PERFORMANCE REPORT

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INLAND FISHERIES DIVISION MONITORING AND MANAGEMENT PROGRAM

2016 Fisheries Management Survey Report

Amistad Reservoir

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SURVEY AND MANAGEMENT SUMMARY

Fish populations in Amistad Reservoir were surveyed in 2016 and 2017 using electrofishing and in 2017 using gill netting. Historical data are presented with the 2016-2017 data for comparison. This report summarizes the results of the surveys and contains a management plan for the reservoir based on those findings.

- **Reservoir Description:** Amistad Reservoir is a 63,680 acre Texas-Mexico border impoundment on the Rio Grande River. It was constructed in 1969 and is managed by the International Boundary and Water Commission to provide water for irrigation and hydro-electric power generation. Boat and angler access is excellent. The National Park Service (NPS) maintains 9 public boat ramps. Water level averaged 25 feet below conservation pool elevation (CP) since spring 2015, however it remained relatively stable fluctuating just 11 feet since then which contributed to the expansion of aquatic plants. Occurrence of aquatic vegetation, primarily hydrilla and pondweed spp., was 35.8% in 2016.

- **Management History:** Important sport fishes include Largemouth Bass, catfishes, Striped Bass, and White Bass. Striped Bass were stocked in most years since 1974. Florida Largemouth Bass (FLMB) were stocked periodically from 1975 to 2008 and annually since 2010 to improve FLMB introgression and trophy Largemouth Bass potential. Angler harvest of all sport fishes has been regulated according to statewide size and bag limits. Since 2004, the NPS has regulated and quantified black bass tournaments via a mandatory tournament permitting program.

- **Fish Community**
  - **Prey species:** Gizzard Shad, Threadfin Shad, and sunfish spp. comprise the prey community. As a group, these species were sufficiently abundant and sufficiently sized to support existing predators.

  - **Catfishes:** Channel, Blue, and Flathead catfishes were present in low numbers. Gill net catch-per-unit-effort (CPUE) ranged from 0.2 to 1.1 fish/net-night(nn) in 2017.

  - **White Bass:** Gill net CPUE was 1.6 fish/nn in 2017. The majority of White Bass collected (80%) exceeded the 10-inch minimum length limit.

  - **Striped Bass:** Gill net CPUE was 2.9 fish/nn in 2017. The majority of Striped Bass collected (79%) exceeded the 18-inch minimum length limit.

  - **Black Basses:** Largemouth Bass abundance has increased according to recent spring samples which are likely due to expanding aquatic plant coverage. Likewise, growth has increased compared to previous estimates. Smallmouth Bass abundance was low (electrofishing CPUE =2.5 fish/h).

  - **White Crappie:** This species is present in the reservoir, but in low abundance. Gill net CPUE was 0.4 fish/nn in 2017.

Management Strategies: Continue stocking Striped Bass at 3-5 fish/acre annually to maintain the fishery. Continue to annually stock Florida Largemouth Bass at 1,000 fish/km of shoreline to enhance trophy potential. Inform the public about the negative impacts of aquatic invasive species, and monitor for presence of aquatic invasive species during routine fish population and habitat surveys. Work cooperatively with reservoir management agencies in performing outreach and addressing issues.

INTRODUCTION

This document is a summary of fisheries data collected from Amistad Reservoir in 2016-2017. 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 fishes was collected, this report deals primarily with major sport fishes and important prey species. Historical data are presented with the 2016-2017 data for comparison.

Reservoir Description

Amistad Reservoir is a 63,680 acre impoundment on the Rio Grande River, of which 34,312 acres (54%) lie within Texas (Appendix A). It was constructed in 1969 by the International Boundary and Water Commission to provide water for irrigation and hydro-electric power generation. The reservoir is the centerpiece of the Amistad National Recreation Area which had a visitation of nearly 1.2 million visitors in 2016 (Thomas and Koontz 2017). Most of the Texas shoreline is federally owned and managed by the National Park Service (NPS) as a National Recreation Area. The reservoir has experienced water level fluctuations averaging 12.9 feet annually since 1990. Fisheries habitat primarily consists of aquatic vegetation (hydrilla and pondweed spp.) and flooded terrestrial vegetation. On the Mexico side of the reservoir, commercial fishing occurs using gill nets and hoop nets and harvest of all fishes is unregulated. The reservoir is a popular site for black bass tournaments. Average annual number of tournament events and Black Bass weighed-in were 153 and 31,472, respectively, from 2004 to 2008 (unpublished data, NPS). The total economic value of the fishery was estimated to be $22.7 million in 2007 (Schuett et al. 2012). Other descriptive characteristics for the reservoir are contained in Table 1.

Angler Access

The NPS maintains 9 public boat ramps at the reservoir, four of which are only functional when water level is at or near conservation pool elevation. Two ramps (Diablo East and Rough Canyon) remained open when water level reached a record low level in 2013. The NPS also provides two fish cleaning stations and operates a tournament permitting and scheduling program to avoid over-crowding at boat ramps and to obtain tournament catch statistics. Shoreline angling access is limited and fishing is not allowed at boat ramp locations per NPS rule. Boat ramp characteristics are in Table 2.

Management History

Previous management strategies and actions: Management strategies and actions from the previous survey report (Myers and Dennis 2014) were:

1. Maintain a Striped Bass Fishery
   Action: Striped Bass fingerlings were unavailable for stocking in 2016. In 2015 and 2017, 325,606 and 232,920 fish were stocked, respectively.
2. Maintain/enhance trophy Largemouth Bass potential.
   Action: Florida Largemouth Bass fingerlings (FLMB) numbering 502,442 and 504,830 were stocked in 2016 and 2017, respectively.
3. Monitor for the presence of aquatic invasive species and cooperate with NPS to inform users about such and measures to take to reduce risk of introductions.
   Action: A habitat/vegetation survey was conducted in 2016 and no invasive aquatic plants besides hydrilla were found occurring. “Clean, Drain, and Dry” signs were provided to the NPS for posting at access points. Coordinate with agencies responsible for management and monitoring of the reservoir.
4. Work cooperatively with other management agencies.
   Action: Youth fishing events were conducted in cooperation with NPS in 2016 and 2017. District staff reviewed NPS press release concerning tournament Largemouth Bass mortality event attributed to fish release tube.

Harvest regulation history: Harvest of all sport fishes has been managed according to statewide regulations since reservoir impoundment (Table 3).

Stocking history: Northern strain Largemouth Bass, FLMB, Blue and Channel Catfishes, Smallmouth Bass, Striped Bass, Palmetto Bass, Walleye, Northern Pike, and Muskellunge have been stocked in the past. Only FLMB and Striped Bass continue to be stocked. Annual stockings of FLMB have been conducted since 2010 to maintain high FLMB introgression and trophy potential. Striped Bass were stocked in most years since 1974 to support a fishery. The complete stocking history is in Table 4.

Vegetation/habitat management history: Aquatic vegetation has been routinely monitored and quantified. In 2012, a few dozen left over Christmas trees donated by Home Depot in Del Rio were secured to large cement blocks and deployed to serve as a fish attractor.

Water transfer: Amistad Reservoir is used to store, conserve, and distribute water for downstream irrigation needs in both Mexico and the U.S. Rio Grande River water is allocated per terms of a treaty formed in 1944 between the two countries. Each country has separate operational control of the dam and release water in response to downstream irrigation needs. No inter-basin transfer of water is known to exist.

METHODS

Surveys were conducted to achieve survey and sampling objectives in accordance with the 2016-2019 objective-based sampling (OBS) plan for Amistad Reservoir (Myers and Dennis 2014). Primary components of the OBS plan are listed in Table 5. All survey sites were randomly selected, except when otherwise specified, and all surveys were conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2015).

Electrofishing – Largemouth Bass, sunfishes, Gizzard Shad, and Threadfin Shad were collected by electrofishing (2 h at 24, 5-min stations) during fall. Electrofishing was conducted at eight more stations than specified in the OBS plan during fall 2016 to improve estimate precision. During spring electrofishing (2 h at 24, 5-min stations), only Largemouth Bass were collected. Catch per unit effort (CPUE) for electrofishing was recorded as the number of fish caught per hour (fish/h) of actual electrofishing. Ages for Largemouth Bass were determined using otoliths from 13 randomly-selected fish ranging between 13.0 and 14.9 inches total length (TL).

Gill netting – White Bass, Striped Bass, catfishes, and White Crappie were targeted. In 2012 and 2015, 15 net-nights of sampling effort were conducted at random stations. In 2017, 16 net-nights of sampling effort at 16 biologist-selected stations) was used in 2017 per the 2016-2019 OBS plan. CPUE for gill netting was recorded as the number of fish caught per net night (fish/nn).

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.

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). 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 estimates.

