SOUTH DAKOTA STATEWIDE FISHERIES SURVEY
Richmond, Brown County
UJA-Lake-831-800
2016

Lake Information

Name:	Richmond	**Maximum Depth:**	23 Feet
County:	Brown	**Mean Depth:**	8 Feet
Surface Area:	741 Acres		

Surveys and Investigations

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

Gear	Date	Effort
AFS std frame net	August 09, 2016	6 net-nights
AFS std frame net	August 10, 2016	6 net-nights
AFS std frame net	August 11, 2016	6 net-nights
AFS std gill net	August 09, 2016	4 net-nights
AFS std gill net	August 10, 2016	4 net-nights
AFS std gill net	August 11, 2016	4 net-nights
boat shocker (night)	September 29, 2016	2405 seconds

Common Fish Species Present

Walleye

Largemouth Bass

Bluegill

Black Crappie

Black Bullhead

White Bass

Common Carp

Channel Catfish

Yellow Perch

White Sucker

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
AFS std frame net	Black Bullhead	85.5	37.1	76	1	0		90	1
	Black Crappie	9.8	4.6	84	4	24	5	107	1
	Bluegill	4.8	3.3	97		38	7	119	2
	Channel Catfish	0.5	0.3	100		78		94	10
	Common Carp	1.0	0.3	100		83		91	3
	Northern Pike	0.3	0.2	67		17		79	3
	Walleye	2.4	1.0	16	9	2		83	1
	White Bass	6.4	2.4	93	4	43	6	88	1
	White Sucker	0.4	0.2	100		100		91	3
	Yellow Perch	0.3	0.2	40		0		102	5
AFS std gill net	Black Bullhead	42.5	7.7	41	3	0		98	1
	Black Crappie	0.6	0.3	57		29		112	5
	Bluegill	0.1	0.1	100		0		140	
	Channel Catfish	2.2	0.6	92		54	15	109	4
	Common Carp	2.3	0.7	96		15		95	2
	Northern Pike	0.1	0.1	100		0		88	
	Walleye	2.4	0.9	52	14	3		87	1
	White Bass	2.8	1.3	91		0		92	1
	Yellow Perch	1.8	0.8	82		50	17	102	2
boat shocker (night)	Walleye	10.5	4.7	0		0		94	3

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	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Avg
AFS std frame net	Black Bullhead										85.5	85.5
	Black Crappie										9.8	9.8
	Bluegill										4.8	4.8
	Channel Catfish										0.5	0.5
	Common Carp										1.0	1.0
	Northern Pike										0.3	0.3
	Walleye										2.4	2.4
	White Bass										6.4	6.4
	White Sucker										0.4	0.4
	Yellow Perch										0.3	0.3
AFS std gill net	Black Bullhead										42.5	42.5
	Black Crappie										0.6	0.6
	Bluegill										0.1	0.1
	Channel Catfish										2.2	2.2
	Common Carp										2.3	2.3
	Northern Pike										0.1	0.1
	Walleye										2.4	2.4
	White Bass										2.8	2.8
	Yellow Perch										1.8	1.8
boat shocker (night)	Largemouth Bass	7.0		2.0								4.5
	Smallmouth Bass	1.0										1.0
	Walleye	2.0	46.2	7.6		34.0					10.5	20.1
frame net (std 3/4 in)	Black Bullhead	18.2	1.4	55.8	76.5	39.1	236.3	229.2	99.2	65.2		91.2
	Black Crappie	241.1	192.6	58.0	0.7	5.9	8.8	8.1	14.3	9.4		59.9
	Bluegill	83.3	33.3	29.7	60.2	60.7	51.3	20.0	33.6	17.9		43.3
	Bluegill X Gr. Sunfish Hybrid					0.1						0.1
	Channel Catfish	4.0	1.8	2.2	2.1	0.9	0.1	0.3	0.4	0.7		1.4
	Common Carp	1.2	1.8	0.4	0.4	0.1	0.4	0.2	0.8	0.6		0.7
	Green Sunfish									0.1		0.1
	Largemouth Bass		0.3		0.1							0.2
	Northern Pike	0.2	0.3	0.1	0.7	0.6	0.4	0.1	0.2	0.7		0.4
	Pumpkinseed					0.1						0.1
	Rock Bass	0.1		0.1								0.1

