

Punished Woman Lake

Site Description

Location

Water designation number (WDN)	05-0004-00
Legal description	T119N-R51W-Sec.14-16
County (ies)	Codington
Location from nearest town	Northern edge of the city limits of South Shore, SD

Survey Dates and Sampling Information

Survey dates	July 9-10, 2013 (FN, GN)
Frame net sets (n)	10
Gill net sets (n)	3

Morphometry (Figure 1)

Watershed area (acres)	14,920
Surface area (acres)	477
Maximum depth (ft)	≈12
Mean depth (ft)	unknown

Ownership and Public Access

Punished Woman Lake is a meandered lake owned by the State of South Dakota and the fishery is managed by the SDGFP. Public access sites have been established on the south and east shorelines (Figure 1). The south access location includes a boat ramp and is maintained by the city of South Shore (Figure 2). Lands adjacent to Punished Woman Lake are under ownership of the State of South Dakota, the City of South Shore, and private individuals.

Watershed and Land Use

The 14,920 acre Punished Woman Lake sub-watershed (HUC-12) is located within the larger North Fork Yellow Bank River (HUC-10) watershed. Land use within the watershed is primarily agricultural including a mix of pasture or grassland and cropland. Additionally, the city of South Shore is located on the southern shore of Punished Woman Lake.

Water Level Observations

The South Dakota Water Management Board established OHWL is 1845.0 fmsl, and the outlet elevation of Punished Woman Lake is 1844.5 fmsl. On May 21, 2013 the elevation was 1844.7 fmsl and indicated an increase from the fall 2012 elevation of 1843.2 fmsl. On October 7, 2013 the elevation was 1844.5 fmsl.

Fish Management Information

Primary species	Northern Pike, Yellow Perch
Other species	Black Bullhead, Common Carp, Golden Shiner, Walleye, White Sucker
Lake-specific regulations	none
Management classification	warm-water semi-permanent
Fish consumption advisories	none