Habitat – A habitat/vegetation survey was conducted in 2016 using the random point sampling method according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2015).

Water level – The source for water level data was the United States Geological Survey (USGS 2017).

RESULTS AND DISCUSSION

Habitat: Water level averaged 25 feet below CP during the study period; however, it was relatively stable fluctuating only 11 feet. This led to the expansion of aquatic plants. Total combined aquatic vegetation was 35.8% occurrence in 2016, the highest level recorded since 2007 (Figure 2). Hydrilla (15% occurrence) and pondweed spp. (15.9% occurrence) were the predominant species (Table 6). A shoreline structural survey was not conducted as no significant shoreline modifications took place since the 2005 shoreline structural survey was completed by Myers and Dennis (2012).

Prey species: Electrofishing catch rate of Gizzard Shad was substantially greater in 2016 (49.5 fish/h) than 2011 (16.5 fish/h) and somewhat similar to 2007 (37.0 fish/h; Figure 3). Proportionally few Gizzard Shad are suitably-sized as prey (IOV=0-3 across survey years) with most fish exceeding 12 inches TL. Although the reservoir contained Threadfin Shad which are suitably-sized as prey, electrofishing CPUE was low in 2016 (10 fish/h; Appendix B). Electrofishing CPUE of Bluegill in 2016 (13.5 fish/h) remained low compared to 2007 (90.0 fish/h; Figure 4). In contrast, Redbreast Sunfish electrofishing CPUE in 2016 (73.5 fish/h) was similar to 2007 (67.0 fish/h), but lower than 2011 (103 fish/h; Figure 5). Although relative abundances of prey species were low, Largemouth Bass condition (W_r) was good (see below) suggesting sufficient forage is available in the reservoir to support existing predators.

Catfishes: Channel Catfish has been the predominant catfish spp. present in the reservoir (Myers and Dennis 2014). Gill netting CPUE was low for this species in 2017 (0.9 fish/h), as well as for Blue and Flathead catfishes at biologist-selected stations (Appendix B).

White Bass: Use of the sampling protocol set forth in the 2016-2019 OBS plan (16 nn at biologist-selected stations) yielded a catch of 25 stock-size fish in 2017 (Figure 6) which was in line with the sampling objective ($\geq$25 stock fish). Precision of the PSD and CPUE-stock estimates (SE = 7 and RSE = 30, respectively) was adequate given the survey objective of monitoring for large-scale changes in population size structure and relative abundance. Total catch in 2017 was markedly less than in 2015 (51 fish) and 2012 (67 fish) when sampling was conducted at 15 random stations. However, CPUE estimates were more precise in 2017 (RSE = 30) than in 2015 (RSE = 40) and 2012 (RSE = 55). This was due to less variable catch among nets in 2017 which is a function of restricting sampling to locales of the reservoir known for containing White Bass. The majority of White Bass collected in 2017 (80%) exceeded the minimum length limit (PSD=84). Body Condition was good ranging with W_r ranging from 80 to 100.

Striped Bass: Use of the sampling protocol described in the 2016-2019 OBS plan (16 nn at biologist-selected stations) yielded a catch of 47 Striped Bass in 2017 (Figure 7). Total catch was considerably higher in 2017 than in 2015 (14 fish) and 2012 (4 fish) when sampling occurred at 15 random stations. Precision of CPUE estimates was likewise better in 2017 (RSE = 20) than in 2015 (RSE = 50-53) and 2012 (RSE = 44). There were no specific sampling objectives in the 2016-2019 OBS plan for this species. Given the high catch of Striped Bass using biologist-selected station sampling protocol, $\geq$25 fish will be added as sampling objectives for abundance and size structure survey metrics in the 2017-2021 OBS plan. The majority of Striped Bass collected in 2017 (79%) exceeded the minimum length limit (PSD = 15). Body condition was good for fish $\leq$21 inches TL ($W_r \geq 84$) and poor for larger fish ($W_r \leq 68$).

Largemouth Bass: Electrofishing CPUE of Largemouth Bass has been variable. This is likely due to fluctuating water level and availability of fisheries habitat. For fall sampling, CPUE ranged from a low of 45.5 fish/h in 2016 to a high of 105.0 fish/h in 2007 (Figure 8). For spring sampling, CPUE ranged from a low of 30 fish/h in 2014 to a high of 84 fish/h in 2017 (Figure 9). Considering the sampling time frames, fall sampling suggests a decreasing trend in relative abundance since 2007, whereas spring sampling indicates relative abundance has increased during since 2014. The population size structure has been consistent across years. Stock size fish represented 80-87% of total fish collected during fall sampling and 60-81% of total fish collected in spring samples. Likewise, PSD has remained fairly consistent

across years ranging from 50-71 for fall sampling and 52-80 for spring sampling. Except for fish >17 inches in 2011, body condition (W_r) has been good in sample years remaining $\geq$90 for most length classes in fall and $\geq$85 for most length classes in spring. Introgression of FLMB into the population has been consistently high since 2006 ranging from 73 to 83% FLMB alleles (Table 7). The % FLMB in the population in 2016 (17%) was within the range of 2006 and 2009 estimates (13.3% and 23.0%, respectively) and greater than the 2011 estimate (7%). Annual stockings of FLMB initiated in 2010 are likely responsible for maintaining the consistently high FLMB introgression and possibly the recent increase in % FLMB in the population from 2011 to 2016. Age data collected in spring 2015 indicated slow growth evidenced by the presence of six year classes (2008-2013) in a sample of 12 fish ranging in size from 13 to 15 inches TL (Myers and Dennis 2014). Age data collected in fall 2016 suggests that growth has improved as 2 year classes (2014 and 2015) were represented in the sample of 13 fish ranging from 13 to 15 inches TL. The increase in aquatic plant coverage yields favorable conditions for continued improvement in the Largemouth Bass and prey species populations (sunfishes).

Fisheries management plan for Amistad Reservoir, Texas

Prepared – July 2017

ISSUE 1: Historically Striped Bass were a popular sport fish at Amistad Reservoir, but in recent years fishing effort for this species has decreased. Annual stocking is required to maintain the population because this species does not successfully reproduce in Amistad Reservoir.

MANAGEMENT STRATEGY

1. Stock Striped Bass annually at 3-5 fish/acre.
2. Assess the Striped Bass population biennially using gill nets and the fishery in 2018 using creel sampling.

ISSUE 2: Amistad is well known for its high quality Largemouth Bass fishery and for catches of trophy-size fish. The reservoir was ranked as the 6th best Largemouth Bass fishing destination in 2012 by ESPN-Bassmaster. It has produced 12 ShareLunkers (Largemouth Bass $\geq$13 lbs. that are donated to TPWD for brood fish). While numerous largemouth bass weighing over 10 lbs. have been documented caught according to recent creel surveys, no ShareLunkers have been donated since 2010.

MANAGEMENT STRATEGY

1. Annually stock FLMB fingerlings at a rate of 1,000/ km of shoreline to increase the proportion of FLMB in the population, and in turn production of trophy fish.
2. Assess the Largemouth Bass population biennially using electrofishing in spring and fall and the fishery using creel sampling in 2018.

ISSUE 3: 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.

ISSUE 4: Multiple government agencies are charged with monitoring and management of the reservoir. These include International Boundary and Water Commission, National Park Service, Texas Commission on Environmental Quality, and TPWD. Although agency responsibilities differ, issues arise such as renovation of the fish release tube, Largemouth Bass barotrauma, copper toxicity concern, and golden algae monitoring that are best addressed through coordinated efforts.

MANAGEMENT STRATEGY

1. Partner with NPS in conducting an annual youth fishing event.
2. Provide assistance to the NPS in rebuilding the fish release tube.

Objective-Based Sampling Plan and Schedule 2017-2021

Sport fish, forage fish, and other important fishes

The primary sport fish in Amistad Reservoir is Largemouth Bass; 85-95% of the fishing effort was directed at Largemouth Bass in the past three creel surveys. Other sport fish include Channel Catfish, White Bass, Striped Bass, and Smallmouth Bass. Known important forage species include Bluegill, Redbreast Sunfish, and Gizzard Shad.

