations large enough to impact salvinia abundance.

Water transfer: The annual water yield from Toledo Bend Reservoir is 2,086,600 acre-feet, of which half is allocated to SRA-Texas and half to SRA-Louisiana (collectively the SRAs). Of the 1,043,300 acre-feet/year allocated to SRA-Texas, a water right exists for 750,000 acre-feet/year. In 2003, SRA-Texas applied for the unpermitted 293,300 acre feet. The SRAs operate the Toledo Bend Project primarily for

purposes of water supply and conservation, and secondarily for renewable hydropower production and recreation. Hydroelectric power production is for Entergy Gulf States, Inc, CLECO Power, LLC, and Entergy Louisiana, LLC, and major direct water sales are to the cities of Hemphill and Huxley and two industrial companies (Tenaska and XTO). In 2003, SRA-Texas agreed to examine the feasibility of inter-basin transfer of water to north Texas (i.e., Dallas Water Utilities, Tarrant Regional Water District and North Texas Municipal Water District). The development of this pipeline project is projected for 2060 (Texas Water Development Board 2012).

METHODS

Fishes were collected by electrofishing (2 hours at 24, 5-min stations during March [largemouth bass only] and October) and gill netting (15 net nights at 15 stations during March). 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 nets, as the number of fish caught per net night (fish/nn). All survey sites were randomly selected on the Texas side of the reservoir and all surveys were conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2011).

An annual access-point creel survey was conducted from June 2013 through May 2014. Angler interviews were conducted on 5 weekend days and 4 weekdays per quarter 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 weights (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.

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.

An aquatic vegetation survey of the entire reservoir was conducted in 2013 by airplane. Coverages were calculated for all prevalent species.

Source for water level data was the United States Geological Survey (USGS 2014).

Results of largemouth bass tournaments collected from the internet to supplement population information from electrofishing and creel surveys are included in Appendix C.

RESULTS AND DISCUSSION

Habitat: A structural habitat survey conducted in 2003 indicated that the littoral zone included primarily dead timber and boat docks (Driscoll 2004). Over 60,000 acres of standing timber were present in Texas waters. Historically, aquatic vegetation coverage at Toledo Bend Reservoir (primarily hydrilla) has exceeded 20,000 surface acres. Since 2008, hydrilla has ranged from 3,890 acres (2010) to 14,698 acres (2013) (Table 5). Although hydrilla is listed on the TPWD and federal list of prohibitive plants, it is considered beneficial habitat at Toledo Bend Reservoir, as coverage has never been problematic or caused access problems. Nuisance exotic species include giant salvinia and water hyacinth. In 2013, giant salvinia coverage reached the historic high of 9,314 acres. Although both species are distributed reservoir-wide, a majority of plant biomass is located in shallow, backwater areas (headwaters of both the reservoir and major embayments).

Creel: Similar to previous survey years, fishing effort on the Texas side of Toledo Bend Reservoir was primarily directed at black basses (78.0%) and crappies (15.9%) (Table 6). In 2013/2014, total fishing effort and total directed expenditures increased to 535,642 h and \$6,082,890, respectively (Table 7).

Prey species: Primary prey species included Gizzard Shad, Threadfin Shad, and Bluegill. All three species provided abundant prey. Gizzard Shad catch rates were relatively stable during the last three sampling years (range = 64.0 to 99.0/h), and IOVs ranged from 19 to 56 (Figure 2). Historically, Threadfin Shad catch rates have been highly variable; catch rate in 2013 was 1,091.0/h (Appendix A). Bluegill catch rates by electrofishing during the previous three survey years were also variable (range = 310.0 to 626.2/h) (Figure 3). Few anglers sought sunfish (0.7% of total fishing effort) (Table 6), and total estimated harvest was 18,570 fish (Table 8).

Catfishes: Blue Catfish gill net catch rates were relatively similar (range = 7.1 to 11.9/nn) during the last three sampling years (Figure 5). Fish > 30 inches were caught in each of the last three survey years, and PSDs ranged from 28 to 43. Fish condition was moderate as W_r ranged from 82 to 125, indicating adequate prey availability.

Gill net catch rates of Channel Catfish were also relatively similar during the last three survey years (2010 = 8.7/nn; 2012 = 5.8/nn; 2014 = 4.2/nn) (Figure 6). In 2012 and 2014, population size structure was dominated by smaller fish (PSD = 6).

Catfish anglers (rod and reel only) accounted for 1.4% of the total fishing effort (Table 6) and catch rate was 2.2/h (Table 9). Total estimated harvest was 9,854 fish; 50% of harvested fish were Blue Catfish (Figure 7). Anecdotal information indicated that blue and flathead catfish provided a substantial passive gear fishery.

Temperate basses: Historically, gill net catch rates of White Bass have averaged 1.8/nn, reflecting a low-density population in the reservoir. During the last three survey years, catch rates ranged from 0.3 to 3.6/nn (Figure 9).

Since the 1970s, Striped Bass were frequently stocked by the LDWF to support broodfish procurement for palmetto bass production. However, no fish have been stocked since 2009. During the last three survey years, none were caught with gill nets.

During the last three creel surveys, little directed fishing effort for temperate basses was observed (Table 6). However, during the spawning season (January through March) a popular White Bass fishery exists in the Sabine River upstream of the reservoir. Estimated temperate bass harvest was 18,360 fish in 2013/2014 (Table 9); 64% of harvested fish were Yellow Bass (Figure 11).

Black basses: Spotted Bass were present in the reservoir, but only one was collected by electrofishing in 2013 (Appendix A). Total estimated harvest was 10,000 fish in 2013/2014 (Figure 15).

Fall electrofishing catch rates during 2010 to 2013 reflected relatively high and stable Largemouth Bass abundance (range = 126.0 to 223.1/h) (Figure 13). Population size structure was similar across years (PSD range = 39 to 49; PSD-14 range = 20 to 22). Relative weights ranged from 85 to 125, indicating largemouth bass were in moderate condition.

Similarly, spring electrofishing catch rates were also relatively high (range = 149.5 to 209.5/h) (Figure 14). However, spring surveys reflected higher proportions of larger fish (PSD range = 68 to 70; PSD-14 range = 35 to 43).

Although the reservoir has been stocked with FLMB annually since 1990 (only exception in 2006) (Table 4),

reservoir-wide FLMB influence has remained low and relatively stable. Since 2006, FLMB alleles ranged from 24 to 29% and no pure FLMB were collected (Table 11).

The majority of total fishing effort (78.0%) was directed at black basses (35.6% was tournament-related) (Table 5). From 2009 to 2014, angler catch rates were relatively high and consistent, exceeding 1.0/h during all three survey periods (Table 10). During 2013/2014, total directed effort and harvest was 418,045 h and 96,783 fish, respectively. A total of 43,983 fish were retained by tournament anglers for weigh-in and release. Although the proportion of legal-size fish immediately released increased during the last three survey years, it was still relatively low when compared to most Texas reservoirs (range = 24 to 43%). Although the total catch of fish \geq 4 pounds increased from 4,340 fish to 17,769 fish during the last two survey periods, the proportion of total catch was similar (range = 2.6 to 3.4%) (Table 10).

A tournament-monitoring program was implemented in June 2004 to increase information on legal-size fish (\geq 14 inches) and provide greater insight regarding large (> 20 inches) fish abundance (Appendix C). Since 2009, results reflect relatively high abundance of legal-size fish and desirable numbers of larger fish. Proportion of teams catching limits (5 legal-size fish) ranged from 46.6 to 56.2%, while the proportion of individual anglers ranged from 26.1 to 81.8%. Average winning weights ranged from 24.9 to 27.6 pounds for team events and 19.2 to 22.8 pounds for individual events. The proportion of teams with weights > 15 pounds was similar (15.7 to 23.2%), while individual events were more variable (5.2 to 32.4%). Across years for all tournaments, average big bass weight ranged from 7.7 to 9.5 pounds.

Crappies: Historically, trap net catch rates of crappies have been low (2.3/nn). Trap net surveys were discontinued in 2004.

Creel data reflected a productive crappie fishery that was second to the black bass fishery in terms of total fishing effort (15.9%; Table 6). Angler catch rate was high (2.1/h; Table 12) and total harvest was 208,955 fish (Table 12; Figure 18).

Fisheries management plan for Toledo Bend Reservoir, Texas

Prepared – July 2014

ISSUE 1: Creel surveys indicate most sportfishing effort at Toledo Bend Reservoir is for Largemouth Bass. The reservoir also hosts a considerable number of annual bass tournaments (36% of black bass effort). Tournament-monitoring and creel data reflect angler catch of large fish (> 8 pounds) and the reservoir has produced seven ShareLunkers (three since 2012).

MANAGEMENT STRATEGIES

1. Continue annual stocking of FLMB (\geq 500,000 fingerlings) to maintain and improve large fish potential.
2. Continue the tournament-monitoring program to increase information on legal-size fish.
3. Conduct biennial electrofishing and creel surveys to monitor status of the Largemouth Bass population.
4. Examine Largemouth Bass growth every four years.
5. Promote fish handling procedures that minimize tournament-related mortality to minimize impacts on largemouth bass population and reduce conflicts with non-tournament anglers.

ISSUE 2: Giant salvinia exceeded 9,000 acres in 2013 (historical high) and impeded angler access. Transport to other waters is likely.

MANAGEMENT STRATEGIES

1. The TPWD AHE office has taken the lead role with management of giant salvinia. Assist AHE staff with implementation of management strategies.
2. Monitor giant salvinia coverage annually via airplane to document plant distribution and effects of control measures (i.e., herbicides, booms, weevils).
3. Continue to oversee herbicide treatments by private contractors.
4. At access points, maintain all educational signs and continue herbicide treatments to prevent transport to other waters.
5. In cooperation with TPWD Communications Division, continue educational campaign via media releases, signage, and informational booths at public events.
6. Continue discussions with SRA regarding water level drawdowns to decrease plant coverage.
7. Continue to investigate effects of salvinia weevil releases.
8. Continue to communicate with LDWF regarding plant distribution and control measures.

