

Clear Lake

Site Description

Location

Water designation number (WDN)	23-0003-00
Legal description	T115N-R49W-Sec. 13,14,23,24,25
County (ies)	Deuel
Location from nearest town	2.0 miles east of Clear Lake, SD

Survey Dates and Sampling Information

Survey dates	June 27-28, 2013 (FN, GN)
Frame net sets (n)	12
Gill net sets (n)	3

Morphometry (Figure 1)

Watershed area (acres)	17,341
Surface area (acres)	≈530
Maximum depth (ft)	≈11
Mean depth (ft)	unknown

Ownership and Public Access

Clear Lake is a meandered lake owned by the State of South Dakota and the fishery is managed by the SDGFP. Clear Lake has exceptional public access with a county gravel road running along the north and east sides; and SD HWY 22 along the south shore. A city owned park on the east shore of the lake provides camping, picnic area, and a public boat ramp (Figure 1).

Watershed and Land Use

The 17,341 acre Clear Lake sub-watershed (HUC-12) is located within the larger Hidewood Creek (HUC-10) watershed. Land use within the watershed is primarily agricultural.

Water Level Observations

The Water Management Board established OHWM is 1774.0 fmsl, and the outlet elevation of Clear Lake is 1773.5 fmsl. On May 15, 2013 Clear Lake was above both the OHWM and outlet elevation at 1774.5 fmsl. On October 7, 2013 the elevation of Clear Lake had declined slightly to 1774.3 fmsl.

Fish Management Information

Primary species	Northern Pike, Yellow Perch
Other species	Bigmouth Buffalo, Black Bullhead, Bluegill, Common Carp, Walleye, White Sucker, Yellow Bullhead
Lake-specific regulations	none
Management classification	warm-water marginal
Fish Consumption Advisories	none



Figure 1. Map depicting geographic location of Clear Lake (Deuel County) from Clear Lake, South Dakota (top); also noted is the boat ramp (CD Access) and standardized net locations for Clear Lake (bottom). CDFN= frame nets, CDGN= gill nets

Management Objectives

- 1) Maintain a mean gill net CPUE of stock-length Northern Pike ≥ 3 , a PSD of 30-60, and a PSD-P of 5-10.
- 2) Maintain a mean gill net CPUE of stock-length Yellow Perch ≥ 30 , a PSD of 30-60, and a PSD-P of 5-10.
- 3) Maintain a mean frame net CPUE of stock-length bullhead ≤ 100 .

Results and Discussion

Clear Lake is a shallow-natural lake located near the City of Clear Lake, Deuel County, South Dakota. A major surface water connection enters the lake from the northwest via a diversion channel created in the early 1900s (Wittmus and McIntire 1999). Water exiting Clear Lake flows southwest through a natural drainage before entering Hidewood Creek and eventually the Big Sioux River approximately 2 miles northwest of Estelline (SDDENR 1983a; Wittmus and McIntire 1999).

Clear Lake has excellent public access and at times the lake has provided angling opportunities for black bullhead, northern pike, yellow perch, and more recently walleye. However, the lake is shallow with a maximum depth of 11 ft and susceptible to relatively-frequent winterkill events that affect the quality of the fishery. Currently, Clear Lake is managed as a self-sustaining northern pike and yellow perch fishery.

Primary Species

Northern Pike: Northern Pike typically are not sampled effectively during standardized mid-summer fish community surveys. As a result, mean gill net CPUE values are often low. In 2013, gill nets captured five individuals that ranged in TL from 41 to 85 cm (16.1 to 33.5 in; Figure 2). The mean gill net CPUE of stock-length Northern Pike was 1.7 (Table 1) and below the minimum objective (≥ 3 stock-length fish/net night; Table 3). Since 2005, the mean gill net CPUE has ranged from a low of 1.7 to a high of 4.0 (Table 2). Currently, relative abundance is considered moderate.

Given the low sample size, few inferences can be made concerning size structure, growth, and/or condition.

Yellow Perch: The mean gill net CPUE of stock-length Yellow Perch was 7.0 (Table 1) and below the minimum objective (≥ 30 stock-length Yellow Perch/net night; Table 3). The 2013 mean gill net CPUE represented an increase from the 2005 and 2007 CPUE values of 1.7 and 2.7 (Table 2), but still indicated low relative abundance.

