SOUTH DAKOTA STATEWIDE FISHERIES SURVEY
Bitter, Day County
UBS-Lake-409-800
2015

Lake Information

Name: Bitter

County: Day

Surface Area: 18,783 Acres

Maximum Depth: 32 Feet

Surveys and Investigations

Survey methods used by gear type, date, and effort.

Gear	Date	Effort
boat shocker (night)	September 16, 2015	3600 seconds
std exp gill net	August 25, 2015	4 net-nights
std exp gill net	August 26, 2015	4 net-nights

Common Fish Species Present

Walleye

Northern Pike

Yellow Perch

White Bass

Common Carp

Terminology

Catch per unit effort (**CPUE**) refers to the relative abundance of a species. It is defined as the number of fish captured per unit of effort (i.e., number of fish captured per net-night or number of fish captured per hour electrofishing). In this report CPUE is typically given for only stock-length fish (see length categories table for stock lengths).

$$CPUE = \frac{number\ of\ fish}{effort}$$

Population size structure is quantified using the indices proportional size distribution of quality-length fish (**PSD**) and proportional size distribution of preferred-length fish (**PSD-P**). These indices indicate the proportion of stock-length fish that are equal to or greater than a given length. Minimum lengths for stock, quality and preferred length fish are given in the length categories table.

$$PSD = \left(\frac{number\ of\ fish \geq quality\ length}{number\ of\ fish \geq stock\ length}\right) \text{x } 100$$

$$PSD - P = \left(\frac{number\ of\ fish\ \geq preferred\ length}{number\ of\ fish \geq stock\ length}\right) \text{x } 100$$

Relative weight (**Wr**) is used to quantify fish plumpness. Relative weight is the ratio of what a fish weighs (W) compared to a length-specific standard weight (Ws) multiplied by 100. Relative weight values of 95-105 are commonly cited as optimum values, but values in the 80s are common during summer sampling in South Dakota.

$$Wr = \left(\frac{W}{Ws}\right) \text{x } 100$$

Confidence intervals (**CI**) are provided for many of the estimates calculated in this report. The confidence interval provides a range in which the true mean is expected to fall. For example, with an 80% CI we are 80% confident that the interval contains the true value.

Length categories include stock (**S**), quality (**Q**), preferred (**P**), memorable (**M**) and trophy (**T**). Length categories for most species have been defined based on a percentage of the world record length for that species. Some species mentioned in this report do not have defined length categories. Length categories for species used in this report are provided in the following table. Measurements are the minimum total length for each category and are reported in inches (in) and centimeters (cm).

	Stock		Quality		Preferred		Memorable		Trophy	
Species Name	(in)	(cm)	(in)	(cm)	(in)	(cm)	(in)	(cm)	(in)	(cm)
Bigmouth Buffalo	11	28	18	46	24	61	30	76	37	94
Black Bullhead	6	15	9	23	12	30	15	38	18	46
Black Crappie	5	13	8	20	10	25	12	30	15	38

	Stock		Quality		Preferred		Memorable		Trophy	
Species Name	(in)	(cm)	(in)	(cm)	(in)	(cm)	(in)	(cm)	(in)	(cm)
Blue Catfish	12	30	20	51	30	76	35	89	45	114
Bluegill	3	8	6	15	8	20	10	25	12	30
Bluegill X Gr. Sunfish Hybrid	3	8	6	15	8	20	10	25	12	30
Brown Bullhead	5	13	8	20	11	28	14	36	17	43
Burbot	8	20	15	38	21	53	26	67	32	82
Channel Catfish	11	28	16	41	24	61	28	71	36	91
Common Carp	11	28	16	41	21	53	26	66	33	84
Flathead Catfish	14	35	20	51	28	71	34	86	40	102
Freshwater Drum	8	20	12	30	15	38	20	51	25	63
Gizzard Shad	7	18	11	28						
Green Sunfish	3	8	6	15	8	20	10	25	12	30
Lake Herring	5	13	8	20	11	28	14	35	17	43
Largemouth Bass	8	20	12	30	15	38	20	51	25	63
Longnose Gar	16	41	27	69	36	91	45	114	55	140
Muskellunge	20	51	30	76	38	97	42	107	50	127
Northern Pike	14	35	21	53	28	71	34	86	44	112
Paddlefish	16	41	26	66	33	84	41	104	51	130
Pumpkinseed	3	8	6	15	8	20	10	25	12	30
Redear Sunfish	4	10	7	18	9	23	11	28	13	33
River Carpsucker	7	18	11	28	14	36	18	46	22	56
Rock Bass	4	10	7	18	9	23	11	28	13	33
Rudd	6	15	10	25	12	30	15	38	19	48
Sauger	8	20	12	30	15	38	20	51	25	63
Saugeye	9	23	14	35	18	46	22	56	27	69
Shorthead Redhorse	6	15	10	25	13	33	16	41	20	51
Smallmouth Bass	7	18	11	28	14	35	17	43	20	51
Smallmouth Buffalo	11	28	18	46	24	61	30	76	37	94
Spotted Bass	7	18	11	28	14	35	17	43	20	51
Striped Bass	12	30	20	51	30	76	35	89	45	114
Striped Bass Hybrid (wiper)	8	20	12	30	15	38	20	51	25	63
Walleye	10	25	15	38	20	51	25	63	30	76
White Bass	6	15	9	23	12	30	15	38	18	46
White Crappie	5	13	8	20	10	25	12	30	15	38
White Perch	5	13	8	20	10	25	12	30	15	38
White Sucker	6	15	10	25	13	33	16	41	20	51
Yellow Bass	4	10	7	18	9	23	11	28	13	33
Yellow Bullhead	4	10	7	18	9	23	11	28	14	36
Yellow Perch	5	13	8	20	10	25	12	30	15	38