South Dakota Department of Game, Fish and Parks

Punished Woman Lake Codington County

1997

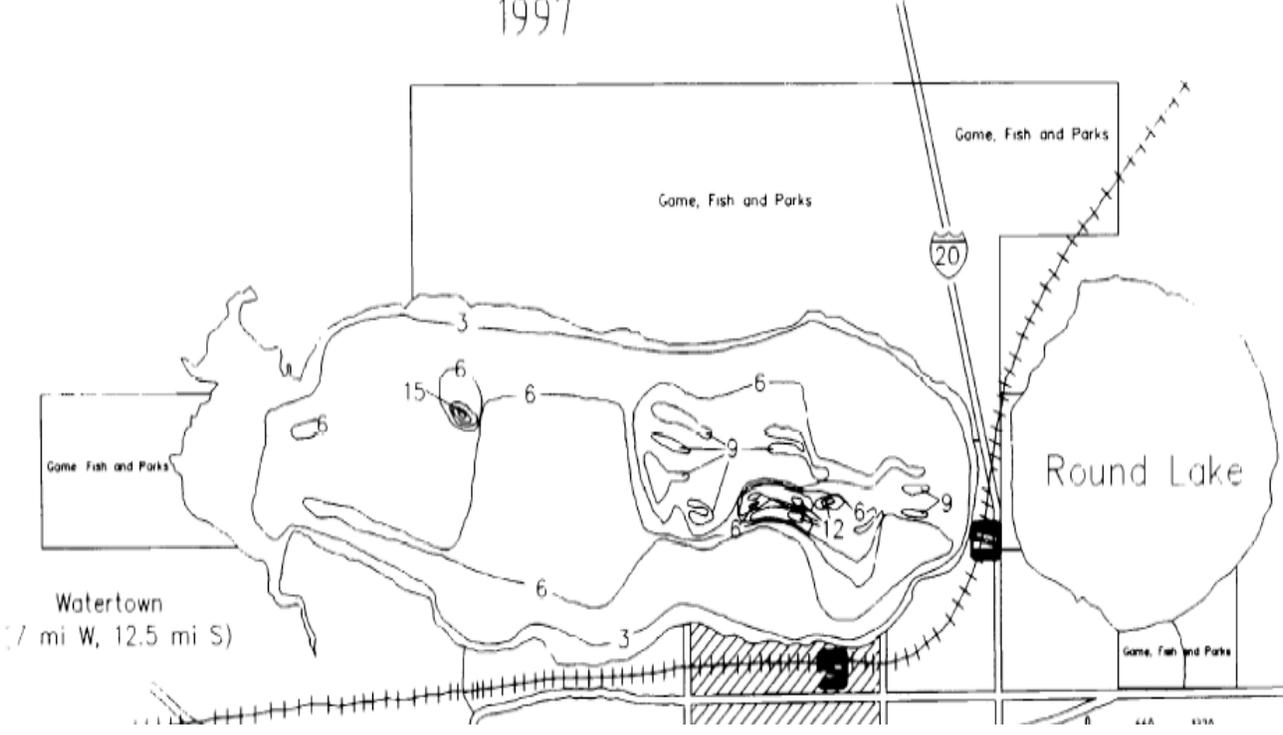


Figure 1. Contour map of Punished Woman Lake, Codington County, South Dakota.



Figure 2. Map depicting geographic location of Punished Woman and Round Lakes from South Shore, South Dakota (top). Also noted is the public access site and standardized net locations for Punished Woman Lake (bottom). PWFN= frame net; PWGN= gill net

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 Black Bullhead ≤ 100 .

Results and Discussion

Punished Woman Lake is located on the northern edge of the South Shore city limits and is a relatively-shallow natural lake with good public access. The lake is unique in that approximately 2.4 miles (51%) of the 4.5 miles of shoreline are owned by the State of South Dakota and managed as a Game Production Area (GPA). Currently Punished Woman Lake is primarily managed as a Northern Pike and Yellow Perch fishery. Overall, as many as seven fish species contribute to the 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. Northern pike relative abundance in Punished Woman Lake has generally been considered high with mean gill net CPUE values ≥ 4.0 in each survey conducted from 2003-2009 (Table 2). In 2013, the mean gill net CPUE of stock-length northern pike was 5.7 (Table 1) and above the minimum objective (≥ 3 stock-length Northern Pike/net; Table 3). Currently, relative abundance remains high.

Gill net captured Northern Pike ranged in TL from 40 to 74 cm (15.7 to 29.1 in), had a PSD of 41, and a PSD-P of 18 (Table 1; Figure 3). The PSD was within the management objective of 30-60; while the PSD-P was above the management objective of 5-10; Table 3). However, size structure indices should be interpreted with caution as sample size was low (i.e., 17 stock-length Northern Pike).

No Northern Pike age or growth information was collected. The condition of gill net captured Northern Pike was similar to that of Northern Pike captured from other northeast South Dakota lakes (e.g., Round and Pelican Lakes) with mean W_r values that ranged from 81 to 94 for all length categories (e.g., stock to quality) sampled. Stock-length Northern Pike had a mean W_r of 88 (Table 1). A slight decreasing trend in W_r was apparent as TL increased.

Yellow Perch: The mean gill net CPUE of stock-length Yellow Perch was 22.3 (Table 1) and below the minimum objective (≥ 30 stock-length Yellow Perch/net night; Table 3). Since 2003, mean gill net CPUE values of stock-length Yellow Perch have ranged from a low of 1.0 (2005) to a high of 28.0 (2006; Table 2). The 2012 mean gill

net CPUE represented an increase from the 2009 mean CPUE of 13.0 (Table 2) and indicated moderate relative abundance.

Yellow Perch in the gill net catch ranged in TL from 8 to 20 cm (3.1 to 7.9 in) with the majority (62%) being < stock-length (13 cm; 5 in; Figure 4). Of those that surpassed stock-length few exceeded quality-length (20 cm; 8 in) resulting in a PSD of 1, which was well below the management objective of 30-60 (Table 1; Table 3; Figure 4). No preferred-length Yellow Perch were sampled.

Otoliths were collected from a sub-sample of gill net captured Yellow Perch; unfortunately, collected otoliths were difficult to read and the 2013 age/growth information should be interpreted with caution. Age structure information indicated that Yellow Perch in Punished Woman Lake have exhibited consistent recruitment in recent years with five consecutive year classes (2008-2012) present in the gill net catch (Table 4). The 2011 year class was the most represented and comprised 46% of Yellow Perch collected in gill nets; while year classes produced in 2009 and 2010 comprised an additional 24% and 22% (Table 4).