Gill net captured Yellow Perch ranged in TL from 17 to 28 cm (6.7 to 11.0 in; Figure 3). Age estimates made using otoliths revealed the presence of two year classes (2009 and 2011; Table 4). The weighted mean TL at capture of age-4 Yellow Perch was 266 mm (10.5 in; Table 5). Although sample sizes were low, gill net

captured Yellow Perch had high condition, with mean W_r values that were ≥ 100 for all length categories (e.g., stock to quality) sampled. The mean W_r of stock-length Yellow Perch was 104 (Table 1).

Other Species

Black Bullhead: Black Bullheads were the most abundant fish species in the frame net catch with a mean frame net CPUE of 112.9 (Table 1). The 2013 frame net CPUE represented a substantial increase from the 2009 CPUE of 17.5 (Table 2) and was above the management objective (≤ 100 stock-length bullhead/net night; Table 3). Currently, relative abundance is high.

Frame net captured Black Bullhead ranged in TL from 14 to 29 cm (5.5 to 11.4 in; Figure 4). A high proportion, primarily the result of what appears to be a single strong year class, exceeded quality-length (23 cm; 9 in) and resulted in a PSD of 96 (Table 1; Figure 4). No growth information was collected in 2013. The majority of Black Bullheads sampled were in the quality-preferred length category, which had a mean W_r of 96.

Walleye: The shallow nature and susceptibility of Clear Lake to winterkill exclude Walleye from being a primary management species. However, the potential exists for occasional strong year classes to develop and provide angling opportunities. Therefore, stockings should continue provided water levels are favorable (i.e., lake is full), excess Walleye are available, and higher priority stockings have been completed.

Although Walleye are not a primary management species, due to the susceptibility of winter kill events in Clear Lake, they have provided an important sport fishery in recent years. In each of the past three fish community surveys conducted (2005, 2009 and 2013) Walleye relative abundance has been moderate to high, with mean gill net CPUE values that ranged from a low of 8.7 (2013) to a high of 26.3 (2005; Table 2).

Walleye in the 2013 gill net catch ranged in TL from 18 to 61 cm (7.1 to 24.0 in; Figure 5). The PSD of 38 and PSD-P of 8 indicated a relatively balanced population, defined as a PSD of 30-60 and a PSD-P of 5-10 (Table 1; Figure 5). However, size structure indices should be interpreted with caution as sample size was low (i.e., 26 stock-length Walleye).

Based on ages obtained using otoliths, six year classes (2004, and 2008-2012) were present in the sample (Table 6). Year classes that represented both stocked and non-stocked years were sampled (Table 6; Table 8). The naturally-produced 2011 year class was the most abundant and comprised 59% of Walleye in the gill net catch (Table 6). Age-2 Walleye (2011 cohort) had a weighted mean TL at capture of 304 mm (12.0 in; Table 7). Since 2005, the weighted mean TL at capture of age-2 Walleye has ranged from 304 to 403 mm (12.0 to 15.7 in; Table 7).

Other: Bigmouth Buffalo, Common Carp, and White Sucker were other fish species captured during the 2013 fish community survey (Table 1).

Management Recommendations

- 1) Conduct fish community assessment surveys utilizing gill nets and frame nets every four years (next scheduled for summer 2017) to monitor fish relative abundance, fish population size structures, fish growth, and stocking success.
- 2) Collect otoliths from walleye and yellow perch to assess the age structure and growth rates of each population.
- 3) Stock walleye (≈ 500 fry/acre) when extra are available and all higher priority stockings have been fulfilled.
- 4) Monitor winter and summer kill events. In cases of substantial winter/summer kill the need to re-establish a fishery in Clear Lake should be evaluated. If so desired, northern pike, walleye, and yellow perch should be stocked to re-establish a fish community.

