PERFORMANCE REPORT

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INLAND FISHERIES DIVISION MONITORING AND MANAGEMENT PROGRAM

2016 Survey Report

Ray Hubbard Reservoir

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SURVEY AND MANAGEMENT SUMMARY

Fish populations in Ray Hubbard Reservoir were surveyed in 2013-2016 using electrofishing and in 2016 trap netting, and in 2015 and 2017 using gill netting. This report summarizes the results of the surveys and contains a management plan for the reservoir based on those findings.

- **Reservoir Description:** Ray Hubbard Reservoir is a 22,745-acre impoundment constructed on the East Fork of the Trinity River by the City of Dallas in 1968 to provide water for municipal, industrial, and recreational purposes. Ray Hubbard Reservoir lies within Dallas, Collin, Rockwall and Kaufman counties. The reservoir is part of the Dallas-Ft. Worth metroplex. The reservoir has a 1,074 square-mile watershed that lies in the Blackland Prairies ecological region. The reservoir is 13 miles long and 3 miles wide (widest point). It contains 452,040 acre-feet of water at conservation elevation (435.5 ft above mean sea level), and has a maximum depth of 40 feet. Angler and boat access is adequate. At the time of sampling the fishery habitat was primarily dead trees, emergent vegetation, and eroded banks. Hydrilla (*Hydrilla verticillata*) is present and has historically provided fish habitat. However, for the last several years the Hydrilla coverage has been minimal.

- **Management History:** Important sport fish include Largemouth Bass, crappie, White Bass, Hybrid Striped Bass, and Blue and Channel Catfish. All species are managed with statewide regulations. Hybrid Striped Bass are requested annually for stocking and provide a popular fishery. The reservoir has a population of large Blue Catfish and has produced ShareLunker Largemouth Bass. Florida Largemouth Bass were stocked annually from 2013-2015.

- **Fish Community**
  - **Prey species:** Threadfin Shad were collected in great abundance. Gizzard Shad were also present in good abundance. Bluegill and Longear Sunfish were also abundant as prey. Bluegill over 6 inches are available for anglers.

  - **Catfishes:** The Blue Catfish population continued to be excellent with large individuals available for anglers. The relative abundance of Channel Catfish has gone up after several years of decline. No flathead catfish were sampled during annual gill netting but are present.

  - **Temperate basses:** White Bass catch rates were lower than the previous survey. Hybrid Striped Bass catch rate also declined when compared to the previous survey.

  - **Largemouth Bass:** The Largemouth Bass population has remained good over the past several years with good size structure. The Florida Largemouth Bass influence is high.

  - **Crappie:** The White Crappie population catch rate was the same compared to previous survey. Black Crappie catch rates increased.

- **Management Strategies:** Ray Hubbard reservoir has a popular Hybrid Striped Bass fishery. Maintaining the fishery requires annual stockings. Hybrid Striped Bass will be stocked annually with alternating years of fry and fingerlings. Summer low-frequency electrofishing, fall electrofishing, trap netting will be conducted in 2020 while spring gill netting surveys will be conducted in 2020 and 2021. Additional summer low-frequency will be conducted in summer of 2018 to monitor Blue Catfish population. Annual exotic vegetation surveys will be conducted to monitor hydrilla abundance.

INTRODUCTION

This document is a summary of fisheries data collected from Ray Hubbard Reservoir in 2013-2017. 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 2013-2017 data for comparison.

Reservoir Description

Ray Hubbard Reservoir, is a 22,745-acre impoundment constructed on the East Fork of the Trinity River by the City of Dallas in 1968 to provide water for municipal, industrial, and recreational purposes. Ray Hubbard Reservoir is located one-mile east of Rockwall and lies within Dallas, Collin, Rockwall and Kaufman counties. The reservoir is surrounded by urban development and is part of the Dallas-Ft. Worth metroplex. The reservoir has a 1,074 square-mile watershed that lies in the Blackland Prairies ecological region and is primarily used for agricultural and residential development. The reservoir is 13 miles long and 3 miles wide (widest point). It contains 490,000 acre-feet of water at conservation elevation (435.5 ft above msl), and has a maximum depth of 40 feet. It is classified as hyper eutrophic by the Texas Commission on Environmental Quality (Texas Commission on Environmental Quality 2011). At the time of sampling the fishery habitat was primarily standing timber, native emergent vegetation, and rocky habitat in the form of rip-rap. Hydrilla (*Hydrilla verticillata*) is present in very low abundance.

Angler Access

Ray Hubbard Reservoir has nine public boat ramps, one of which is for small craft only. Five of these ramps are free ramps. The others require a fee. Additional boat ramp characteristics are in Table 2. The small vessel ramp in Paddle Point Park is associated with a TPWD paddling trail. Shoreline fishing access can be found at Bob Jones, Ray Hubbard Green Belt, Robertson, Wind Surf Bay Park, Terry, and Barnes Bridge Parks, Lakeside Park South, and the Hwy 66 boat ramp.

Management History

Previous management strategies and actions: Management strategies and actions from the previous survey report (Brock and Hungerford 2013) included:

1. A quality fishery for Hybrid Striped Bass has persisted in Ray Hubbard Reservoir since the stocking program began. The fishery supports several guides targeting Hybrid Striped Bass. Maintenance of the population relies on annual stockings.
   Action: Continued requesting Palmetto Bass annually at 10-15 fish per acre. Palmetto Bass were stocked in 2013 (fry), 2014 (fingerlings), 2015 (fry) and 2016 (fingerlings). Sunshine Bass were stocked in 2013 (fingerlings), 2014 (fingerlings), and 2015 (fingerlings).

2. The Largemouth Bass population has a history of producing trophy sized fish. Genetic analysis revealed a high FLMB allele frequency but no FLMB genotypes.
   Actions: Florida Largemouth Bass were requested and stocked in 2013, 2014, and 2015. Genetic analysis was conducted in fall of 2016 to determine effectiveness of stockings.

3. The exotic vegetation hydrilla (*Hydrilla verticillata*) is present in Ray Hubbard Reservoir and its abundance is variable from year to year. It has never caused access problems and no treatment plan has ever been developed for control.
   Actions: Exotic vegetation surveys were conducted with minimal Hydrilla being found.

4. The exotic species zebra mussel (*Dreissena polymorpha*) has been found in Texoma Reservoir. Water from Texoma Reservoir is pumped into Lavon Reservoir for water supply purposes. Lavon Reservoir is directly upstream from Ray Hubbard Reservoir and infestation of zebra mussel is possible.

   Actions: The City of Dallas and lakeside marinas were updated regarding any new information on the zebra mussel issue.

Harvest regulation history: Sport fish populations in Ray Hubbard Reservoir have been managed with statewide regulations (Table 3).

Stocking history: Ray Hubbard Reservoir has been stocked frequently with Florida Largemouth Bass and Hybrid Striped Bass. The complete stocking history is in Table 4.

Vegetation/ habitat management history: No habitat management projects have been conducted on the reservoir. Exotic vegetation surveys have been conducted annually to monitor hydrilla. Although present, hydrilla has never hampered access or cause problems with property owners. Its abundance is currently less than one acre.

Water transfer: Ray Hubbard Reservoir is primarily used as water supply for the City of Dallas. No interbasin transfers exist. Ray Hubbard is downstream of Lavon Reservoir which had zebra mussels in a tributary.

METHODS

Surveys were conducted to achieve survey and sampling objectives in accordance with the objective-based sampling (OBS) plan for Ray Hubbard Reservoir (TPWD, Inland Fisheries Division, unpublished manual revised 2015). Primary components of the OBS plan are listed in Table 5. All survey sites were randomly selected and all surveys were conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2015).

Exotic vegetation – The reservoir shoreline that was accessible by boat was inspected for the exotic vegetation Hydrilla. If found, acreage was determined by GIS analysis.

Electrofishing - Black basses, Sunfishes, Gizzard Shad, and Threadfin Shad were collected by electrofishing (2.0 hours at 24, 5-min stations). Catch per unit effort (CPUE) for electrofishing was recorded as the number of fish caught per hour (fish/h) of actual electrofishing.

Trap netting - Crappie were collected using trap nets (15 net nights at 15 stations). CPUE for trap netting was recorded as the number of fish caught per net night (fish/nn).

Gill netting - Blue and Channel Catfish, Hybrid Striped Bass, and White Bass were collected by gill netting (15 net nights at 15 stations). CPUE for gill netting was recorded as the number of fish caught per net night (fish/nn). Ages for Hybrid Striped Bass were determined using otoliths.

Genetics - Genetic analysis of Largemouth Bass was conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2015). Micro-satellite DNA analysis was used to determine genetic composition of individual fish from 2005 through 2012 and by electrophoresis for previous years.

Statistics - 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). Palmetto Bass PSD was

calculated according to Dumont and Neely (2011). 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.

*Water leve*l - Source for water level data was the United States Geological Survey (USGS 2017).

RESULTS AND DISCUSSION

Habitat: At the time of sampling the habitat consisted primarily of riprap, native shoreline emergent species and limited floating leaf species. No habitat survey was conducted. Hydrilla coverage remained very low (Table 6).

Creel Survey: No creel survey was conducted on Ray Hubbard Reservoir during this survey period. The last creel survey was conducted in 2004-2005.

Prey species: Total electrofishing catch rate of Threadfin Shad averaged 736.0/hr from 2013-2016 which is well above the reservoir average (Appendix A). Catch rate varied from 312.5/hr in 2014 to 1,180.0/hr in 2016. Gizzard Shad catch rate averaged 429.5/hr which is above the reservoir average and varied from a low of 225.5/hr in 2016 to a high of 554.5/hr in 2014 (Figure 2; Appendix A). Index of vulnerability (IOV) for Gizzard Shad averaged 83 during this period. Bluegill catch rate averaged 113.3/hr from 2013-2016 which is just below the reservoir average (Figure 3; Appendix A). The catch rate of Bluegill ≥ 6 inches was 38.0/hr in 2016 which was higher than two previous samples but lower than historical samples (Appendix C). The Longear Sunfish catch rate average was 45.0/hr from 2013-2016 which was well below the reservoir average (Appendix C).