		CPUE										
Gear	Species	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Avg
frame net (std 3/4 in)	Smallmouth Bass	0.6	0.8	0.5	1.0	0.1						0.6
	Snapping Turtle	0.0										0.0
	Walleye	1.4	0.7	1.1	1.5	2.2	0.8	1.0	2.2	3.3		1.6
	Western Painted Turtle	0.0								0.0		0.0
	White Bass	26.6	13.3	8.1	6.1	17.6	5.2	4.0	2.7	3.7		9.7
	White Sucker	0.8	0.2	0.2	0.1	0.1	0.2	0.2		0.2		0.3
	Yellow Perch	0.2	0.4	0.6	0.2	0.9	1.2	0.3	1.9	0.9		0.7
std exp gill net	Black Bullhead	6.3	3.5	3.7	12.5	8.2	108.5	109.0	90.7	51.6		43.8
	Black Crappie	27.2	61.3	4.3	0.2	0.1	1.0	2.2	0.7	1.0		10.9
	Bluegill	0.2	0.3	0.1	1.5	0.2	1.3	1.0	0.2			0.6
	Channel Catfish	2.7	2.5	0.7	1.3	0.7	2.2	1.5	0.2	0.2		1.3
	Common Carp	5.5	2.0	0.2	0.3	0.1	1.7	1.5	0.8	1.4		1.5
	Northern Pike		0.3	0.1	3.7	0.2	0.7	1.0	0.5	0.4		0.9
	Walleye	2.7	1.5	0.8	5.2	2.8	5.8	4.0	1.8	7.2		3.5
	White Bass	10.2	10.5	0.9	1.3	0.4	2.0	1.5	0.2	0.2		3.0
	White Sucker				0.2		0.2	0.2	0.3	0.2		0.2
	Yellow Perch	0.8	4.8	1.2	10.7	1.8	11.8	8.3	11.3	8.8		6.6

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	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
AFS std frame net	Black Crappie	PSD										84
		PSD-P										24
		Wr										107
	Northern Pike	PSD										67
		PSD-P										17
		Wr										79
	Walleye	PSD										16
		PSD-P										2
		Wr										83
	Yellow Perch	PSD										40
		PSD-P										0
		Wr										102
AFS std gill net	Black Crappie	PSD										57
		PSD-P										29
		Wr										112
	Northern Pike	PSD										100
		PSD-P										0
		Wr										88
	Walleye	PSD										52
		PSD-P										3
		Wr										87
	Yellow Perch	PSD										82
		PSD-P										50
		Wr										102
boat shocker (night)	Walleye	PSD	0	0	0		0					0
		PSD-P	0	0	0		0					0
		Wr	81	84	86		89					94
frame net (std 3/4 in)	Black Crappie	PSD	13	88	93	67	23	66	64	85	96	
		PSD-P	2	2	0	8	2	0	0	0	5	
		Wr	96	106	103	105	101	108	106	99	100	
	Northern Pike	PSD	100	20	50	23	55	38	0	100	58	

			Year									
Gear	Species	Index	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
frame net (std 3/4 in)	Northern Pike	PSD-P	100	20	0	8	18	0	0	67	33	
		Wr	77	79	84	85	79	75	59	76	87	
	Walleye	PSD	41	31	21	4	25	7	22	8	5	
		PSD-P	15	15	5	4	0	0	6	0	0	
		Wr	73	82	84	85	85	78	81	85	90	
	Yellow Perch	PSD	67	75	100	100	50	55	100	88	100	
		PSD-P	0	13	36	75	0	0	0	15	41	
		Wr	91	99	88	85	88	95	96	92	100	
std exp gill net	Black Crappie	PSD	4	82	96	100	0	50	54	100	60	
		PSD-P	0	0	0	0	0	0	0	0	40	
		Wr	111	108	107	104	115	123	105	103	121	
	Northern Pike	PSD		0	100	14	100	50	100	100	50	
		PSD-P		0	0	5	0	0	17	0	0	
		Wr		86	78	88	83	82	78	88	88	
	Walleye	PSD	81	67	7	10	30	54	21	27	17	
		PSD-P	44	11	0	0	2	6	8	0	0	
		Wr	79	83	88	90	90	84	84	84	93	
	Yellow Perch	PSD	60	41	100	23	31	61	56	84	93	
		PSD-P	20	7	19	9	3	0	0	9	30	
		Wr	93	102	102	97	98	101	97	103	111	

Length at Capture

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

Species: Black Crappie

		Mean Length (expanded sample number) at capture by age									
Year	N	1	2	3	4	5	6	7	8	9	10+
2016	176	157 (17)	203 (46)	228 (8)	250 (7)	247 (76)	244 (20)			234 (3)	
2015	168	136 (4)	201 (6)	234 (19)	231 (114)	242 (26)					
2014	257		143 (1)	184 (1)	205 (151)	221 (81)	218 (24)				
2013	146		192 (51)	217 (95)							
2010	12	139 (2)	190 (2)	217 (1)	235 (1)	239 (6)					
2009	1084	106 (40)	182 (57)	193 (9)	220 (965)	245 (14)					
2008	3684	133 (40)	130 (140)	209 (3378)	238 (92)	294 (34)					
2007	4580		189 (4145)	185 (283)	231 (75)	227 (1)	282 (76)				