Table 1. Mean catch rate (CPUE; gill/frame nets = catch/net night) of stock-length fish, proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish, and mean relative weight (Wr) of stock-length fish for various fish species captured in frame nets and experimental gill nets in Clear Lake, 2013. Confidence intervals include 80 percent (\pm CI-80) or 90 percent (\pm CI-90). BIB= bigmouth buffalo; BLB= black bullhead; BLG= bluegill; COC= common carp; NOP= northern pike; WAE= walleye; WHS= white sucker; YEB= yellow bullhead; YEP= yellow perch

Species	Abundance		Stock Density Indices				Condition	
	CPUE	CI-80	PSD	CI-90	PSD-P	CI-90	Wr	CI-90
<i>Frame nets</i>								
BIB	4.3	3.2	94	6	78	10	80	1
BLB	112.9	21.9	96	1	0	---	97	1
COC	0.3	0.3	100	0	75	59	---	---
NOP	0.2	0.2	50	50	0	---	---	---
WAE	0.5	0.3	17	34	17	34	85	---
WHS	0.3	0.3	100	0	100	0	100	---
YEP	0.1	0.1	100	---	0	---	---	---
<i>Gill nets</i>								
BIB	0.3	0.6	100	---	0	---	93	---
BLB	26.7	13.6	98	3	0	---	101	<1
COC	0.3	0.6	0	---	0	---	---	---
NOP	1.7	1.7	60	52	40	52	81	9
WAE	8.7	3.3	38	17	8	9	87	1
WHS	3.7	2.3	100	0	100	0	106	3
YEP	7.0	5.4	81	15	67	18	104	2

Table 2. Historic mean catch rate (CPUE; gill/frame nets = catch/net night) of stock-length fish for various fish species captured in frame nets and experimental gill nets from Clear Lake 2005-2013. BIB=Bigmouth Buffalo; BLB= Black Bullhead; BLG=Bluegill; COC= Common Carp; HYB=Hybrid Sunfish; NOP= Northern Pike; WAE= Walleye; WHS= White Sucker; YEB=Yellow Bullhead; YEP= Yellow Perch

Species	CPUE		
	2005	2009	2013
<i>Frame nets</i>			
BIB	---	3.3	4.3
BLB	---	17.5	112.9
BLG	---	0.1	0.0
COC	---	1.0	0.3
HYB ¹	---	0.1	0.0
NOP	---	2.8	0.2
WAE	---	2.5	0.5
WHS	---	0.5	0.3
YEB	---	0.1	0.0
YEP	---	0.3	0.1
<i>Gill nets</i>			
BIB	0.0	0.0	0.3
BLB	6.0	10.3	26.7
COC	0.0	2.7	0.3
NOP	2.7	4.0	1.7
WAE	26.3	10.3	8.7
WHS	13.0	4.3	3.7
YEP	1.7	2.7	7.0

Table 3. Mean catch rate (CPUE; gill/frame nets = catch/net night) of stock-length fish, proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish, and relative weight (Wr) for selected species captured by frame nets and experimental gill nets in Clear Lake, 2005-2013. BLB= Black Bullhead; NOP= Northern Pike; WAE= Walleye; YEP= Yellow Perch

Species	2005	2009	2013	Objective
<i>Frame nets</i>				
BLB				
CPUE	---	18	113	≤ 100
PSD	---	86	96	---
PSD-P	---	1	0	---
Wr	---	89	97	---
<i>Gill nets</i>				
NOP				
CPUE	3	4	2	≥ 3
PSD	100	42	60	30-60
PSD-P	13	0	40	5-10
Wr	87	74	81	---
WAE				
CPUE	26	10	9	---
PSD	92	55	38	---
PSD-P	13	10	8	---
Wr	95	92	87	---
YEP				
CPUE	2	3	7	≥ 30
PSD	80	63	81	30-60
PSD-P	20	13	67	5-10
Wr	100	94	104	---

Table 4. Year class distribution based on expanded age/length summary for Yellow Perch sampled in gill nets from Clear Lake, 2010-2013.

Survey Year	Year Class							
	2013	2012	2011	2010	2009	2008	2007	2006
2013			4		17			
2009	---	---	---	---			3	5

Table 5. Weighted mean total length (mm) at capture by gender for Yellow Perch captured in experimental gill nets (expanded sample size) from Clear Lake, 2009-2013. Note: sampling was conducted at approximately the same time during each year allowing comparisons among years to monitor growth trends.

Year	Age			
	1	2	3	4
2013				
Male	---	---	---	247 (1)
Female	---	186 (3)	---	267 (16)
Combined	---	185 (4)	---	266 (17)
2009				
Male	---	---	---	---
Female	---	183 (3)	244 (5)	---
Combined	---	183 (3)	244 (5)	---

Table 6. Year class distribution based on the expanded age/length summary for Walleye sampled in gill nets and associated stocking history (# stocked x 1,000) from Clear Lake, 2005-2013.