Catfishes: The 2017 total gill netting catch rate of Blue Catfish was 6.1/nn which was an increase from the rate observed in 2015 (2.6/nn; Figure 4). This catch rate was similar to reservoir average (Appendix C). Size structure of the Blue Catfish population was very good as indicated by PSD and PSD-P values of 62 and 20, respectively. Body condition of the Blue Catfish sampled were above 80 for most length groups. The total gill netting catch rate of Channel Catfish was 4.3/nn in 2017 which was higher than the previous sample (2.3/nn) in 2015 and similar to reservoir average (Figure 5; Appendix C). Size structure of the population was poor as indicated by PSD and PSD-P values of 0. Body conditions of the Channel Catfish sampled were near 90 for most length groups.

Temperate basses: The 2017 total gill netting catch rate of White Bass was 1.9/nn which was well below previous sample in 2015 (9.9/nn) and below the reservoir average of 7.3/nn (Figure 6; Appendix C). The gill netting catch rate of Hybrid Striped Bass was only 1.7 /nn in 2017 which was lower than the previous sample in 2015 (3.4/nn) and below the reservoir average of 2.5/nn (Figure 7; Appendix C). In Ray Hubbard, Hybrid Striped Bass reach 18 inches between age 2 and 3 (Figure 8).

Largemouth Bass: The total electrofishing catch rate of Largemouth Bass averaged 143.5/ hr from 2013-2016 which is above the reservoir average (Appendix C). The catch varied from 76.5/hr in 2014 to 290.5/hr in 2015 (Figure 9). Catch rate of fish greater 14 inches was also variable (Figure 9). Size structure estimates of the Largemouth Bass population was highly variable from 2013-2016. Surveys in 2013 and 2014 had high PSD and PSD-P values while surveys in 2015 and 2016 had more moderate estimates of 36 and 7 respectively (Figure 9). Size structures were probably influenced by the strong year class produced after high water levels occurred in 2015. Body condition in 2016 was at or above 90 for most size classes of fish. Florida Largemouth Bass allele percentage was 45% in 2016 (Table 7).

Crappies: The total trap netting catch rate of White Crappie was 2.6/nn in 2016, which is equal to the previous survey but lower than the reservoir average of 7.5/nn (Figure 10: Appendix C). The size

structure of the population is good as indicated by a PSD value of 64 and PSD-P of 36. The Black Crappie catch rate was 7.5/nn in 2016, which is higher than the 2012 survey (3.5/nn) and higher than the reservoir average of 3.1/nn (Figure 12; Appendix C). The size structure of the Black Crappie population is good as indicated by a PSD of 73. The combined catch rate of both species was 10.1 which is similar to reservoir average for combined catch rates (Appendix C).

Fisheries management plan for Ray Hubbard Reservoir, Texas

Prepared – July 2017.

ISSUE 1: A quality fishery for Hybrid Striped Bass has persisted in Ray Hubbard Reservoir since the stocking program began. The fishery supports several guides targeting Hybrid Striped Bass. Maintenance of the population relies on annual stockings. The Ray Hubbard Sportmen's Association have also raised funds to purchase Sunshine Bass for supplemental stocking.

MANAGEMENT STRATEGIES

1. Request annual stockings of Hybrid Striped Bass fingerlings as required by special research project.
2. Continue to develop partnership with the Ray Hubbard Sportmen's Association to buy supplemental fish for stocking. Any stockings will occur after special research project is completed.
3. Collect fish from guide services to supplement age and growth sample.
4. Develop fishing log for guide services to aid in Hybrid Striped Bass population evaluation.

ISSUE 2: A quality fishery for Blue Catfish persists in Ray Hubbard Reservoir. Gill net sampling has resulted in good sampling statistics to monitor changes in the population. However, gill netting may not be the most efficient method of sample collection when maintenance and man hours are included in determining sample efficiency.

MANAGEMENT STRATEGIES

1. Conduct summer time low-frequency electrofishing in 2018 and 2020 to determine if adequate sampling statistics can be obtained when compared to gill net sampling.

ISSUE 3: Zebra mussels (*Dreissena polymorpha*) are a threat to colonize Ray Hubbard Reservoir. Directly upstream of Ray Hubbard is Lavon Reservoir which has had zebra mussels discovered in one of its tributaries, that population is believed to be extirpated. Several boats with adult Zebra Mussels attached have been intercepted before launching.

MANAGEMENT STRATEGIES

1. Cooperate with the controlling authority to post appropriate signage at access points around the reservoir where necessary.
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. Maintain and monitor zebra mussel samplers at marinas.

ISSUE 4: The exotic vegetation Hydrilla is present in Ray Hubbard Reservoir and its abundance is variable from year to year. It has never caused access problems and no treatment plan has ever been developed for control.

MANAGEMENT STRATEGIES

1. Conduct exotic vegetation surveys annually to monitor Hydrilla.

Objective-Based Sampling Plan and Schedule

2017-2021

Sport fish, forage fish, and other important fishes:

Important sport fishes in Ray Hubbard Reservoir include Largemouth Bass, Channel and Blue Catfish, White Bass, Hybrid Striped Bass and White Crappie. Known important forage species include Bluegill, Longear Sunfish, Threadfin and Gizzard Shad.

Low density fisheries:

Flathead Catfish: Flathead Catfish are present in Ray Hubbard Reservoir, however, they are rarely captured in gill nets. Data on CPUE and size structure data will be recorded from all Flathead Catfish collected by gill nets targeting catfishes, and temperate bass. Flathead Catfish will not be collected from low-frequency electrofishing.

Survey objectives, fisheries metrics, and sampling objectives

Ray Hubbard Reservoir has been chosen to take part in an evaluation of the stocking of Palmetto and Sunshine Bass. The final procedures for the project have not be determined. Thus objectives listed below could change based on those finalized procedures.

Creel Survey: A 36 day annual creel survey will be conducted from June 2020-May 2021. The creel results will provide updated angling trends for the reservoir.

Catfishes: Catfishes are the second most sought after sport fish in Ray Hubbard Reservoir (16 % of total angling effort; creel conducted 2004-2005). It is currently not known what percentage of catfish anglers target Blue Catfish and what percentage target Channel Catfish. However, based on observations of angler effort trends on other district reservoirs, more of the effort is probably directed toward Blue Catfish. The popularity and reputation for quality catfish fishing at this reservoir warrant sampling time and effort. Gill net surveys consisting of 15 gill nets will be conducted in 2019 and 2021. Survey information on both species will be collected to determine CPUE and size structure of both species. Based on past catch rates, this should be adequate to obtain an RSE of CPUE-S $\leq$ 25 but not adequate to obtain confidence in size structure (PSD; 50 fish minimum at 15 stations with 80% confidence). If RSE objectives are not met no additional gill netting will be conducted. No objective will be set for size structure information. A minimum of 20 Low-frequency electrofishing stations will be sampled in summer of 2018 and 2020 to determine if it is a more efficient method to capture Blue Catfish.

Temperate Basses: The popularity and reputation for quality White Bass and Hybrid Striped Bass fishing at this reservoir warrant sampling time and effort. Previous creel survey data indicated 11% of anglers targeted White Bass. Although angler effort is high for the species, no sampling objectives will be set for White Bass because of the variability in year class strength of the population. Data on White Bass will be collected when gill net surveys are conducted in 2019 and 2021. This should give an idea of the population status when compared to past surveys. Hybrid Striped Bass are a popular sport fish in Ray Hubbard even though the latest creel conducted in 2004-2005 revealed only 2% directed effort towards

Hybrid Striped Bass. Gill net surveys consisting of 15 gill nets will be conducted in spring of 2019 and 2021. As with White Bass, data on Hybrid Striped Bass will be collected when the gillnet survey for catfishes is conducted in the spring of 2019 and 2021. Because of the historically high variability of gillnetting catch rate data for Hybrid Striped Bass, no sampling objective will be set for CPUE. If 50 fish are not collected to provide adequate confidence in size structure (PSD; 50 fish minimum at 15 stations with 80% confidence) or for age and growth information, additional fish will be collected via angling until the target number of fish are obtained. Fin clips from all hybrids sampled will be collected and sent for analysis to determine if the hybrids are Sunshine Bass or Palmetto Bass.

Largemouth Bass: According to the most recent creel survey conducted on Ray Hubbard Reservoir (2004-2005), 24 % of anglers target Largemouth Bass and they are the most popular sport fish in Ray Hubbard Reservoir. The popularity and reputation for quality Largemouth Bass fishing at this reservoir warrant sampling time and effort. Trend data on CPUE, size structure, and body condition have been collected annually from 2004-2015 with fall nighttime electrofishing. To continue monitoring of Largemouth bass, fall nighttime electrofishing will be conducted. A minimum of 24 randomly selected 5-min electrofishing sites will be sampled in fall of 2018 and 2020. Based on past catch rates, this should be adequate to obtain an RSE of CPUE-S $\leq$ 25 (the anticipated effort to meet both sampling objectives is 24 stations with 80% confidence). If the RSE objective is not met, additional electrofishing sampling will only continue if 50 stocked sized fish or larger are not captured in the 24 sample sites for size structure determination (PSD; 50 fish minimum at 24 stations with 80% confidence).