The weighted mean TL at capture for age-2 male Yellow Perch was 101 mm (4.0 in) compared to 110 mm (4.3 in) for age-2 females (Table 5). Few older (i.e., >age 2) males were captured in the gill net catch. Age-3 and age-4 females had weighted mean TL at capture values of 135 and 150 mm (5.3 and 5.9 in; Table 5). The majority of stock-length Yellow Perch sampled were in the stock-quality length category, which had a mean W_r of 90.

Other Species

Black Bullhead: Black Bullheads were the most abundant species in the 2013 frame net catch (Table 1). The mean frame net CPUE of stock-length Black Bullhead was 62.4 (Table 1) and within the management objective (≤ 100 stock-length Black Bullhead/net-night; Table 3). The 2013 mean frame net CPUE represented an increase from the 2009 mean CPUE of 22.4, but was lower than the 2006 mean CPUE of 181.2 (Table 2). Currently, relative abundance is considered high.

Frame net captured Black Bullheads ranged in TL from 12 to 26 cm (4.7 to 10.2 in), had a PSD of 44, and a PSD-P of 0 (Table 1, Figure 5). No age and growth information was collected. Mean W_r values of Black Bullhead captured in the 2013 frame net catch ranged from 80-93 for all length categories (e.g., stock to quality) sampled. An increasing trend in condition was apparent as TL increased.

Walleye: The shallow nature and susceptibility of Punished Woman 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, periodic stockings should continue provided water levels are favorable (i.e., lake is full), excess Walleye are available, and higher priority stockings have been completed.

In 2013, gill nets captured 22 stock-length Walleye that ranged in TL from 18 to 47 cm (7.1 to 18.5 in; Figure 6). The mean gill net CPUE of stock-length Walleye was 7.3, which represented an increase from the 2009 mean CPUE of 4.0, and was the highest recorded from 2003-2013 (Table 1; Table 2).

Age estimates made using otoliths suggested the presence of three Walleye year classes (2008, 2010, and 2011; Table 6). The 2010 cohort, which coincided with a fry stocking, was the most represented and comprised 83% of walleye in the gill net catch (Table 6). The 2010 year class has exhibited moderate growth with a weighted mean TL at capture of 361 mm (14.2 in) at age 3 (Table 6). Mean Wr values ranged from 92 to 98 for all length categories (e.g., stock to quality) sampled with the mean Wr of stock-length Walleye being 96 (Table 1). No length-related trends in condition were apparent.

Other: Common carp, golden shiner, and white sucker were other fish species captured during the 2013 fish community survey (Table 1).

Management Recommendations

- 1) Conduct fish community surveys utilizing gill nets and frame nets on an every fourth year basis (next survey scheduled in summer 2017) to monitor fish relative abundance, fish population size structures, fish growth, and stocking success.
- 2) Continue to manage as a self-sustaining northern pike and yellow perch fishery.
- 3) Stock walleye (≈ 500 fry/acre) periodically provided water levels are favorable (i.e., lake is full), excess walleye are available, and other higher priority stockings have been completed.
- 4) Collect otoliths from walleye and yellow perch to assess age structure and growth rates of each population.
- 5) Monitor winter and summer kill events. In cases of substantial winter/summer kill stock with northern pike and yellow perch to re-establish a fish community.

Table 1. Mean catch rate (CPUE; catch/net night) of stock-length fish, proportional size distribution of quality- (PSD) and preferred-length fish (PSD-P), and mean relative weight (Wr) of stock-length fish for various fish species captured in frame nets and experimental gill nets from Punished Woman Lake, 2013. Confidence intervals include 80 percent (\pm CI-80) or 90 percent (\pm CI-90). BLB= Black Bullhead; COC= Common Carp; GOS= Golden Shiner; NOP= Northern Pike; WAE= Walleye; WHS= White Sucker; 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>								
BLB	62.4	34.4	44	3	0	---	90	1
COC	0.2	0.2	50	50	0	---	110	30
GOS ¹	0.2	0.2	---	---	---	---	---	---
NOP	1.3	0.7	77	22	31	24	85	5
WAE	0.2	0.2	100	0	50	50	98	26
WHS	0.4	0.2	75	59	75	59	94	11
YEP	4.8	3.0	6	6	0	---	82	1
<i>Gill nets</i>								
BLB	80.3	48.5	18	4	0	---	90	1
COC	0.7	1.3	50	50	0	---	124	50
GOS ¹	10.3	2.3	---	---	---	---	---	---
NOP	5.7	4.4	41	21	18	17	91	3
WAE	7.3	4.4	32	17	0	---	96	2
WHS	11.0	1.9	82	11	64	14	99	1
YEP	22.3	25.2	1	2	0	---	90	1