Survey Year	Year Class												
	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001
2013		1	16	2	5	2		1					
2009	---	---	---	---		10	15	13		1	1		
2005	---	---	---	---	---	---	---	---			48		31
# stocked													
fry		600		600		600							
sm. fingerling													
lg. fingerling													

Table 7. Weighted mean total length at capture (mm) for walleye sampled in experimental gill nets (expanded sample size) from Clear Lake, 2005-2013. Note: sampling was conducted at approximately the same time during each year allowing comparisons among years to monitor growth trends.

Year	Age						
	1	2	3	4	5	6	7
2013	189 (1)	304 (16)	420 (2)	461 (5)	494 (2)	---	619 (1)
2009	201 (10)	361 (15)	452 (13)	---	596 (1)	609 (1)	---
2005	---	403 (48)	---	502 (31)	---	---	---

Table 8. Stocking history including size and number for fishes stocked into Clear Lake, 2001-2013.

Year	Species	Size	Number
2001	NOP	fry	500,000
2003	YEP	adult	200
2004	YEP	adult	1,000
2005	YEP	fingerling	1,000
2008	WAE	fry	600,000
2010	WAE	fry	600,000
2012	WAE	fry	300,000

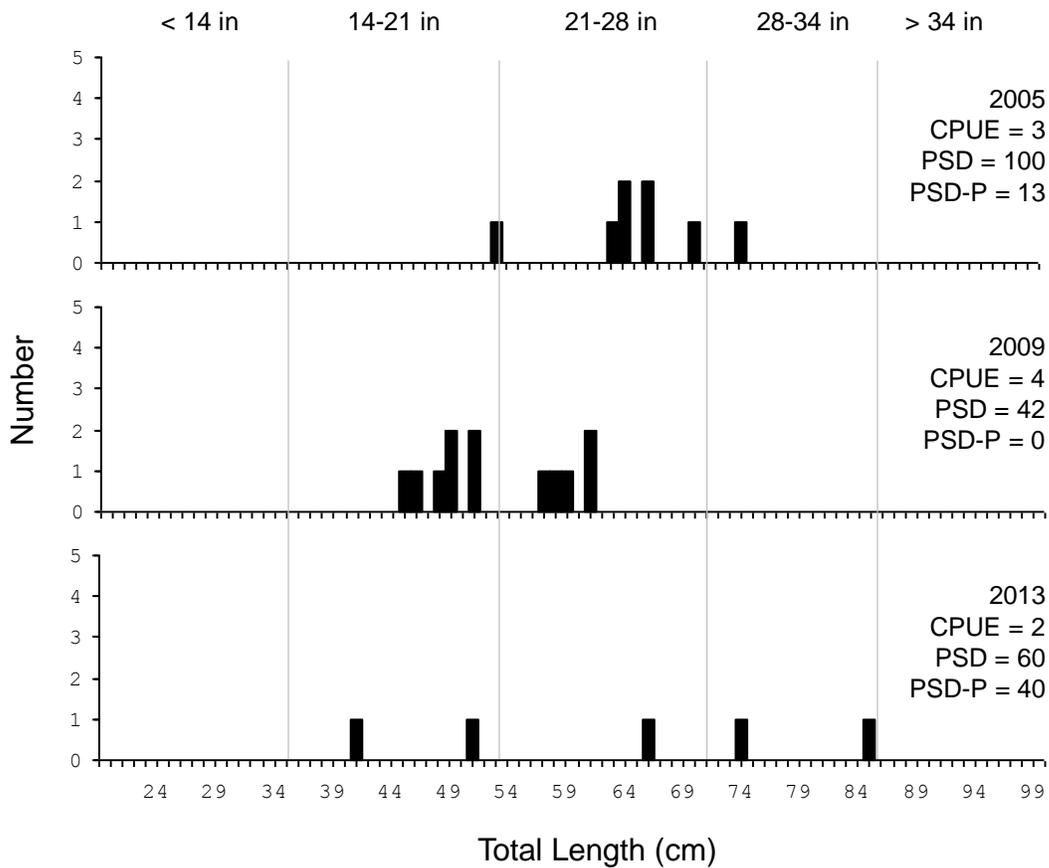


Figure 2. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for Northern Pike captured using experimental gill nets in Clear Lake, 2005-2013.