ISSUE 3: The crappie fishery at Toledo Bend Reservoir is significant (16% of the total annual fishing effort and annual harvest > 200,000 fish).

MANAGEMENT STRATEGY

1. Conduct biennial creel surveys to monitor the crappie fishery, as trap netting at Toledo Bend Reservoir is not effective.

ISSUE 4: A considerable catfish fishery also exists. Although the rod and reel catfish fishery is minor, the majority of the actual directed catfish effort is likely due to passive gear anglers.

MANAGEMENT STRATEGY

1. Conduct biennial gillnetting surveys to monitor catfish populations.

ISSUE 5: Area constituents are interested in TPWD activities and management actions related to Toledo Bend Reservoir and need to be informed.

MANAGEMENT STRATEGY

1. Continue to publish monthly articles on TPWD activities in the *Lakecaster*, a newsletter distributed to approximately 30 counties in Texas and Louisiana.

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 biennial electrofishing (both spring and fall) and creel surveys to closely monitor the popular Largemouth Bass fishery (Table 13). Biennial creels are also needed to monitor the crappie fishery due to ineffectiveness of trap nets. Gill net surveys will be conducted every two years to adequately monitor catfish populations. Growth of Largemouth Bass will be examined every four years.

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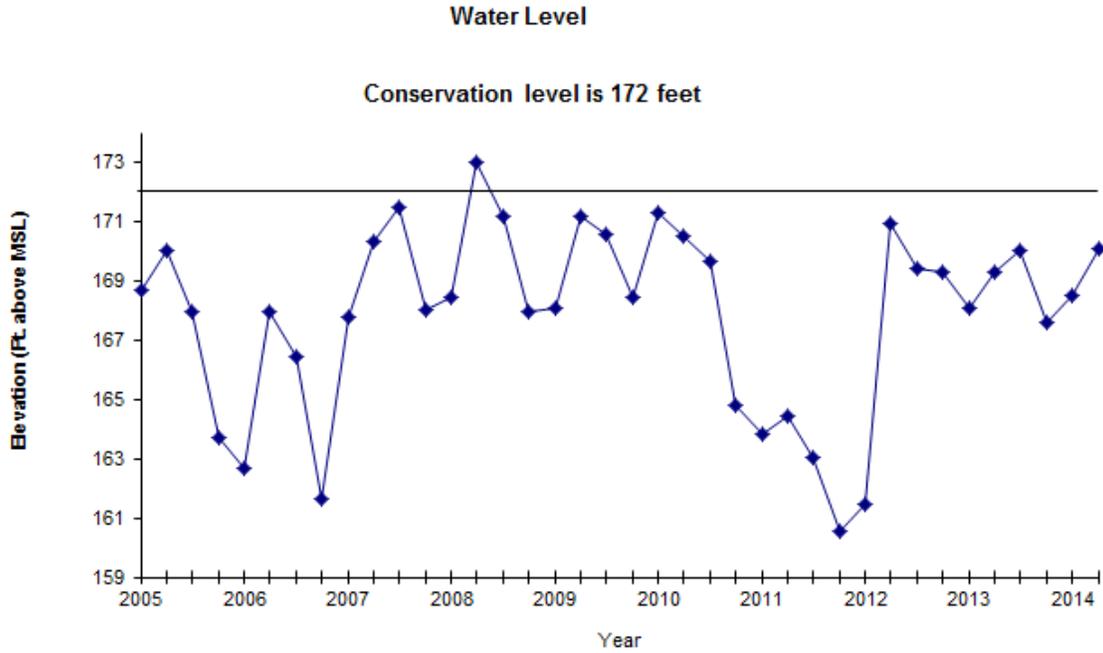


Figure 1. Quarterly water level elevations in feet above mean sea level (MSL) recorded for Toledo Bend Reservoir, Texas.

Table 1. Characteristics of Toledo Bend Reservoir, Texas.

Characteristic	Description
Year constructed	1966
Controlling authority	Sabine River Authority
Counties	Newton, Sabine, and Shelby
Reservoir type	Mainstream
Shoreline Development Index (SDI)	21.2
Conductivity	120 umhos/cm

Table 2. Boat ramp characteristics for Toledo Bend Reservoir, Texas.

Boat ramp	Latitude Longitude (dd)
Andersons	31.162648; -93.583517
Newton County	31.153861; -93.594517
Paradise Point	31.205157; -93.659961
Cypress Creek	31.209098; -93.649099
Willow Oak	31.211520; -93.733369
Six Mile	31.238681; -93.755865
K and K Marina	31.243349; -93.772163
Twin Oaks	31.246955; -93.758859
Fox's Lodge	31.279648; -93.701261
Fin and Feather	31.279031; -93.720730
Jack's 944	31.298236; -93.753221
White Oak	31.310339; -93.698019
Indian Mounds	31.328243; -93.694740
Lowes Creek	31.372340; -93.716929
Harborlight	31.409432; -93.781470
Mid Lake Campground	31.416172; -93.778926
Alpine Marina	31.426599; -93.749389
Chateau Shores	31.458580; -93.759177
Frontier Park	31.454580; -93.769585
Pendleton Harbor	31.463457; -93.751533
Playcation Marina	31.520378; -93.800937
Holly Park	31.522311; -93.801259
Newell's Fishing World	31.516551; -93.771824
Shamrock Marina	31.522458; -93.786841
East Hamilton	31.597306; -93.839628
Ragtown	31.681047; -93.828269

Bayou Siepe	31.732396; -93.829848
Huxley Bay Marina	31.751496; -93.844425
Bill's Landing	31.821105; -93.906238
Tenaha Creek	31.843365; -93.941008
Swede Johnson	31.919395; -93.968925
Joaquin	31.972200; -94.008469

Table 3. Harvest regulations for Toledo Bend Reservoir, Texas.

Species	Bag Limit	Length limit
Catfishes: Channel and Blue Catfish	50 (in any combination)	None ^a
Catfish, Flathead	10	18-inch minimum
Bass, White	25	None
Bass, Striped	5	None ^b
Bass, Largemouth	8 ^c	14-inch minimum
Bass, Spotted	8 ^c	None
Crappies: White and Black Crappie	25 (in any combination)	None

^aOnly 5 Blue or Channel Catfish \geq 20 inches may be retained each day. As of 1 September 2014, the harvestable-length portion of the Blue and Channel Catfish regulation will be changed to 30 inches.

^bOnly 2 Striped Bass \geq 30 inches may be retained each day.

^cBag limit for Spotted and Largemouth Bass is 8 in the aggregate.

Table 4. Stocking history of Toledo Bend Reservoir, Texas. FGL = fingerling; AFGL = advanced fingerling; UNK = unknown.

Species	Year	Number	Size
Channel Catfish	1967	544,745	AFGL
	Total	544,745	
Flathead Catfish	1973	400	UNK
	Total	400	
Florida Largemouth Bass	1985	225,300	FGL
	1985	107,323	FRY
	1988	150,000	FRY
	1990	446,797	FRY
	1991	194,714	FGL
	1991	207,291	FRY
	1992	406,497	FGL
	1993	204,653	FGL
	1993	1,616,523	FRY
	1994	370,104	FGL
	1994	733,997	FRY
	1995	400,007	FGL
	1996	450,015	FGL
	1997	234,875	FGL
	1998	162,837	FGL
	1998	237,898	FRY
	1999	1,206,777	FGL
	2000	321,974	FGL
	2001	508,505	FGL
	2002	740,373	FGL
	2003	961,015	FGL
	2004	492,536	FGL
	2005	849,436	FGL
	2007	502,918	FGL
	2008	512,768	FGL
	2009	860,614	FGL
2010	509,034	FGL	
2011	499,321	FGL	
2012	500,666	FGL	
2013	604,447	FGL	
Total		15,219,215	
Largemouth Bass	1967	1,689,700	FRY
	1967	284,300	UNK
	1987	305	AFGL
	1987	22,900	FGL

Species	Year	Number	Size
	Total	1,997,205	
Paddlefish	1992	106,234	UNK
	1995	15,334	UNK
	Total	121,568	
ShareLunker Largemouth Bass	2006	4,592	FGL
	2008	2,604	FGL
	2012	9,051	FGL
	2013	4,677	FGL
	Total	20,924	
Striped Bass	1974	16,290	FGL
	1976	60,178	UNK
	1977	100,200	UNK
	1979	95,000	UNK
	1981	96,249	UNK
	1983	104,133	UNK
	1984	406,920	FGL
	1985	484,500	FGL
	1986	203,000	FRY
	1988	719,115	FGL
	1988	29,200	FRY
	1991	240,364	FGL
	2002	272,179	FGL
	Total	2,827,328	

Table 5. Survey of prevalent aquatic vegetation, Toledo Bend Reservoir, September 2008 - 2013. Surface area (acres) is listed (both Texas and Louisiana) with percent of total reservoir surface area in parentheses.

Species	2008	2009	2010	2011	2012	2013
American lotus	1,729 (1)	838 (<1)	200 (<1)	19 (<1)	3,074 (2)	1,386 (1)
Giant salvinia (Tier II)*	4,091 (3)	2,555 (2)	31 (<1)	Trace	1,960 (1)	9,314 (6)
Hydrilla (Tier III)*	4,373 (3)	8,544 (5)	3,890 (2)	10,081 (6)	5,421 (3)	14,698 (9)
Water hyacinth (Tier II)*	2,822 (2)	78 (<1)	Trace	Trace	Trace	Trace

*Tier II is Maintenance, Tier III is Watch Status

Table 6. Percent directed angler effort by species for Toledo Bend Reservoir, Texas, 2009 - 2014. For black basses, proportions of tournament-angler effort are in parentheses. Survey periods were from 1 June through 31 May.