Survey objectives, fisheries metrics, and sampling objectives

Largemouth Bass: Largemouth Bass are the most highly sought after sport fish in the Reservoir. This fishery is a popular destination for anglers from across the nation and has been ranked in the top 10 (including #1) of the top 100 bass fishing lakes in the nation by ESPN-Bassmaster. This reservoir experiences extreme water level fluctuations and changes in habitat which leads to fluctuations in Largemouth Bass abundance, size structure, and fishing quality. Since 2001, the population has been sampled on a biennial basis to track trends in abundance, size structure, growth, and Florida Bass genetic introgression. As one of the premier Largemouth Bass fisheries in the nation, continued biennial sampling will be needed to track trends in the population and fishery and identify issues and conditions as they arise. Fall night time electrofishing will occur every other fall (2018 and 2020) and spring daytime bass-only electrofishing will occur every other spring (2019 and 2021). The fall surveys will consist of 18 randomly selected 5-minute stations. Based on our evaluation of existing electrofishing data, RSE $\leq$20 for CPUE-(S), the collection of 50+ stock-sized and larger bass for size structure determination, 30 fish for genetic analysis, and 13 fish between 13.0 and 14.9 inches for age and growth analysis can be achieved with 12 stations. However, we chose to set the total effort at 18 stations because completing both 18 and 24 stations requires two nights of sampling effort. Spring surveys will consist of 24 randomly selected stations to collect 50+ fish for size structure determination and should allow for an RSE $\leq$25 for CPUE-(S). No further sampling effort will be expended in the spring.

The Largemouth Bass fishery will be quantified using a 6-month creel survey conducted January through June, 2018. Sixteen days per quarter will be sampled. Sampling effort will be evenly split between weekend and weekday creels. Sample sites (boat ramps) will be stratified among the five most used boat ramps using vehicle counts supplied by the National Park Service. This same sampling protocol was used for the last three creel surveys at the reservoir. Based on creel data, sampling objectives will be: RSE $\leq$25 for angling effort, RSE $\leq$50 for angler catch/harvest, and length data recorded for $\geq$100 harvested fish. No additional creel sampling effort will occur if sampling objectives are not met.

Smallmouth Bass: Electrofishing surveys do not sample this species effectively at Amistad Reservoir. Electrofishing CPUE of Smallmouth Bass was 1.0 fish/h in spring 2015. However, anglers do report catches of this species. From January through June in 2012 and 2015, angler catch was 3,411 and 3,712 fish, respectively, according to creel survey sampling. As such, creel survey sampling (as described above) will be used to monitor for large-scale changes in the Smallmouth Bass fishery. Angler catch/ harvest and size of catch are the primary survey objectives. Specific sampling objectives are impractical for this species because of their low catch and anglers historically have not specifically targeted Smallmouth Bass.

Catfishes: Channel, Blue, and Flathead Catfish are present in the reservoir in low abundance and Channel catfish are the predominant species (Myers and Dennis 2014). Standard spring gill net surveys have been ineffective at collecting a sufficient number of Channel Catfish for meaningful analyses. In 2011, 2012, and 2015, catch ranged from 13-25 fish using 15 net-nights of effort. Likewise, use of gill nets at biologist-selected stations in 2017 was unsuccessful at sampling a sufficient number of this

species (catch = 15 fish). Fishing for catfishes has accounted for up to 8% of the total fishing effort on the reservoir (Myers and Dennis 2014). The survey objective is to monitor for large-scale changes in angler utilization. Specific survey objectives are to determine angling effort, angler catch/harvest, and size of catch using creel survey sampling as described above. Specific sampling objectives are impractical due to low fishing directed toward catfishes.

White Bass: The primary objectives for White Bass are to determine large-scale changes in relative abundance and size structure. From personal observations during previous creel surveys, most anglers targeting White Bass fish for them in the Castle Canyon and Devil's River areas of the reservoir from January through March. Therefore, sampling will be accomplished using gill nets at biologist-selected stations in each of those areas to maximize catch. A minimum of eight nets will be set for one night in each area. The sampling objective is to collect ≥25 stock size fish. If the sampling objective is not met, no additional sampling effort will be conducted. This sampling protocol was used in 2017 and the sampling objective was achieved with the collection of 25 stock-size White Bass yielding a CPUE of 1.6 fish/nn with an RSE of 30. The next sampling event will occur in 2019.

Secondary survey objectives are to monitor for large-scale changes in the White Bass fishery as determined by evaluation of trends in angling effort, angler catch/harvest, and size of catch using creel survey sampling in 2018 as described above. Specific sampling objectives are impractical because this species typically accounts for <5% of total angling effort on the reservoir (Myers and Dennis 2014).

Striped Bass: The primary objectives for Striped Bass are to determine large-scale changes in relative abundance and size structure. Striped Bass will be sampled in conjunction with White Bass as described above using biologist-selected stations in 'popular' fishing areas. The sampling objective is to collect ≥25 fish. If this objective is not met, no additional sampling effort will be conducted. This sampling protocol was used in 2017 and the sampling objective was achieved with the collection of 47 Striped Bass. The next sampling event will occur in 2019.

Secondary survey objectives are to monitor for large scale changes in the Striped Bass fishery as determined by evaluation of trends in angling effort, angler catch/harvest, and size of catch using creel survey sampling in 2018 as described above. Specific sampling objectives are impractical because this species typically accounts for <1% of total angling effort on the reservoir (Myers and Dennis 2014).

Bluegill, Redbreast Sunfish, and Gizzard Shad: Bluegill, Redbreast Sunfish, and Gizzard Shad are the primary forage fishes at Amistad Reservoir. Major changes in the relative abundances of Bluegill and Redbreast can be indicated in CPUE trend data for these sunfishes. Sampling of sunfishes concurrently with Largemouth Bass in the fall should provide adequate precision (RSE≤20) for CPUE (T) to detect major changes in relative abundance. Gizzard Shad CPUEs are so variable that trends in abundance cannot be detected with a reasonable amount of sampling effort. They will be collected concurrently with Largemouth Bass sampling, but due to high variability, the data will be of minimal use. No additional sampling effort will be expended to increase estimate precision for Bluegill, Redbreast Sunfish, and Gizzard Shad.

Negligible fisheries

Negligible fisheries in Amistad Reservoir include Alligator Gar, Blue Catfish, Flathead Catfish, and White Crappie. The presence or absence of these species will be determined using biologist-selected gill net surveys described above.

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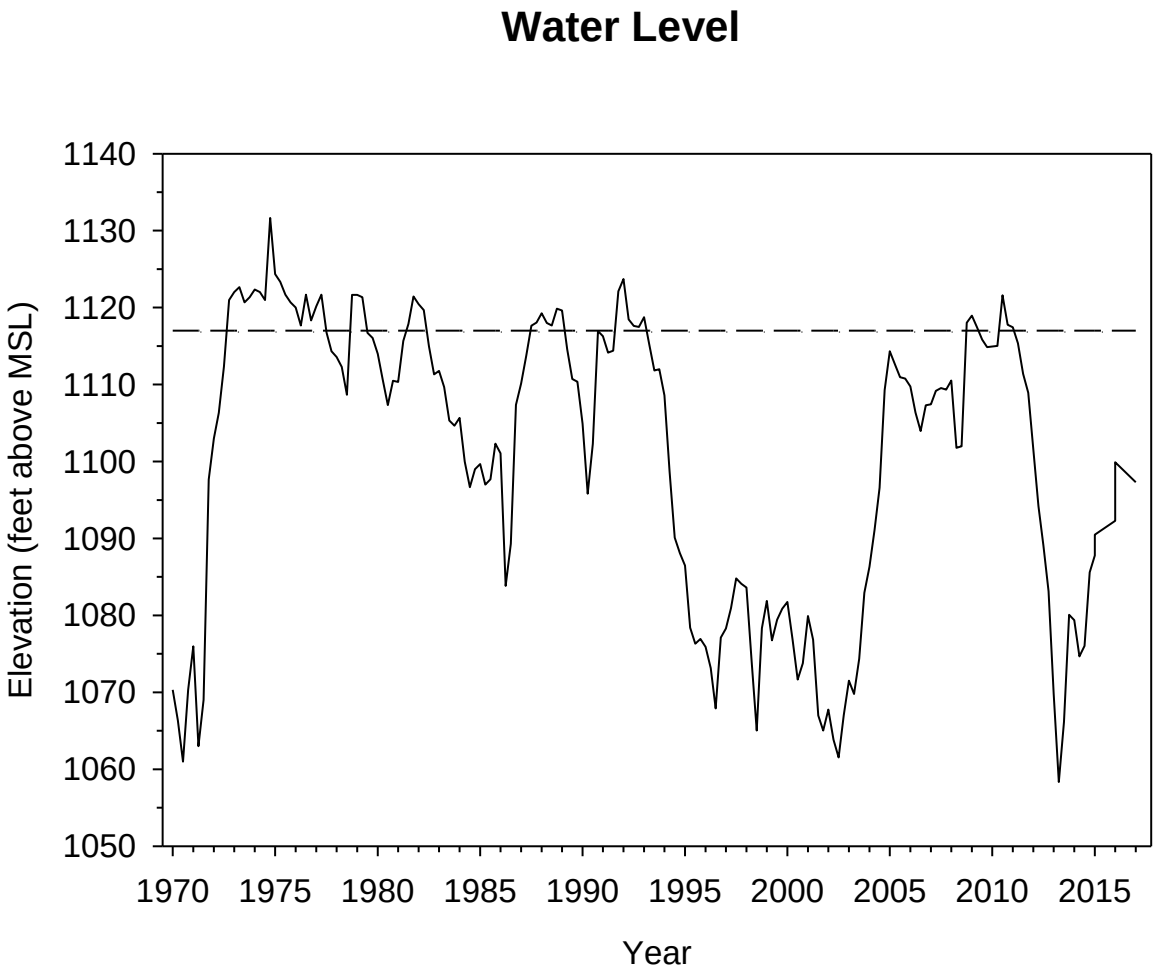


Figure 1. Average water level elevation in feet above mean sea level (MSL) by quarter since 1970 for Amistad Reservoir, Texas. Conservation pool elevation is 1,117 feet above MSL and is represented by the horizontal dashed line.