¹ All fish sizes

Table 2. Historic mean catch rate (CPUE; gill/frame nets = catch/net night) of stock-length fish for various fish species captured by frame nets and experimental gill nets in Punished Woman Lake, 2003-2013. BLB = Black Bullhead; COC= Common Carp; GOS= Golden Shiner; NOP = Northern Pike; WAE = Walleye; WHS = White Sucker; YEP = Yellow Perch

Species	Year						
	2003	2004	2005	2006 ²	2007 ²	2009	2013
<i>Frame nets</i>							
BLB	8.9	---	---	181.2	---	22.4	62.4
COC	0.0	---	---	0.0	---	0.0	0.2
GOS ¹	0.1	---	---	0.3	---	0.0	0.2
NOP	1.4	---	---	0.1	---	0.2	1.3
WAE	0.3	---	---	0.0	---	0.2	0.2
WHS	0.4	---	---	0.0	---	0.1	0.4
YEP	6.4	---	---	48.2	---	1.5	4.8
<i>Gill nets</i>							
BLB	16.3	6.7	29.3	78.5	35.3	64.3	80.3
COC	0.8	0.3	0.0	0.0	0.0	0.3	0.7
GOS ¹	8.5	31.0	3.3	3.3	0.0	7.3	10.3
NOP	8.8	5.3	5.7	6.5	6.0	4.0	5.7
WAE	1.8	4.0	2.0	5.8	1.7	4.0	7.3
WHS	3.5	3.0	5.3	5.8	6.3	5.7	11.0
YEP	27.3	7.3	1.0	28.0	15.0	13.0	22.3

¹ All fish sizes.

² Monofilament gill net mesh size (0.75", 1.00", 1.25", 1.50", 2.00" and 2.50")

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 mean relative weight (Wr) for selected species captured by frame nets and experimental gill nets in Punished Woman Lake, 2003-2013. BLB = Black Bullhead; NOP = Northern Pike; WAE = Walleye; YEP = Yellow Perch

Species	2003	2004	2005	2006 ¹	2007 ¹	2009	2013	Objective
<i>Frame nets</i>								
BLB								
CPUE	9	---	---	181	---	22	62	≤ 100
PSD	47	---	---	1	---	13	44	---
PSD-P	3	---	---	0	---	0	0	---
Wr	83	---	---	80	---	92	90	---
<i>Gill nets</i>								
NOP								
CPUE	9	5	6	7	6	4	6	≥ 3
PSD	54	88	65	50	78	33	41	30-60
PSD-P	3	19	0	0	22	8	18	5-10
Wr	85	80	79	87	91	81	91	---
WAE								
CPUE	2	4	2	6	2	4	7	---
PSD	0	67	33	70	100	83	32	---
PSD-P	0	0	0	17	0	0	0	---
Wr	96	101	93	97	96	95	96	---
YEP								
CPUE	27	7	1	28	15	13	22	≥ 30
PSD	35	55	33	4	9	5	1	30-60
PSD-P	4	32	0	0	0	0	0	5-10
Wr	99	101	91	97	94	102	90	---

¹ Monofilament gill net mesh size (0.75", 1.00", 1.25", 1.50", 2.00" and 2.50")

Table 4. Year class distribution based on the expanded age/length summary for Yellow Perch sampled in gill nets from Punished Woman Lake, 2009-2013.

Survey Year	Year Class								
	2013	2012	2011	2010	2009	2008	2007	2006	2005
2013		8	79	38	42	6			
2009	---	---	---	---		48	19	17	2

Table 5. Weighted mean total length at capture (mm) by gender for Yellow Perch captured in experimental gill nets (expanded sample size) from Punished Woman 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	5
2013					
Male	100 (3)	101 (20)	115 (2)	148 (3)	155 (2)
Female	99 (10)	110 (54)	135 (31)	150 (37)	194 (4)
Combined	98 (8)	106 (79)	131 (38)	150 (42)	181 (6)
2009					
Male	107 (14)	146 (3)	159 (5)	---	---
Female	111 (34)	152 (18)	167 (10)	213 (2)	---
Combined	110 (48)	151 (19)	163 (17)	213 (2)	---