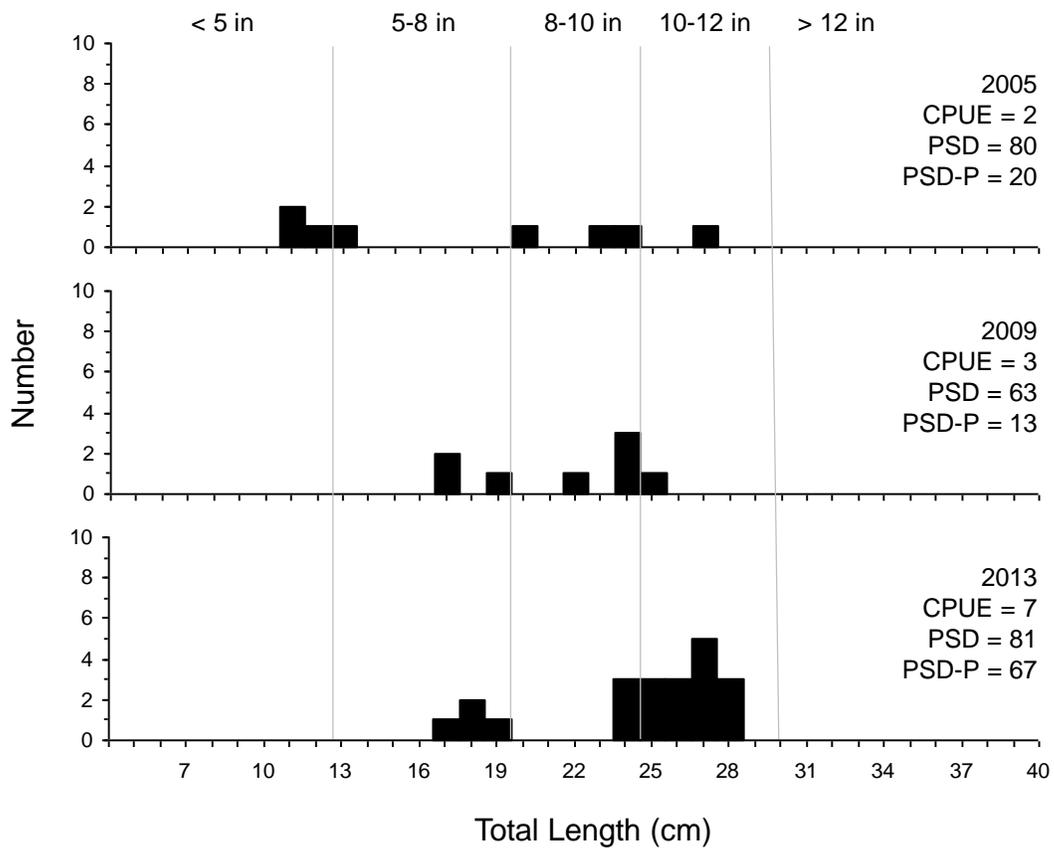


Figure 3. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for Yellow Perch captured using experimental gill nets in Clear Lake, 2005-2013.