Species	Year		
	2009/2010	2011/2012*	2013/2014
Catfishes	2.1	2.5	1.4
Temperate basses	0.8	2.6	0.7
Sunfishes	1.6	2.7	0.7
Black basses	76.3 (32.3)	67.3 (50.0)	78.0 (35.6)
Crappies	14.4	21.7	15.9
Anything	4.8	3.2	3.1

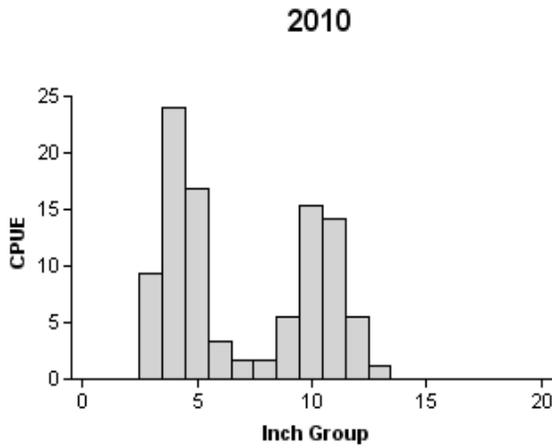
*2011/2012 survey only included summer and winter quarters

Table 7. Total fishing effort (h) for all species and total directed expenditures at Toledo Bend Reservoir, Texas, 2009 - 2014. Survey periods were from 1 June through 31 May. Relative standard error is in parentheses.

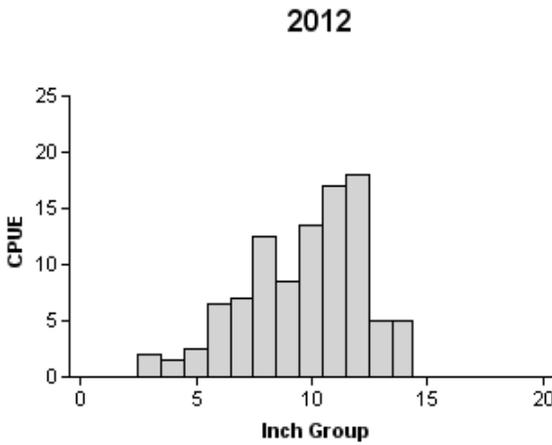
Creel statistic	Year		
	2009/2010	2011/2012*	2013/2014
Total fishing effort	476,589 (20)	141,767 (13)	535,642 (17)
Total directed expenditures	\$3,322,820 (25)	\$1,665,630 (30)	\$6,082,890 (25)

*2011/2012 survey only included summer and winter quarters

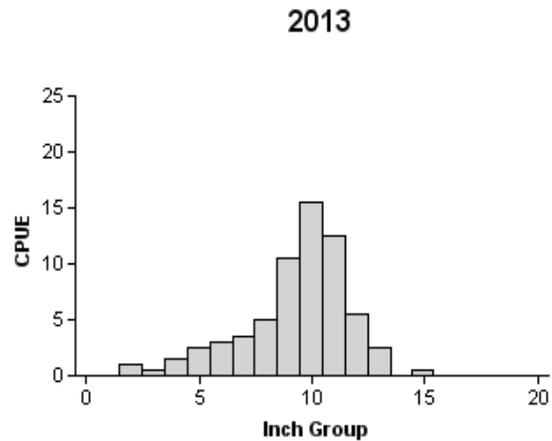
Gizzard Shad



Effort = 1.8
 Total CPUE = 98.2 (29; 180)
 IOV = 56 (10.2)



Effort = 2.0
 Total CPUE = 99.0 (24; 198)
 IOV = 20 (5.4)



Effort = 2.0
 Total CPUE = 64.0 (30; 128)
 IOV = 19 (6.9)

Figure 2. Number of Gizzard Shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Toledo Bend Reservoir, Texas, 2010, 2012, and 2013.

Bluegill

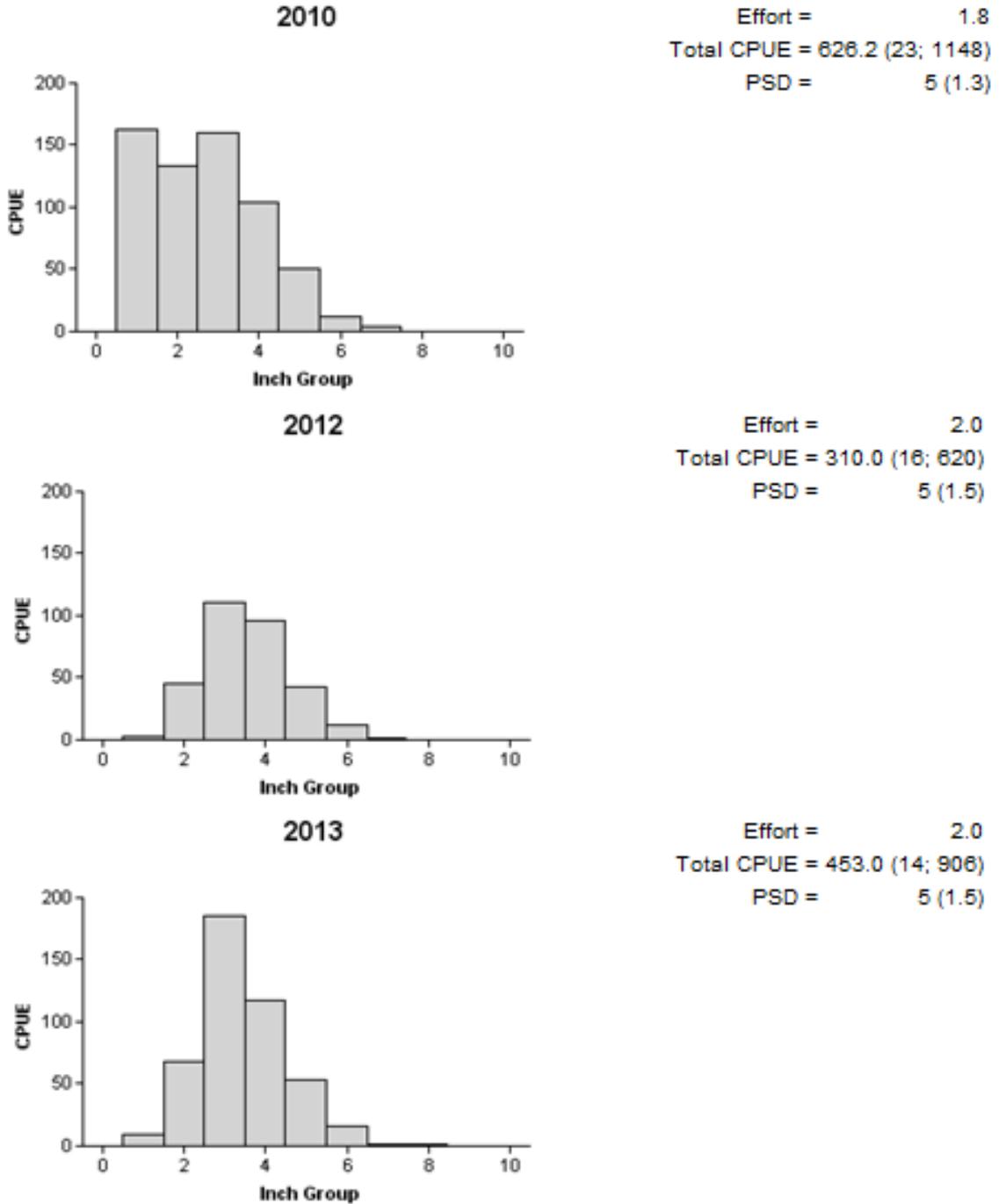


Figure 3. Number of Bluegill caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Toledo Bend Reservoir, Texas, 2010, 2012, and 2013.

Sunfishes

Table 8. Creel survey statistics for sunfishes at Toledo Bend Reservoir, Texas from June 2009 through May 2010, June through August 2011/March through May 2012, and June 2013 through May 2014. Total catch per hour is for anglers targeting sunfishes and total harvest is the estimated number of sunfishes harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel survey statistic	Year		
	2009/2010	2011/2012*	2013/2014
Directed effort (h)	7,799 (45)	3,886 (38)	3,926 (52)
Directed effort/acre	0.11 (45)	0.05 (38)	0.06 (52)
Total catch per hour	4.22 (55)	5.68 (48)	12.78 (46)
Total harvest	28,498 (83)	19,126 (14)	18,570 (142)
Harvest/acre	0.40 (83)	0.27 (14)	0.26 (142)
Percent legal released	66	65	69

*2011/2012 survey only included summer and winter quarters

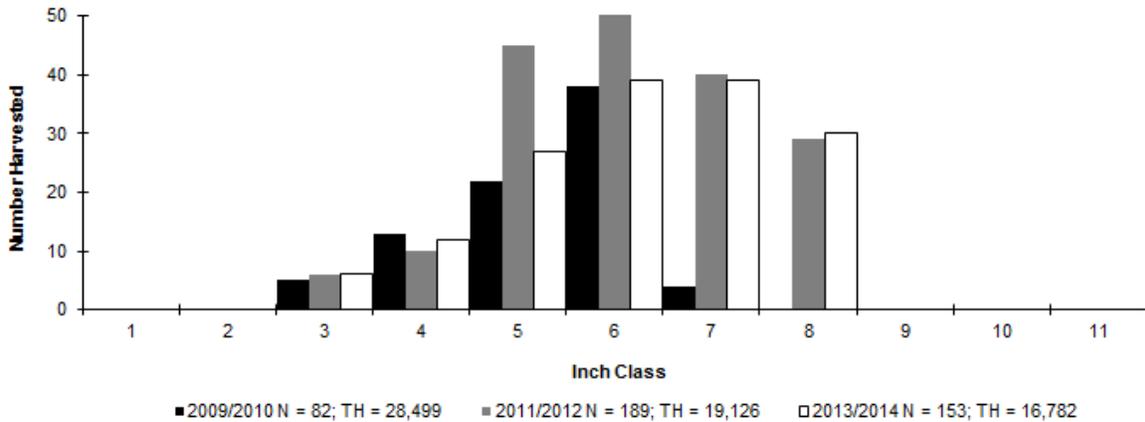


Figure 4. Length frequency of harvested Bluegill observed during creel surveys at Toledo Bend Reservoir, Texas, June 2009 through May 2014, all anglers combined. N is the number of harvested Bluegill observed during creel surveys, and TH is the total estimated harvest for the creel period.

