Navarro Mills Reservoir

2020 Fisheries Management Survey Report

PERFORMANCE REPORT

As Required by

FEDERAL AID IN SPORT FISH RESTORATION ACT

TEXAS

FEDERAL AID PROJECT F-221-M-4

INLAND FISHERIES DIVISION MONITORING AND MANAGEMENT PROGRAM

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Survey and Management Summary

Fish populations in Navarro Mills Reservoir were surveyed in 2020 using daytime electrofishing and trap netting and in 2021 using gill netting. Historical data are presented with the 2020-2021 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: Navarro Mills Reservoir is a 4,336-acre impoundment located on Richland Creek in the Trinity River Basin approximately 9 miles north of Dawson, Texas. Navarro Mills is operated by the U.S. Army Corps of Engineers (USACE); there is no residential shoreline development and angler access is excellent. Habitat features consisted of standing timber, rocks, and terrestrial vegetation.

Management History: Important sport fish include Largemouth Bass, Blue and Channel Catfish, White Bass, and White Crappie. No stocking has been conducted at Navarro Mills Reservoir since 2003. Fish community surveys are conducted every four years. The reservoir is managed under statewide harvest regulations.

Fish Community

- **Prey species:** Threadfin Shad were abundant in the reservoir. Electrofishing catch of Gizzard Shad was moderate and most were available as prey to most sport fish. Electrofishing catch of Bluegill was poor and all fish collected were less than 5-inches long.

- **Catfishes:** Blue and Channel Catfish are present in the reservoir; both species were abundant and have the potential to provide excellent angling opportunities.

- **Temperate basses:** White Bass were present in the reservoir. Population densities continue to fluctuate in relation to reservoir elevation and spring-time precipitation.

- **Largemouth Bass:** Largemouth Bass remain at low densities within the reservoir. The population is likely limited by high turbidity, extreme water level fluctuation and poor littoral habitat.

- **Crappie:** Black and White Crappie are present within the reservoir. White Crappie continued to dominate the population and displayed good size structure during the 2020 survey. Growth of White Crappie sampled during the 2020 survey was fast.

Management Strategies: Conduct general monitoring surveys with daytime electrofishing, trap nets, and gill net surveys in 2024-2025. Access and vegetation surveys will be conducted in 2024. Consult USACE about habitat improvement. Inform the public about the negative impacts of aquatic invasive species. Continue managing all sport fish under statewide harvest regulations.

Introduction

This document is a summary of fisheries data collected from Navarro Mills Reservoir in 2020-2021. 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 2020-2021 data for comparison.

Reservoir Description

Navarro Mills Reservoir is a 4,336-acre impoundment on Richland Creek, a tributary of the Trinity River approximately 9 miles north of Dawson, Texas. It was constructed by the U.S. Army Corps of Engineers (USACE) in 1963 to provide flood control, recreation, and water for municipal and industrial purposes. Navarro Mills is turbid and eutrophic with a mean TSI chl-a of 58.08 (Texas Commission on Environmental Quality 2020). Land use surrounding the reservoir is primarily agricultural and contributes to high turbidity and accelerated siltation. The habitat types within the littoral zone are not diverse and aquatic vegetation is scarce. However, during 2015-2016 Navarro Mills Reservoir was several feet over conservation pool resulting in flooded terrestrial vegetation along approximately 28 miles of shoreline (Norman and Ott 2016). The majority of the shoreline is eroded bank, with small areas of rocky shoreline or riprap. Navarro Mills Reservoir is operated by USACE and no residential shoreline development exists. Other descriptive characteristics for Navarro Mills Reservoir are found in Table 1.

Angler Access

Navarro Mills Reservoir has four access areas with public boat ramps at each. A marina is present at Liberty Hill Park and offers boat storage, bait, and snacks. The ramps at Oak Park, Wolf Creek, Brushy Prairie, and Liberty Hill were all accessible at the time of the survey. Additional boat ramp characteristics are presented in Table 2. Shoreline access is excellent at each access area.

Management History

Previous management strategies and actions: Management strategies and actions from the previous survey report (Norman and Ott 2017) included:

1. Consult with USACE staff to gauge interest in artificial fish attractors for crappie recruitment and angling success.
   Action: USACE staff was consulted regarding a brush pile enhancement project. Initially interest was high, however USACE staff was reluctant to deploy artificial materials into the watershed and no further actions have been taken.

2. Post appropriate signage at access points to further educate the ecological risks of invasive aquatic species and promote Clean-Drain-Dry practices.

   Action: Display of signage is current at all boat ramps.

Harvest regulation history: All sport fishes in Navarro Mills Reservoir are currently managed with statewide harvest regulations (Table 3).

Stocking history: No stocking has been conducted at Navarro Mills Reservoir since 2003. A complete stocking history is presented in Table 4.

Water transfer: Navarro Mills is primarily used for flood control, municipal water supply and recreation. One permanent pumping station on the reservoir is operated by the City of Corsicana Water Supply for use as municipal water. Downstream flow from Navarro Mills Reservoir is direct to Richland Chambers Reservoir but no inter-basin transfers exist.

Methods

Surveys were conducted to achieve survey and sampling objectives in accordance with the objective-based sampling (OBS) plan for Navarro Mills (Norman and Ott 2017). Primary components of the OBS plan are listed in Table 5. All survey sites were randomly selected, and trap netting and gill netting were conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2017). Electrofishing survey sites were randomly se

Electrofishing – Gizzard Shad, Threadfin Shad, sunfishes and Largemouth Bass were collected by daytime electrofishing (1 hour at 12, 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 (10 net nights at 10 stations). CPUE for trap netting was recorded as the number of fish caught per net night (fish/nn). Age at harvest length for White Crappie were determined using otoliths from 15 randomly selected fish (range: 9.1 to 10.9 inches).

Gill netting –Blue Catfish, Channel Catfish, and White Bass were collected by gill netting (10 net nights tat 10 stations). CPUE for gill netting was recorded as the number of fish caught per net night (fish/nn). Age at harvest length for White Bass were determined using otoliths from 15 randomly selected fish (range: 9.3 – 10.7 inches).

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 statistics.

Habitat – A vegetation survey was conducted in 2020. An aquatic vegetation survey was performed per the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2017). Shoreline distances and areas of vegetation were estimated using ESRI ArcGIS software.

Water level – Source for water level data was the United States Geological Survey (USGS 2021).

Results and Discussion

Habitat: An aquatic vegetation survey was conducted in August 2020. Total vegetation coverage was less than 1% of reservoir surface area; buttonbush was the only vegetation observed during the survey (Table 6). A physical habitat survey was last conducted in 1997 (Ott and Bister 2001). Water level fluctuation (Figure 1), high siltation, and turbidity severely limit the potential for aquatic macrophyte growth.