Table 1. Characteristics of Amistad Reservoir, Texas.

Characteristic	Description
Year constructed	1969
Controlling authority	International Boundary and Water Commission
County	Val Verde
Reservoir type	Mainstream
Shoreline Development Index	23.47
Conductivity	871 µS/cm

Table 2. Boat ramp characteristics for Amistad Reservoir, Texas, August, 2016. Reservoir elevation at time of survey was 1,093.6 feet above mean sea level.

Boat ramp	Latitude and longitude	Public	N parking spaces	Elevation at end of ramp (feet above MSL)	Condition
Diablo East	29.477313 -101.016495	Y	250	unknown	Excellent
Black Brush	29.474045 -100.986480	Y	50	1,077[a]	Excellent
Air Force	29.473237 -101.037822	Y	50	1,077[a]	Excellent
Rough Canyon	29.576928 -100.978195	Y	50	unknown	Excellent
Box Canyon	29.524826 -101.173759	Y	50	1,077[a]	Excellent
Spur 454	29.465880 -100.956986	Y	10	1107[a]	Fair
277 South	29.494889 -100.907736	Y	10	1107[a]	Fair
277 North	29.509789 -100.906474	Y	10	1107[a]	Fair
Spur 406	29.551029 -101.020351	Y	10	1107[a]	Fair

[a]estimated

Table 3. Harvest regulations for Amistad Reservoir, Texas.

Species	Bag limit	Length limit
Catfish: Channel and Blue, their hybrids and subspecies	25 (in any combination)	12-inch minimum
Catfish, Flathead	5	18-inch minimum
Bass, White	25	10-inch minimum
Bass, Largemouth and Smallmouth	5 (in any combination)	14-inch minimum
Bass: Striped	5	18-inch minimum
Gar, Alligator	1	none
Crappie: White and Black, their hybrids and subspecies	25 (in any combination)	10-inch minimum

Table 4. Stocking history of Amistad Reservoir, Texas.

Species	Year	Number Stocked	Size
Bass, Florida Largemouth	2017	504,830	Fingerling
	2016	502,442	Fingerling
	2015	444,685	Fingerling
	2014	500,217	Fingerling
	2013	504,890	Fingerling
	2012	269,075	Fingerling
	2011	252,283	Fingerling
	2010	252,550	Fingerling
	2008	501,874	Fingerling
	2004	552,648	Fingerling
	1997	500,943	Fingerling
	1996	130,768	Fingerling
	1992	507,075	Fingerling
	1980	214,700	Fingerling
	1979	450,000	Fingerling
	1978	288,000	Fingerling
	1978	308,000	Fry
	1977	429,420	Fingerling
	1977	244,800	Fry
	1976	260,000	Fingerling
	1975	52,000	Fingerling
	Total	7,671,200	
Bass, Largemouth	2005	289,666	Fingerling
	2004	42,077	Fingerling
	1973	1,050	Unknown
	1972	100	Unknown
	1971	446,660	Unknown
	1969	810,700	Unknown
	1968	928,425	Unknown
	1967	1,053,750	Unknown
	Total	3,572,428	
Bass, ShareLunker Largemouth	2010	2,081	Fingerling
	2008	2,614	Fingerling
	2006	4,519	Fingerling
	Total	9,214	
Bass, Smallmouth	1983	200,500	Unknown
	1978	164,750	Unknown

Table 4. Continued.

Species	Year	Number Stocked	Size
Smallmouth Bass	1976	200,000	Unknown
continued	1975	100,000	Unknown
	Total	665,250	
Bass, Palmetto	1982	1,270,000	Unknown
	1976	173,662	Unknown
	1975	171,300	Unknown
	Total	1,614,962	
Bass, Striped	2017	232,920	Fingerling
	2015	325,606	Fingerling
	2014	153,371	Fingerling
	2010	152,998	Fingerling
	2009	184,494	Fingerling
	2008	140,348	Fingerling
	2007	127,685	Fingerling
	2006	120,085	Fingerling
	2005	318,908	Fingerling
	2004	99,311	Fingerling
	2002	133,800	Fingerling
	2000	436,717	Fingerling
	1999	67,800	Fingerling
	1998	67,885	Fingerling
	1997	67,463	Fingerling
	1995	100,259	Fingerling
	1994	1,316,638	Fingerling
	1993	255,094	Fingerling
	1993	402,843	Fry
	1992	339,369	Fingerling
	1991	252,371	Fingerling
	1991	80,000	Fry
	1988	850,000	Fry
	1986	180,770	Fingerling
	1984	649,289	Fingerling
	1982	101,000	Unknown
	1980	12,000	Unknown
	1979	255,000	Unknown

Table 4. Continued.

Species	Year	Number Stocked	Size
Striped Bass	1977	693,107	Unknown
continued	1976	62,992	Unknown
	1974	82,616	Fingerling
	Total	8,467,630	
Catfish, Blue	1971	5,445	Unknown
Catfish, Channel	1973	50,550	Unknown
	1972	10,100	Unknown
	1971	8,000	Unknown
	1969	77,025	Unknown
	1968	317,695	Unknown
	1967	22,650	Unknown
	Total	486,020	
Crappie, White	1989	144,491	Fry
	1968	100	Unknown
	Total	144,591	
Muskellunge	1976	700	Unknown
Pike, Northern	1976	1,030,305	Unknown
Walleye	1978	5,000,000	Unknown
	1977	2,033,000	Unknown
	1976	5,100,000	Unknown
	1975	5,250,000	Unknown
	1954	10,000	Unknown
	Total	17,393,000	

Table 5. Objective-based sampling plan components for Amistad Reservoir, Texas, 2016-2017.

Gear/target species	Survey objective	Metrics	Sampling objective
Electrofishing[a]			
Largemouth Bass	Abundance	CPUE-stock	RSE-Stock ≤ 20
	Size structure	PSD, length frequency	N ≥ 50 stock
	Age-and-growth	Age at 14 inches	N = 13, 13.0 – 14.9 inches
	Genetics	% FLMB	N = 30, any age
Bluegill	Abundance	CPUE-total	RSE ≤ 20
Redbreast Sunfish	Abundance	CPUE-total	RSE ≤ 20
Gizzard Shad	Abundance	CPUE-total	None
	Size structure	PSD, length frequency	None
	Prey availability	IOV	None
Gill netting[a]			
White Bass	Abundance	CPUE-stock	N ≥ 25 stock
	Size structure	Length frequency	N ≥ 25 stock
Striped Bass	Abundance	CPUE-stock	None
	Size structure	Length frequency	None

[a] No additional electrofishing and gill netting will be conducted if sampling objectives are not met.

Table 6. Results of vegetation survey conducted at Amistad Reservoir in August 2016. Percent occurrence with lower and upper 95% confidence limits (CL) is shown by vegetation species/type. Sampling occurred at 246 random sites on the Texas side of the reservoir. Water level at time of survey was 1,093.6 feet above mean sea level (23.4 feet low).