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

Survey Year	Year Class												
	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001
2013			2	19		2							
2009	---	---	---	---		2	2	8	2				
2007 ¹	---	---	---	---	---	---		7		3	2		
2006 ¹	---	---	---	---	---	---	---	---		7	7		9
2005	---	---	---	---	---	---	---	---		2	4	2	
Number stocked													
fry	400	225		450		500					477	400	450
sm. fingerling								50		35			
lg. fingerling													

¹ Monofilament gill net mesh size (.75", 1", 1.25", 1.5", 2" and 2.5")

Table 7. Weighted mean total length at capture (mm) for Walleye captured in experimental gill nets (expanded sample size) from Punished Woman 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
2013	---	223 (2)	361 (19)	---	474 (2)
2009	177 (2)	370 (2)	414 (8)	482 (2)	---
2007	214 (7)	---	437 (3)	487 (2)	---
2006	---	325 (7)	447 (7)	---	498 (9)
2005	202 (2)	340 (4)	423 (2)	---	---

Table 8. Stocking history including size and number for fishes stocked into Punished Woman Lake, 2001-2013. WAE= walleye

Year	Species	Size	Number
2001	WAE	fry	450,000
2002	WAE	fry	400,000
2003	WAE	fry	477,000
2004	WAE	small fingerling	35,200
2006	WAE	small fingerling	50,490
2008	WAE	fry	500,000
2010	WAE	fry	450,000
2012	WAE	fry	225,000
2013	WAE	fry	400,000