Catch Summary of Stock Length Fish

Catch per unit effort (CPUE), proportional size distribution (PSD), proportional size distribution of preferred length fish (PSD-P), and relative weight (Wr) for species sampled in survey with 80% confidence interval (CI-80).

		Abundance		Stock Density Indices				Condition	
Gear	Species	CPUE	CI-80	PSD	CI-80	PSD-P	CI-80	Wr	CI-80
boat shocker (night)	Walleye	2.0	1.9	0		0		95	6
std exp gill net	Common Carp	0.1	0.2	100		100		120	
	Northern Pike	1.5	0.7	100		33		78	3
	Walleye	41.4	2.7	14	3	1		89	0
	White Bass	0.5	0.5	100		100		108	1
	Yellow Perch	8.4	3.3	40	9	21	7	112	2

10-Year Catch Per Unit Effort by Gear and Species

Catch per unit effort (CPUE) and average (Avg) of species across 10 years using different gear types.

		CPUE										
Gear	Species	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Avg
boat shocker (night)	Walleye		440.0	138.9	422.2		377.0	36.0	34.0	9.6	2.0	182.5
frame net (std 3/4 in)	Black Bullhead								0.2			0.2
	Common Carp								1.4			1.4
	Northern Pike								2.3			2.3
	Walleye								5.7			5.7
	White Bass								0.2			0.2
	Yellow Perch								0.2			0.2
std exp gill net	Black Crappie	0.1				0.0	0.2					0.1
	Common Carp	0.0	0.3	0.1		0.1	0.5	0.1	0.0	1.4	0.1	0.3
	Northern Pike	0.8	0.3	0.4	0.2	0.3	0.5	5.0	4.1	1.5	1.5	1.5
	Rock Bass							0.4				0.4
	Spottail Shiner						0.0					0.0
	Walleye	31.8	16.9	9.1	3.7	16.9	6.7	19.8	18.0	38.8	41.4	20.3
	White Bass		0.1	0.1			0.0	0.1	0.0	1.9	0.5	0.4
	White Sucker				0.1	0.1	0.1		0.4			0.2
	Yellow Perch	11.8	2.6	4.1	6.9	8.6	13.0	67.3	21.4	5.8	8.4	15.0

10-Year Size Structure and Condition Statistics by Gear and Species

Species proportional size distribution (PSD), proportional size distribution of preferred length fish (PSD-P), and relative weight (Wr) collected by different gear types across 10 years.

			Year									
Gear	Species	Index	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
boat shocker (night)	Walleye	PSD		0	0	0		0	0	0	0	0
		PSD-P		0	0	0		0	0	0	0	0
		Wr		98	97	106		96	87	91	95	95
frame net (std 3/4 in)	Northern Pike	PSD								76		
		PSD-P								17		
		Wr								78		
	Walleye	PSD								11		
		PSD-P								3		
		Wr								85		
	Yellow Perch	PSD								33		
		PSD-P								0		
		Wr								111		
std exp gill net	Black Crappie	PSD	100				0	25				
		PSD-P	0				0	0				
		Wr	134				137	128				
	Northern Pike	PSD	100	100	100	100	63	100	98	100	100	100
		PSD-P	17	100	100	25	13	33	28	18	50	33
		Wr	102	84	75	88	93	89	86	76	75	78
	Walleye	PSD	50	91	81	24	19	76	58	30	8	14
		PSD-P	8	10	8	2	3	4	4	6	3	1
		Wr	96	90	92	95	102	93	86	83	91	89
	Yellow Perch	PSD	64	86	42	34	29	84	59	78	80	40
		PSD-P	49	29	24	13	22	14	40	49	48	21
		Wr	107	115	114	117	107	110	106	111	111	112

Length at Capture

Mean length at capture by age across years sampled, sample size (N).