Species/vegetation type	Percent occurrence	Lower CL	Upper CL
Chara	6.5	3.4	9.6
Hydrilla (Tier III)	15.0	10.6	19.5
Naiad spp.	<1.0	<1.0	<1.0
Pondweed spp.	15.9	11.5	21.0
Combined vegetation	35.8	29.8	42.1

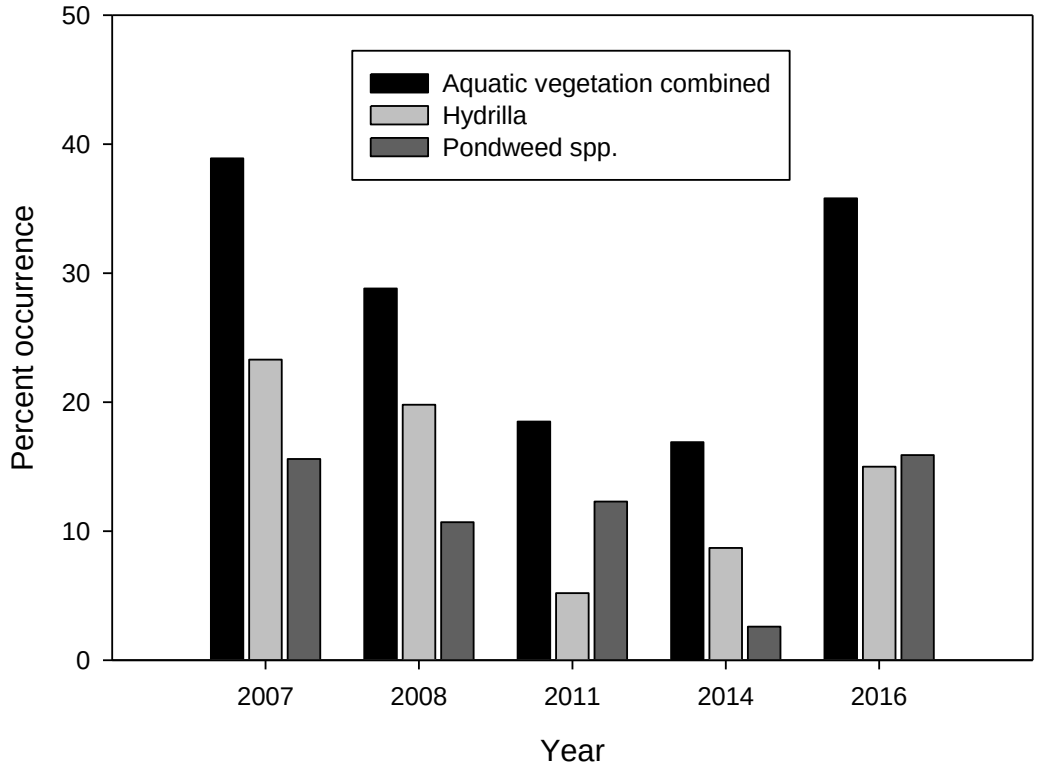


Figure 2. Percent occurrence of aquatic vegetation combined, hydrilla, and pondweed spp. at Amistad Reservoir (Texas side) in 2007, 2008, 2011, 2014, and 2016.

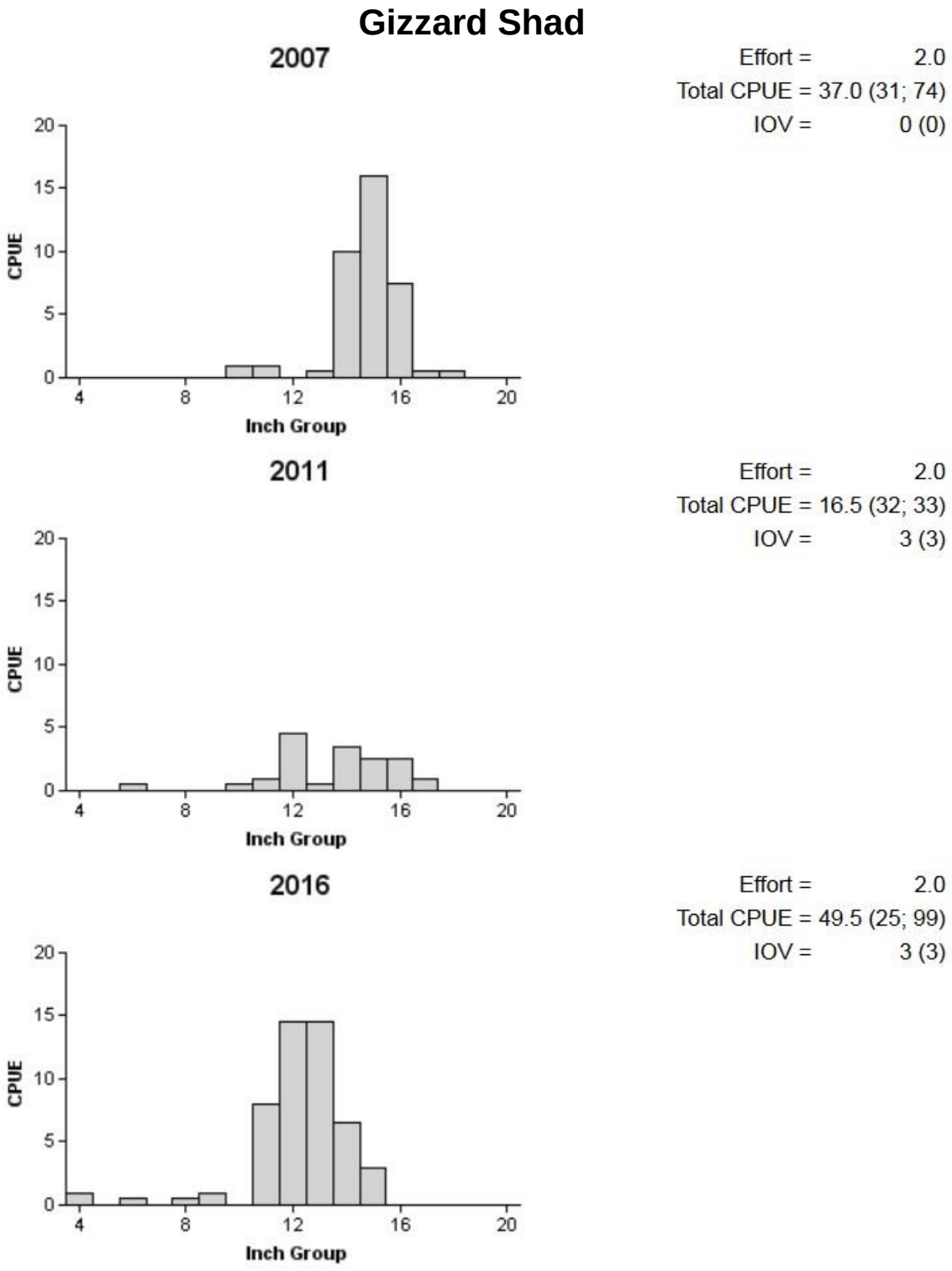


Figure 3. Number of Gizzard Shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Amistad Reservoir, Texas, 2007, 2011, and 2016.

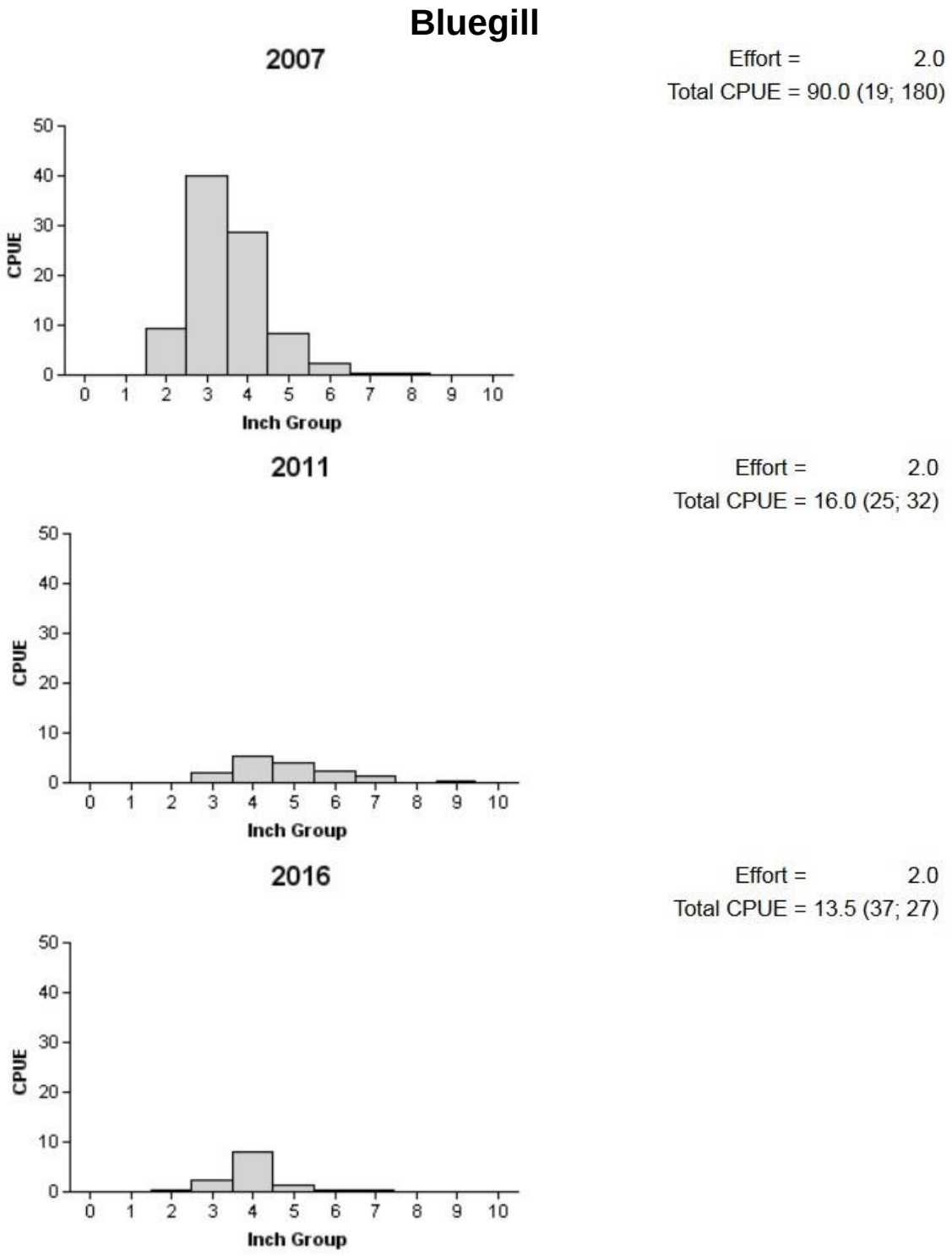


Figure 4. Number of Bluegill caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Amistad Reservoir, Texas, 2007, 2011, and 2016.