Prey Species: Bluegill, Longear Sunfish, Threadfin, and Gizzard Shad are the primary forage in Ray Hubbard Reservoir. Like Largemouth Bass, trend data on CPUE and size structure have been collected with fall nighttime electrofishing. Sampling, as with Largemouth Bass above, will allow for monitoring of large-scale changes in Bluegill, Longear Sunfish, Threadfin and Gizzard Shad relative abundance and size structure. Sampling effort based on achieving sampling objectives for Largemouth Bass will result in sufficient numbers of Bluegill, Longear Sunfish, Threadfin and Gizzard Shad for size structure estimation (PSD for sunfish species; IOV for Gizzard Shad; 50 fish minimum at 24 stations with 80% confidence)

Crappie: Previous creel survey data indicate White crappie angling comprised 12% of total angling effort. In recent surveys, black crappie have increased greatly. A 15 single-cod shoreline trap netting survey will be conducted in fall of 2020 to monitor cate rate and size structure. This should provide sufficient information for monitoring of large-scale changes of population.

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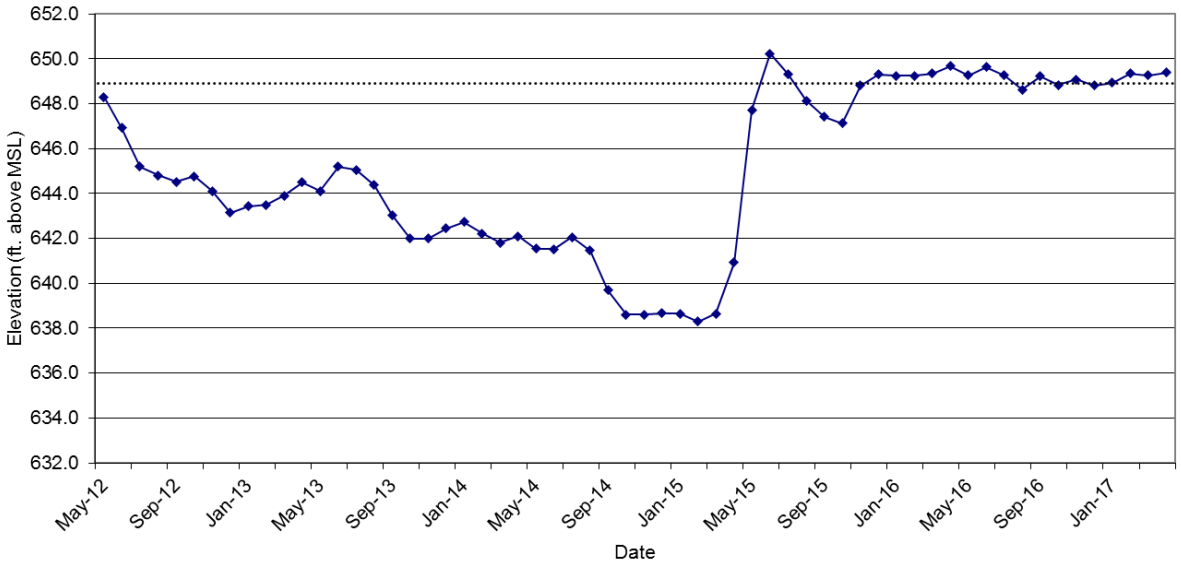


Figure 1. Mean monthly water level elevations in feet above mean sea level (MSL) recorded for Ray Hubbard Reservoir, Texas from May 2012-March 2017. Conservation pool is 435.5 feet above MSL and is represented by dashed line.

Table 1. Characteristics of Ray Hubbard Reservoir, Texas.

Characteristic	Description
Year constructed	1968
Controlling authority	City of Dallas
Counties	Collin, Dallas; Rockwall; Kaufman
Reservoir type	Mainstream Trinity River
Conductivity	241 µS/cm

Table 2. Boat ramp characteristics for Ray Hubbard Reservoir, Texas, September, 2016. Reservoir elevation at time of survey was 434.4 feet above mean sea level.

Boat ramp	Latitude Longitude (dd)	Public	Parking capacity (N)	Elevation at end of boat ramp (ft)	Condition
John Paul Jones Park	32.867 -96.573	Y	35	427.8	Good. No courtesy dock
Captains Cove Marina	32.856 -96.545	Y	80	428.8	Good
Terry Park	32.8395 -96.50616	Y	50	430.1	Good
Chandlers Marina	32.876 -96.4825	Y	150	422.9	Good
Robertson Park South - West	32.8725 -96.5218	Y	50	428.1	Adequate. No courtesy dock
Robertson Park South - East	32.8755 -96.51467	Y	50	NA	Adequate. No courtesy dock
Harbor Bay Marina	32.8966 -96.4816	Y	280	426.7	Good
Hwy 66 Boat Ramp	32.9295 -96.474	Y	100	428.3	Good
Paddle Point Park	32.8924 -96.5367	Y	25	NA	Good. Gravel ramp for small craft only

Table 3. Harvest regulations for Ray Hubbard Reservoir, Texas.

Species	Bag Limit	Length Limit
Catfish: Channel and Blue Catfish, their hybrids and subspecies	25 (in any combination)	12 – inch minimum
Catfish, Flathead	5	18 – inch minimum
Bass, White	25	10 – inch minimum
Bass, Hybrid Striped	5	18 – inch minimum
Bass, Striped	5	18 – inch minimum
Bass, Largemouth	5	14 – inch minimum
Crappie: White and Black Crappie, their hybrids and subspecies	25 (in any combination)	10 – inch minimum

Table 4. Stocking history of Ray Hubbard, Texas. Life stages are fry (FRY), fingerlings (FGL), advanced fingerlings (AFGL), 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	1990	109,175	FGL	2.0
	1993	399,958	FGL	2.2
	Total	509,133		
Channel Catfish	1971	96,830	AFGL	7.9
	Total	96,830		
Florida Largemouth Bass	1988	64,872	FRY	1.0
	1991	568,891	FGL	1.4
	1996	549,328	FGL	1.4
	2001	501,365	FGL	1.6
	2003	5,000	FGL	1.5
	2006	542,236	FGL	1.7
	2007	543,441	FGL	1.7
	2010	520,551	FGL	1.7
	2011	511,897	FGL	1.6
	2012	573,599	FGL	1.6
	2013	502,264	FGL	1.6
	2014	433,353	FGL	1.8
	2015	133,112	FGL	1.6
	Total	5,449,909		
Largemouth Bass	1968	1,471,600	FRY	0.7
	1970	2,003,000	FRY	0.7
	1970	201,000	UNK	0.0
	Total	3,675,600		
Mixed Largemouth Bass	1988	502,897		0.9
	Total	502,897		
Palmetto Bass (striped X white bass hybrid)	1976	149,616	UNK	0.0
	1979	114,000	UNK	0.0
	1980	101,800	UNK	0.0
	1982	232,701	UNK	0.0
	1985	271,952	FGL	2.0
	1987	455,017	FRY	1.0
	1988	1,200	AFGL	4.0
	1988	454,647	FRY	1.0
	1989	460,946	FGL	1.3
	1991	235,994	FGL	1.4
	1992	325,185	FGL	1.4
	1993	171,853	FGL	1.6

Table 4. Stocking history continued.

Species	Year	Number	Life Stage	Mean TL (in)
Palmetto Bass (striped X white bass hybrid)	1993	940,000	FRY	0.4
	1994	170,027	FGL	1.7
	1994	171,634	FRY	0.9
	1995	346,142	FGL	1.2
	1996	250,702	FGL	1.6
	1999	56,945	FGL	1.3
	2002	172,336	FGL	1.3
	2003	162,993	FGL	1.5
	2004	100,438	FGL	1.3
	2005	216,814	FGL	1.5
	2005	1,501,902	FRY	0.3
	2007	152,637	FGL	1.5
	2008	114,846	FGL	1.6
	2009	107,290	FGL	1.4
	2011	105,118	FGL	1.3
	2013	2,074,929	FRY	0.2
	2014	88,552	FGL	1.6
	2015	1,313,287	FRY	0.2
	2016	103,070	FGL	1.6
	Total	11,124,573		
Striped bass	1979	111,225	UNK	0.0
	1981	113,482	UNK	0.0
	1983	115,868	UNK	0.0
	1984	338,680	FGL	2.0
	1986	50,800	FGL	2.0
	1986	174,400	FRY	1.0
	1996	11,598	FGL	1.7
	Total	916,053		
Sunshine Bass (white bass x striped bass hybrid)	2013	45,000	FGL	UNK
	2014	93,011	FGL	1.4
	2015	45,000	FGL	UNK
	Total	183,011		
Walleye	1976	230,000	FRY	0.2
	1981	19,237	FRY	0.2
	Total	249,237		

Table 5. Objective-based sampling plan components for Ray Hubbard Reservoir, Texas 2016 – 2017.

Gear/target species		Survey objective	Metrics	Sampling objective
Electrofishing				
	Largemouth Bass	Abundance	CPUE – stock	RSE-Stock ≤ 25
		Size structure	PSD, length frequency	N ≥ 50 stock
		Condition	W_r	10 fish/inch group (max)
		Genetics	% FLMB	N = 30, any age
	Bluegill	Abundance	CPUE – Total	None
		Size structure	PSD, length frequency	N ≥ 50
	Longear Sunfish	Abundance	CPUE – Total	None
	Gizzard Shad	Abundance	CPUE – Total	None
		Prey availability	IOV	N ≥ 50
	Threadfin Shad	Abundance	CPUE	None
Gill netting				
	Channel Catfish	Abundance	CPUE – stock	None
		Size structure	Length frequency	None
	Blue Catfish	Abundance	CPUE – stock	RSE-Stock ≤ 25
		Size structure	Length frequency	N ≥ 50 stock
	White Bass	Abundance	CPUE – stock	None

Table 5. OBS plan components continued.

Gear/target species		Survey objective	Metrics	Sampling objective
	White Bass	Size structure	Length frequency	None
	Hybrid Striped Bass	Abundance	CPUE – stock	None
		Size structure	Length frequency	None
Trap netting				
	Crappie	Abundance	CPUE – stock	None
		Size structure	PSD, length frequency	None

Table 6. Survey of hydrilla in Ray Hubbard Reservoir, Texas. Surface area (acres) is listed with percent of total reservoir surface area in parentheses.