Species: Walleye

		Mean Length (expanded sample number) at capture by age									
Year	N	1	2	3	4	5	6	7	8	9	10+
2016	31		272 (10)	348 (7)	411 (4)	435 (9)	531 (1)				
2015	51	234 (21)	300 (14)	335 (6)	348 (6)	410 (3)		489 (1)			
2014	16	211 (4)	253 (1)	304 (8)	396 (1)	366 (1)	406 (1)				
2013	38	217 (4)	248 (20)	310 (9)	468 (2)	493 (1)	547 (2)				
2012	37	220 (2)	309 (13)		410 (16)	455 (5)					640 (1)
2011	55	249 (8)		361 (37)	380 (7)	426 (2)					637 (1)
2010	31		304 (17)	338 (11)	371 (3)						
2009	27	233 (14)	263 (7)	318 (6)							
2008	13	203 (3)	247 (3)		404 (3)		432 (1)	480 (1)	624 (1)	495 (1)	
2007	19	205 (3)	455 (1)	380 (5)	523 (1)		542 (1)	492 (4)		523 (1)	548 (3)

Species: Yellow Perch

		Mean Length (expanded sample number) at capture by age									
Year	N	1	2	3	4	5	6	7	8	9	10+
2016	22	168 (3)	174 (1)	242 (6)	238 (2)	275 (7)	274 (3)				
2015	44		205 (8)	216 (6)	240 (27)	272 (1)	272 (2)				
2014	68	169 (4)		216 (45)	237 (12)	248 (8)					
2013	50		191 (22)	221 (18)	229 (10)						
2012	69	147 (11)	193 (20)	216 (38)							
2011	32	149 (3)	194 (26)	233 (2)				297 (1)			
2009	21		226 (11)		247 (9)		253 (1)				

Fish Condition

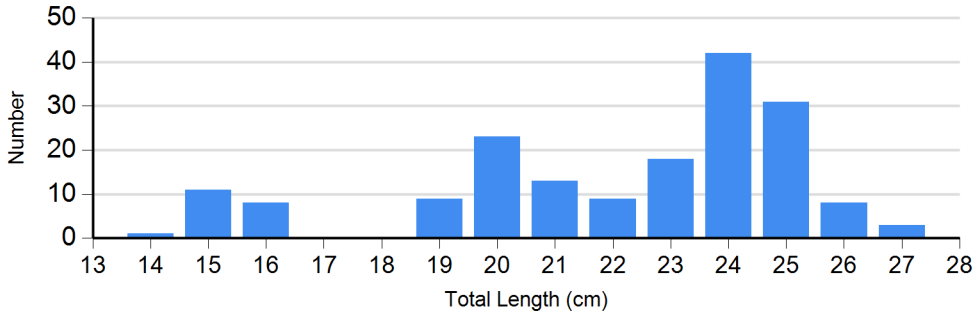
Mean relative weight (Wr) by sample size (N), length category stock to quality (S-Q), quality to preferred (Q-P), preferred to memorable (P-M), and memorable (M) for species collected across survey years with standard error (SE).

		Length Groups							
		S-Q		Q-P		P-M		M	
Species	Year	N	Wr (SE)	N	Wr (SE)	N	Wr (SE)	N	Wr (SE)
Black Crappie Frame Net	2012	54	113 (1.5)	104	106 (0.6)	0		0	
	2013	52	110 (1.2)	94	105 (0.9)	0		0	
	2014	38	102 (1.2)	219	98 (0.4)	0		0	
	2015	7	112 (3.6)	154	100 (0.5)	9	98 (2.6)	0	
	2016	29	121 (3.0)	105	106 (0.9)	42	100 (1.3)	0	
Northern Pike Gill Net	2012	2	83 (1.9)	2	81 (3.5)	0		0	
	2013	0		5	79 (2.8)	1	76	0	
	2014	0		3	88 (2.0)	0		0	
	2015	1	96	1	81	0		0	
	2016	0		1	88	0		0	
Walleye Gill Net	2012	16	83 (1.5)	17	83 (1.4)	1	86	1	103
	2013	19	84 (1.8)	3	82 (2.6)	2	79 (2.1)	0	
	2014	8	84 (1.7)	3	83 (2.6)	0		0	
	2015	30	94 (1.8)	6	89 (1.7)	0		0	
	2016	14	86 (2.0)	14	88 (1.0)	1	87	0	
Yellow Perch Gill Net	2012	28	103 (1.6)	43	100 (1.0)	0		0	
	2013	22	101 (1.5)	28	94 (1.5)	0		0	
	2014	11	105 (1.8)	51	103 (1.1)	6	97 (0.7)	0	
	2015	3	108 (1.5)	28	114 (1.7)	13	105 (1.6)	0	
	2016	4	105 (3.8)	7	107 (3.6)	11	98 (1.5)	0	