Redbreast Sunfish

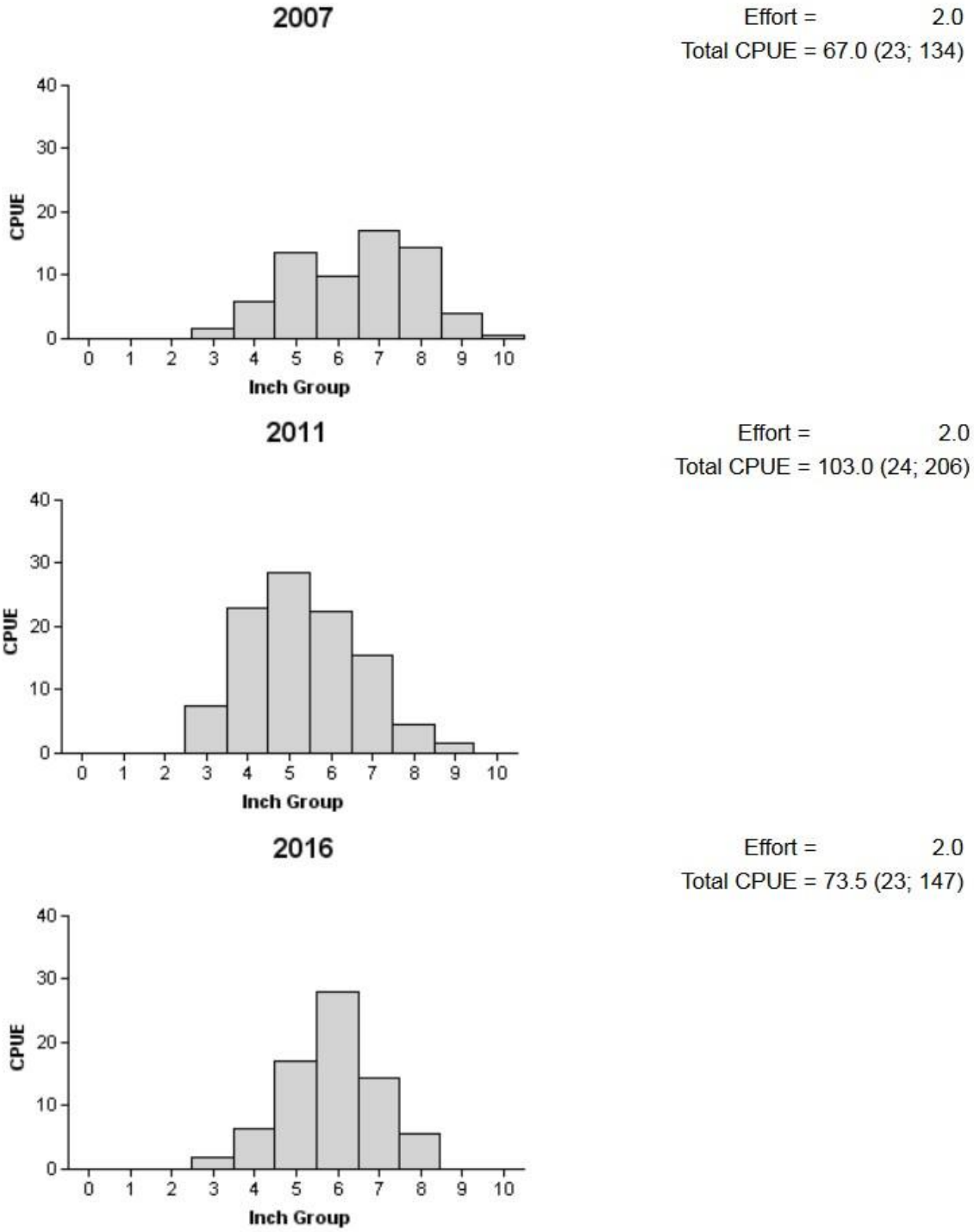


Figure 5. Number of Redbreast Sunfish caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Amistad Reservoir, Texas, 2007, 2011, and 2016.

White Bass

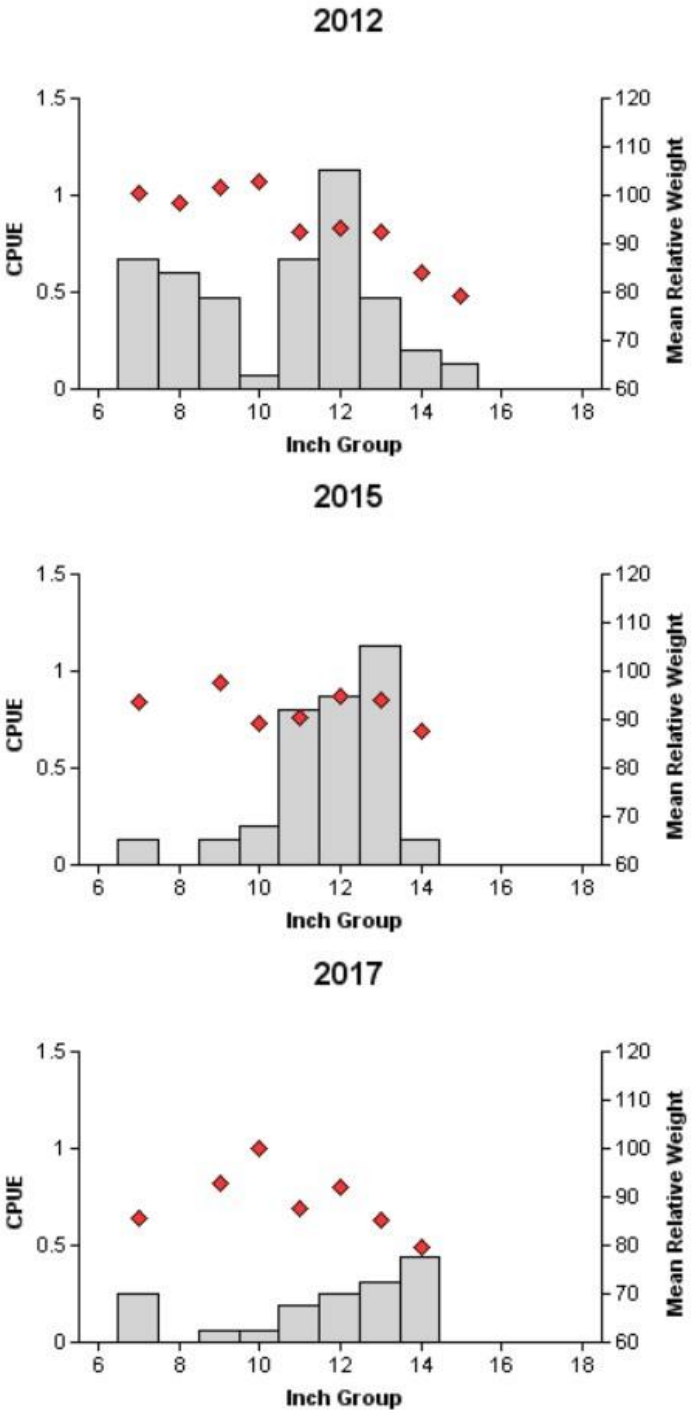


Figure 6. Number of White Bass caught per net night (CPUE) and population indices (RSE and N and SE for size structure are in parentheses) for spring gill net surveys, Amistad Reservoir, Texas, 2012, 2015, and 2017. Sample sites were random in 2012 and 2015 and biologist-selected in 2017.