Vegetation	2008	2009	2010	2011	2012	2013	2014	2015	2016
Hydrilla	857 (4.0)	752 (3.5)	<1	<1	<1	<1	<1	<1	<1

Gizzard Shad

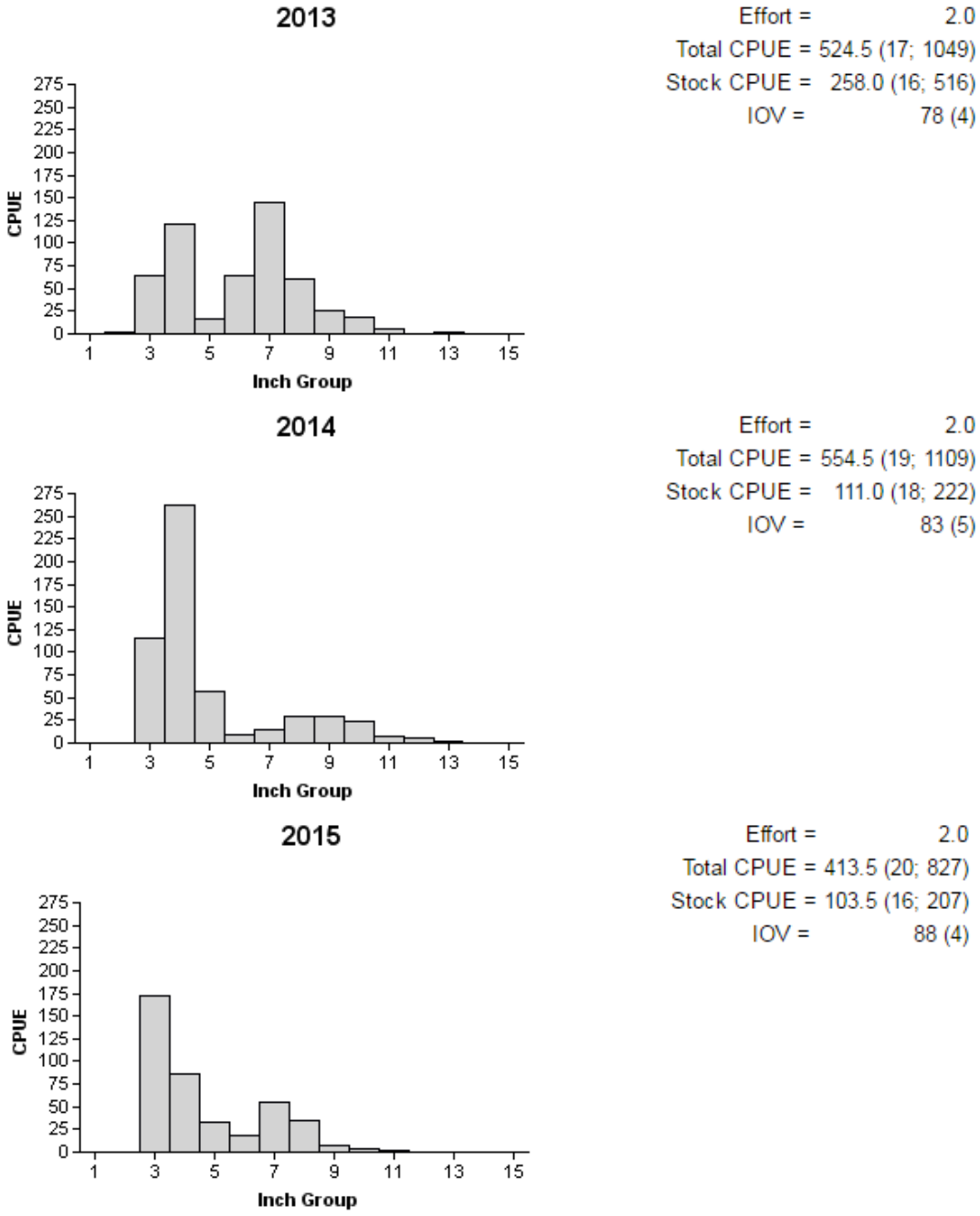
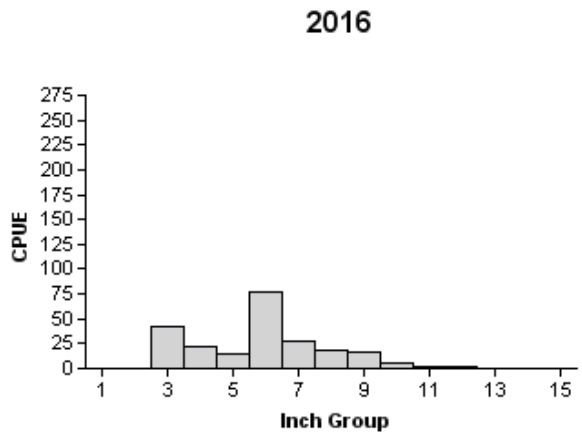


Figure 2. Number of Gizzard Shad caught per hour (CPUE; bars) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Ray Hubbard Reservoir, Texas, 2013, 2014, 2015, and 2016.

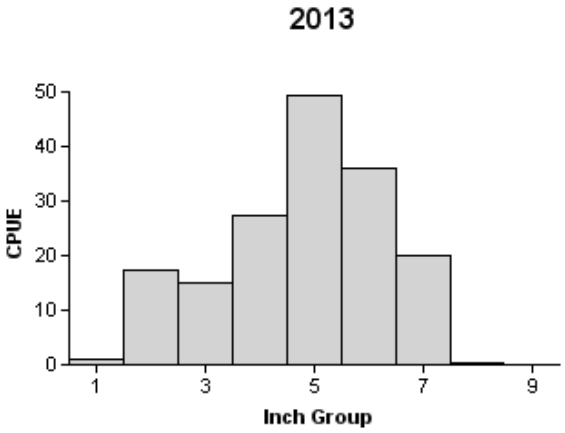
Gizzard Shad



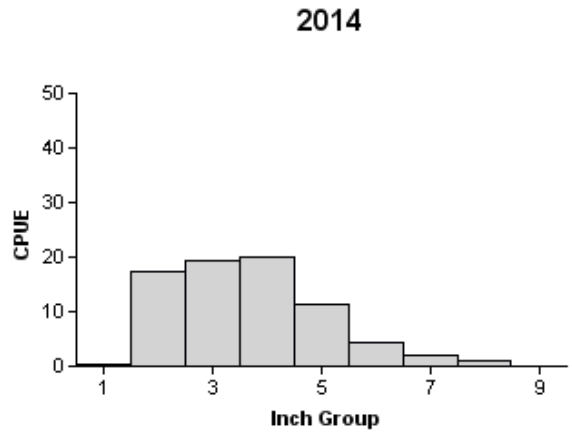
Effort = 2.0
Total CPUE = 225.5 (15; 451)
Stock CPUE = 69.5 (19; 139)
IOV = 82 (4)

Figure 2 continued.

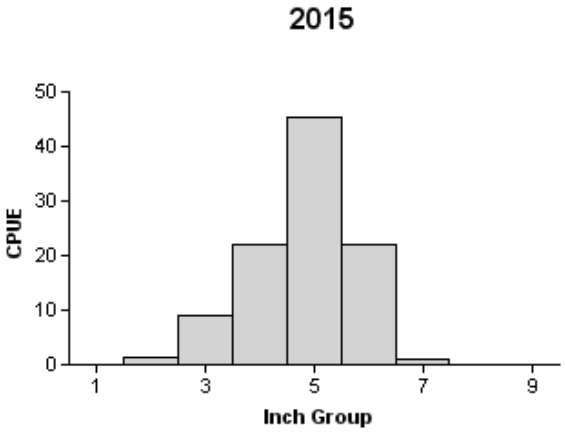
Bluegill



Effort = 2.0
Total CPUE = 167.0 (25; 334)
Stock CPUE = 148.5 (26; 297)
CPUE-6 = 56.5 (30; 113)
PSD = 38 (4)



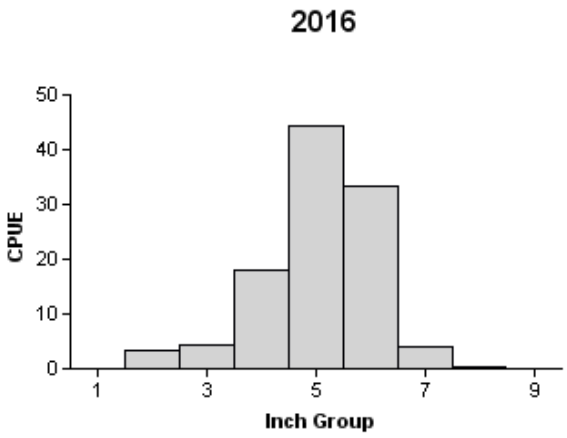
Effort = 2.0
Total CPUE = 76.5 (24; 153)
Stock CPUE = 58.5 (26; 117)
CPUE-6 = 7.5 (52; 15)
PSD = 13 (5)



Effort = 2.0
Total CPUE = 101.0 (29; 202)
Stock CPUE = 99.5 (30; 199)
CPUE-6 = 23.0 (35; 46)
PSD = 23 (4)

Figure 3. 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, Ray Hubbard Reservoir, Texas, 2013, 2014, 2015, and 2016.

Bluegill



Effort =	2.0
Total CPUE =	108.5 (25; 217)
Stock CPUE =	105.0 (25; 210)
CPUE-6 =	38.0 (30; 76)
PSD =	36 (6)

Figure 3 continued.