Length Frequency Distribution

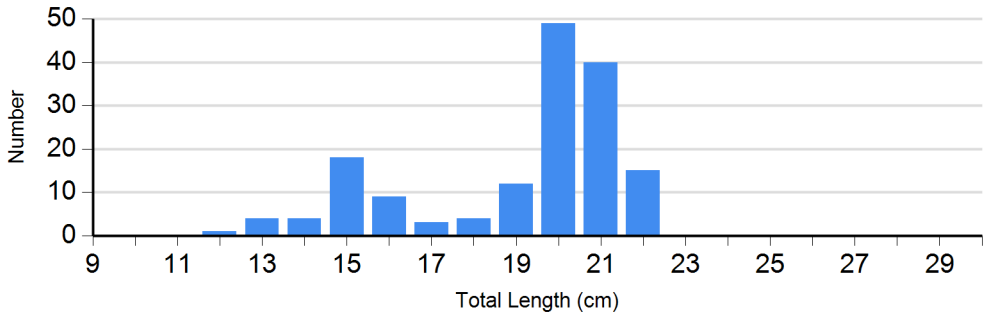
Length frequency histogram of species sampled by year.

Species: Black Crappie
Gear: AFS std frame net

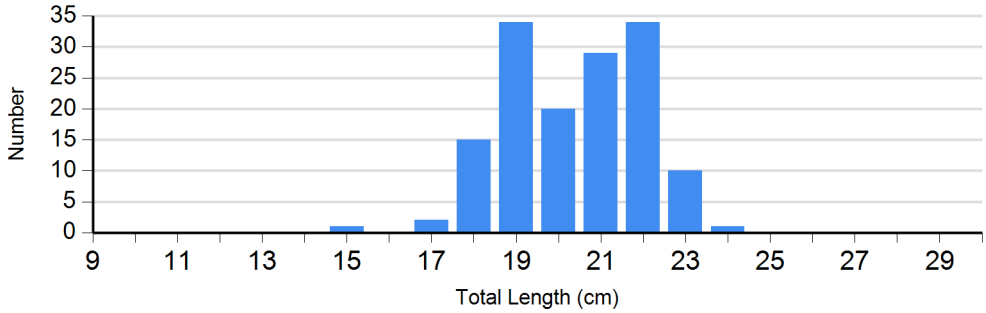


2016

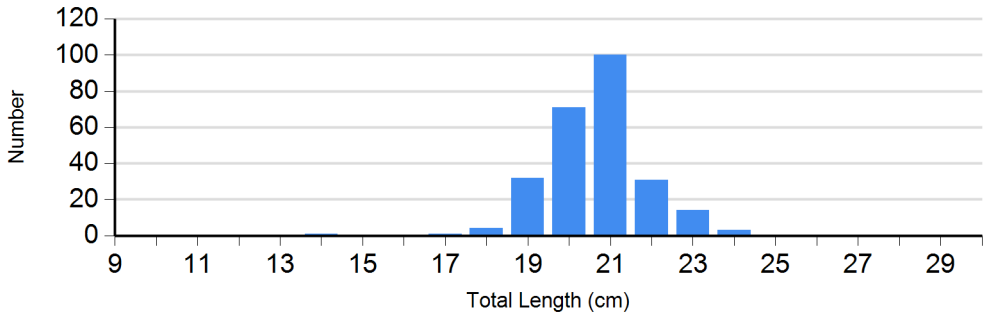
Species: Black Crappie
Gear: frame net (std 3/4 in)