Species: Walleye

		Mean Length (expanded sample number) at capture by age									
Year	N	1	2	3	4	5	6	7	8	9	10+
2015	348	228 (18)	290 (15)	315 (10)	356 (297)		479 (6)			606 (1)	538 (1)
2014	329	202 (18)	255 (13)	321 (280)	416 (2)	486 (12)	575 (1)		543 (1)	551 (1)	675 (1)
2013	150	209 (4)	276 (102)	389 (3)	471 (33)	499 (3)	503 (1)		528 (2)		584 (2)
2012	203	251 (107)	387 (15)	447 (73)	527 (4)			592 (2)			679 (2)
2011	161	313 (6)	397 (137)	464 (11)	474 (1)		545 (2)			653 (1)	594 (3)
2010	408	306 (328)	407 (42)	443 (16)		513 (15)		561 (1)	543 (3)	635 (1)	559 (2)
2009	88	287 (53)	358 (15)	457 (3)	474 (13)			483 (1)		496 (1)	574 (2)
2008	80	271 (19)	355 (1)	431 (50)			508 (4)	509 (2)	495 (1)	598 (1)	525 (2)
2007	135		402 (97)		466 (3)	497 (14)	486 (6)	504 (4)	454 (1)	599 (3)	542 (6)
2006	254	326 (131)	413 (5)	461 (9)	468 (66)		489 (31)	507 (5)	585 (3)	444 (4)	

Species: Yellow Perch

		Mean Length (expanded sample number) at capture by age									
Year	N	1	2	3	4	5	6	7	8	9	10+
2015	70	141 (27)	194 (22)	243 (3)	248 (9)	303 (3)	312 (6)				
2014	48	135 (8)	194 (3)	239 (19)	264 (7)	303 (10)	313 (1)				
2013	171	147 (1)	200 (65)	266 (20)	267 (82)	285 (3)					
2012	565	152 (249)	227 (53)	265 (251)	302 (12)	335 (2)					
2011	312	171 (28)	227 (268)	291 (11)	324 (6)						
2010	207	172 (152)	258 (48)	285 (8)							
2009	166	173 (108)	238 (55)	263 (2)	263 (2)						

Fish Condition

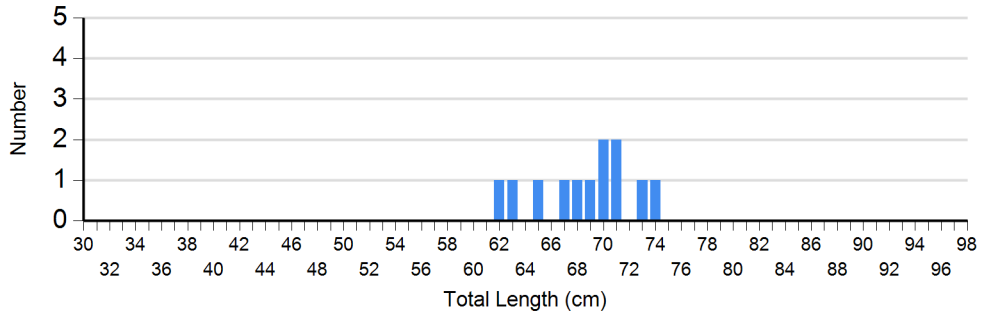
Mean relative weight (Wr) by sample size (N), length category stock to quality (S-Q), quality to preferred (Q-P), preferred to memorable (P-M), and memorable (M) for species collected across survey years with standard error (SE).

		Length Groups							
		S-Q		Q-P		P-M		M	
Species	Year	N	Wr (SE)	N	Wr (SE)	N	Wr (SE)	N	Wr (SE)
Northern Pike Gill Net	2011	0		8	89 (2.6)	4	90 (3.0)	0	
	2012	1	88	28	87 (1.6)	11	84 (1.7)	0	
	2013	0		27	75 (1.3)	4	83 (3.2)	2	78 (12.9)
	2014	0		6	74 (3.3)	5	76 (3.4)	1	78
	2015	0		8	78 (3.1)	4	78 (3.3)	0	
Walleye Gill Net	2011	39	95 (1.2)	116	92 (0.5)	4	92 (4.4)	2	99 (1.8)
	2012	67	83 (0.6)	84	88 (0.7)	5	91 (2.2)	2	88 (0.7)
	2013	101	83 (0.5)	35	82 (0.8)	8	83 (1.8)	0	
	2014	285	92 (0.3)	17	85 (1.5)	7	77 (2.4)	1	75
	2015	286	90 (0.3)	41	87 (0.9)	4	77 (1.7)	0	
Yellow Perch Gill Net	2011	49	112 (1.1)	218	111 (0.7)	37	107 (1.1)	8	106 (2.5)
	2012	223	102 (0.6)	101	111 (0.9)	202	107 (0.6)	12	100 (1.3)
	2013	38	108 (1.2)	49	112 (1.3)	79	112 (0.8)	5	103 (3.4)
	2014	9	106 (4.0)	15	116 (1.9)	14	110 (2.6)	8	110 (1.4)
	2015	40	112 (1.3)	13	118 (2.5)	8	104 (6.0)	6	110 (2.4)