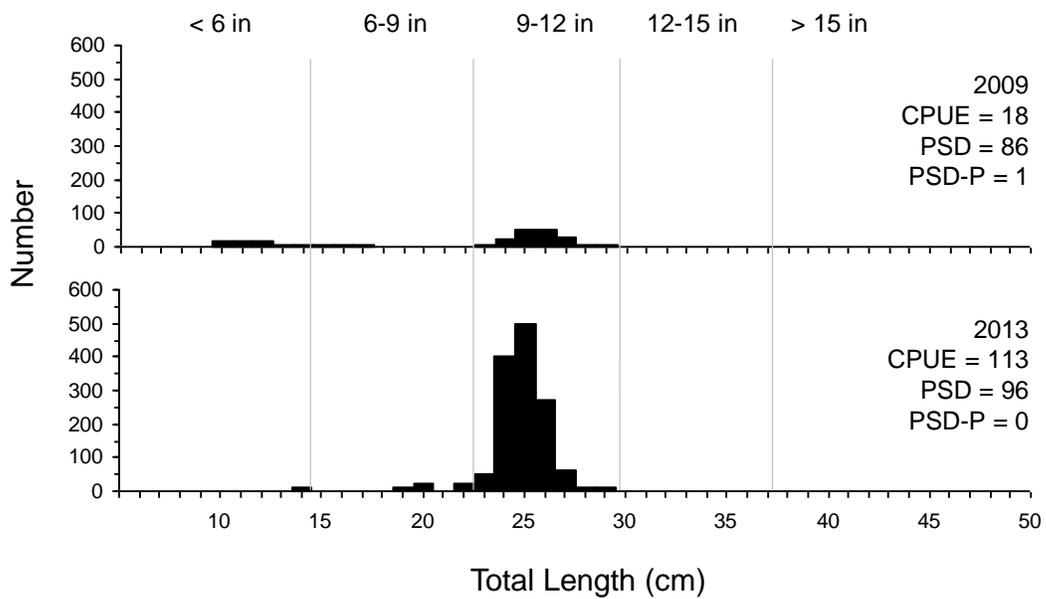


Figure 4. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for Black Bullhead captured using frame nets in Clear Lake, 2009-2013.

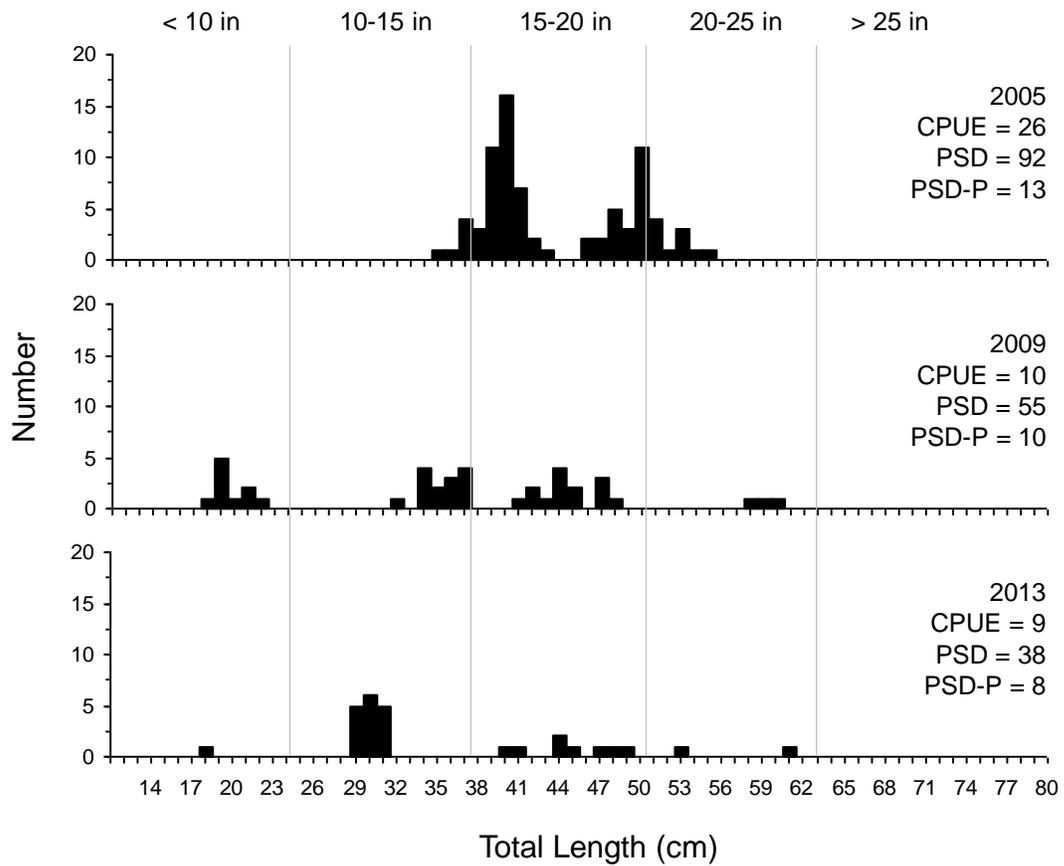


Figure 5. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for Walleye captured using experimental gill nets in Clear Lake, 2005-2013.