Blue Catfish

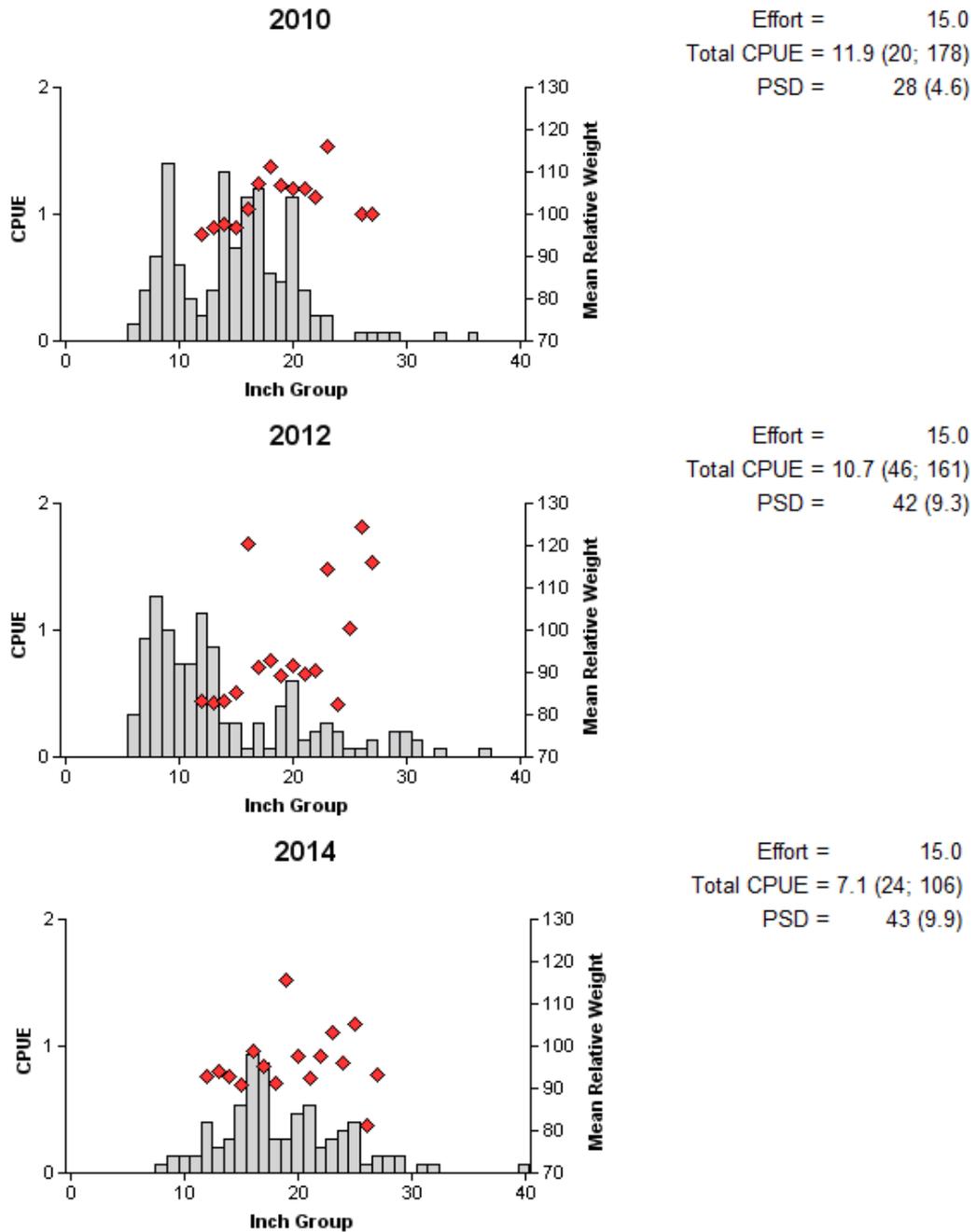


Figure 5. Number of Blue Catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Toledo Bend Reservoir, Texas, 2010, 2012, and 2014.

Channel Catfish

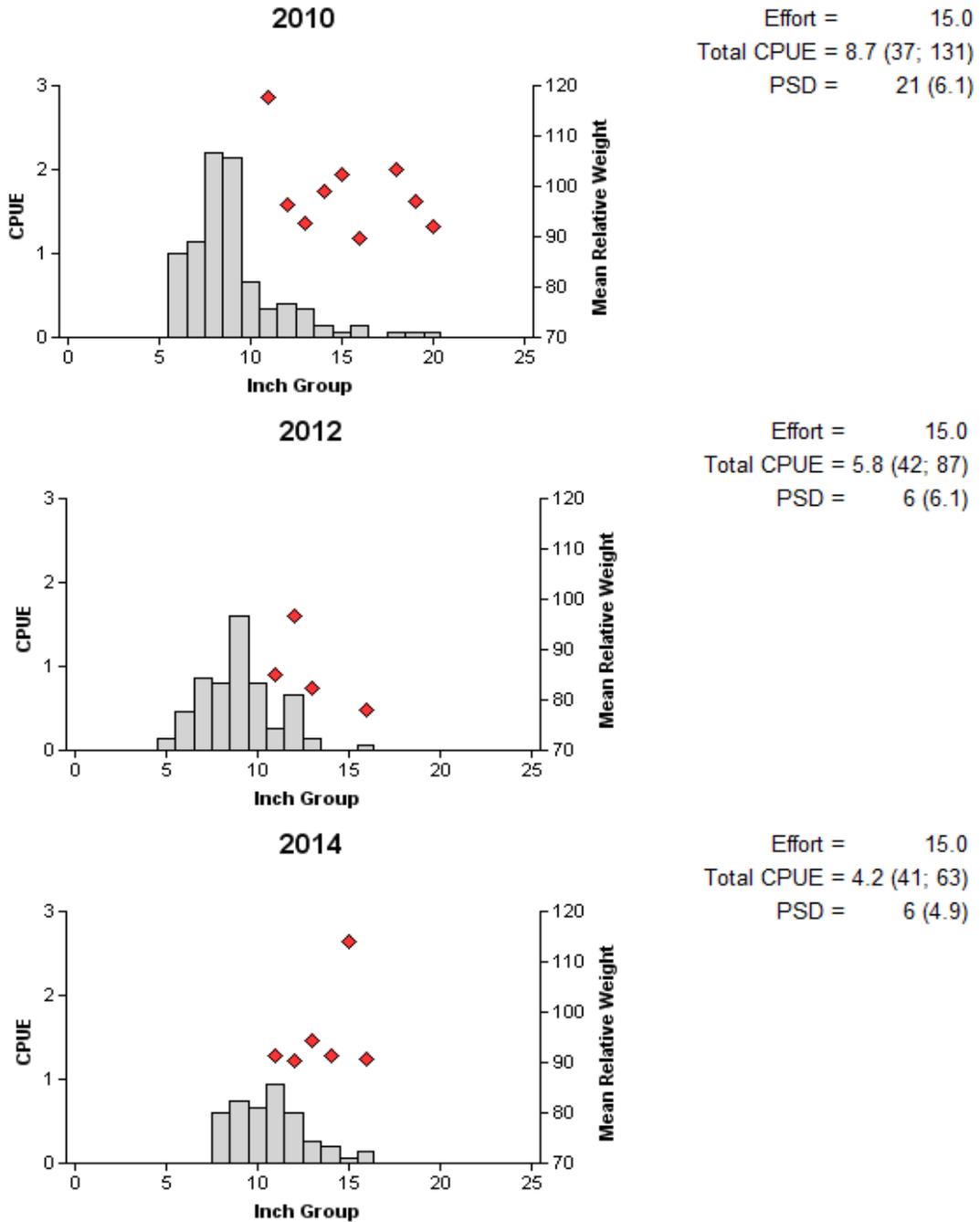


Figure 6. Number of Channel Catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Toledo Bend Reservoir, Texas, 2010, 2012, and 2014.