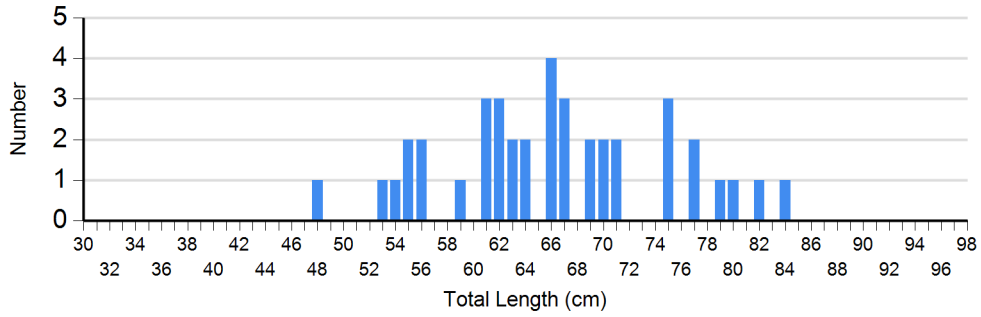
Length Frequency Distribution

Length frequency histogram of species sampled by year.

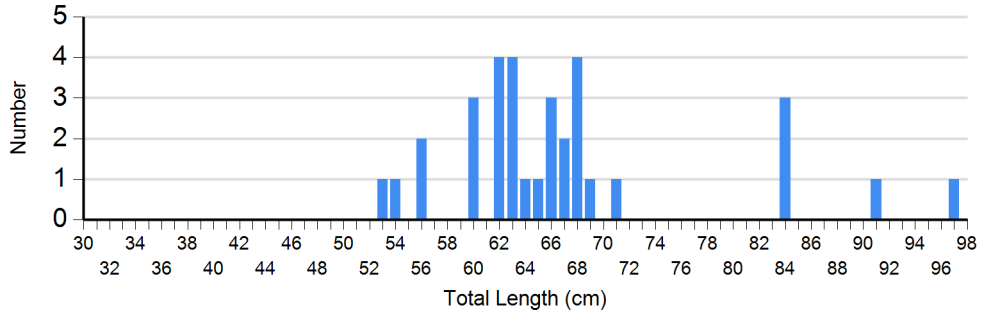
Species: Northern Pike
Gear: std exp gill net