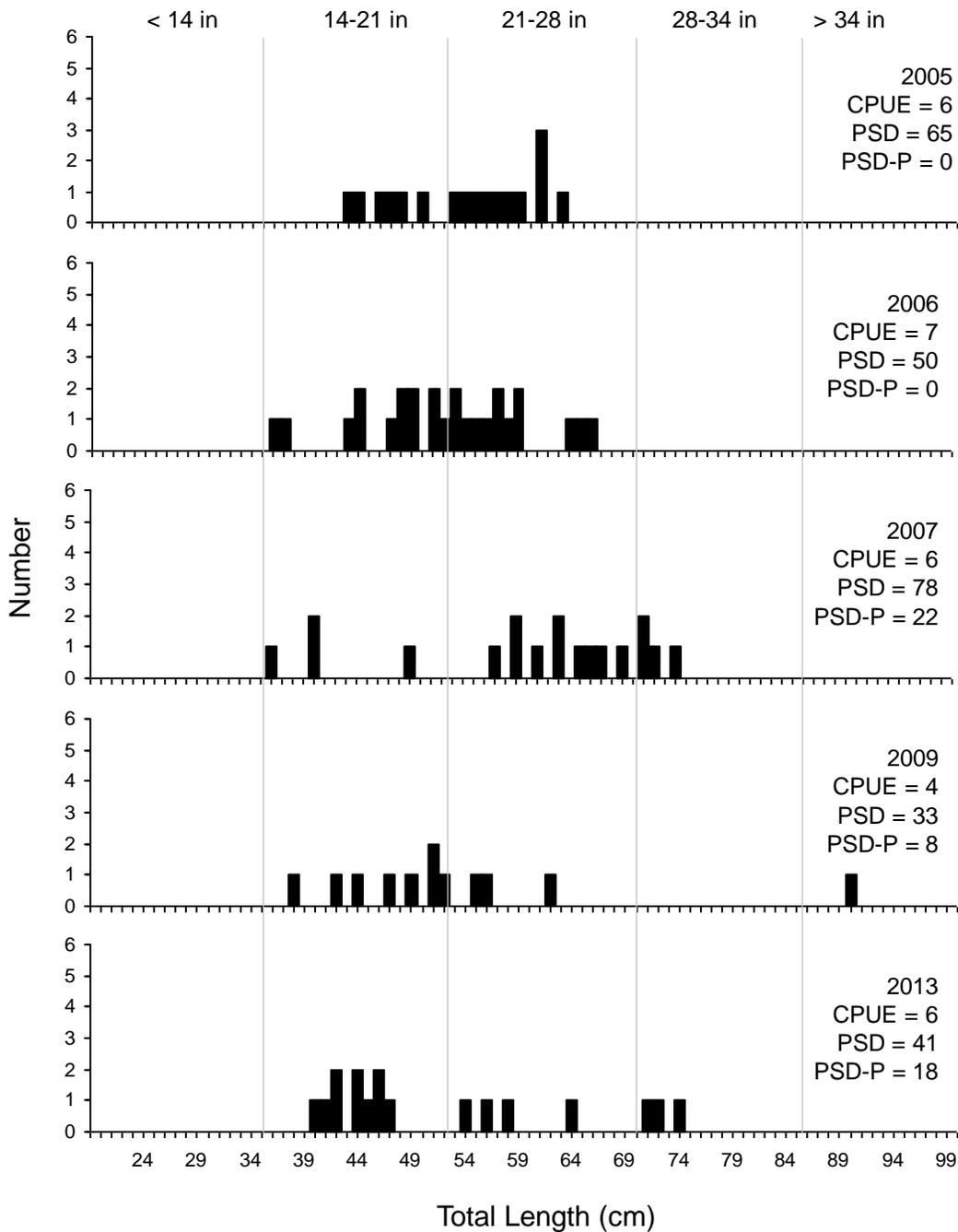


Figure 3. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for northern pike captured using gill nets in Punished Woman Lake, 2005-2013.