Blue Catfish

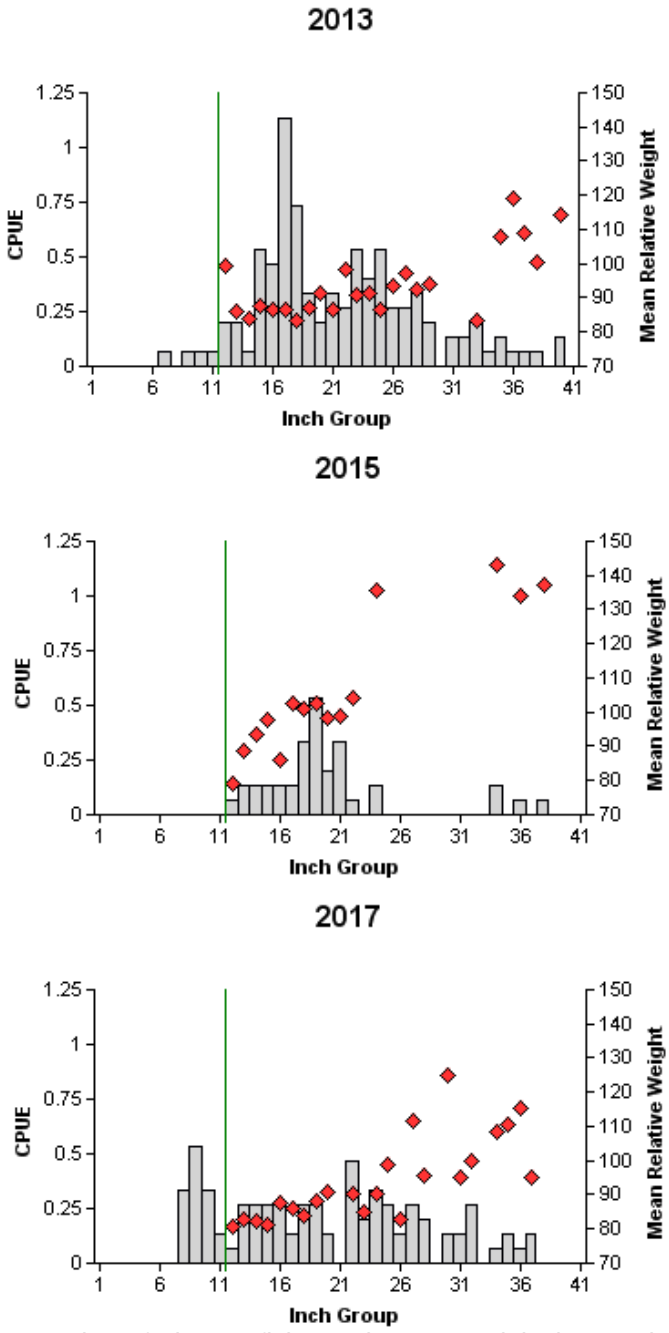


Figure 4. Number of Blue Catfish caught per net night (CPUE; bars) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Ray Hubbard Reservoir, Texas, 2013, 2015, and 2017. Vertical line represents length limit at time of sampling.

Channel Catfish

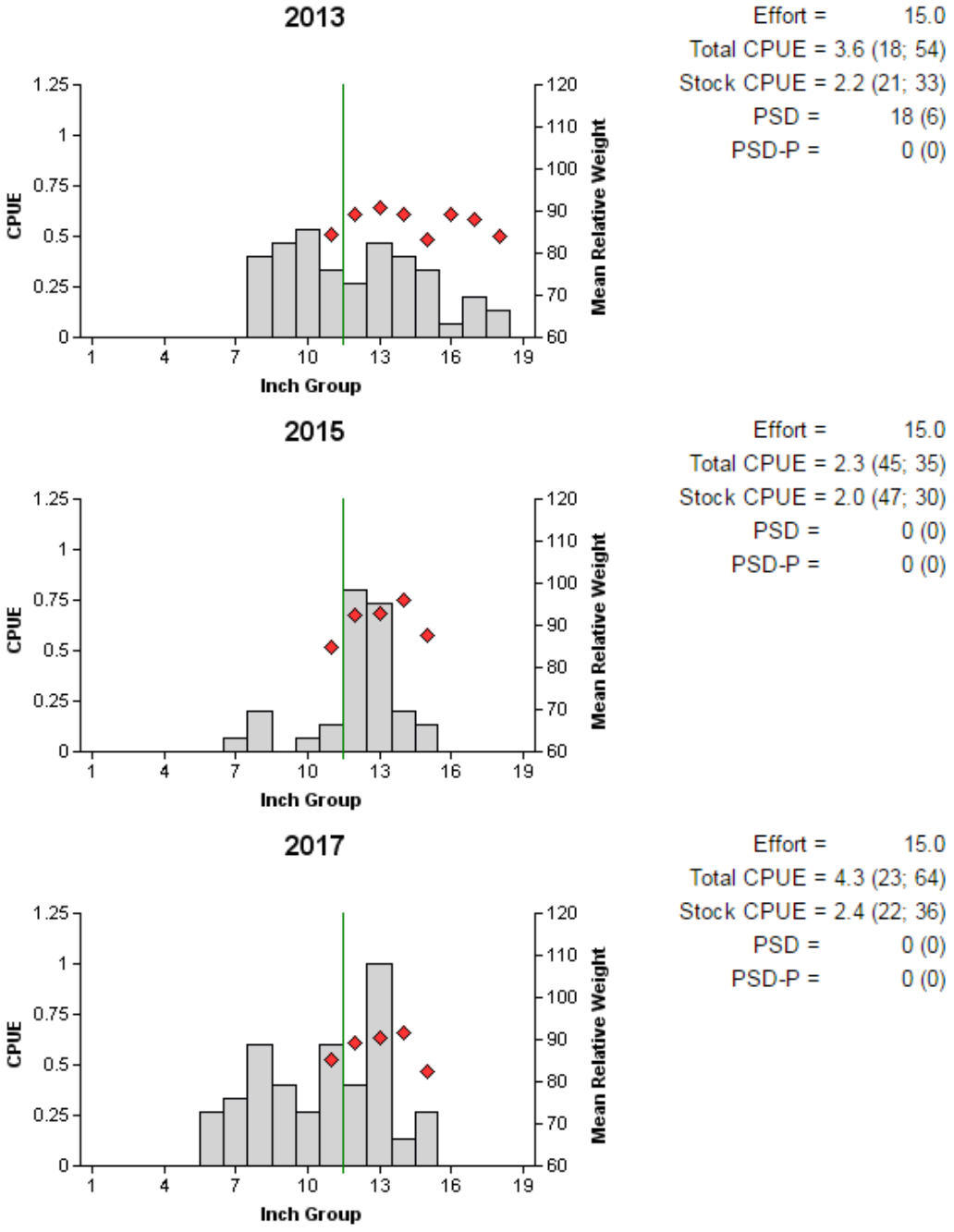


Figure 5. Number of Channel Catfish caught per net night (CPUE; bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Ray Hubbard Reservoir, Texas, 2013, 2015, and 2017. Vertical line represents length limit at time of sampling.

White Bass

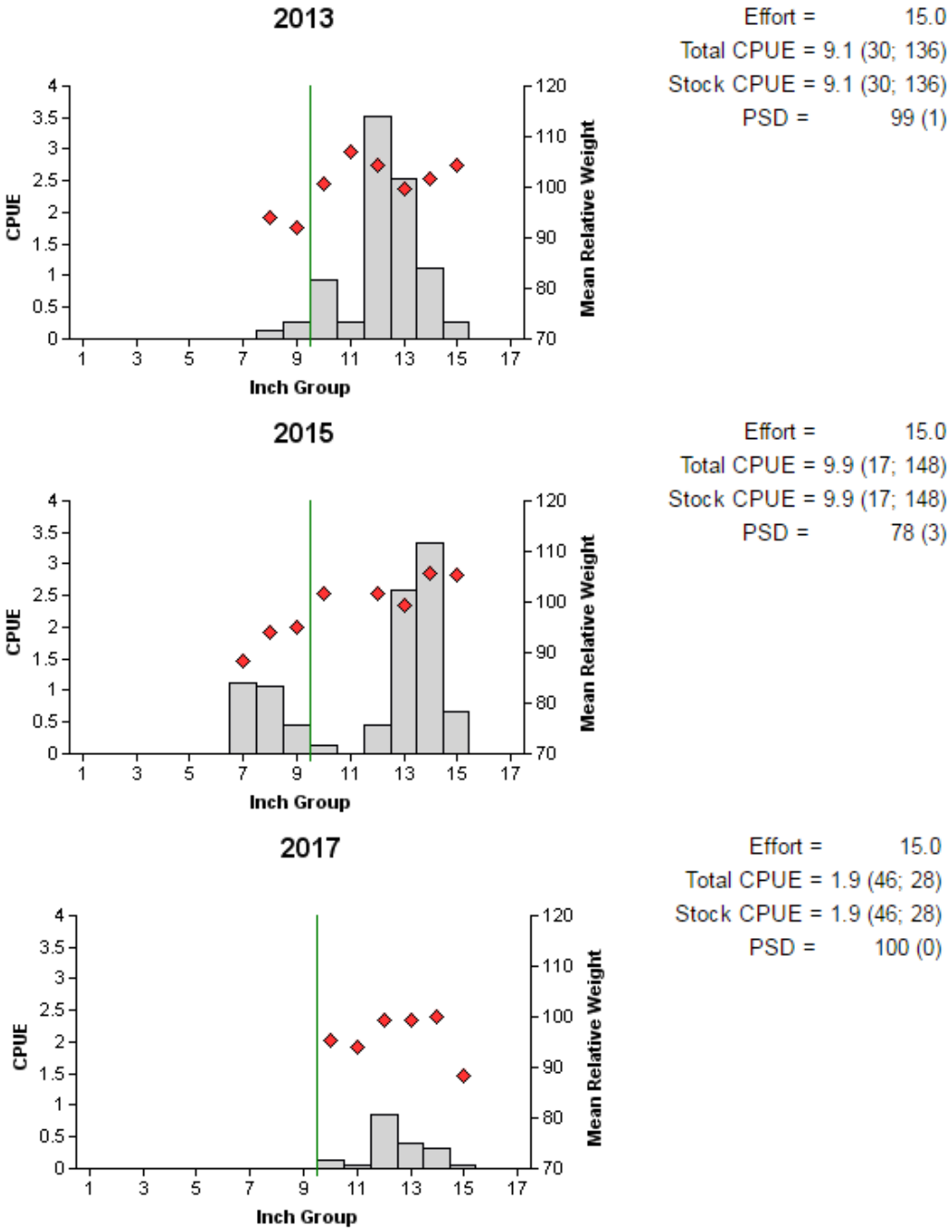


Figure 6. Number of White Bass caught per net night (CPUE; bars), mean relative weight (diamonds), and population indices (RSE and N are in parentheses) for spring gill net surveys, Ray Hubbard Reservoir, Texas, 2013, 2015, and 2017. Vertical line represents length limit at time of sampling.