Prey species: Threadfin and Gizzard Shad were the primary prey base within the reservoir; sunfish were present at low densities. Electrofishing catch rates of Gizzard Shad and Bluegill Shad were 160.0/h and 10.0/h, respectively (Figures 2 - 3). Index of vulnerability (IOV) for Gizzard Shad indicated 84% of fish were available as prey to predators. Low catch rate of Bluegill could potentially be attributed to daytime electrofishing, although previous surveys conducted under standard night-time procedures did not produce substantially better results (Norman and Ott 2017). Poor littoral habitat and high turbidity likely limit the Bluegill population within the reservoir.

Blue Catfish: The gill net catch rate of Blue Catfish was 42.3/nn in 2021; substantially higher than the 2013 (8.4/nn) and 2017 surveys (7.7/nn; Figure 4). Size structure (PSD=7) was dominated primarily by fish 6 to 12 inches in length. The high abundance and low size structure of Blue Catfish in 2021 was likely a reflection of strong year class strength as a result of abundant flooded terrestrial habitat in 2016 (Norman and Ott 2017). Body condition was high in 2021; relative weights (W_r) averaged 100-115 for all size classes and were notably higher than previous surveys.

Channel Catfish: Gill net catch rates of Channel Catfish in 2021 (4.9/nn) were similar to 2017 (4.7/nn) and higher than 2013 (2.2/nn) (Figure 5). Low and variable catch rates over the last three surveys make it difficult to identify significant trends in population indices. Relative weights (W_r) averaged 100-115 for all size classes and were notably higher than previous surveys.

White Bass: The 2021 gill net survey indicated White Bass were more abundant (24.4/nn) than previous surveys (2013 = 6.6/nn; 2017 = 1.4/nn) and was dominated by fish greater than the legal length (10 inches; Figure 6). The White Bass population will likely continue to fluctuate in relation to reservoir elevation, precipitation, and inflow during the spawning season. White Bass growth was moderate; average age at 10 inches (9.3 – 10.7 inches) was 1.6 years (N = 15; range: 1-2 years).

Largemouth Bass: The daytime electrofishing catch rate of Largemouth Bass in 2020 (27.0/h) was similar to 2016 (24.0/h; Figure 7). Size structure improved from 2016 (PSD = 38) to 2020 (PSD = 83). Relative weights were moderate to high ($W_r \geq 90$) for most size classes and are indicative of adequate prey availability. Poor littoral habitat and high turbidity likely limit the Largemouth Bass population within the reservoir.

Crappie: The trap net catch rate of White Crappie in 2020 (19/nn) was lower than previous survey years (2012 = 37/nn; 2016 = 39/nn), however size structure improved over the same time frame (PSD = 57, 81 and 83 in 2012, 2016, and 2020 respectively; Figure 8). Body condition was good with relative weights (W_r) averaging 100-115 for most size classes and were similar to previous surveys. White Crappie growth rate in 2020 was fast; average age at 10 inches (9.1 – 10.9 inches) was 1.2 years (N = 15; range: 1-2 years). Black Crappie were present in the reservoir, but abundance was low (0.1/nn).

Fisheries Management Plan for Navarro Mills Reservoir, Texas

Prepared – July 2021.

ISSUE 1: Crappie have historically been the most dominant sport fish, however, may be decreasing in abundance. The impacts of rapid reservoir ageing could pose a declining trend for crappie recruitment and angling success.

MANAGEMENT STRATEGIES

1. Continue monitoring crappie population trend data with a trap net survey in 2024.

2. Continue to discuss deploying natural or artificial fish attractors with USACE staff to augment degrading natural habitat and increase fishing success.

3. Promote crappie fishery through local media outlets when appropriate.

ISSUE 2: The impacts of reservoir ageing are suspected to impact various sportfish species into the future, however the impacts of reservoir ageing in this system are primarily anecdotal. Additional information regarding the current status of structural habitat within Navarro Mills Reservoir is needed to guide future fisheries management decisions and determine if further actions need to be taken at the watershed level to mitigate impacts of sedimentation.

MANAGEMENT STRATEGIES

1. Conduct structural habitat survey in conjunction with vegetation survey in 2024 to collect trend data on possible effects of reservoir ageing on littoral habitat.

2. Engage USACE staff and other stakeholders about potential projects and funding opportunities to improve watershed health and mitigate reservoir ageing.

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 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 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.

Objective-Based Sampling Plan and Schedule (2021-2025)

Sport fishes in Navarro Mills Reservoir include White Crappie, Blue and Channel Catfish, White Bass, and Largemouth Bass. Important forage species are primarily Gizzard and Threadfin Shad.

Survey objectives, fisheries metrics, and sampling objectives

White Crappie: Anecdotal information suggests crappie are a popular fishery in Navarro Mills Reservoir. Historical trap net data conducted every four years indicates a potential decreasing abundance of White Crappie within the reservoir, with catch rates of 37.6/nn, 39.1/nn and 19/nn over the last three surveys. Multiple variables may have contributed to the decrease in abundance including cyclical Crappie reproduction, interspecific competition with White Bass and Blue Catfish and rapid reservoir ageing. Due to the popularity of this fishery, crappie trend data on relative abundance, size structure, and body condition (measured by CPUE, PSD and W_r) will continue to be monitored every four years. Historical data suggests that sampling objectives (RSE ≤ 25, N ≥ 50) can me be met with 10-20 randomly selected sample sites. Otoliths will be removed from 13 specimens (9.1-10.9 inches), if available from White Crappie, during the 2024 survey for age and growth analysis.

Catfish: Blue and Channel Catfish are present within Navarro Mills Reservoir. Recent gill net surveys indicate a stable yet low relative abundance of Channel Catfish and increasing Blue Catfish relative abundance. Trend data on relative abundance, size structure and body condition (measured by CPUE, PSD and W_r) will be monitored for both species. In the spring of 2025, 10 randomly selected sites will be sampled with gill nets to estimate Blue Catfish and Channel Catfish relative abundance (Table 7). Attempts will be made to estimate size structure and relative abundance for both catfish species, however the limited knowledge on the importance of the Navarro Mills Reservoir catfish fishery does not warrant additional effort to obtain these population indices. If an inadequate sample of stock size Channel Catfish (RSE>25, N<50) is collected after 10 net nights, they will be simply monitored and reported for presence/absence.

White Bass: The White Bass population has been traditionally surveyed every four years with gill netting. Catch rate data has ranged from 1.4/nn – 24.4/nn over the last three surveys. In accordance with the catfish sample objectives, 10 randomly selected gill netting sites will be sampled in the spring of 2025 to monitor White Bass trend data. Attempts will be made to estimate size structure and relative abundance of White Bass, however the limited knowledge on the importance of the Navarro Mills Reservoir White Bass fishery does not warrant additional effort to obtain these population indices. If an inadequate sample of White Bass (RSE>25, N<50) is collected after 10 net nights, they will be simply monitored and reported for presence/absence.