2011



2012



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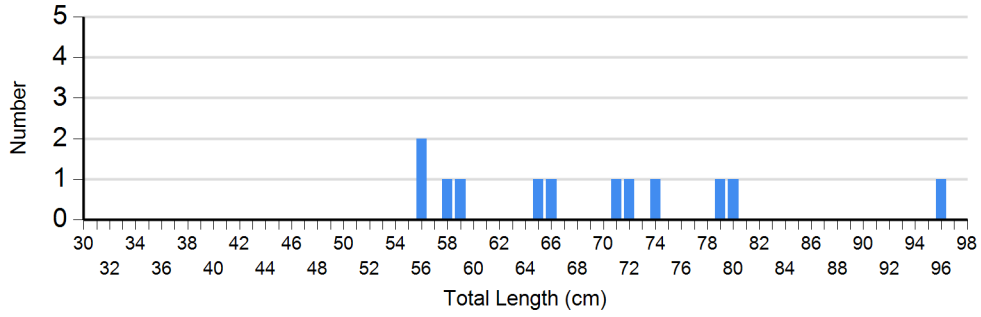
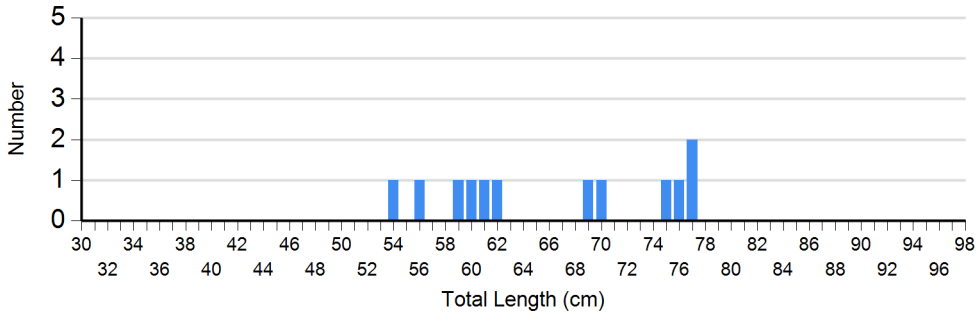
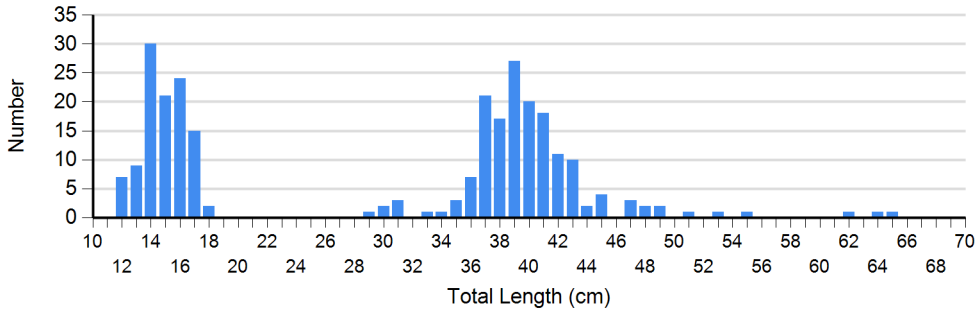


2014

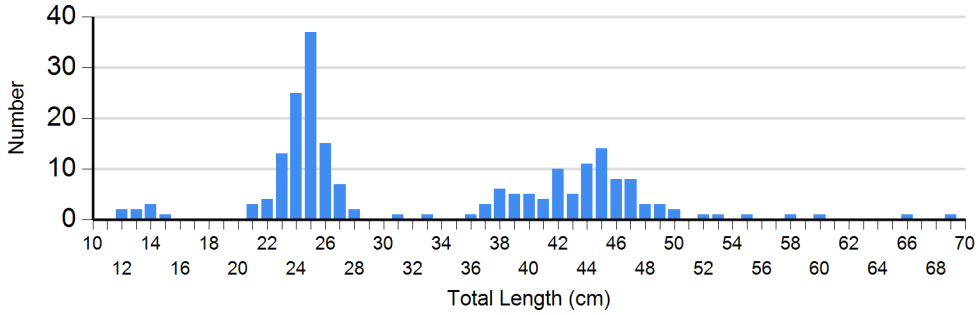


2015

Species: Walleye
Gear: std exp gill net



2011



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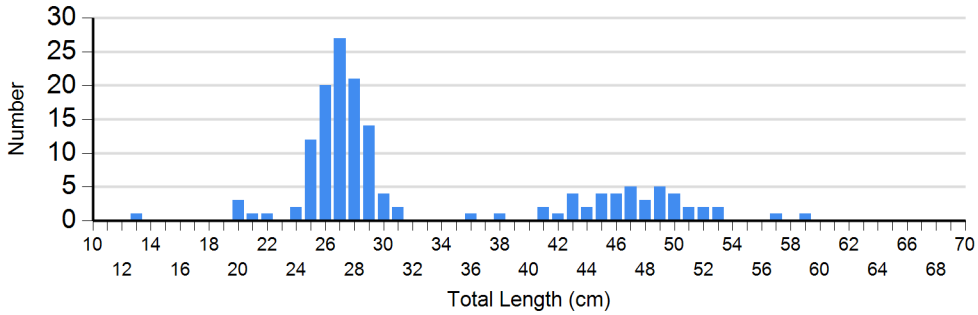