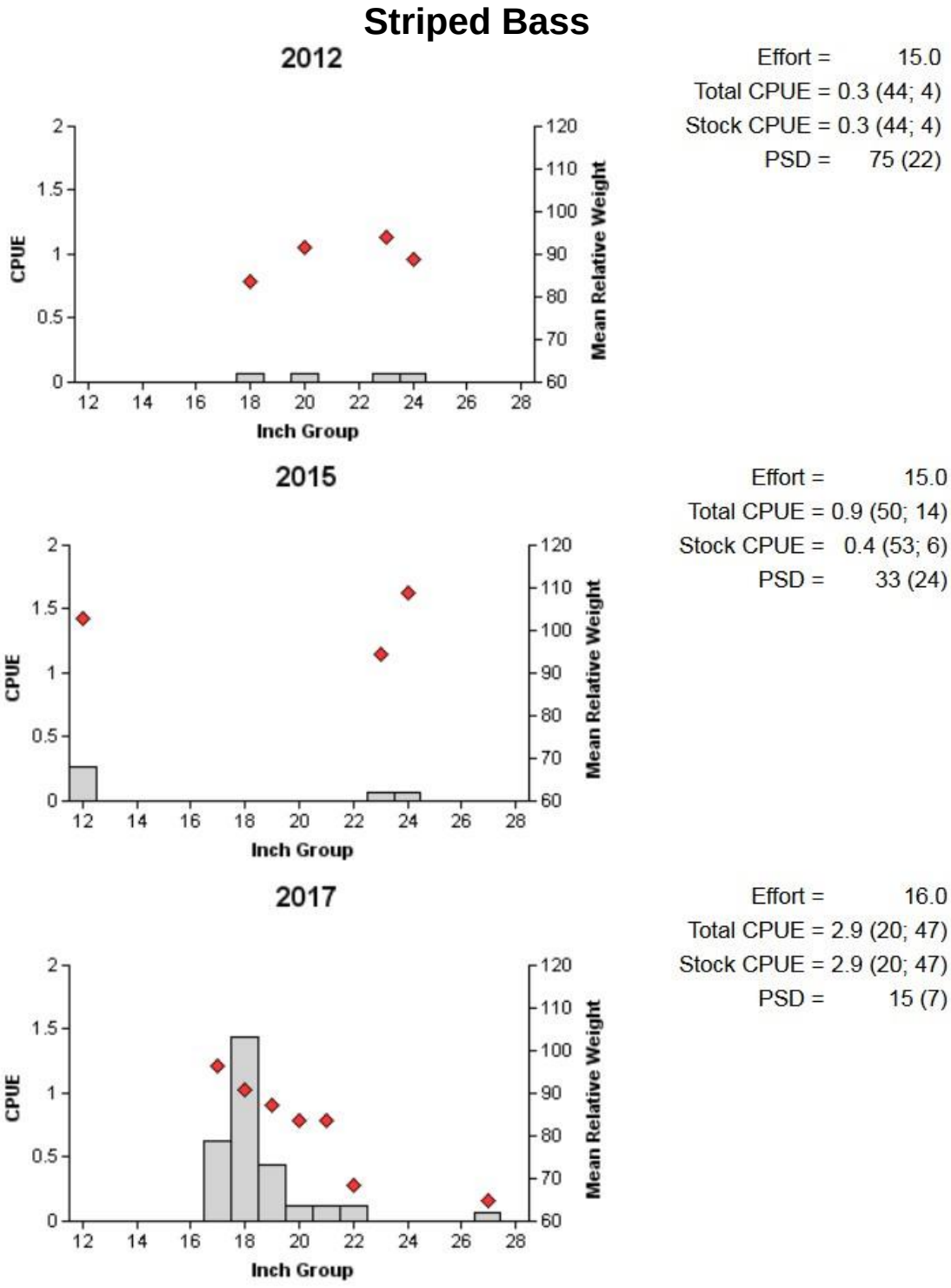


Figure 7. Number of Striped Bass caught per net night (CPUE) and population indices (RSE and N and SE for size structure are in parentheses) for spring gill net surveys, Amistad Reservoir, Texas, 2012, 2015, and 2017. Sample sites were random in 2012 and 2015 and biologist-selected in 2017.

Largemouth Bass

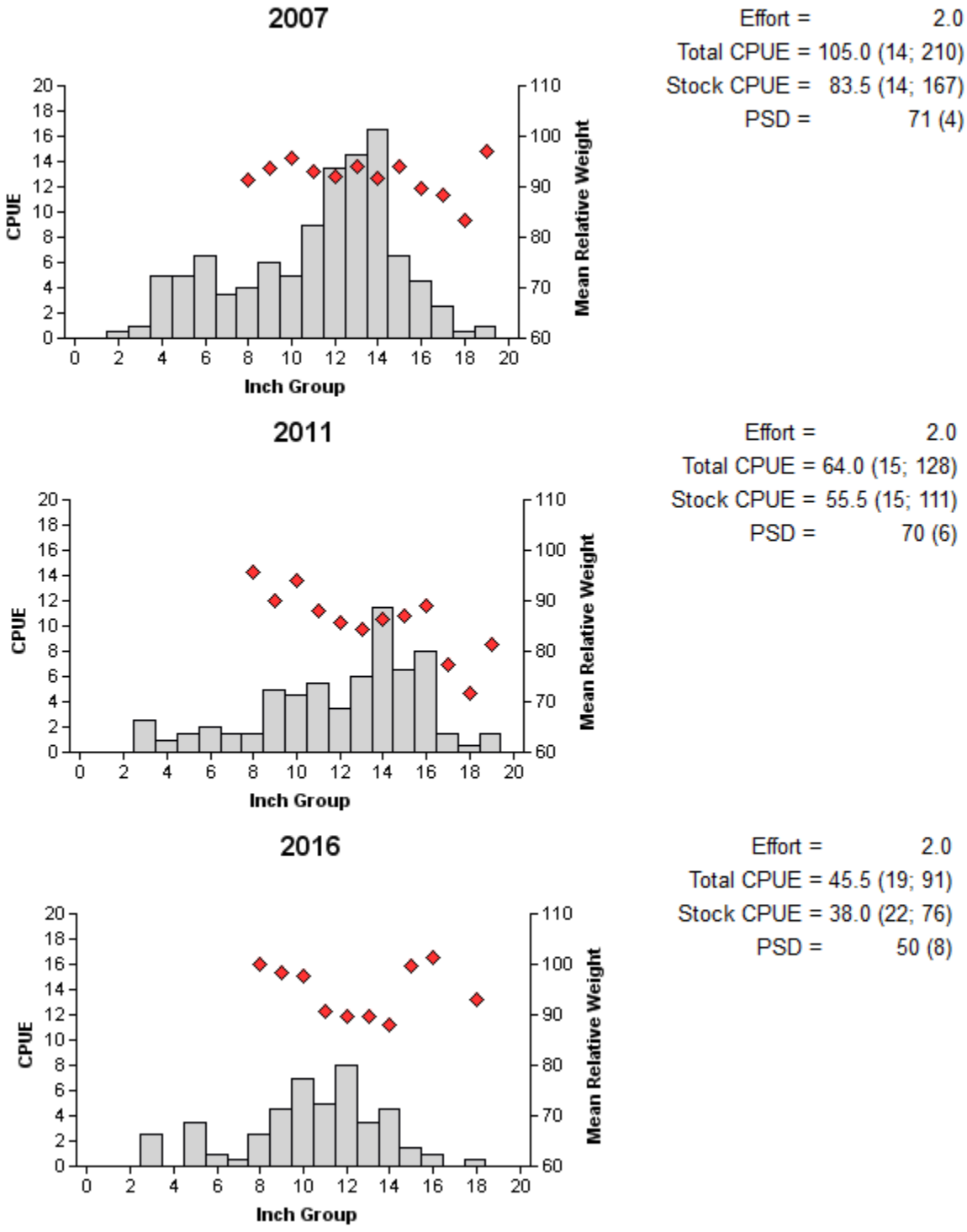


Figure 8. Number of Largemouth Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Amistad Reservoir, Texas, 2007, 2011, and 2016.