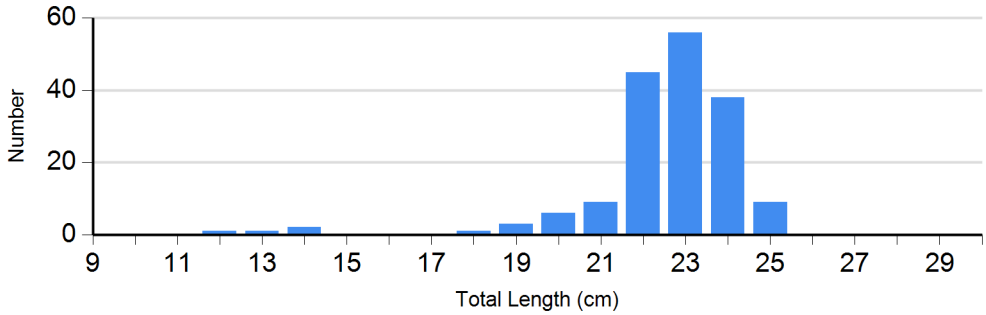
2012



2013

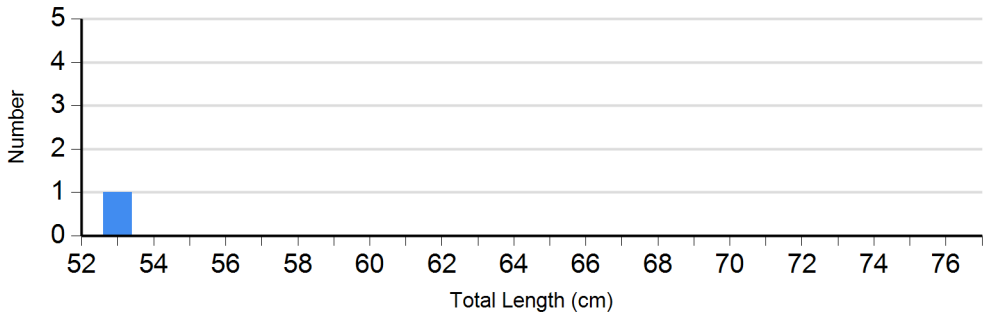


2014



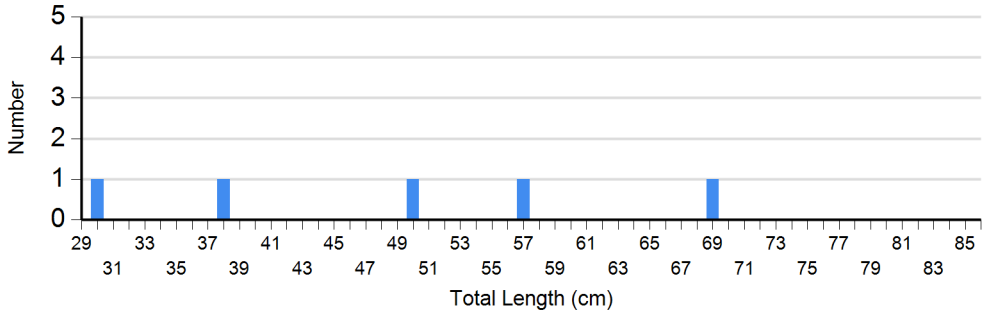
2015

Species: Northern Pike
Gear: AFS std gill net

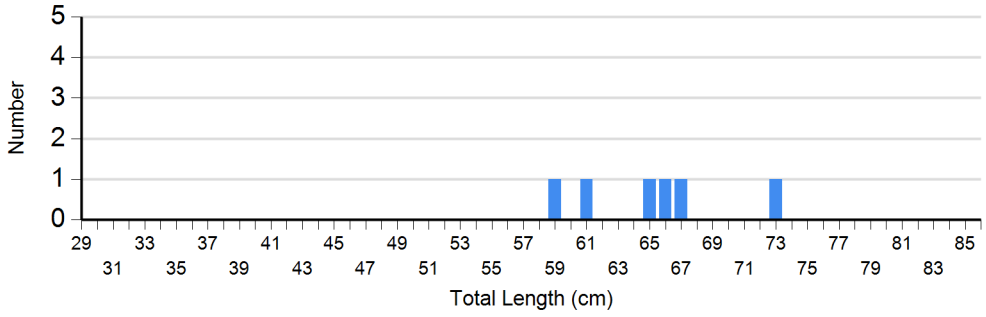


2016

Species: Northern Pike
Gear: std exp gill net



2012



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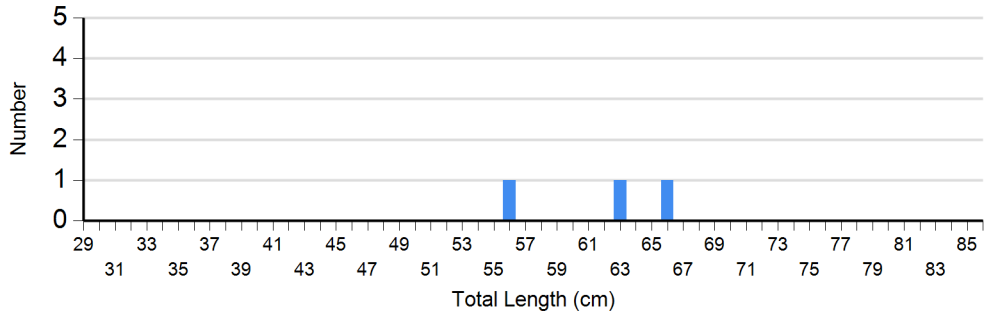