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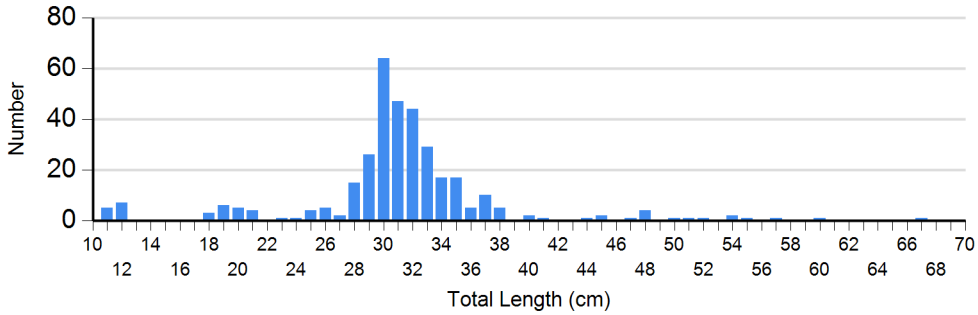
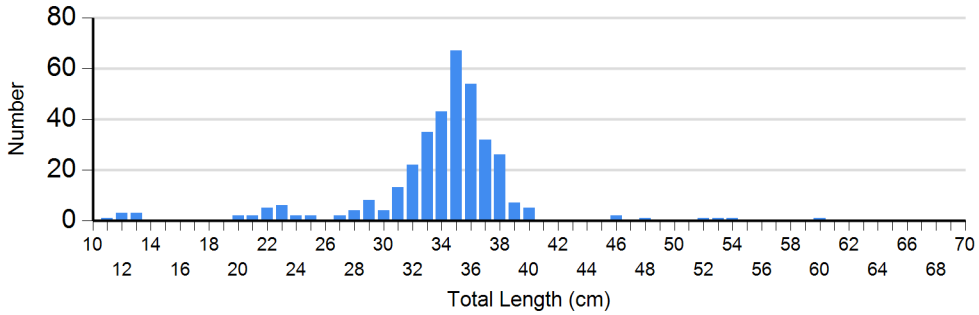
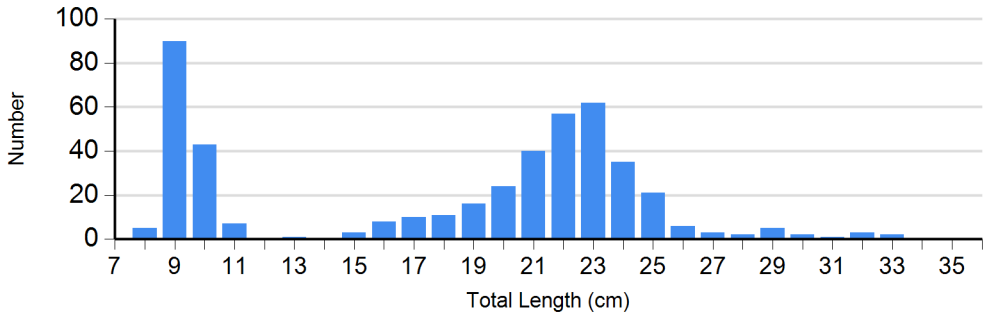


2014

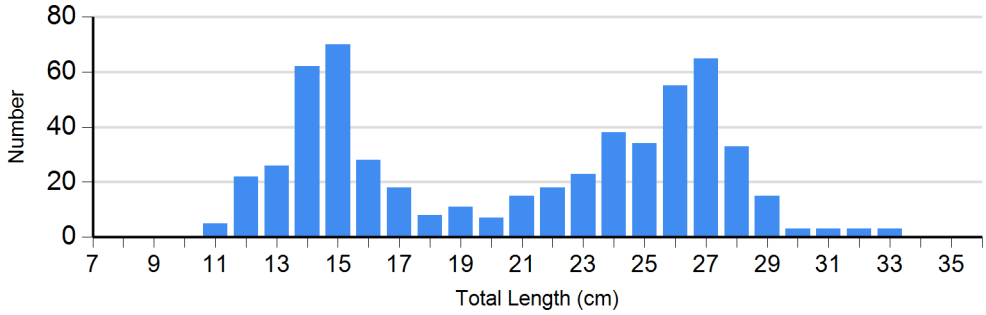


2015

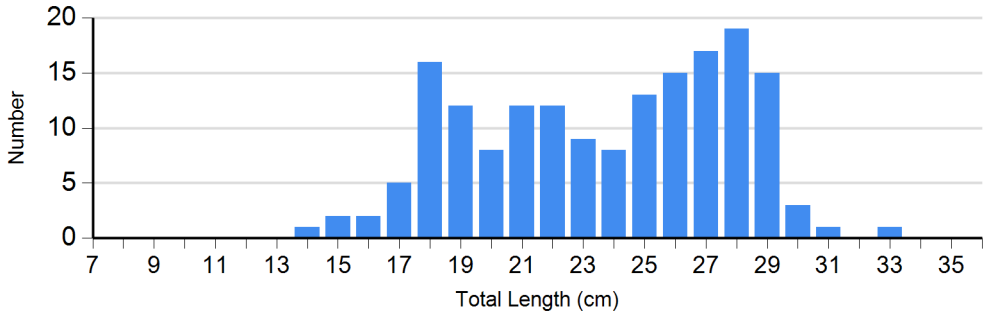
Species: Yellow Perch
Gear: std exp gill net