Catfishes

Table 9. Creel survey statistics for catfishes at Toledo Bend Reservoir, Texas from June 2009 through May 2010, June through August 2011/March through May 2012, and June 2013 through May 2014. Total catch per hour is for anglers targeting catfishes and total harvest is the estimated number of catfishes harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel survey statistic	Year		
	2009/2010	2011/2012*	2013/2014
Directed effort (h)	9,907 (37)	3,536 (50)	7,747 (39)
Directed effort/acre	0.14 (37)	0.05 (51)	0.11 (39)
Total catch per hour	2.18 (82)	4.02 (47)	2.21 (52)
Total harvest	14,954 (125)	5,280 (180)	9,854 (170)
Harvest/acre	0.21 (125)	0.07 (180)	0.14 (170)
Percent legal released	1	28	64

*2011/2012 survey only included summer and winter quarters

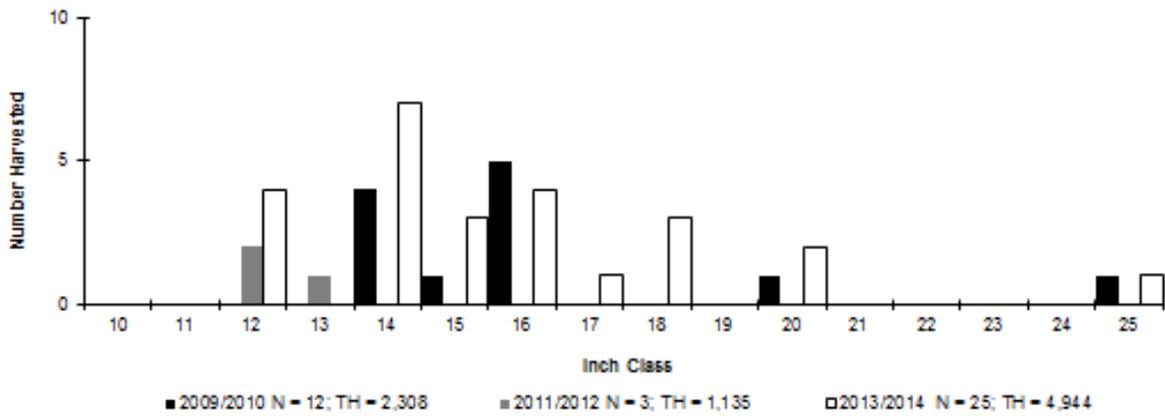


Figure 7. Length frequency of harvested Blue Catfish observed during creel surveys at Toledo Bend Reservoir, Texas, June 2009 through May 2014, all anglers combined. N is the number of harvested Blue Catfish observed during creel surveys, and TH is the total estimated harvest for the creel period.

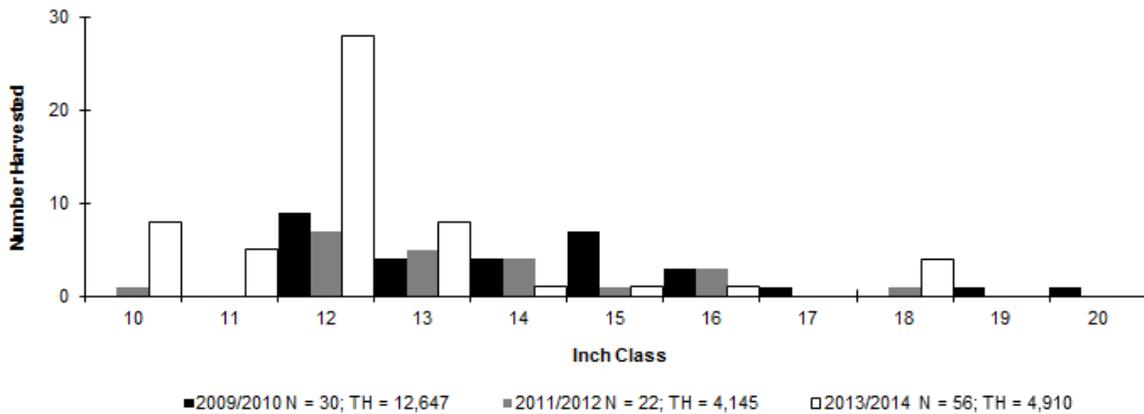


Figure 8. Length frequency of harvested Channel Catfish observed during creel surveys at Toledo Bend Reservoir, Texas, June 2009 through May 2014, all anglers combined. N is the number of harvested Channel Catfish observed during creel surveys, and TH is the total estimated harvest for the creel period.

White Bass

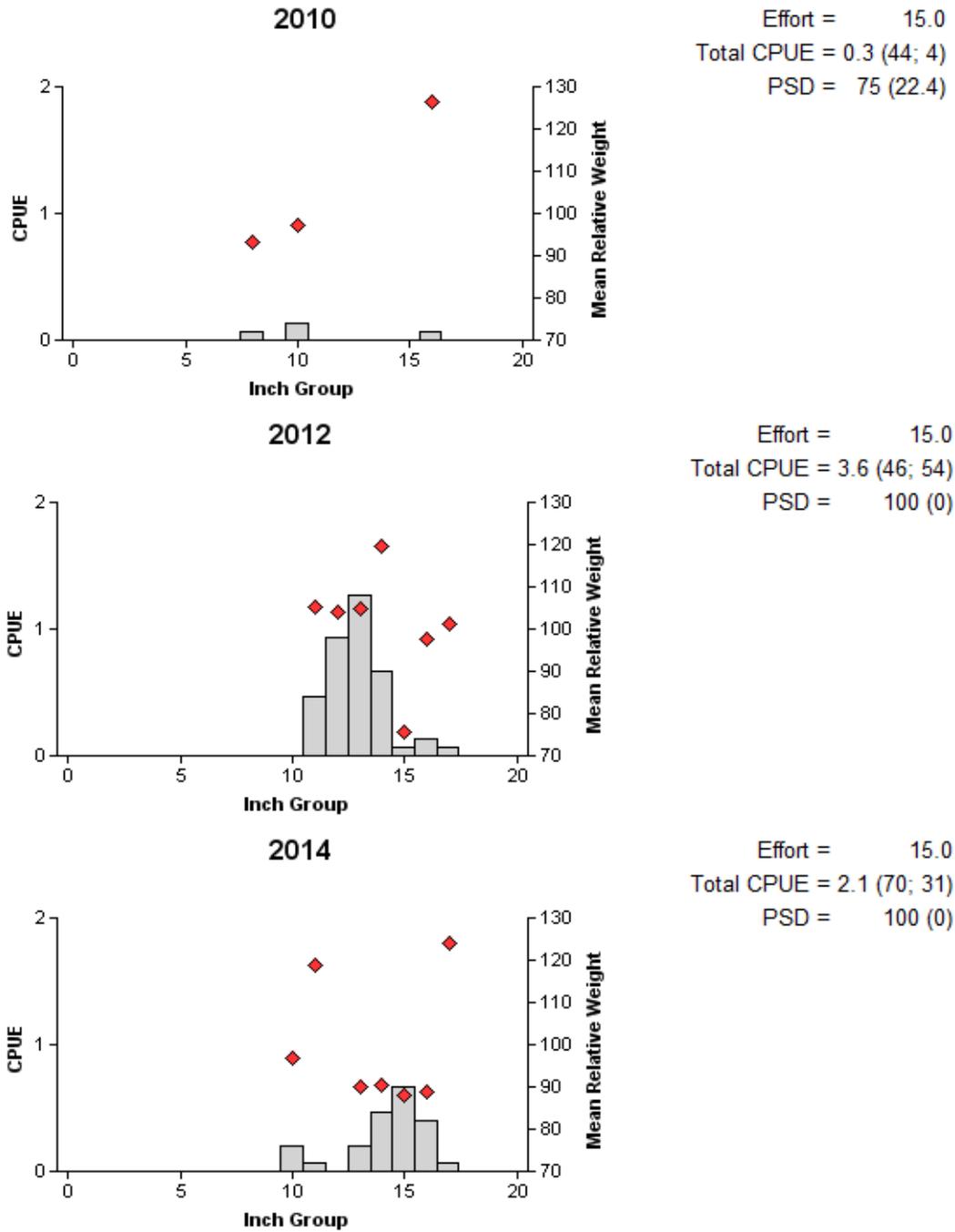


Figure 9. Number of White Bass caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N are in parentheses) for spring gill net surveys, Toledo Bend Reservoir, Texas, 2010, 2012, and 2014.

Temperate basses

Table 9. Creel survey statistics for temperate basses at Toledo Bend Reservoir, Texas from June 2009 through May 2010, June through August 2011/March through May 2012, and June 2013 through May 2014. Total catch per hour is for anglers targeting temperate basses and total harvest is the estimated number of temperate basses harvested by all anglers. Relative standard errors (RSE) are in parentheses.

Creel survey statistic	Year		
	2009/2010	2011/2012*	2013/2014
Directed effort (h)	3,644 (56)	3,610 (53)	3,805 (49)
Directed effort/acre	0.05 (56)	0.05 (53)	0.05 (49)
Total catch per hour	6.57 (47)	3.67 (72)	3.79 (52)
Total harvest	39,545 (95)	4,544 (290)	18,360 (348)
Harvest/acre	0.56 (65)	0.06 (290)	0.26 (348)
Percent legal released	23	72	42

*2011/2012 survey only included summer and winter quarters

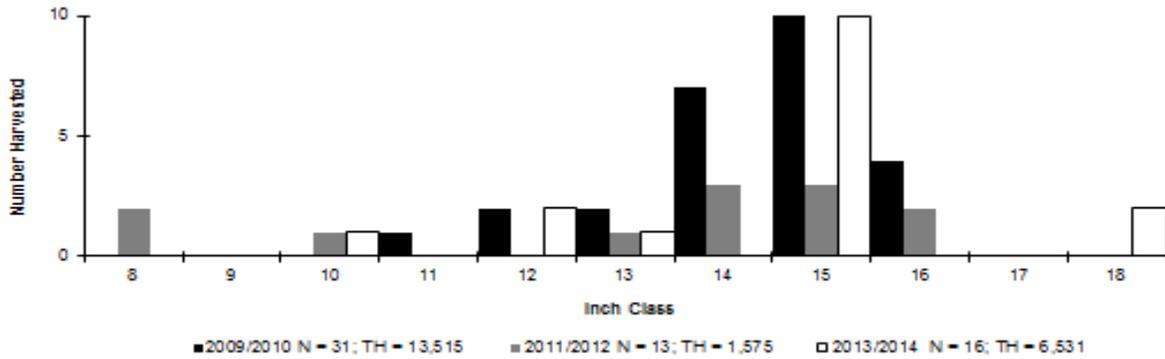


Figure 10. Length frequency of harvested White Bass observed during creel surveys at Toledo Bend Reservoir, Texas, June 2009 through May 2014, all anglers combined. N is the number of harvested White Bass observed during creel surveys, and TH is the total estimated harvest for the creel period.