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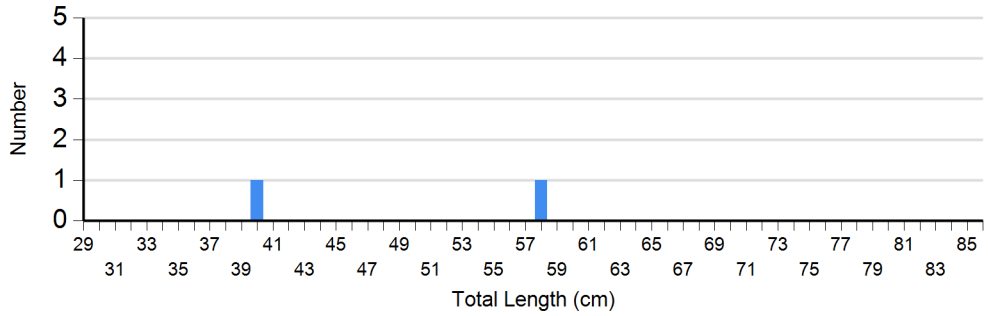
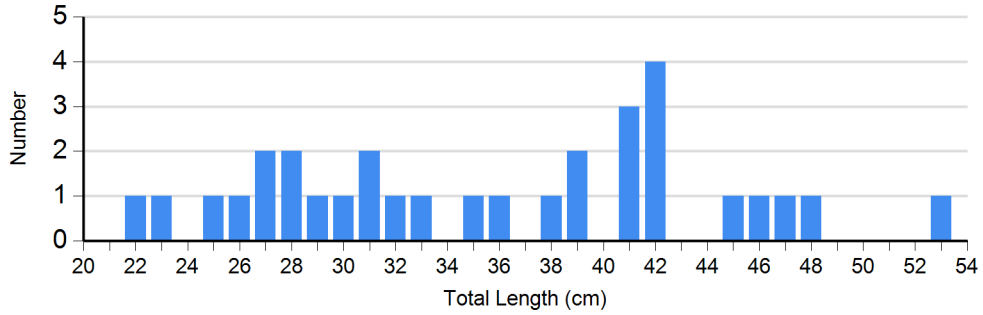


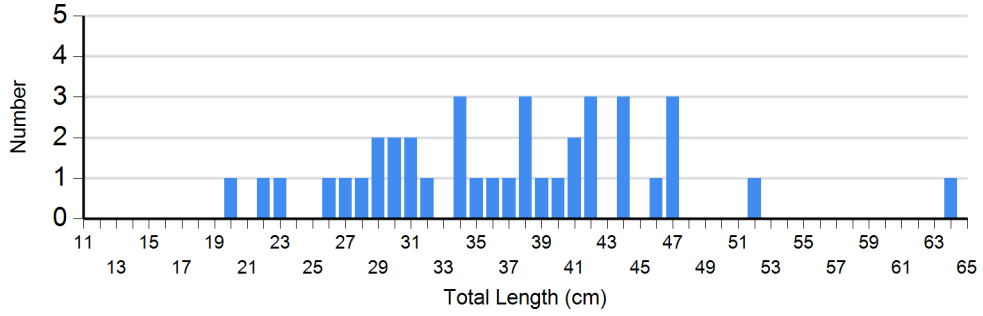
2015

Species: Walleye
Gear: AFS std gill net



2016

Species: Walleye
Gear: std exp gill net



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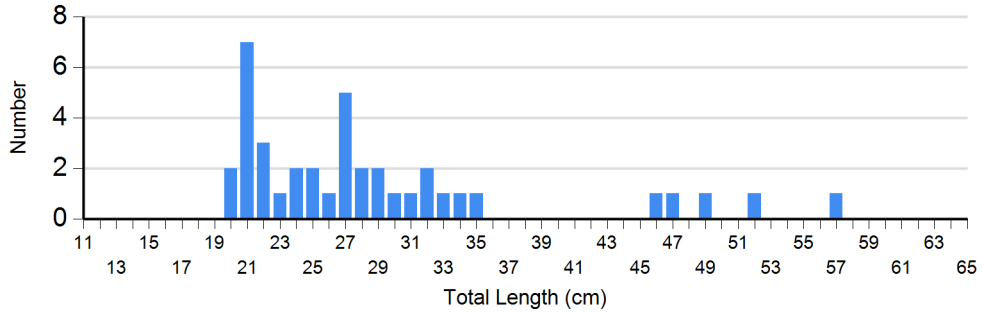

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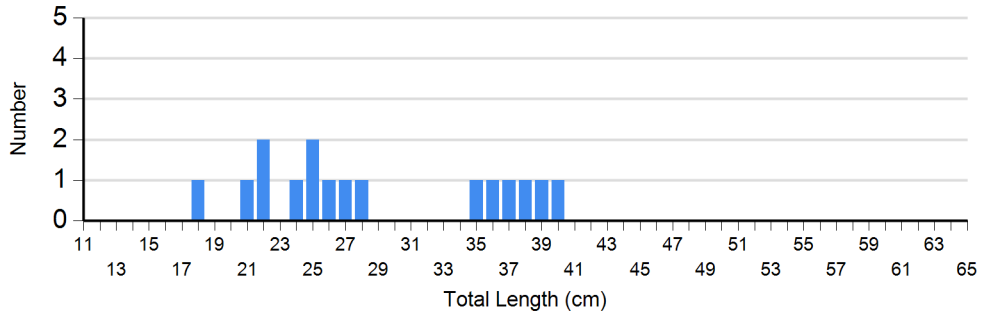