Hybrid Striped Bass

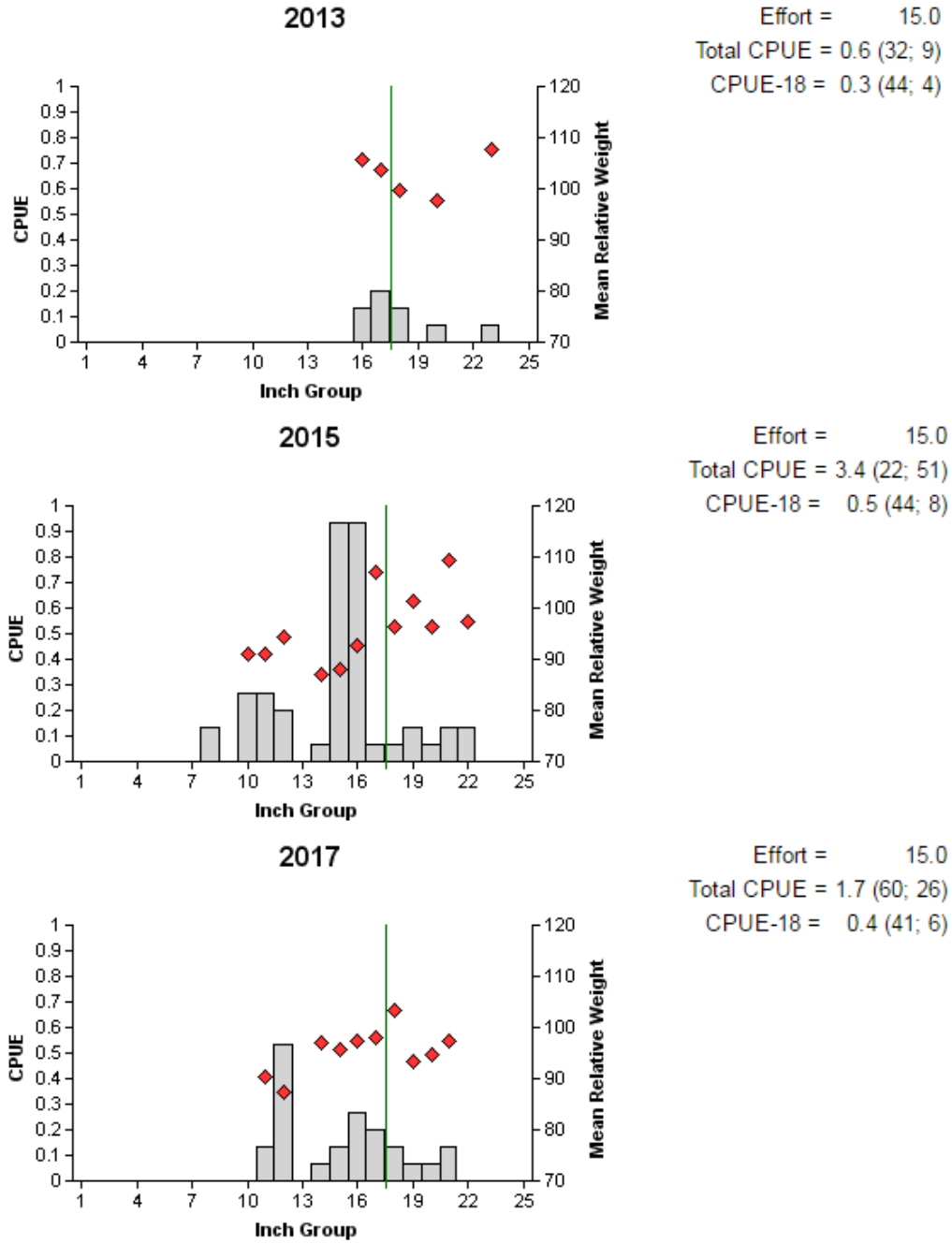


Figure 7. Number of Hybrid Striped Bass caught per net night (CPUE; bars), mean relative weight (diamonds), and population indices (RSE and N are in parentheses) for spring gill net surveys, Ray Hubbard Reservoir, Texas, 2013, 2015, and 2017 Vertical line represents length limit at time of sampling.

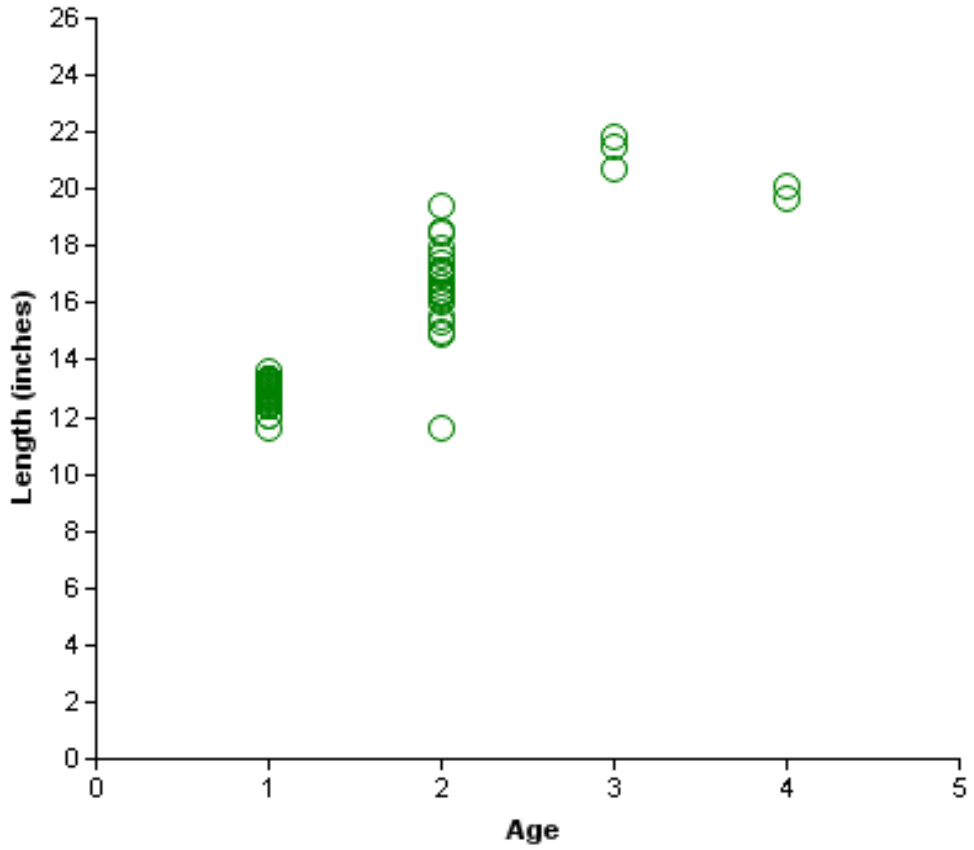
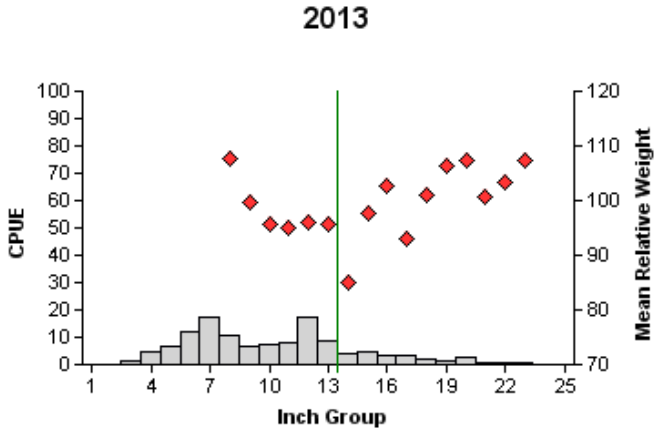
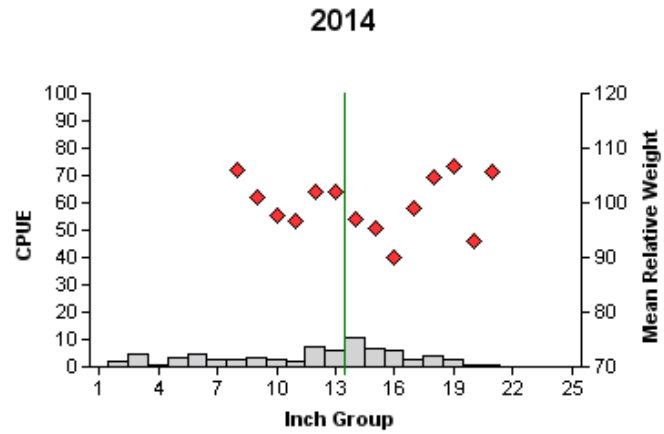


Figure 8. Length at age for Hybrid Striped Bass (sexes combined; N=57) collected from gill net and rod and reel sampling at Ray Hubbard Reservoir, Texas, for spring 2017.