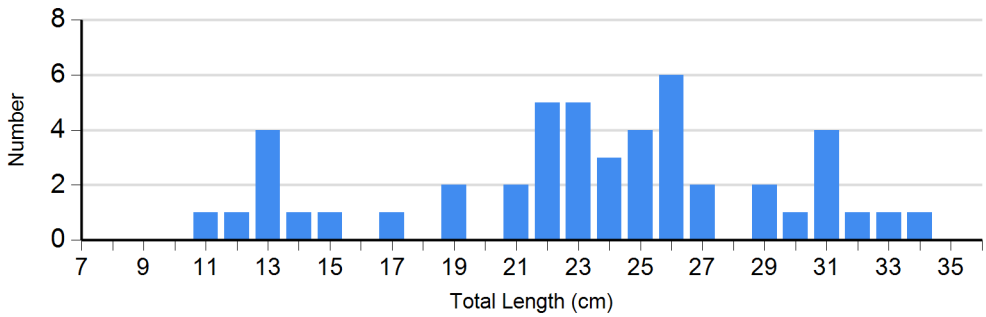
2011



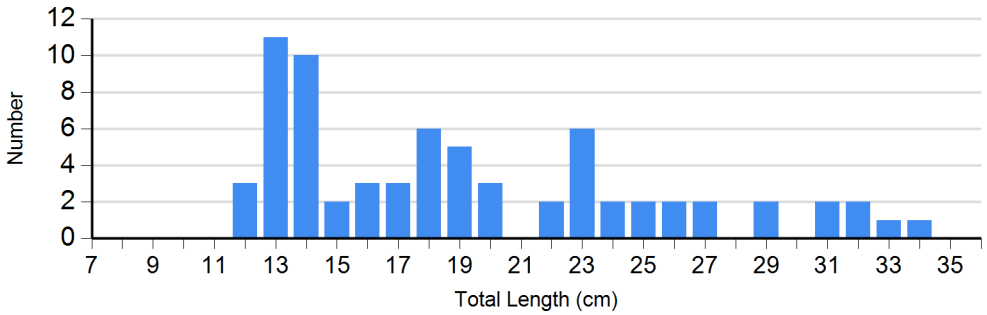
2012



2013



2014

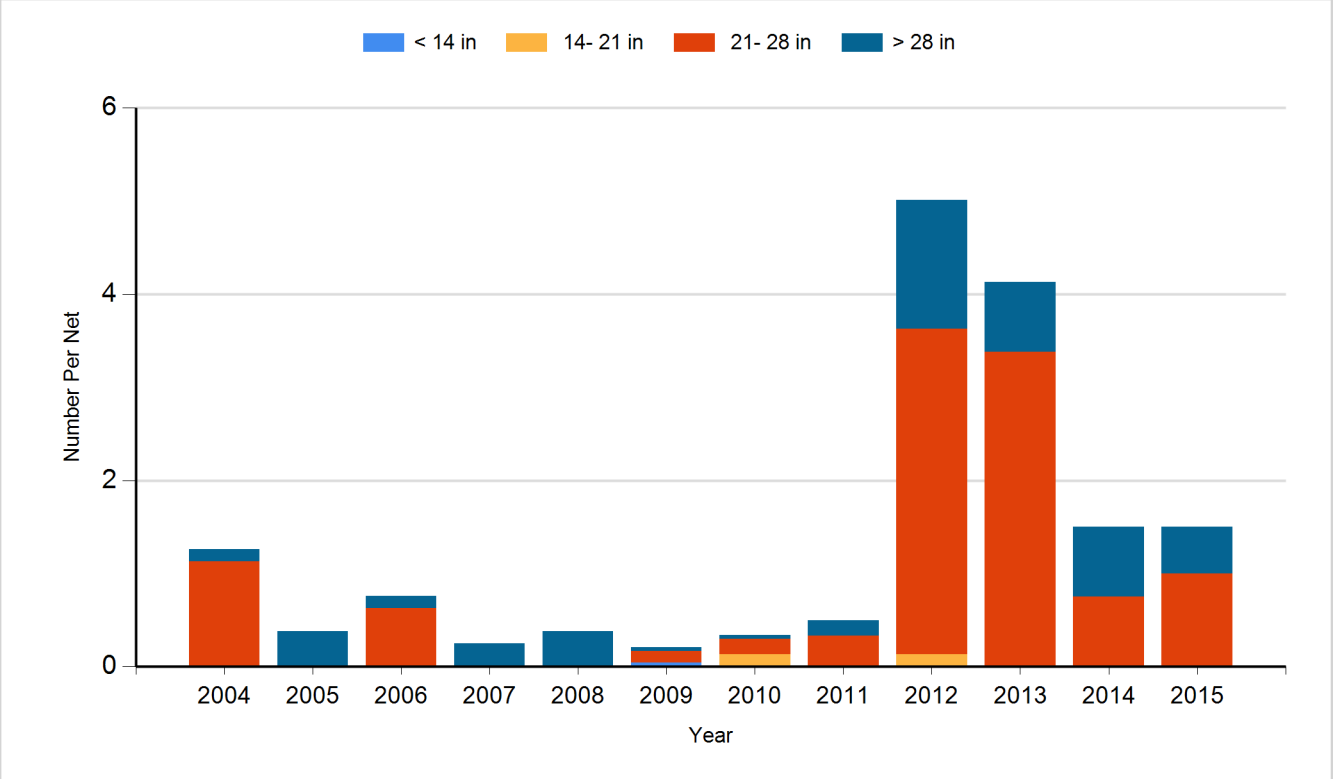

12
10
8
6
4
2
0
Number
7
9
11
13
15
17
19
21
23
25
27
29
31
33
35
Total Length (cm)

2015