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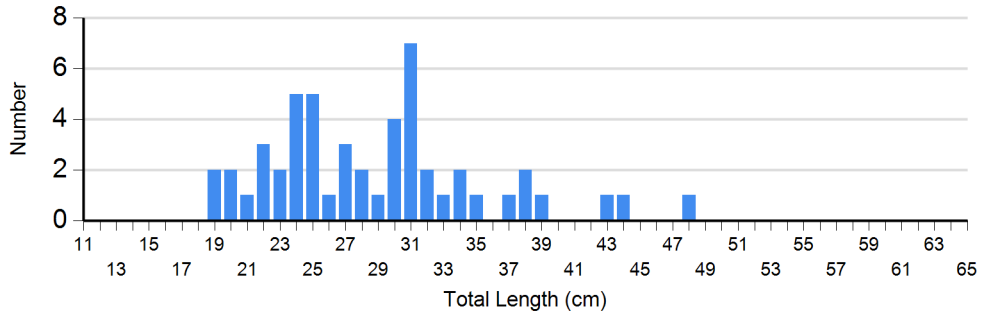
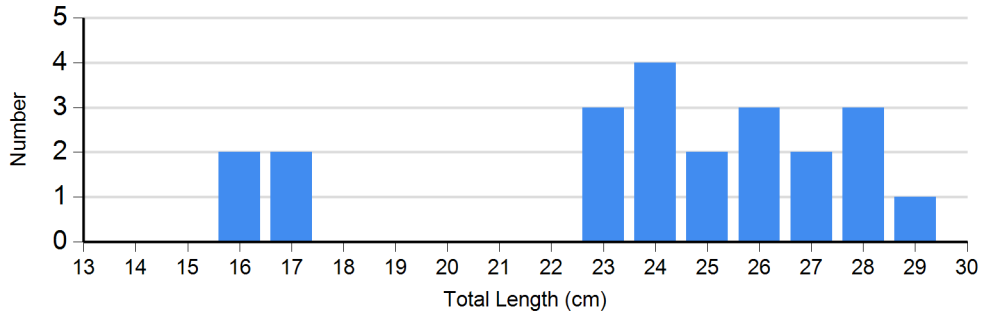


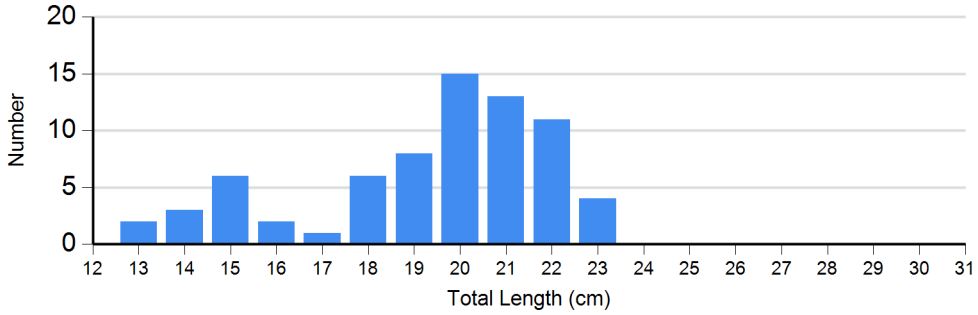
2015

Species: Yellow Perch
Gear: AFS std gill net



2016

Species: Yellow Perch
Gear: std exp gill net



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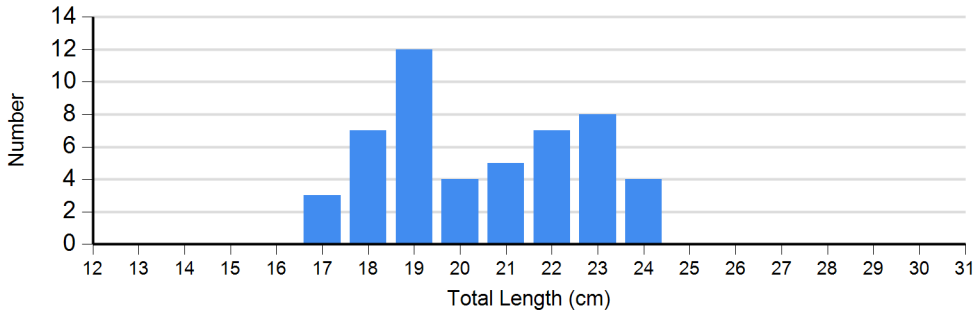

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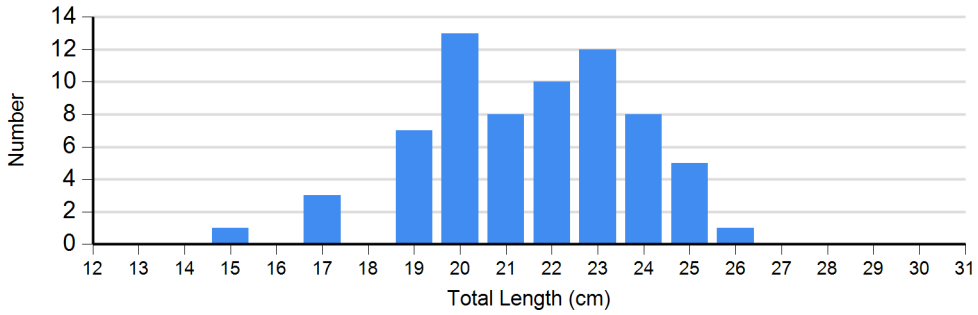