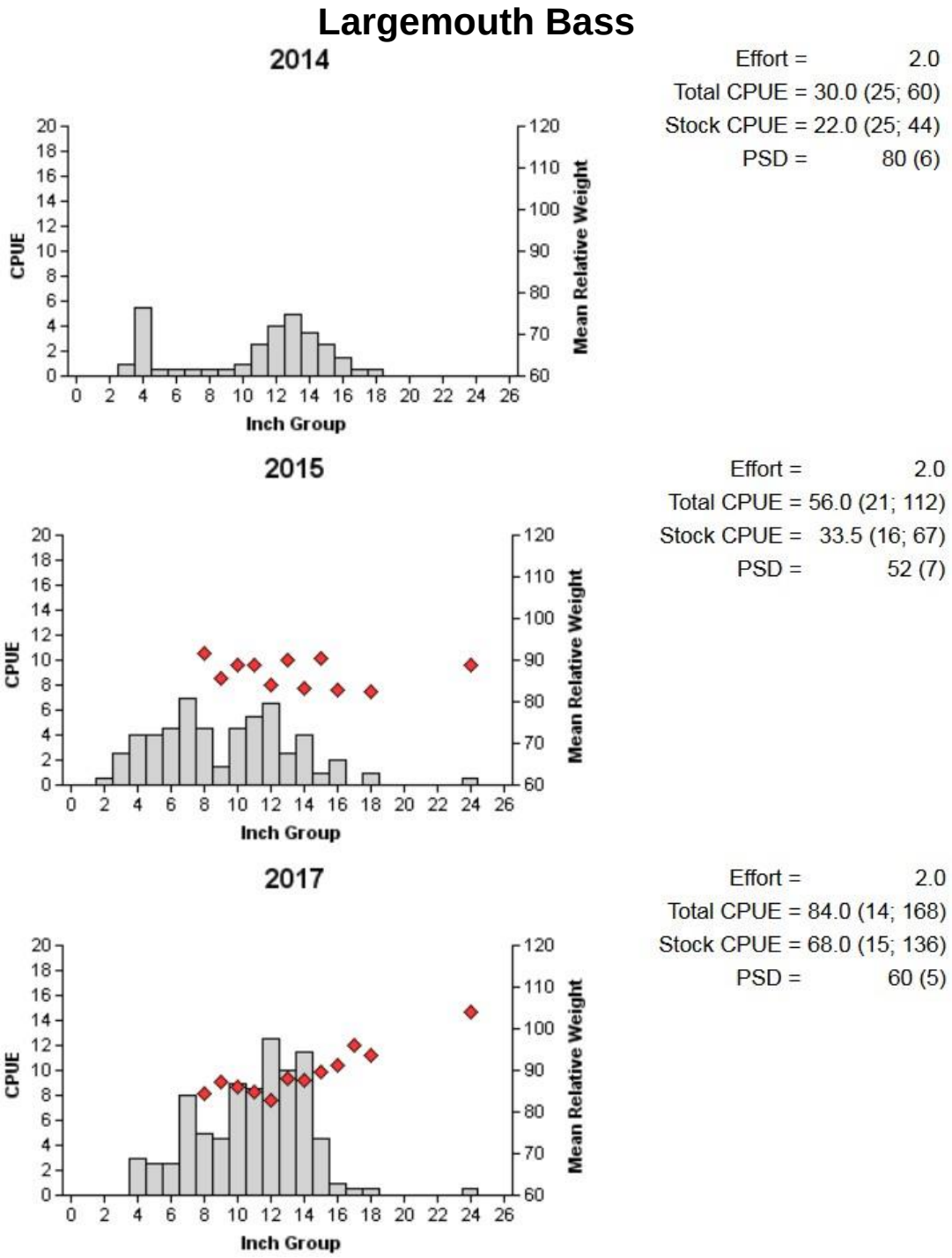


Figure 9. Number of Largemouth Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring bass-only electrofishing surveys, Amistad Reservoir, Texas, 2014, 2015, and 2017. Mean relative weight values were unavailable for 2014 because high winds prevented recording weight of individual fish.

Largemouth Bass

Table 7. Results of genetic analysis of Largemouth Bass collected by fall electrofishing, Amistad Reservoir, Texas, 2006, 2009, 2011, and 2016. FLMB = Florida Largemouth Bass, NLMB = Northern Largemouth Bass, Intergrade = hybrid between a FLMB and a NLMB. Genetic composition was determined using micro-satellite DNA analysis.

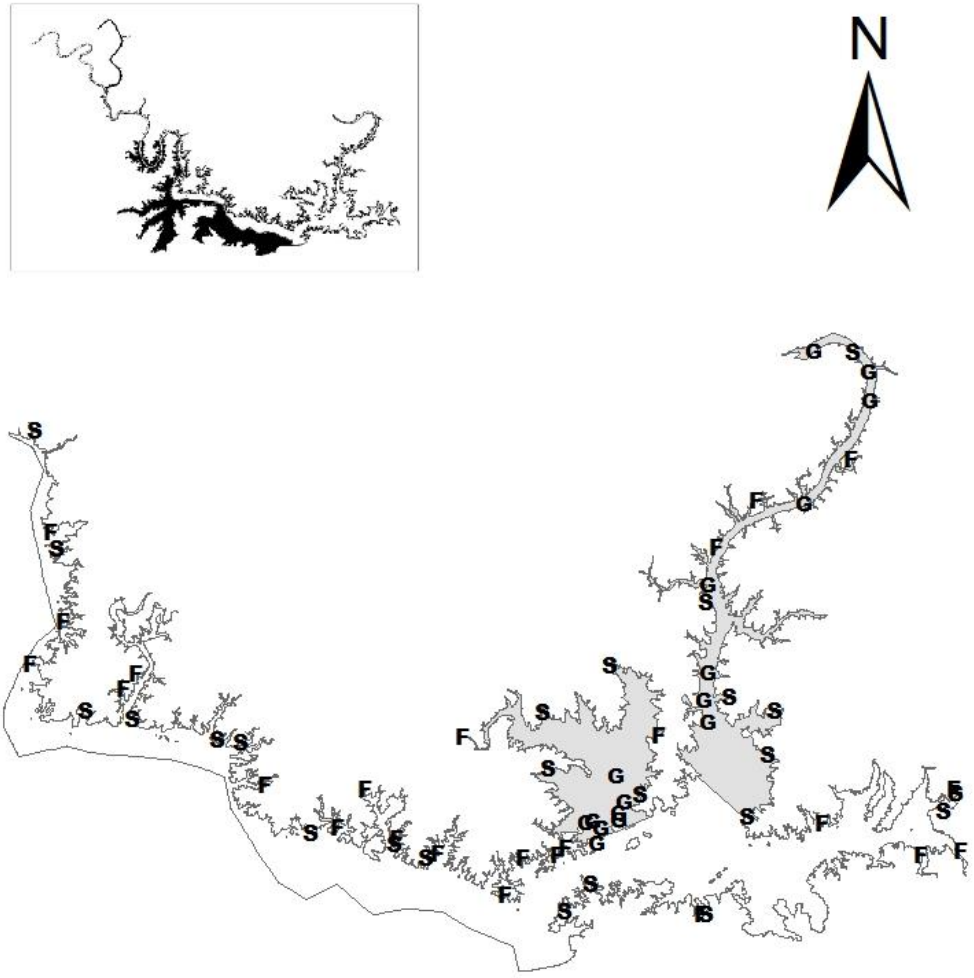
		Number of fish				
Year	Sample size	FLMB	Intergrade	NLMB	% FLMB alleles	% FLMB
2006	413	55	357	1	76.0	13.3
2009	30	7	23	0	82.0	23.0
2011	30	2	28	0	73.0	7.0
2016	30	5	25	0	83.0	17.0

Table 8. Proposed sampling schedule for Amistad 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	Electrofish Fall(Spring)	Trap net	Gill net	Habitat		Access	Creel survey	Report
				Structural	Vegetation			
2017-2018							A	
2018-2019	A(A)				A			A
2019-2020								
2020-2021	S(A)		S		S	S		S

APPENDIX A

Map of Amistad Reservoir sampling locations, 2016-2017. Darkened area in inset photo represents the Mexico portion of the reservoir. Shaded area represents areas where biologist-selected gill net sampling was conducted.



APPENDIX B

Number (N) and catch rate (CPUE) of all species collected from all gear types from Amistad Reservoir, Texas, 2016-2017. Sampling effort was 16 net nights for gill netting at biologist-selected stations, and 2 hours for standard fall electrofishing.

Species	Gill Netting		Electrofishing	
	N	CPUE	N	CPUE
Spotted Gar	6	0.4		
Longnose Gar	11	0.7		
Gizzard Shad	204	12.8	99	49.5
Threadfin Shad			20	10.0
Common Carp	14	0.9		
River Carpsucker	23	1.4		
Smallmouth Buffalo	2	0.1		
Blue Catfish	3	0.2		
Channel Catfish	15	0.9		
Flathead Catfish	18	1.1		
White Bass	25	1.6		
Striped Bass	47	2.9		
Redbreast Sunfish	7	0.4	147	73.5
Warmouth	1	0.1	1	0.50
Bluegill	2	0.1	27	13.5
Redear Sunfish	5	0.3	10	5.0
Smallmouth Bass	4	0.3	5	2.5
Largemouth Bass	40	2.5	91	45.5
White Crappie	6	0.4		
Freshwater Drum	23	1.4		