Largemouth Bass: Navarro Mills Reservoir has historically supported a low-density Largemouth Bass population. Limited stable littoral habitat and high turbidity has likely limited recruitment of bass within the reservoir. Due to low abundance and high turbidity, traditional nighttime electrofishing surveys were substituted for day-time surveys in 2016. Twelve randomly selected day-time electrofishing sites will be sampled in the fall of 2024 to determine presence/absence of Largemouth Bass (Table 7). Relative weight data will be collected on all stock-size Largemouth Bass as an auxiliary method of monitoring the prey base.

Prey Species: Gizzard Shad and Threadfin Shad are the primary prey species in Navarro Mills Reservoir. Traditionally, trend data on relative abundance and size structure (CPUE, IOV) of Gizzard Shad was monitored every four years with fall nighttime electrofishing. In accordance with the Largemouth Bass sample objectives, 12 randomly selected daytime electrofishing sites will be sampled in the fall of 2024 to monitor the prey base. No additional effort will be expended, regardless of survey

precision or sample size; relative weight of Largemouth Bass will provide additional information on the prey base availability within Navarro Mills Reservoir.

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Tables and Figures

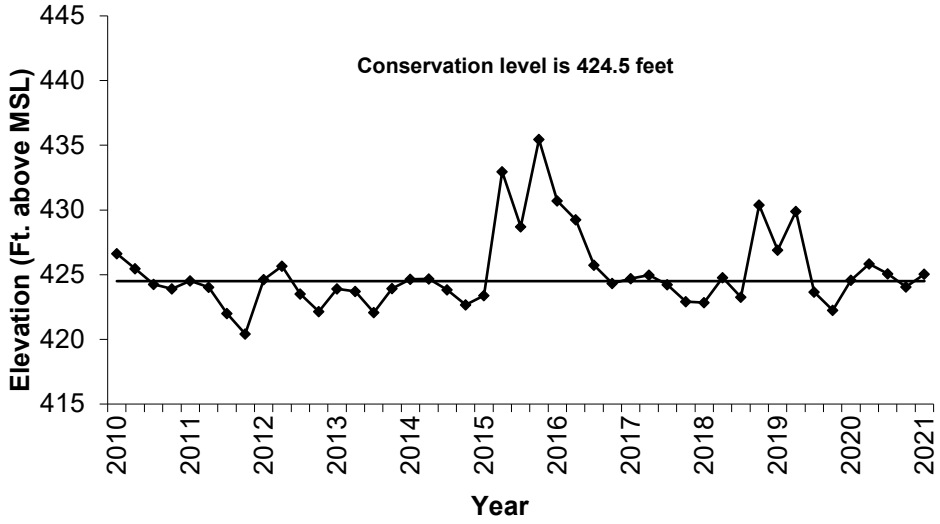


Figure 1. Quarterly water level elevations in feet above mean sea level (MSL) recorded for Navarro Mills Reservoir, Texas.

Table 1. Characteristics of Navarro Mills Reservoir, Texas.

Characteristic	Description
Year constructed	1963
Controlling authority	U.S. Army Corps of Engineers
County	Navarro
Reservoir type	Flood control
Shoreline Development Index (SDI)	3.8
Conductivity	365 µS/cm

Table 2. Boat ramp characteristics for Navarro Mills Reservoir, Texas, 2020. Reservoir elevation at time of survey was 425feet above mean sea level.

Boat ramp	Latitude Longitude (dd)	Public	Parking capacity (N)	Elevation at end of boat ramp (ft)	Condition
Oak Park	31.96602 -96.69666	Y	25	422	Accessible
Wolf Creek	31.96867 -96.72806	Y	25	421	Accessible
Brushy Prairie	31.96850 -96.73198	Y	25	421	Accessible
Liberty Hill 1	31.94602 -96.71028	Y	24	421	Accessible
Liberty Hill 2	31.95146 -96.72025	Y	20	419	Excellent

Table 3. Harvest regulations for Navarro Mills 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, 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 Navarro Mills Reservoir, Texas. FRY = fry; FGL = fingerling; UNK = unknown.

Year	Number	Size
	Channel Catfish	
1984	50,600	FGL
1985	9,680	FGL
1986	50,814	FGL
Species Total	111,094	
	Flathead Catfish	
1968	500	UNK
Species Total	500	
	Striped Bass	
1967	400,000	FRY
1968	176,500	FRY
1969	31,900	FGL
1970	32,800	FGL
1971	21,000	FGL
Species Total	662,280	
	Palmetto Bass	
1975	51,748	UNK
1979	52,750	UNK
1982	50,945	UNK
1984	127,252	FGL
1986	75,050	FGL
1991	76,468	FGL
1992	41,240	FGL
1994	77,400	FGL
1995	107,415	FGL
1996	77,845	FGL
1997	76,569	FGL
1998	82,546	FGL
Species Total	897,228	
	Florida Largemouth Bass	
1976	266,000	FGL
1990	232,037	FRY
1990	17,482	FGL
1995	253,996	FGL
1998	49,973	FGL
2002	218,491	FGL
2003	218,684	FGL
Species Total	1,256,663	

Table 5. Objective-based sampling plan components for Navarro Mills Reservoir, Texas 2020 – 2021.

Gear/target species	Survey objective	Metrics	Sampling objective
Daytime Electrofishing			
Largemouth Bass	Relative abundance	CPUE-Total	
	Size structure	PSD, length frequency	
	Condition	W_r	
Bluegill	Relative abundance	CPUE-Total	
	Size structure	PSD, length frequency	
Gizzard Shad	Relative abundance	CPUE – Total	
	Prey availability	IOV	
Trap netting			
Crappie	Relative abundance	CPUE – Total	RSE ≤ 25
	Size structure	PSD, length frequency	N ≥ 50
	Condition	W_r	10 fish/inch group (max)
Gill netting			
White Bass	Relative abundance	CPUE – stock	RSE-Stock ≤ 25
	Size structure	PSD, length frequency	N ≥ 50
Blue Catfish	Relative abundance	CPUE – stock	RSE-Stock ≤ 25
	Size structure	PSD, length frequency	N ≥ 50
Channel Catfish	Relative abundance	CPUE-Total	
	Size structure	PSD, length frequency	

Table 6. Survey of aquatic vegetation, Navarro Mills Reservoir, Texas, 2016 and 2020.