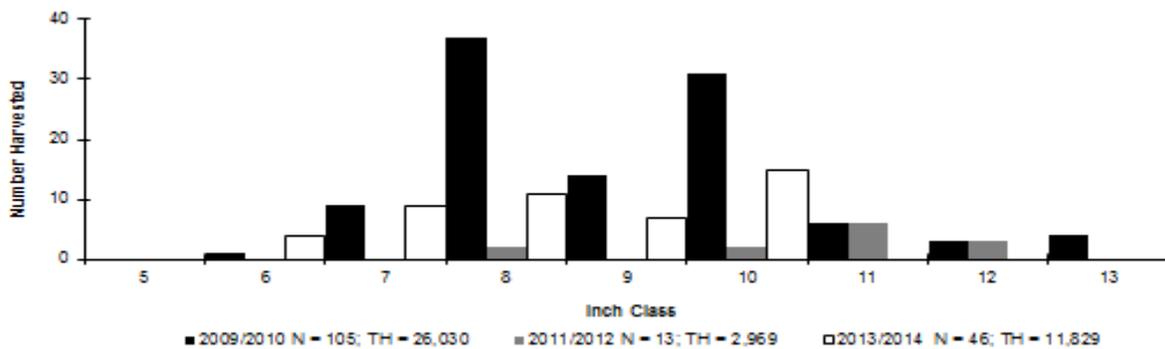


Figure 11. Length frequency of harvested Yellow Bass observed during creel surveys at Toledo Bend Reservoir, Texas, June 2009 through May 2014, all anglers combined. N is the number of harvested Yellow Bass observed during creel surveys, and TH is the total estimated harvest for the creel period.

Largemouth Bass

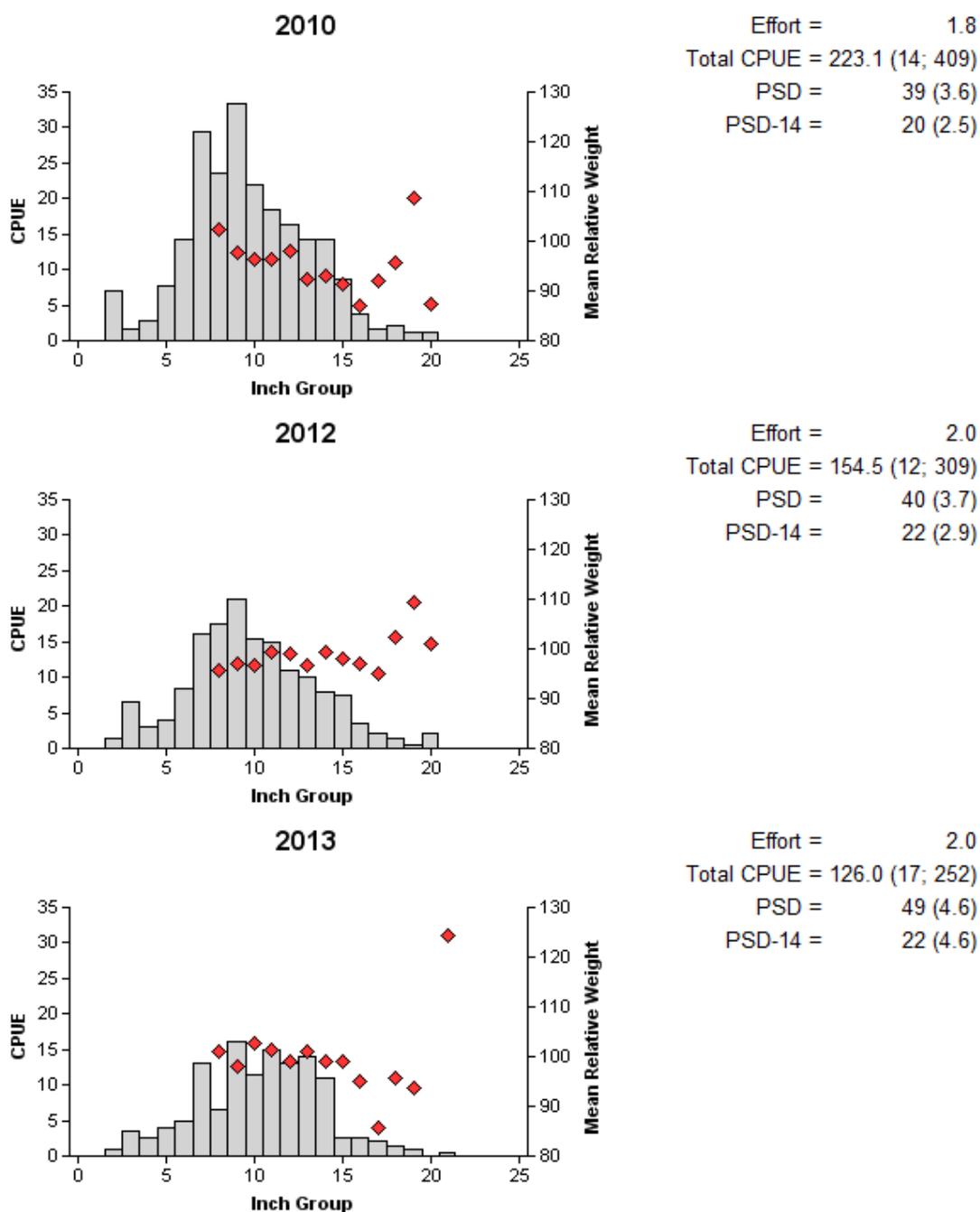


Figure 13. Number of Largemouth Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure) for fall electrofishing surveys, Toledo Bend Reservoir, Texas, 2010, 2012, and 2013.

Largemouth Bass

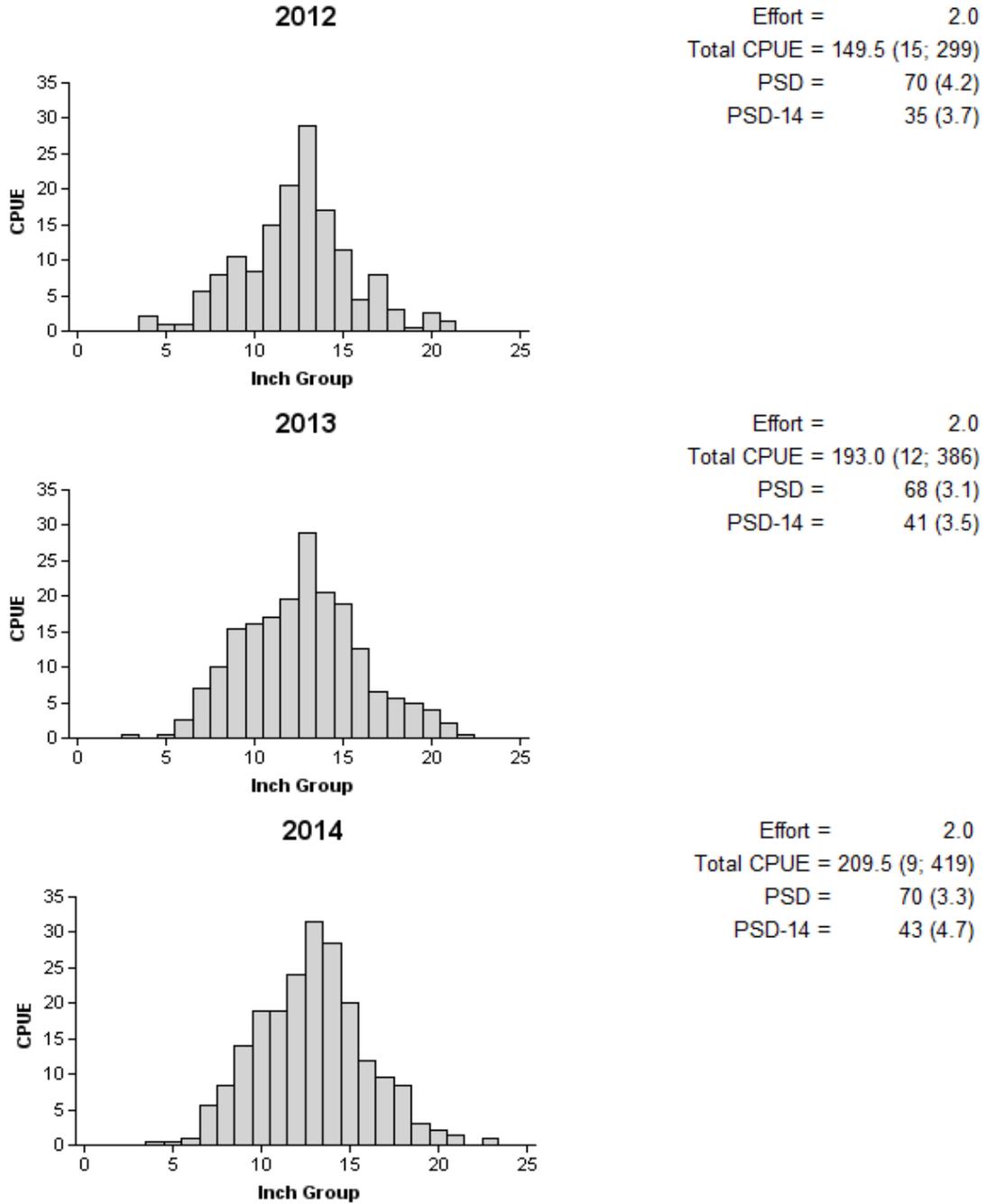


Figure 14. Number of Largemouth Bass caught per hour (CPUE, bars) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring electrofishing surveys, Toledo Bend Reservoir, Texas, 2012, 2013, and 2014.