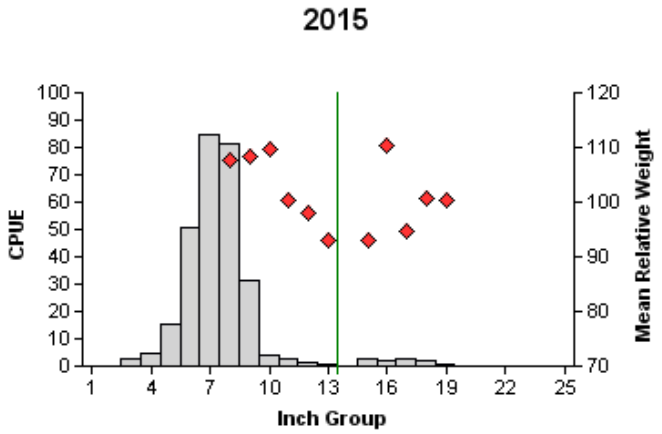
Largemouth Bass



Effort =	2.0
Total CPUE =	126.5 (15; 253)
Stock CPUE =	83.5 (17; 167)
CPUE-14 =	24.5 (23; 49)
PSD =	61 (5)
PSD-P =	25 (4)



Effort =	2.0
Total CPUE =	76.5 (19; 153)
Stock CPUE =	58.0 (22; 116)
CPUE-14 =	33.5 (23; 67)
PSD =	81 (5)
PSD-P =	40 (6)



Effort =	2.0
Total CPUE =	290.5 (17; 581)
Stock CPUE =	131.5 (21; 263)
CPUE-14 =	9.5 (36; 19)
PSD =	9 (3)
PSD-P =	7 (2)

Figure 9. 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, Ray Hubbard Reservoir, Texas, 2013, 2014, 2015, and 2016. Vertical line represent length limit at time of sampling.

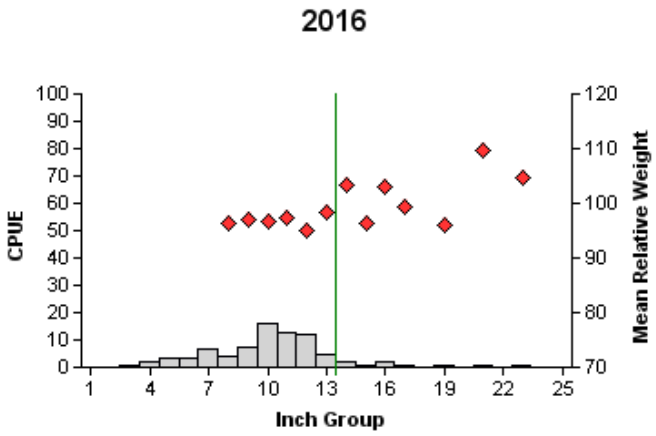


Figure 9 continued.

Table 7. Results of genetic analysis of Largemouth Bass collected by fall electrofishing, Ray Hubbard Reservoir, Texas. 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.

		Number of fish				
Year	Sample size	FLMB	Intergrade	NLMB	% FLMB alleles	% FLMB
2004	29	2	22	5	50	7.1
2008	29	0	NA	0	43	0
2012	30	4	25	1	47	13
2016	30	1	26	3	45	3

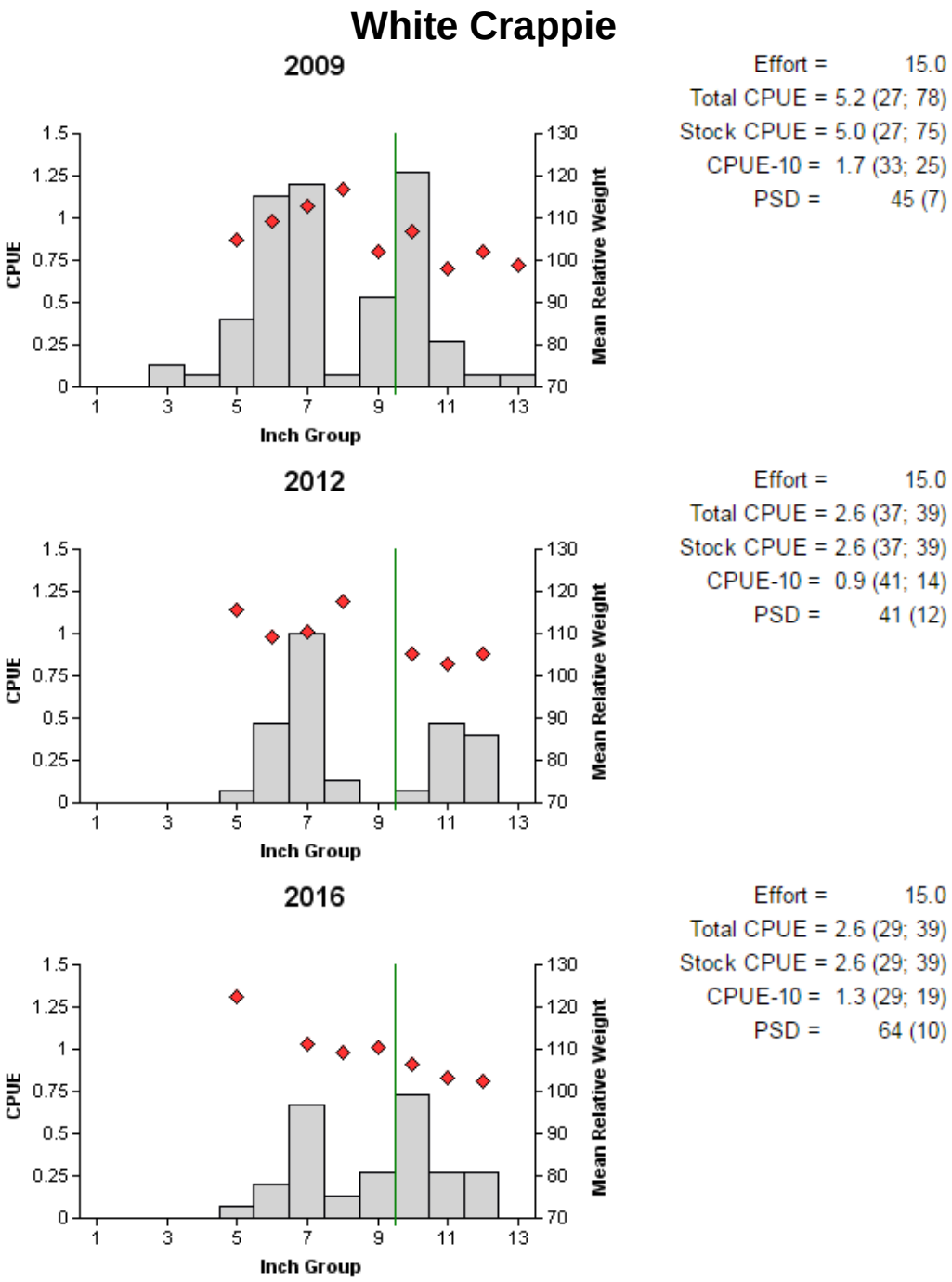


Figure 10. Number of White Crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap net surveys, Ray Hubbard Reservoir, Texas, 2009, 2012, and 2016. Vertical line represents length limit at time of sampling.

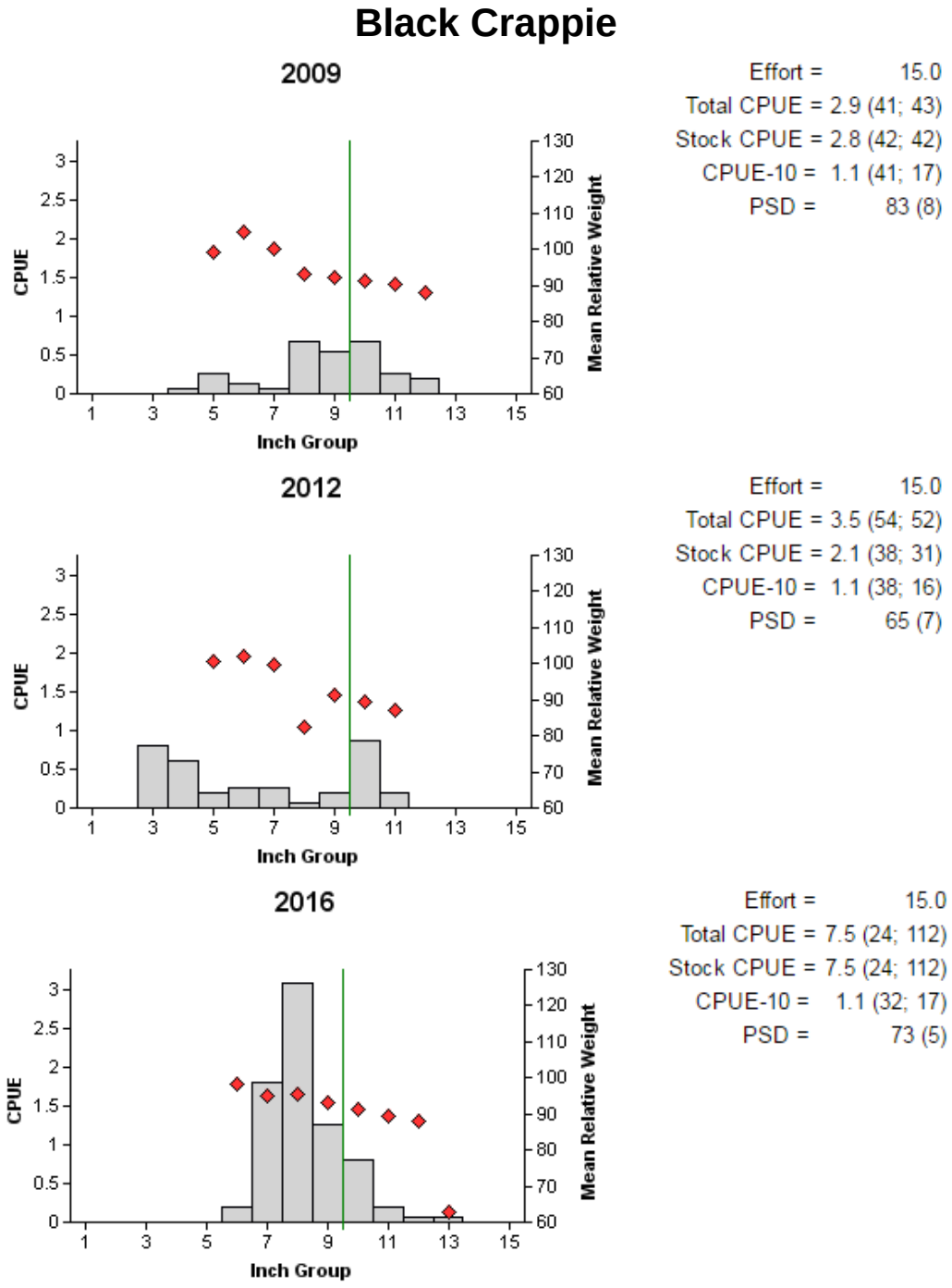


Figure 11. Number of Black Crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap net surveys, Ray Hubbard Reservoir, Texas, 2009, 2012, and 2016. Vertical line represents length limit at time of sampling.