Vegetation	2016[a]	2020[b]
Native emergent		<1.0 (<0.1)
Flooded terrestrial	28.0	

[a] Habitat was measured as approximate linear shoreline miles because reservoir elevation was > 4 feet above conservation pool.
[b] Surface area (acres) is listed with percent of total reservoir surface area in parentheses

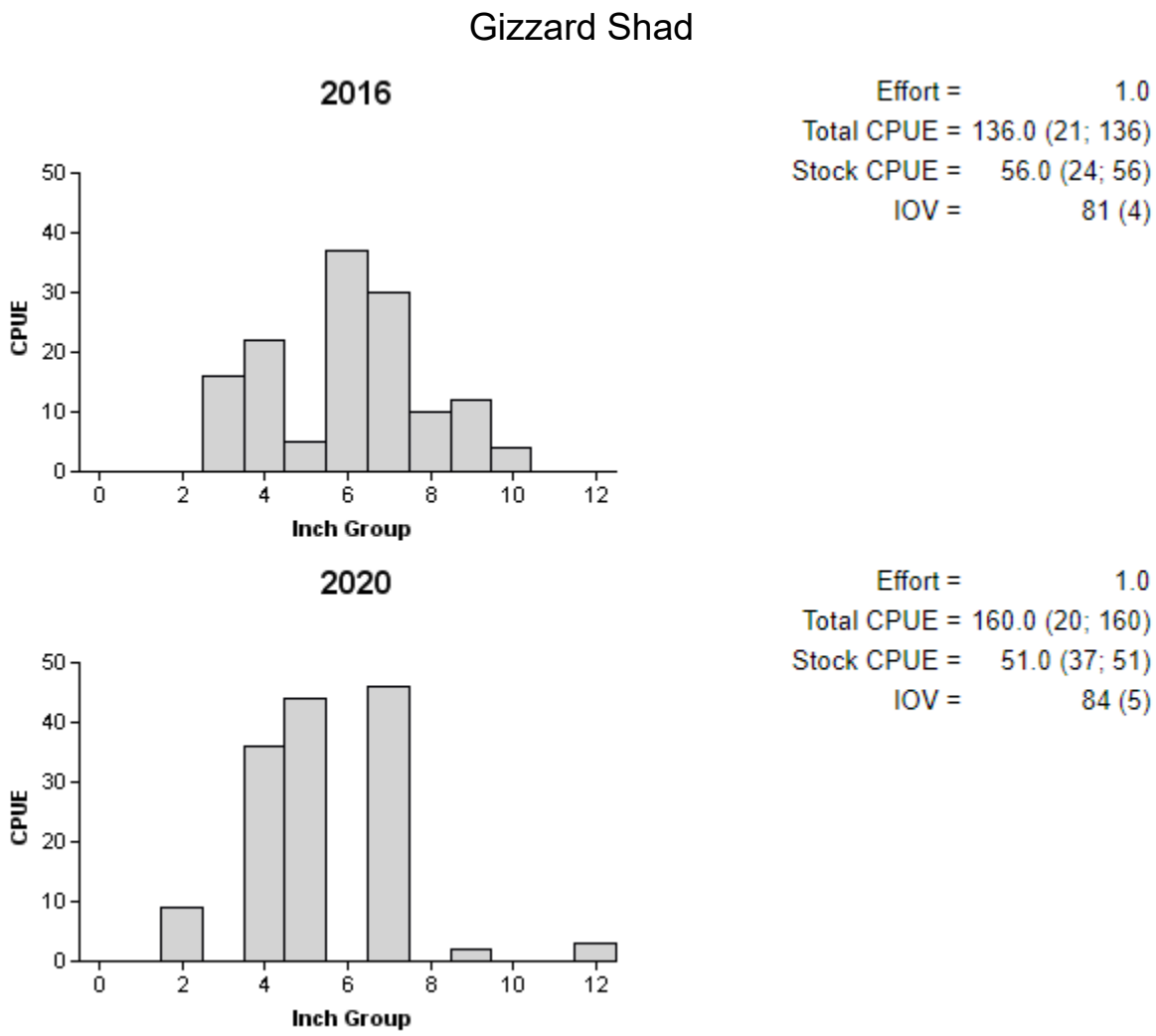


Figure 2. Number of Gizzard Shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall daytime electrofishing survey, Navarro Mills Reservoir, Texas, 2016 and 2020.