Black basses

Table 10. Creel survey statistics for black basses at Toledo Bend Reservoir, Texas from June 2009 through May 2010, June through August 2011/March through May 2012, and June 2013 through May 2014. Catch rate is for all anglers targeting black basses. Harvest is partitioned by the estimated number of fish harvested by non-tournament anglers and the number of fish retained by tournament anglers for weigh-in and release. The estimated number of fish caught by weight category is for all anglers. Relative standard errors (RSE) are in parentheses.

Creel survey statistic	Year		
	2009/2010	2011/2012*	2013/2014
Directed angling effort (h)			
Tournament	62,599 (19)	38,418 (20)	148,956 (22)
Non-tournament	300,648 (22)	56,991 (15)	269,089 (18)
All black bass anglers combined	363,248 (20)	95,411 (15)	418,045 (19)
Angling effort/acre	5.12 (20)	1.34 (15)	5.89 (19)
Catch rate (number/h)	1.09 (12)	1.19 (15)	1.06 (16)
Harvest			
Non-tournament harvest	116,170 (24)	22,500 (15)	96,783 (19)
Harvest/acre	1.64 (24)	0.32 (15)	1.36 (19)
Tournament weigh-in and release	26,718 (8)	11,368 (8)	43,983 (11)
Total catch	398,094 (18)	151,471 (22)	490,999 (45)
< 4.0 lbs	391,504 – 98.3%	147,131 – 97.1%	473,230 – 96.4%
≥ 4–6.9 lbs	6,026 – 1.5%	3,922 – 2.6%	16,460 – 3.4%
≥ 7–9.9 lbs	480 – 0.1%	418 – 0.3%	1,309 – 0.3%
≥ 10 lbs	84 - <0.1%	0	0
Percent legal released (non-tournament)	24	32	43

*2011/2012 survey only included summer and winter quarters

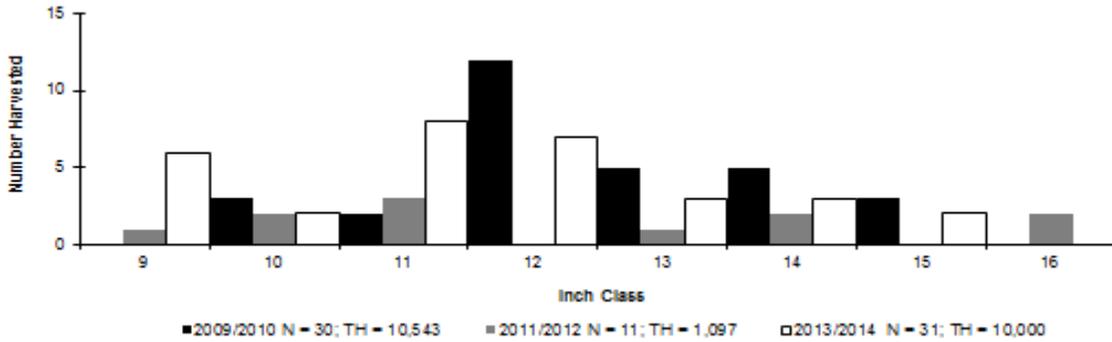


Figure 15. Length frequency of harvested Spotted Bass observed during creel surveys at Toledo Bend Reservoir, Texas, June 2009 through May 2014, all anglers combined. N is the number of harvested spotted bass observed during creel surveys, and TH is the total estimated harvest for the creel period.

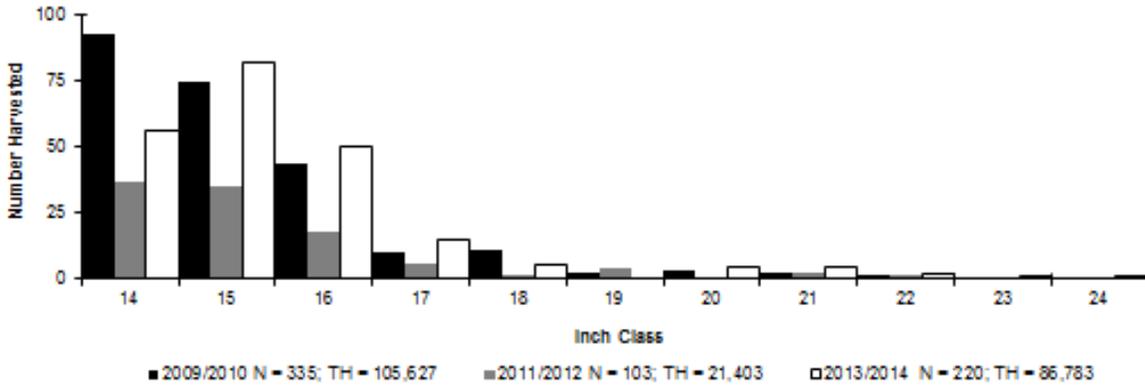


Figure 16. Length frequency of non-tournament harvested Largemouth Bass observed during creel surveys at Toledo Bend Reservoir, Texas, June 2009 through May 2014, all anglers combined. N is the number of harvested largemouth bass observed during creel surveys, and TH is the total estimated harvest for the creel period.

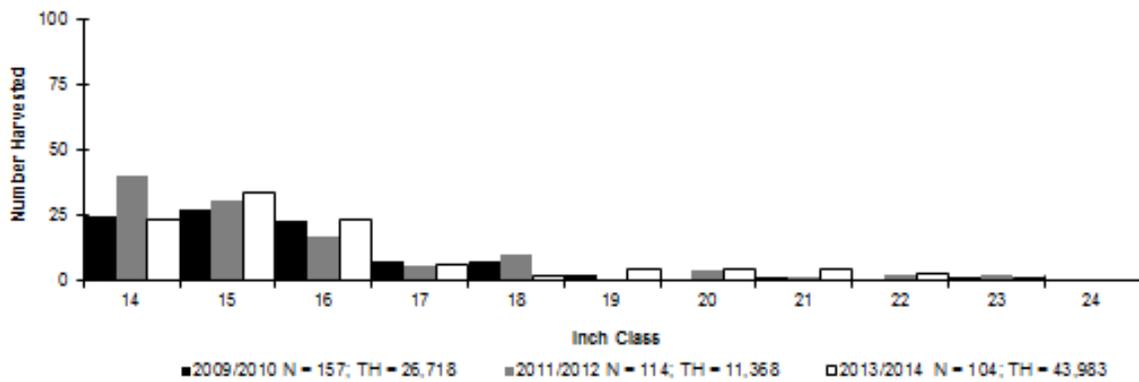


Figure 17. Length frequency of tournament-retained and released Largemouth Bass observed during creel surveys at Toledo Bend Reservoir, Texas, June 2009 through May 2014, all anglers combined. N is the number of harvested largemouth bass observed during creel surveys, and TH is the total estimated harvest for the creel period.

Table 11. Results of genetic analysis of Largemouth Bass collected by fall electrofishing, Toledo Bend Reservoir, Texas, 2006, 2007, and 2011. FLMB = Florida Largemouth Bass, NLMB = Northern Largemouth Bass, Intergrade = hybrid between a FLMB and a NLMB.

Year	Sample size	Number of fish			% FLMB alleles	% FLMB
		FLMB	Intergrade	NLMB		
2006	30	0	20	10	24	0
2007	30	0	28	2	29	0
2011	30	0	29	1	29	0

Crappies

Table 12. Creel survey statistics for crappies at Toledo Bend Reservoir, Texas from June 2009 through May 2010, June through August 2011/March through May 2012, and June 2013 through May 2014. Total catch per hour is for anglers targeting crappies and total harvest is the estimated number of crappies harvested by all anglers. Relative standard errors (RSE) are in parentheses

Creel survey statistic	Year		
	2009/2010	2011/2012*	2013/2014
Directed effort (h)	68,750 (23)	30,795 (18)	85,289 (22)
Directed effort/acre	0.97 (23)	0.44 (18)	1.20 (22)
Total catch per hour	2.61 (23)	2.83 (26)	2.12 (33)
Total harvest	137,403 (27)	73,092 (30)	208,955 (41)
Harvest/acre	1.93 (27)	1.03 (30)	2.94 (41)
Percent legal released	1	28	40

*2011/2012 survey only included summer and winter quarters

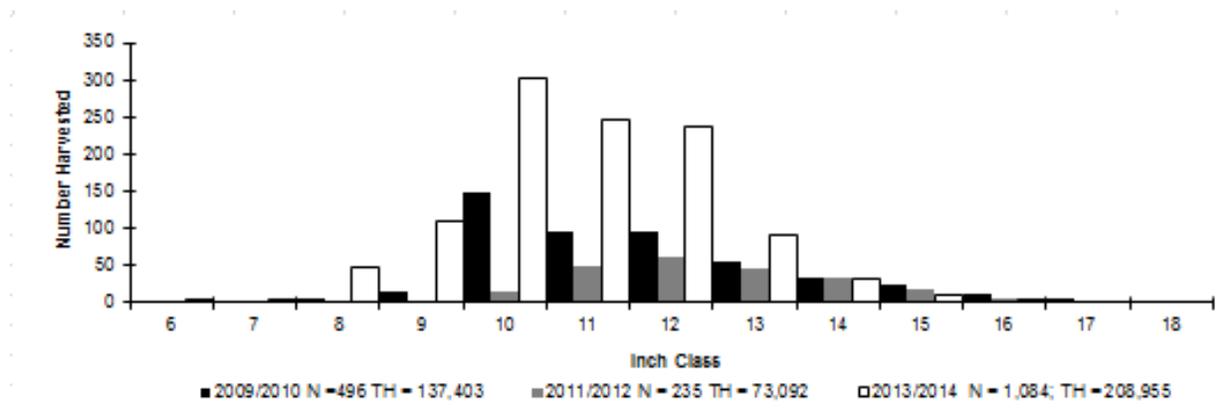


Figure 18. Length frequency of harvested crappies observed during creel surveys at Toledo Bend Reservoir, Texas, June 2009 through May 2014, all anglers combined. N is the number of harvested crappies observed during creel surveys, and TH is the total estimated harvest for the creel period.