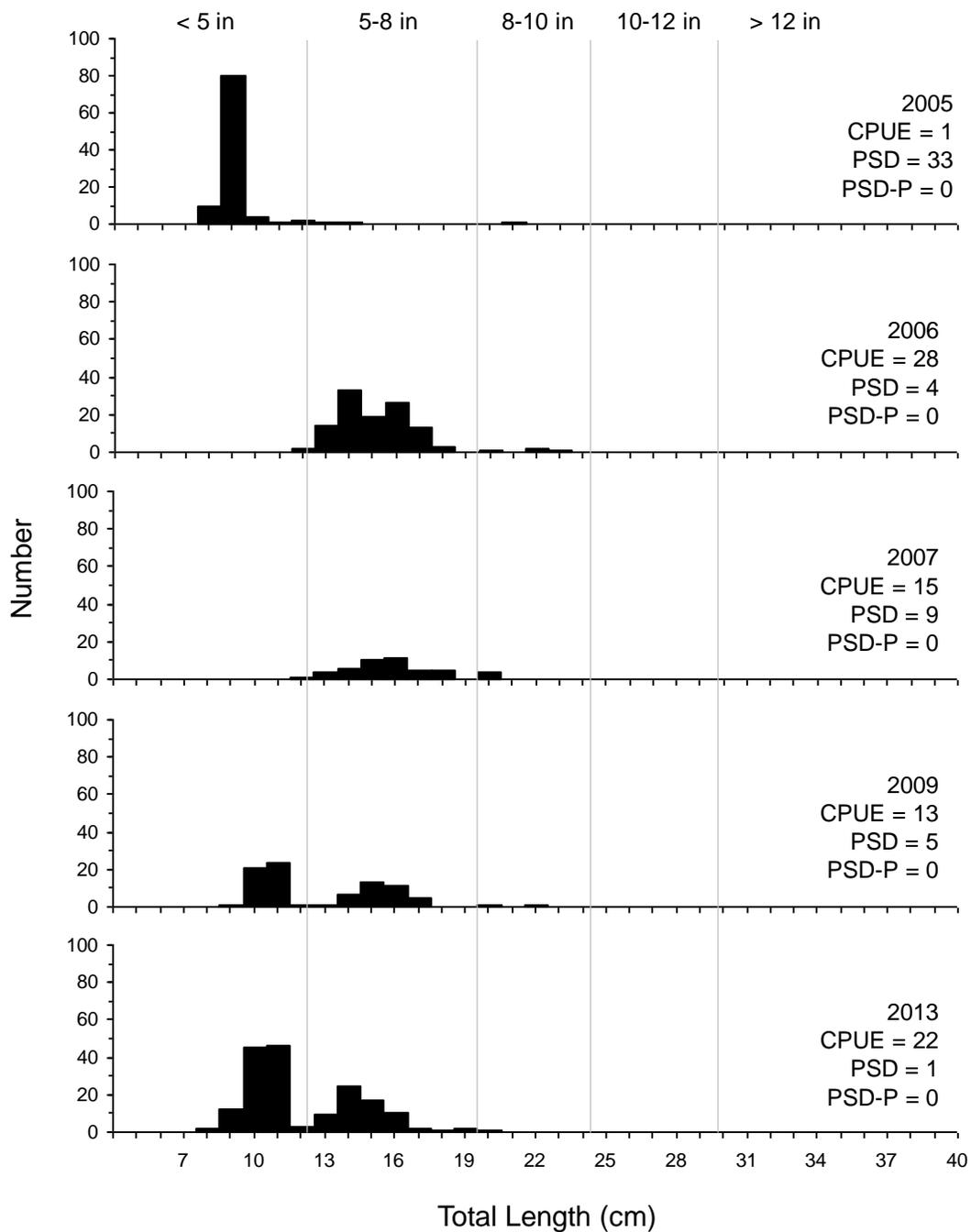


Figure 4. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for yellow perch captured using gill nets in Punished Woman Lake, 2005-2013.

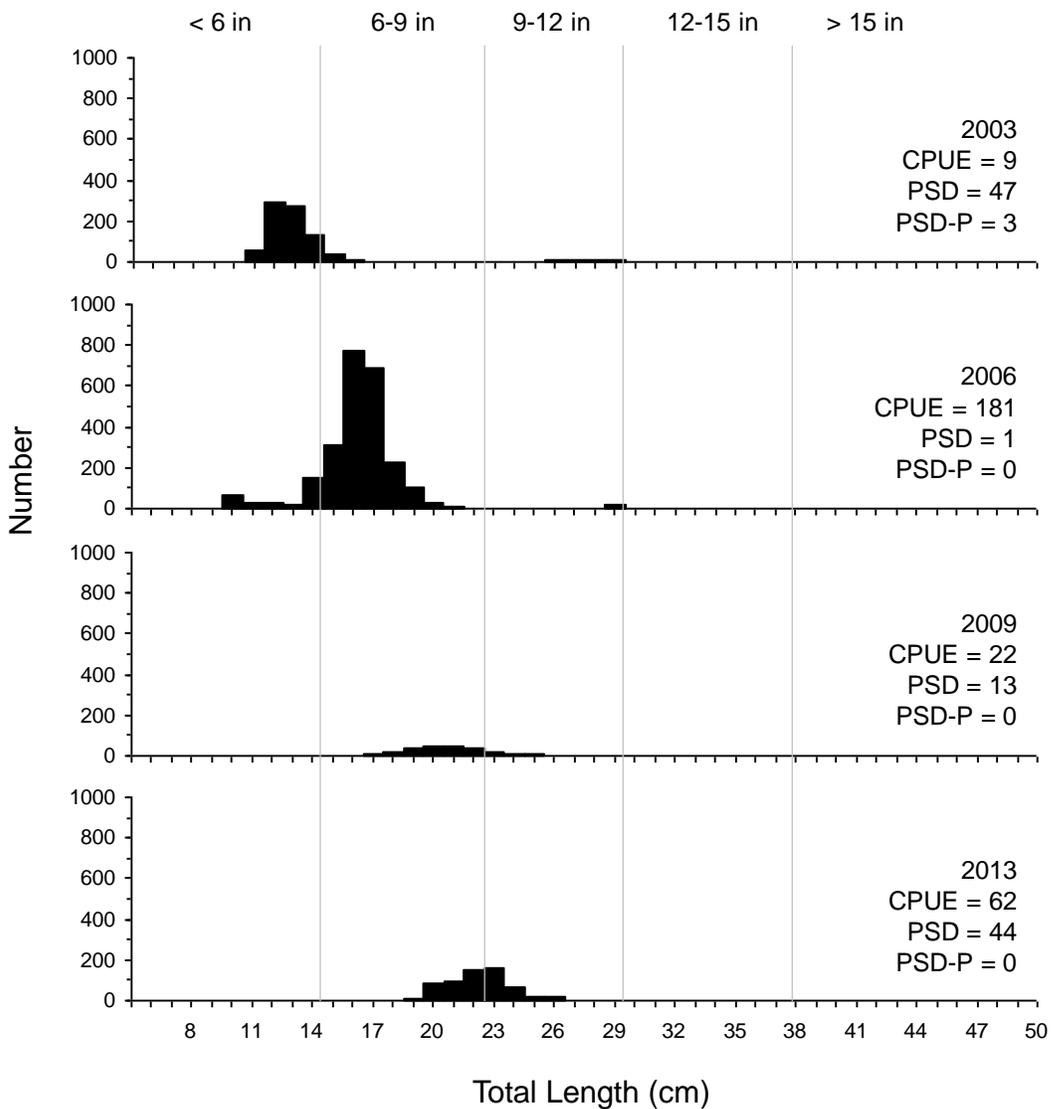


Figure 5. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for Black Bullhead captured using frame nets in Punished Woman Lake, 2003-2013.