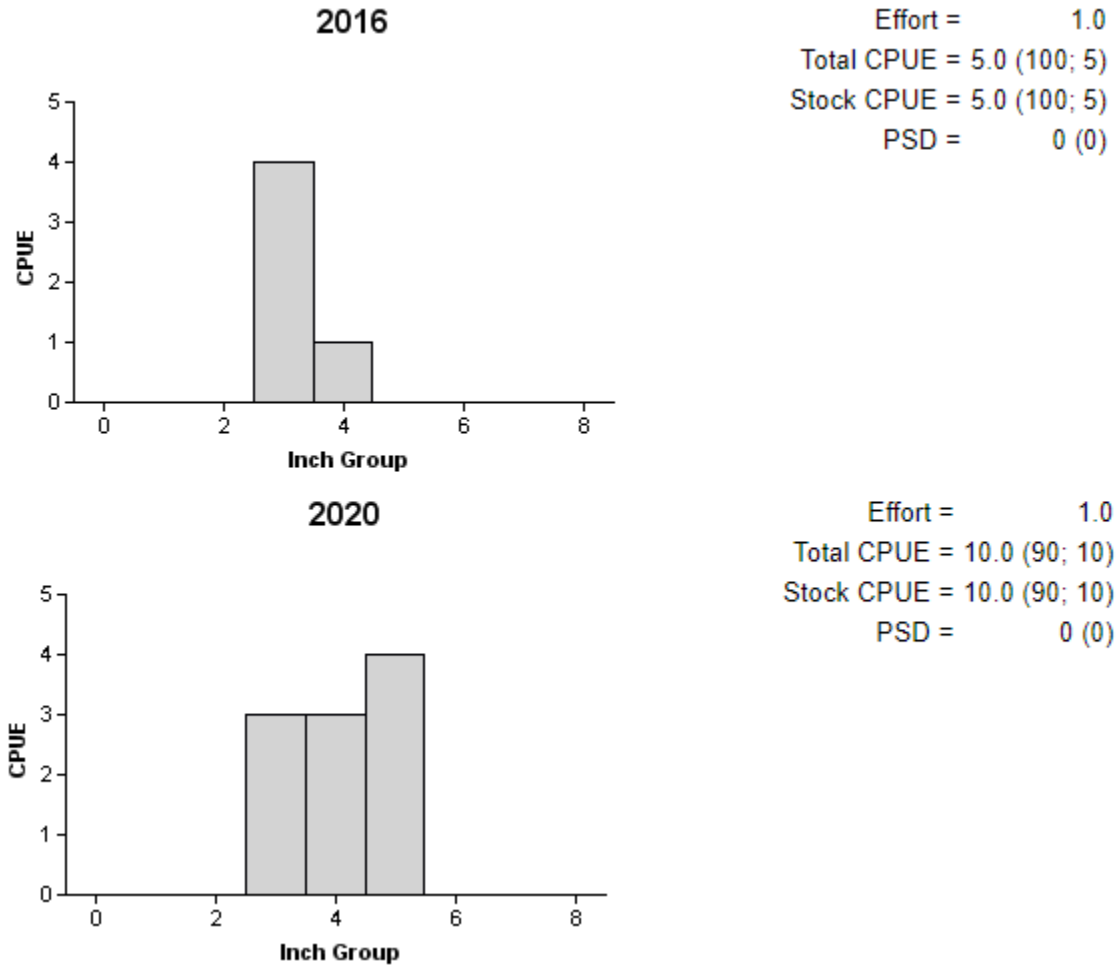


Figure 3. Number of Bluegill caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall daytime electrofishing surveys, Navarro Mills Reservoir, Texas, 2016 and 2020.

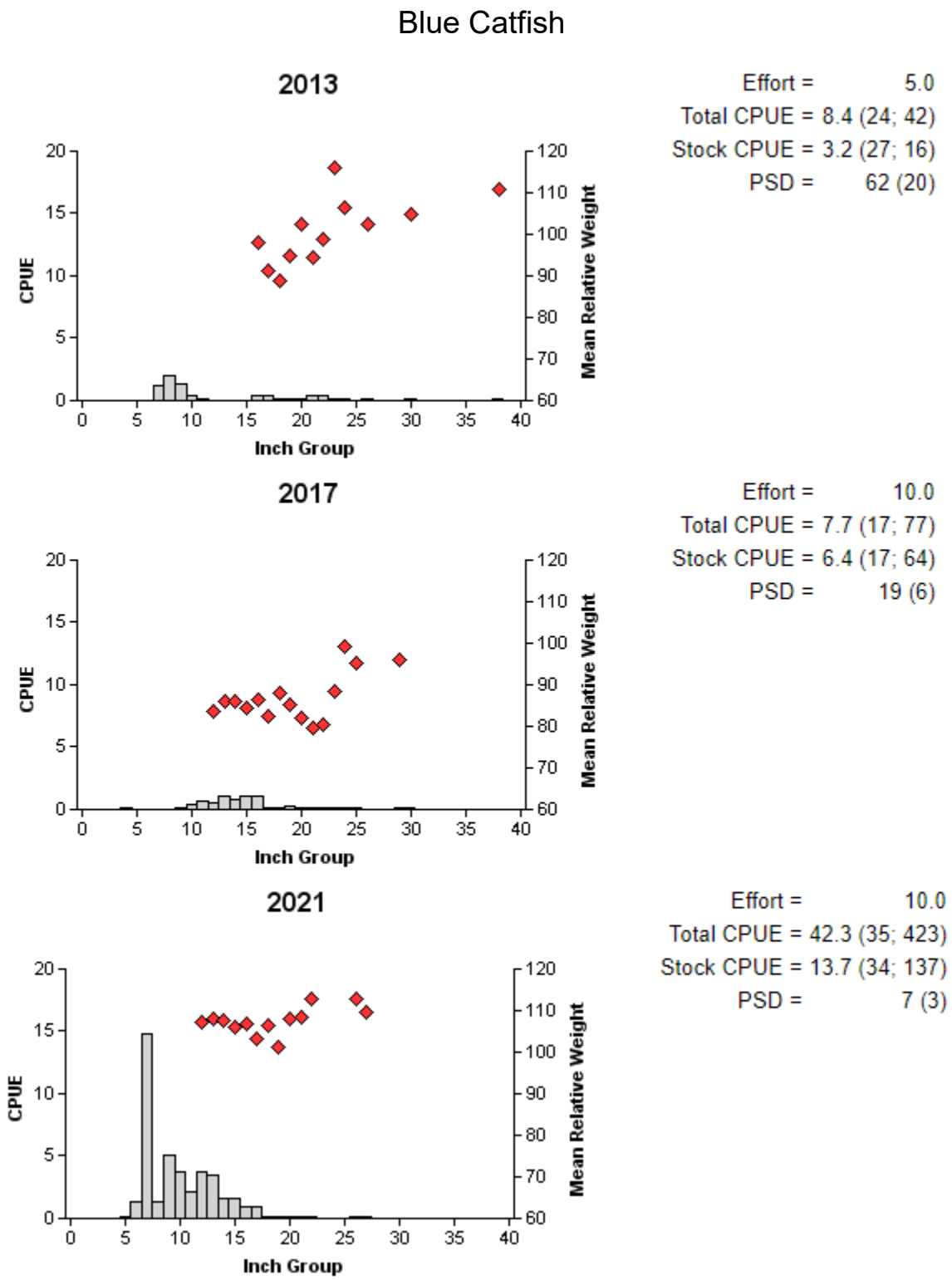


Figure 4. Number of Blue Catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Navarro Mills Reservoir, Texas, 2013, 2017, and 2021. Vertical line indicates minimum length limit.