Table 13. Proposed sampling schedule for Toledo Bend Reservoir, Texas. Survey period is June through May. Gill netting surveys are conducted in the winter, while electrofishing surveys are conducted in the fall and spring. Standard survey denoted by S and additional survey denoted by A.

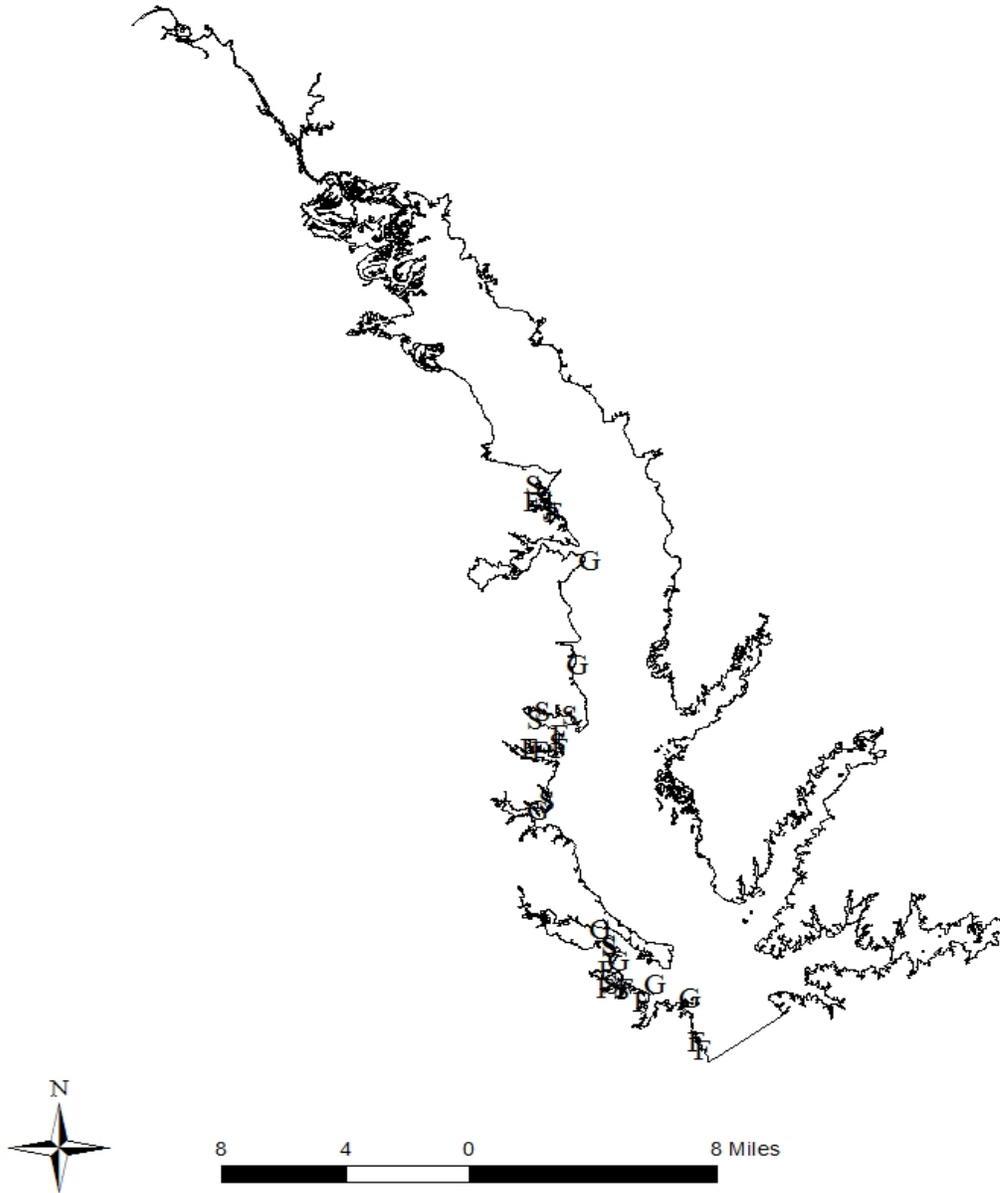
Survey year	Electrofishing Fall (Spring)	Gill net	Habitat			Creel survey	Report
			Structural	Vegetation	Access		
2014-2015				A			
2015-2016	S (A)	S		S	S	A	S
2016-2017				A			
2017-2018	A (A)	A		A		A	

APPENDIX A

Number (N) and catch rate (CPUE) of all target species collected from all gear types from Toledo Bend Reservoir, Texas, 2013-2014. Sampling effort was 15 net nights for gill netting and 2 hours for electrofishing.

Species	Gill Netting		Electrofishing	
	N	CPUE	N	CPUE
Gizzard Shad			128	64.0
Threadfin Shad			2,182	1,091.0
Blue Catfish	106	7.1		
Channel Catfish	63	4.2		
White Bass	31	2.1		
Redbreast Sunfish			38	19.0
Warmouth			11	5.5
Bluegill			906	453.0
Longear Sunfish			19	9.5
Redear Sunfish			104	52.0
Redspotted Sunfish			19	9.5
Spotted Bass			1	0.5
Largemouth Bass			252	126.0
White Crappie	14	0.9		
Black Crappie	80	5.3		

APPENDIX B



Location of sampling sites, north Toledo Bend Reservoir, Texas, 2013-2014. Gill net and spring electrofishing stations are indicated by G and S, respectively. Water level was 2-3 feet below full pool at time of sampling.

APPENDIX B



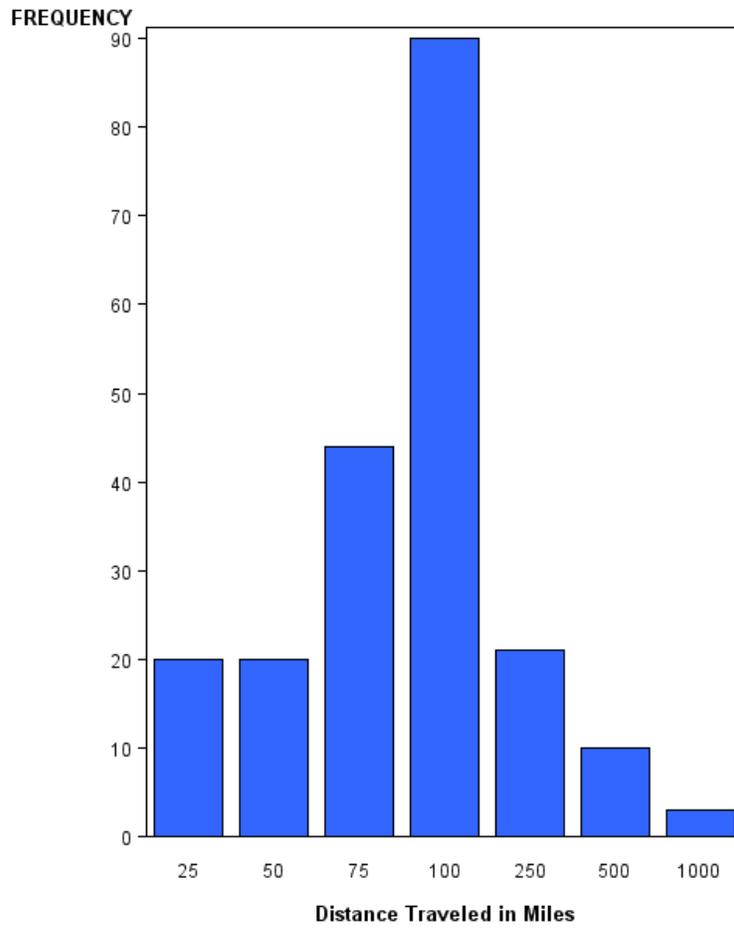
Location of sampling sites, south Toledo Bend Reservoir, Texas, 2013-2014. Gill net and spring electrofishing stations are indicated by G and S, respectively. Water level was 2-3 feet below full pool at time of sampling.

APPENDIX C

Results from individual and team format bass tournaments at Toledo Bend Reservoir, 2009-2013. Only tournaments with 5-fish bag limits and > 50 individuals or teams were included. Weights are expressed in pounds.

Year	N	1 st place weight	2 nd place weight	3 rd place weight	% total weights > 15 lbs.	% catching limit	Big bass weight
Individual							
2009	10	19.2	17.2	15.9	5.2	26.1	7.7
2010	7	22.5	20.5	19.3	22.4	70.2	9.1
2011	4	19.7	18.6	17.6	7.2	35.8	8.0
2012	9	22.7	20.5	19.5	15.7	49.5	8.2
2013	4	22.8	22.1	21.7	32.4	81.8	8.1
Team							
2009	5	24.9	23.8	21.5	18.5	47.7	9.3
2010	6	26.9	23.2	21.7	23.2	55.9	9.0
2011	6	27.1	23.7	21.8	22.0	51.7	9.0
2012	7	27.6	24.5	21.7	22.0	56.2	9.5
2013	6	24.9	23.7	21.5	15.7	46.6	8.6

APPENDIX D



Frequency of anglers that traveled various distances (miles) to Toledo Bend Reservoir, Texas, as determined from the June 2013 through May 2014 creel survey.