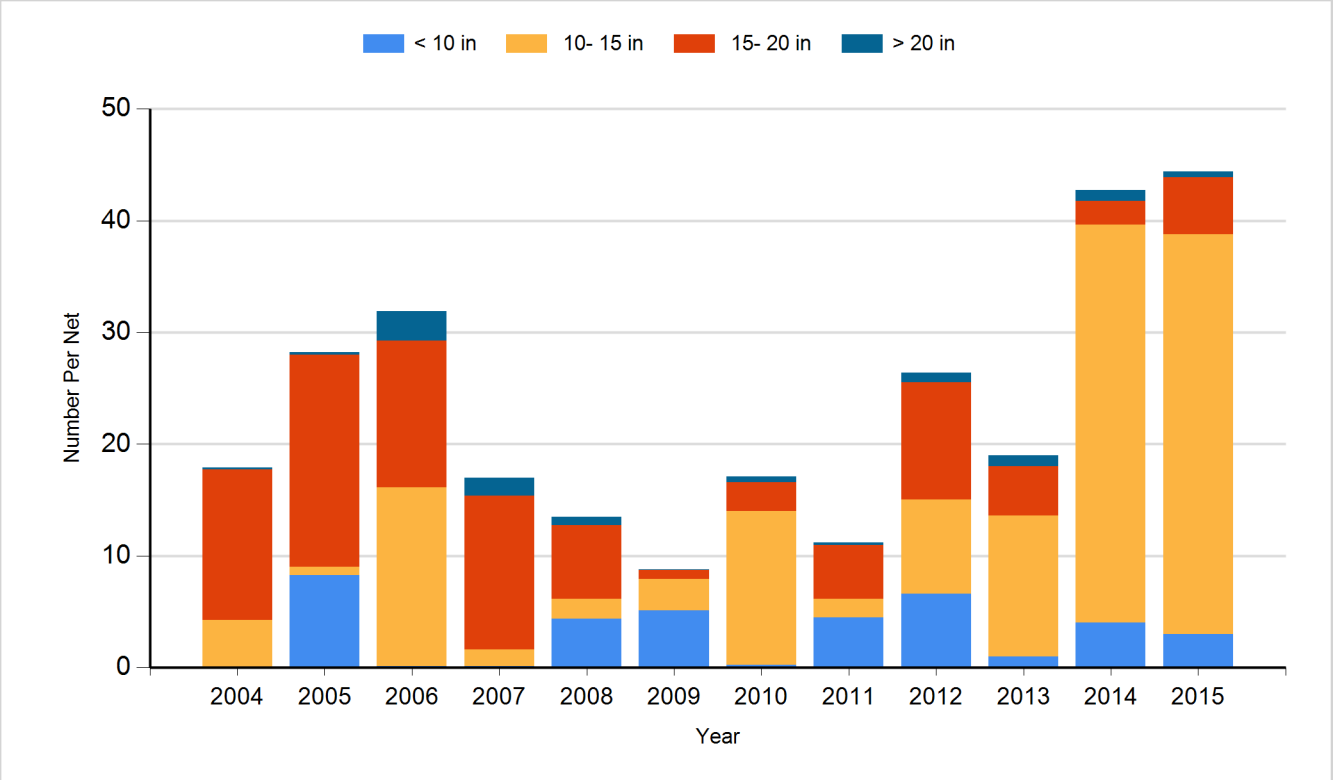
Historic Fish Sizes and Relative Abundance

Size distribution per net by color for species sampled by year.

Species: Northern Pike
Gear: Gill Net



Species: Walleye
Gear: Gill Net



Species: Yellow Perch
Gear: Gill Net