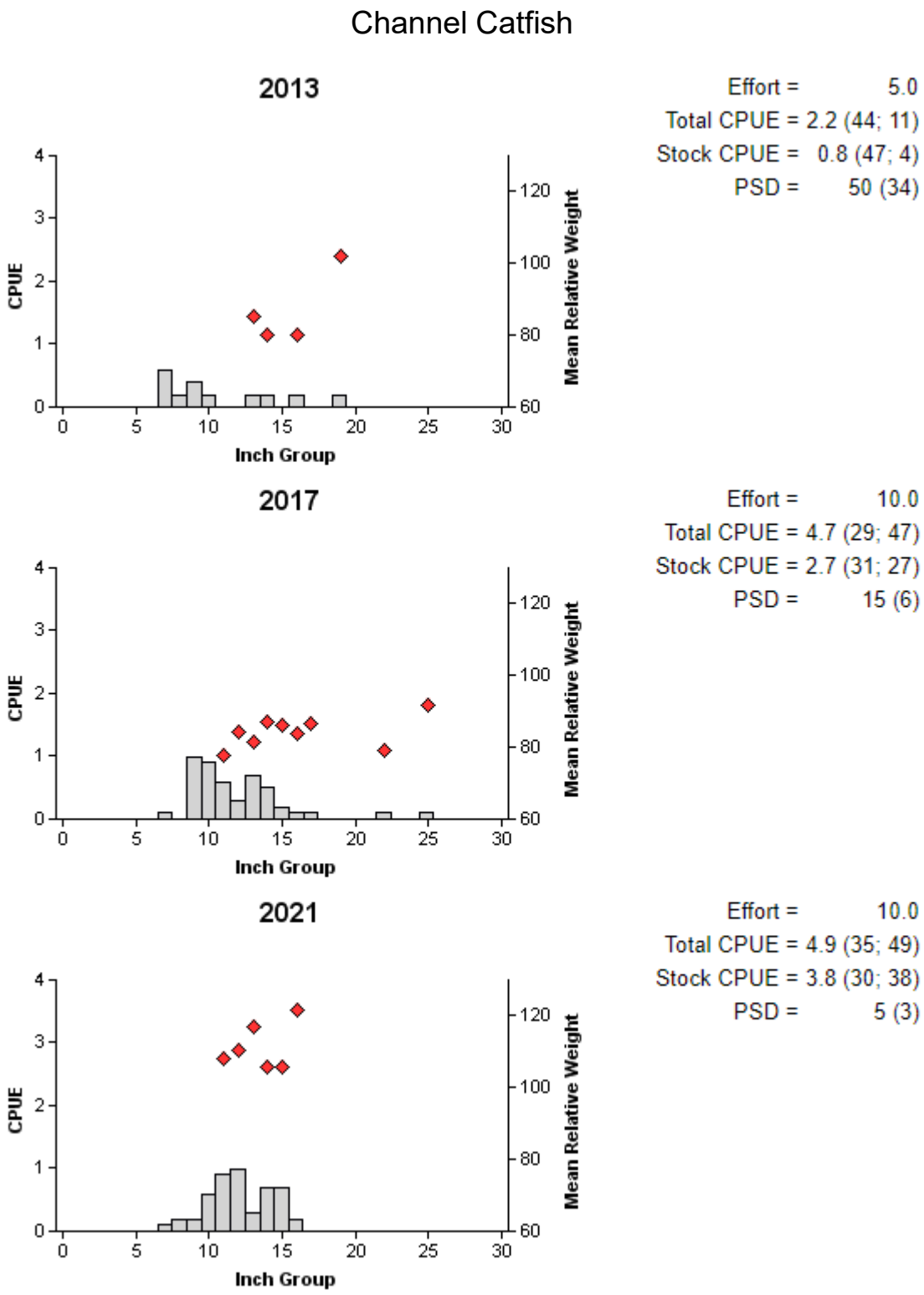


Figure 5. Number of Channel Catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Navarro Mills Reservoir, Texas, 2013, 2017, and 2020. Vertical line indicates minimum length limit

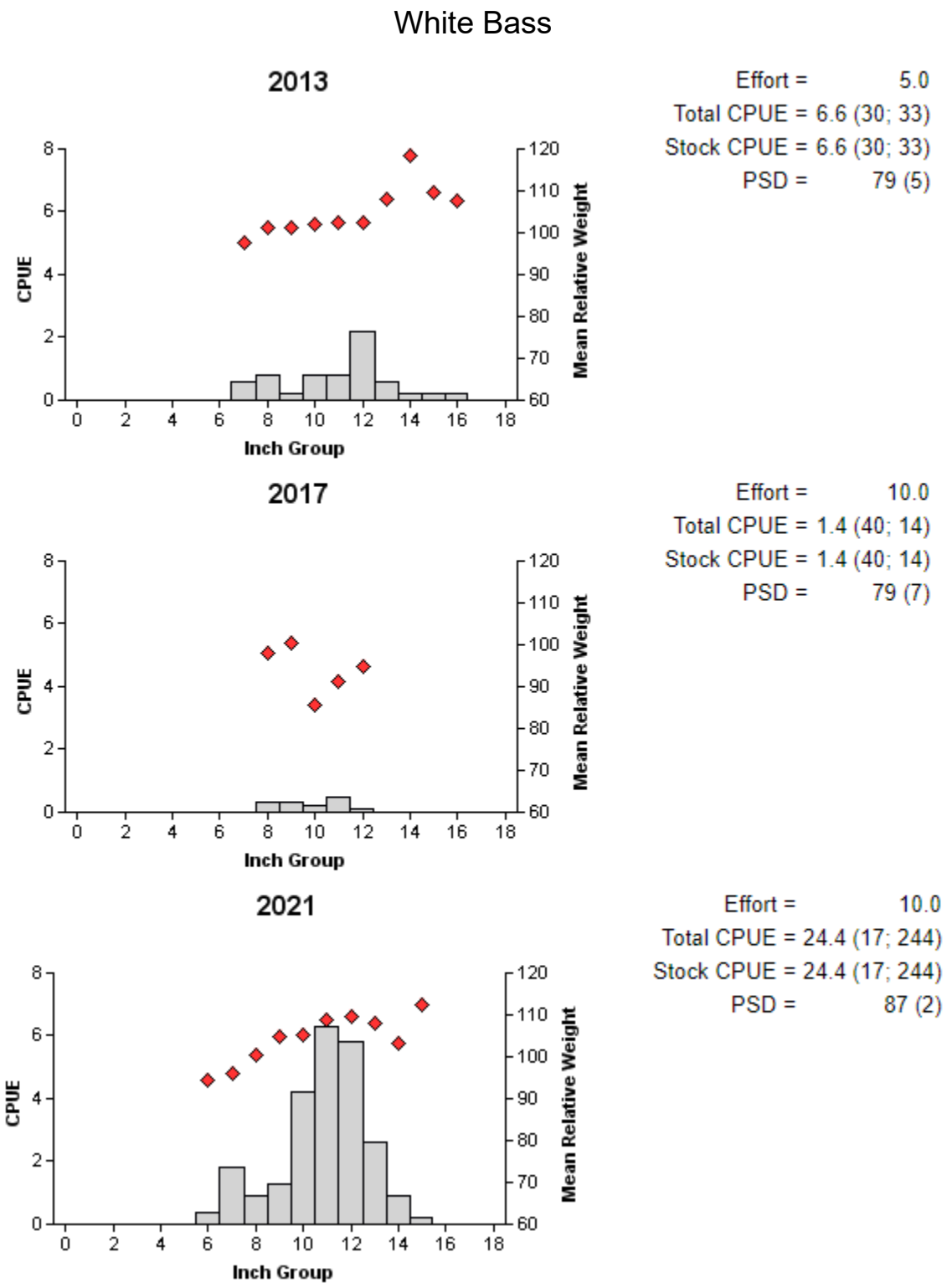


Figure 6. Number of White Bass caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Navarro Mills Reservoir, Texas, 2013, 2017, and 2021. Vertical line indicates minimum length limit.