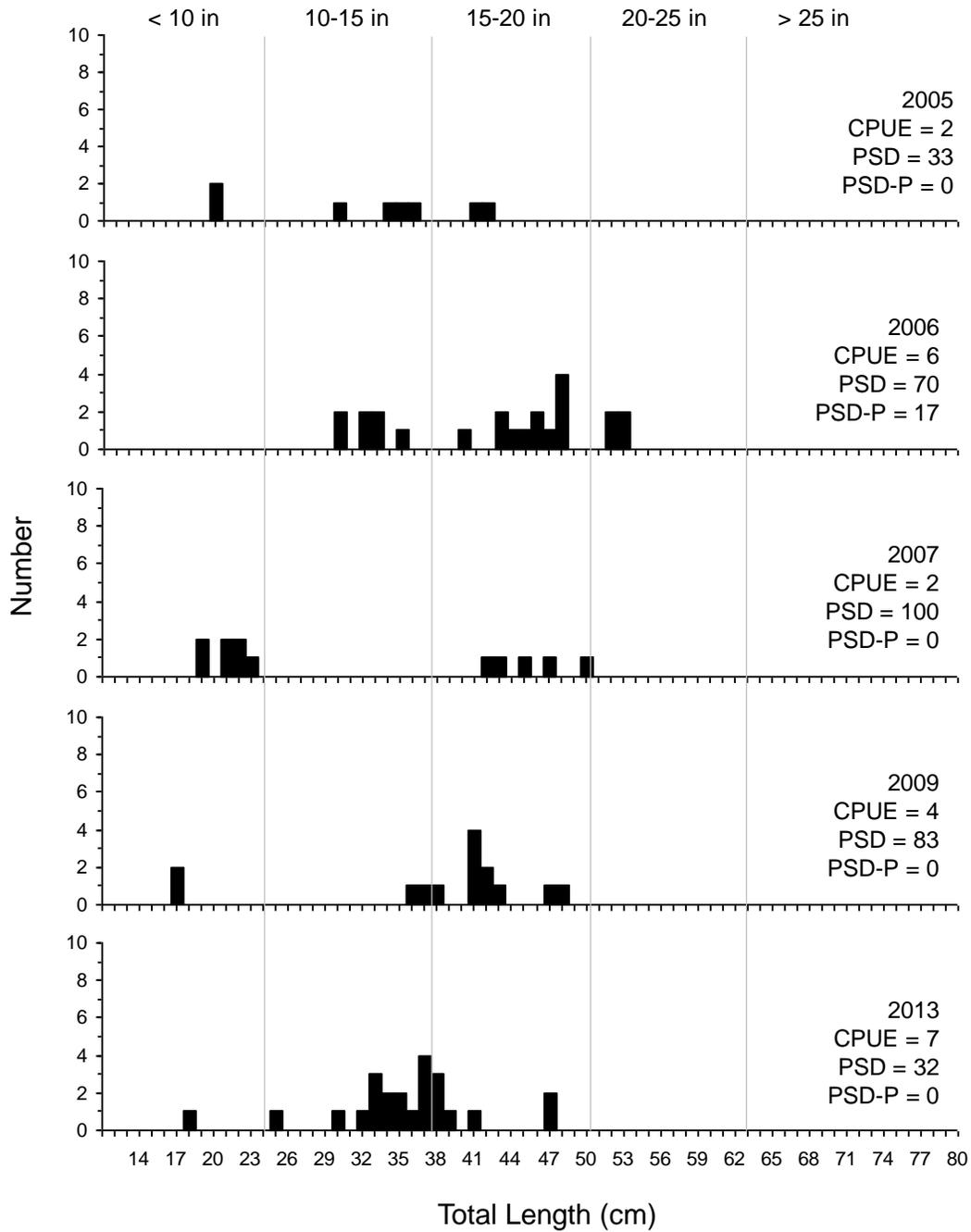


Figure 6. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for Walleye captured using gill nets in Punished Woman Lake, 2005-2013.