Table 8. Proposed sampling schedule for Ray Hubbard Reservoir, Texas. Low frequency electrofishing surveys will be conducted in the summer while electrofishing and trap netting surveys are conducted in the fall. Gill netting is conducted in the spring. Standard surveys are denoted by S and additional surveys denoted by A.

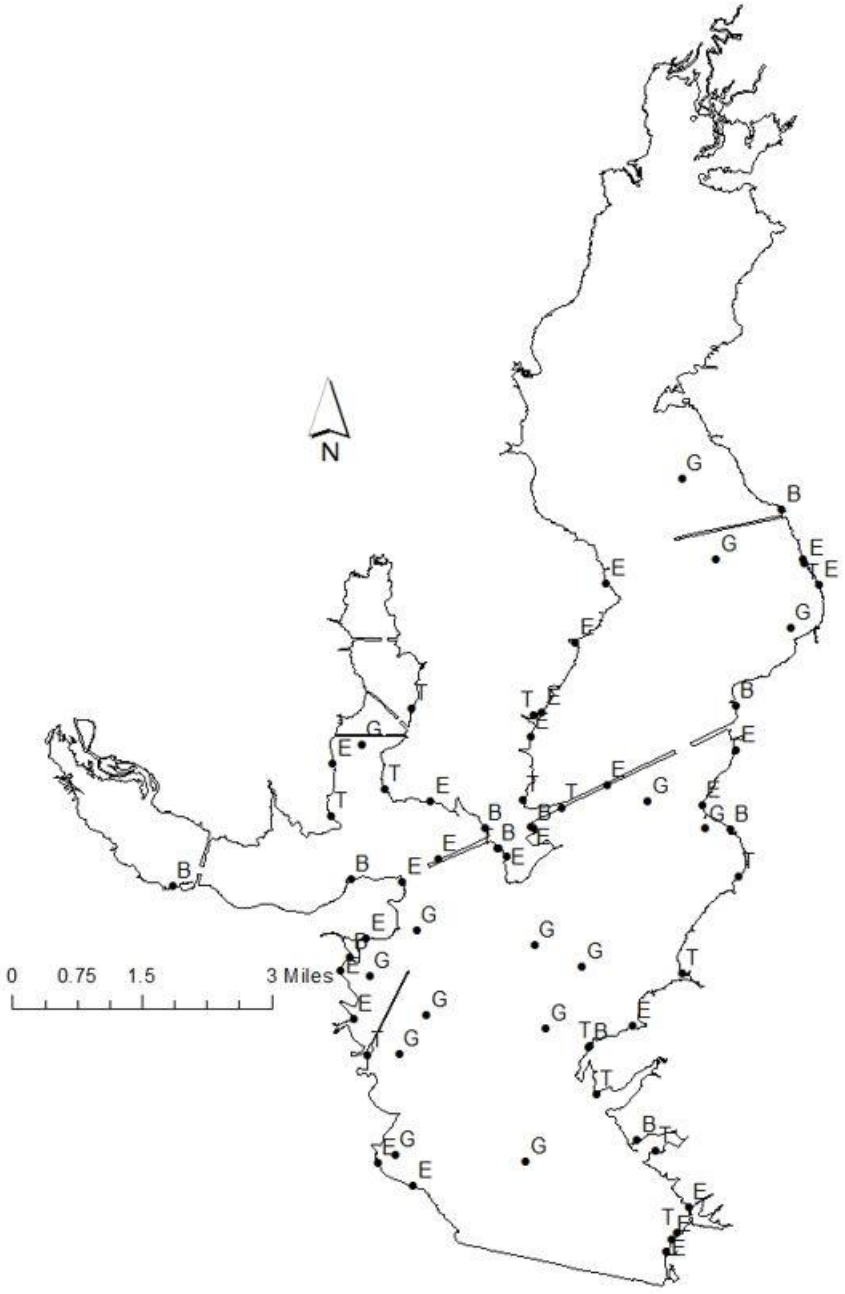
					Habitat				
Survey year	Electrofish Fall(Spring)	Low Frequency Electrofish	Trapnet	Gill net	Structural	Vegetation	Access	Creel survey	Report
2017-2018						A			
2018-2019	A	A		A		A			
2019-2020						A			
2020-2021	S	A	S	S		A	S	S	S

APPENDIX A

Number (N) and catch rate (CPUE) of all species collected from all gear types from Ray Hubbard Reservoir, Texas, 2016-2017. Sampling effort was 15 net nights for gill netting and trap netting, and 2.0 hours for electrofishing.

Species	Gill Netting		Trap Netting		Electrofishing	
	N	CPUE	N	CPUE	N	CPUE
Spotted Gar	2	0.1				
Longnose Gar	1	0.1				
Gizzard Shad	225	15.0			451	225.0
Threadfin Shad	1	0.1			2360	1,180.0
Common Carp	52	3.5				
Smallmouth Buffalo	14	0.9				
Blue Catfish	91	6.1				
Channel Catfish	64	4.3				
White Bass	28	1.9				
Yellow bass	175	11.7				
Palmetto Bass	26	1.7				
Bluegill	7	0.5			217	108.5
Longear Sunfish					88	44.0
Redear Sunfish					9	4.5
Largemouth Bass	3	0.2			159	79.5
White Crappie	6	0.4	39	2.6		
Black Crappie	9	0.6	112	7.47		
Freshwater Drum	13	0.9				

APPENDIX B



Location of sampling sites, Ray Hubbard Reservoir, Texas, 2016-2017. Trap net, gill net, and electrofishing stations, and boat ramps are indicated by T, G, E, and B respectively. Water level was approximately 3 feet below conservation pool at time of sampling.

APPENDIX C

Historical catch rates for targeted species by gear type for Ray Hubbard Reservoir, Texas.

		Year											
Gear	Species	1994	1997	2000	2001	2003	2004	2005	2006	2007	2008	2009	2010
Gill Netting	Blue Catfish	5.0	13.1		8.3	6.1		10.6		2.3		8.1	
(fish/net night)	Channel Catfish	7.6	5.6		5.7	3.9		3.7		5.0		2.1	
	White Bass	11.3	5.7		3.5	11.6		9.1		3.9		9.5	
	Palmetto Bass	7.9	5.1		0.0	0.0		4.1		3.3		1.3	
Electrofishing	Gizzard Shad	309.0	299.5	177.5	299.5	177.5	243.0	98.0	157.0	188.0	273.5	186.0	704.5
(fish/hour)	Threadfin Shad	174.0	100.0	359.5	100.0	359.5	216.5	727.5	251.5	661.5	1195	1104	867.0
	Bluegill	80.5	179.0	96.0	179.0	96.0	100.0	252.0	131.5	161.0	272.0	60.0	176.0
	Longear Sunfish	45.5	263.5	52.0	263.5	52.0	58.0	183.0	81.5	122.0	151.0	84.5	61.5
	Redear Sunfish	0.0	0.0	5.0	0.0	5.0	6.0	30.0	9.5	17.5	11.0	2.0	13.0
	Largemouth Bass	101.0	206.5	96.0	206.5	96.0	65.5	121.5	110.0	139.5	106.5	67.5	148.5
Trap Netting	White Crappie	9.0	6.1	14.1	6.1	14.1	13.7				1.4	5.2	
(fish/net night)	Black Crappie	0.0	5.3	2.3	5.3	2.3	0.9				1.3	2.9	

APPENDIX C continued.

		Year							
Gear	Species	2011	2012	2013	2014	2015	2016	2017	**Ave.**
Gill Netting	Blue Catfish	2.8		8.3		2.6		6.1	**6.7**
(fish/net night)	Channel Catfish	4.8		3.6		2.3		4.3	**4.4**
	White Bass	4.5		9.1		9.9		1.9	**7.3**
	Palmetto Bass	0.1		0.6		3.4		1.7	**2.5**
Electrofishing	Gizzard Shad	676.0	279.0	524.5	554.5	413.5	225.5		**321.4**
(fish/hour)	Threadfin Shad	589.0	790.5	1,018.0	312.5	436.5	1,180.0		**580.1**
	Bluegill	168.5	212.0	167.0	76.5	101.0	108.5		**145.4**
	Longear Sunfish	106.0	237.5	95.0	15.0	26.0	44.0		**107.9**
	Redear Sunfish	7.5	26.5	18.0	2.0	4.5	4.5		**9.0**
	Largemouth Bass	97.0	185.5	126.5	76.5	290.5	79.5		**128.9**
Trap Netting	White Crappie		2.6				2.6		**7.5**
(fish/net night)	Black Crappie		3.5				7.5		**3.1**