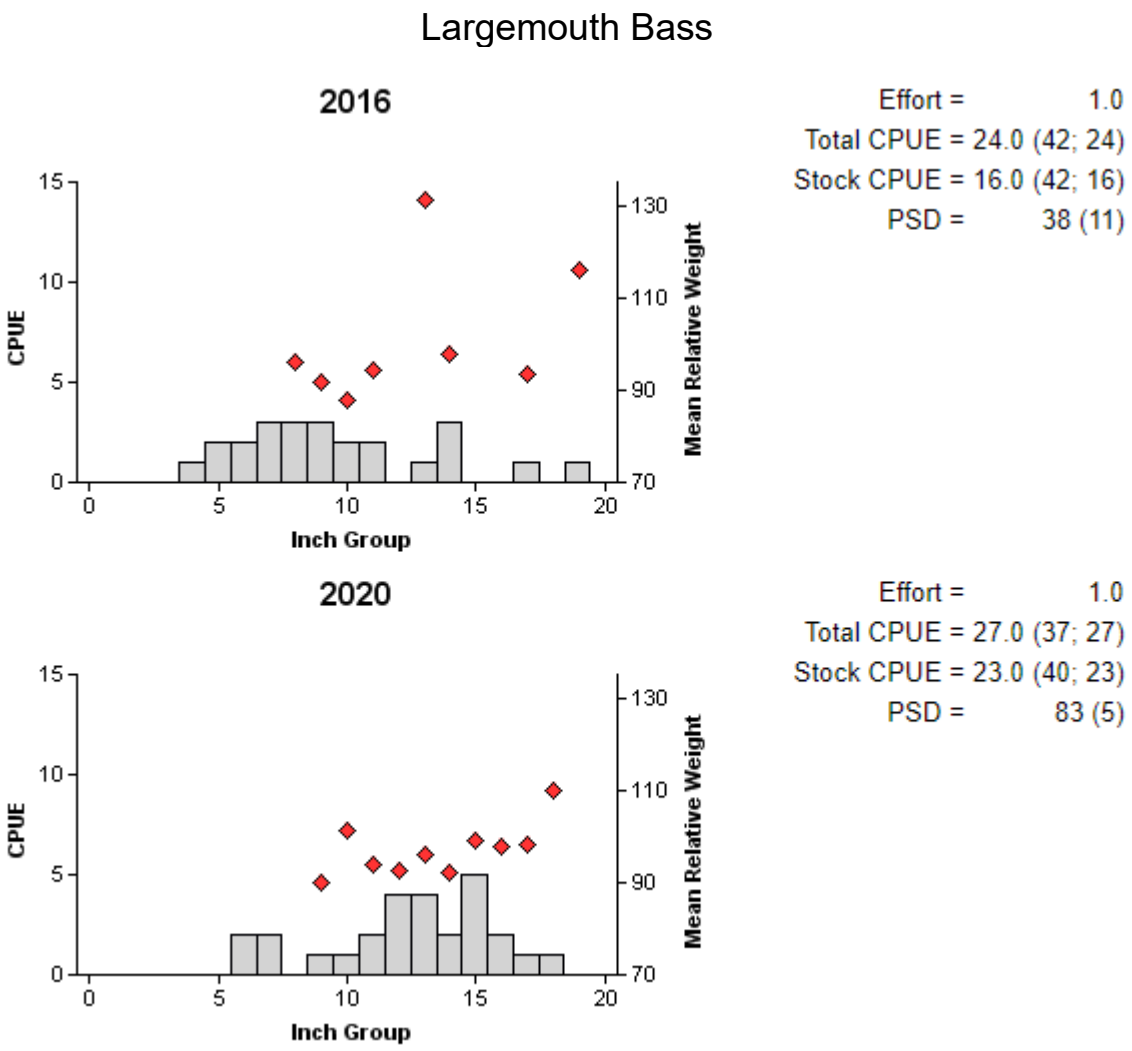


Figure 7. Number of Largemouth Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall daytime electrofishing surveys, Navarro Mills Reservoir, Texas, 2016, and 2020. Vertical line indicates minimum length limit.

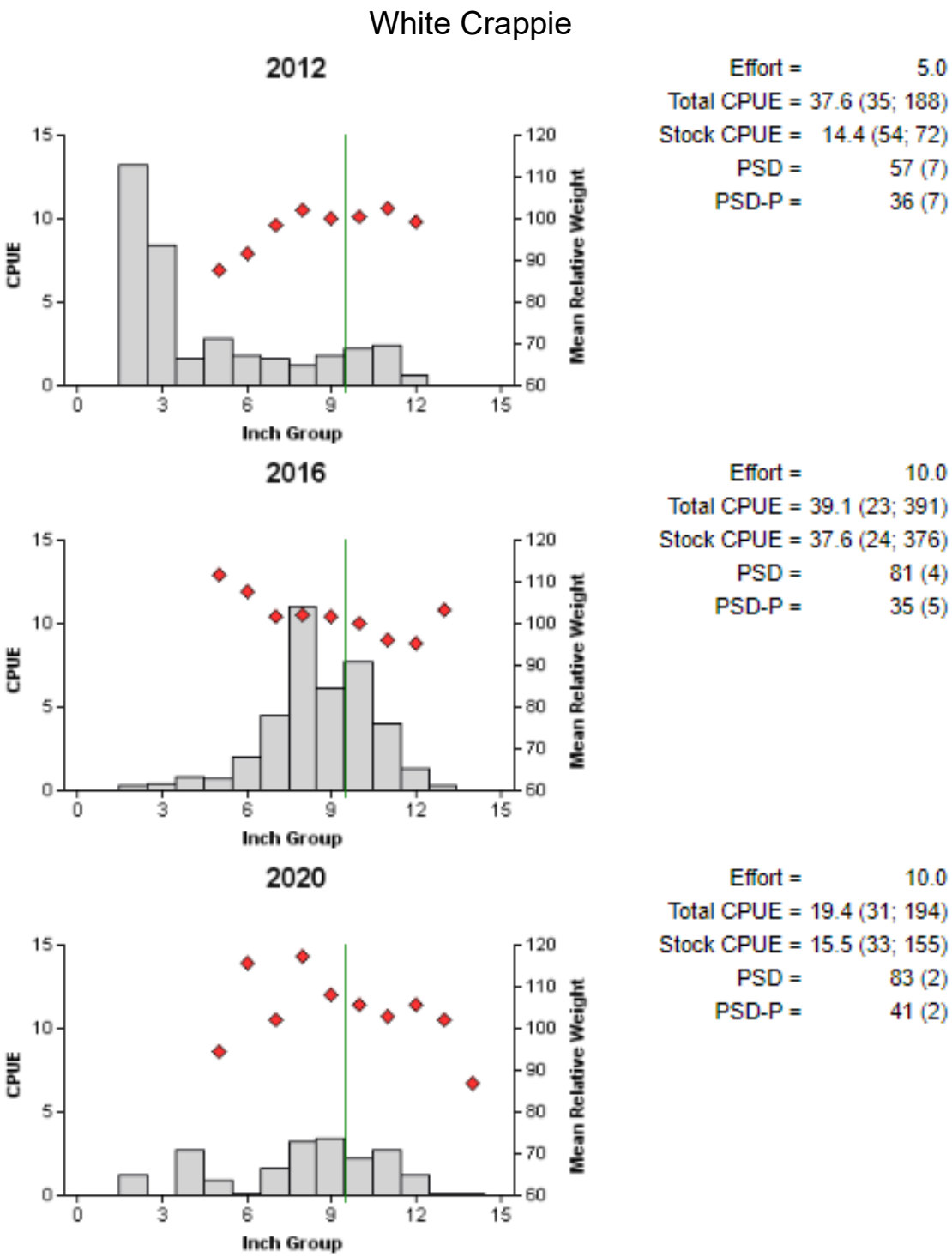


Figure 8. Number of White Crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap netting surveys, Navarro Mills Reservoir, Texas, 2012, 2016, and 2020. Vertical line indicates minimum length limit.

Proposed Sampling Schedule

Table 7. Proposed sampling schedule for Navarro Mills Reservoir, Texas. Survey period is June through May. Gill netting surveys are conducted in the spring, while daytime electrofishing and trap netting surveys are conducted in the fall.

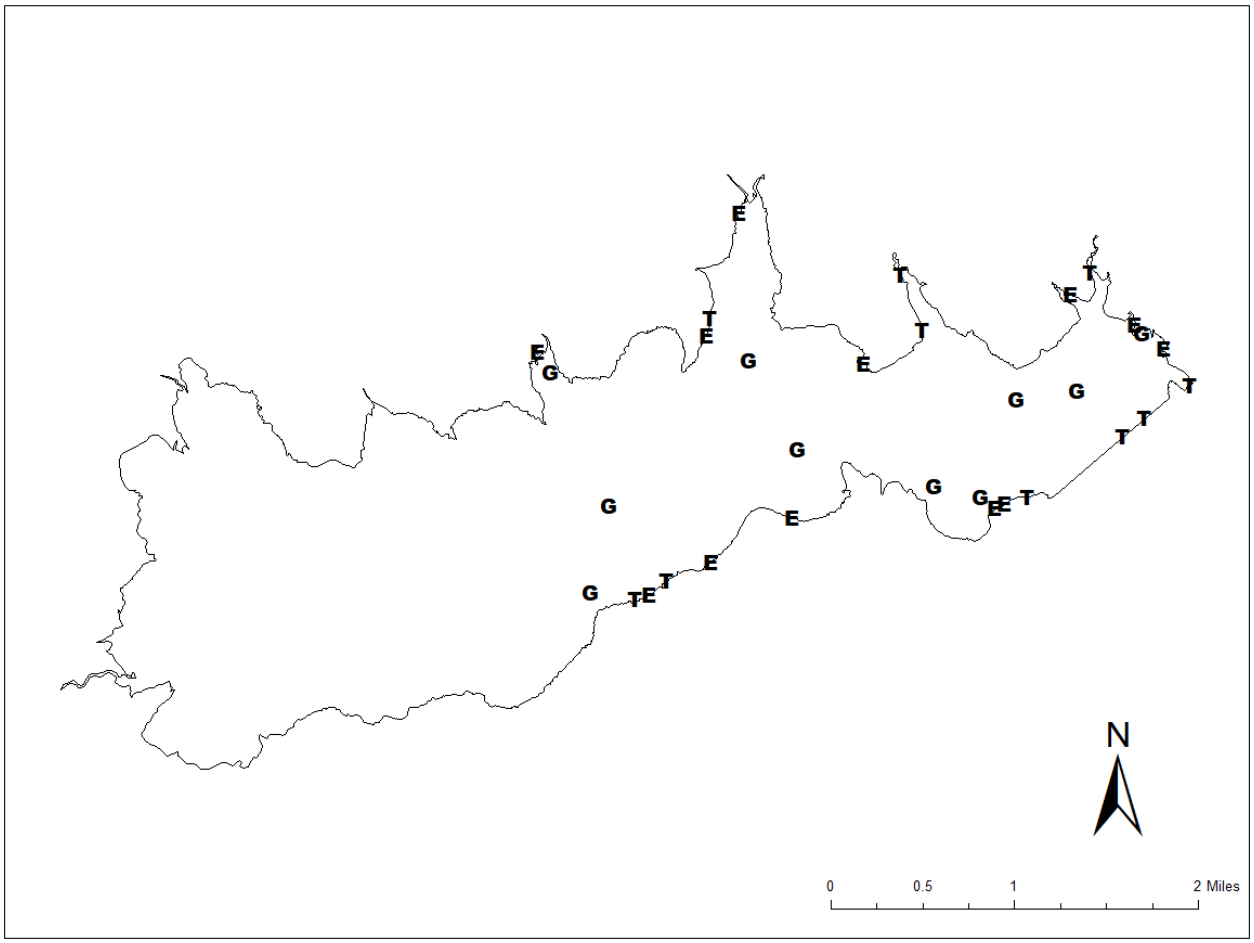
	Survey year			
	2021-2022	2022-2023	2023-2024	2024-2025
Angler Access				X
Vegetation				X
Electrofishing – Fall				X
Trap netting				X
Gill netting				X
Report				X

APPENDIX A – Catch rates for all species from all gear types

Number (N) and catch rate (CPUE) (RSE in parentheses) of all target species collected from all gear types from Navarro Mills Reservoir, Texas, 2020-2021. Sampling effort was 10 net nights for gill netting, 10 net nights for trap netting, and 1 hour for daytime electrofishing.

Species	Gill Netting		Electrofishing		Trap Netting	
	N	CPUE	N	CPUE	N	CPUE
Blue Catfish	423	42.3 (35)				
Channel Catfish	49	4.9 (35)				
White Bass	244	24.4 ()				
Flathead Catfish	1	0.1 (100)				
Gizzard Shad			160	160.0 (20)		
Threadfin Shad			439	439.0 (66)		
Bluegill			10	10.0 (90)		
Largemouth Bass			27	27.0 (37)		
White Crappie					194	19.4 (31)
Black Crappie					1	0.1 (100)

APPENDIX B – Map of sampling locations



Location of sampling sites, Navarro Mills Reservoir, Texas, 2020-2021. Trap net, gill net, and electrofishing stations are indicated by T, G, and E, respectively. Water level was at or above full pool at time of sampling.

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