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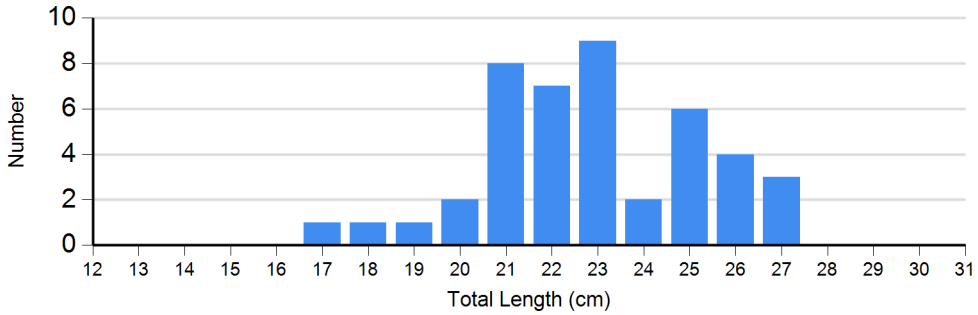
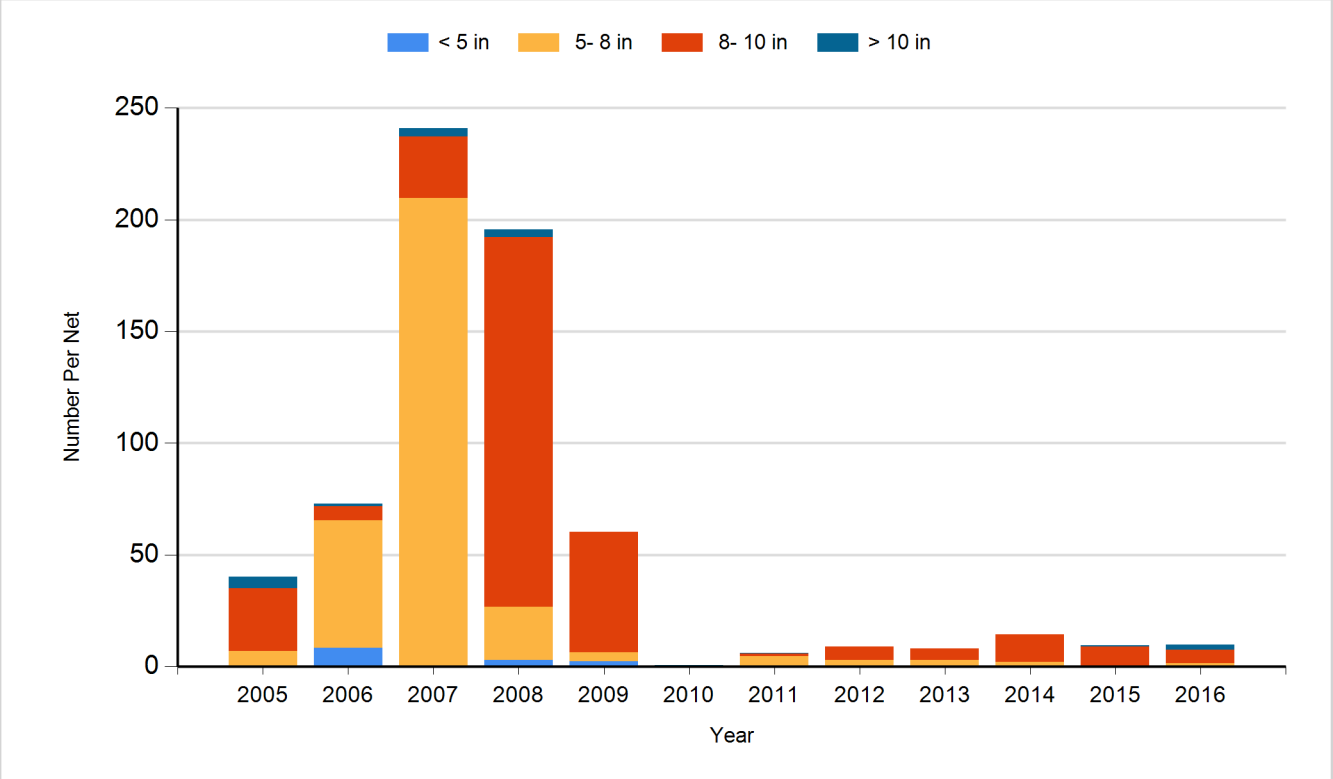


2015

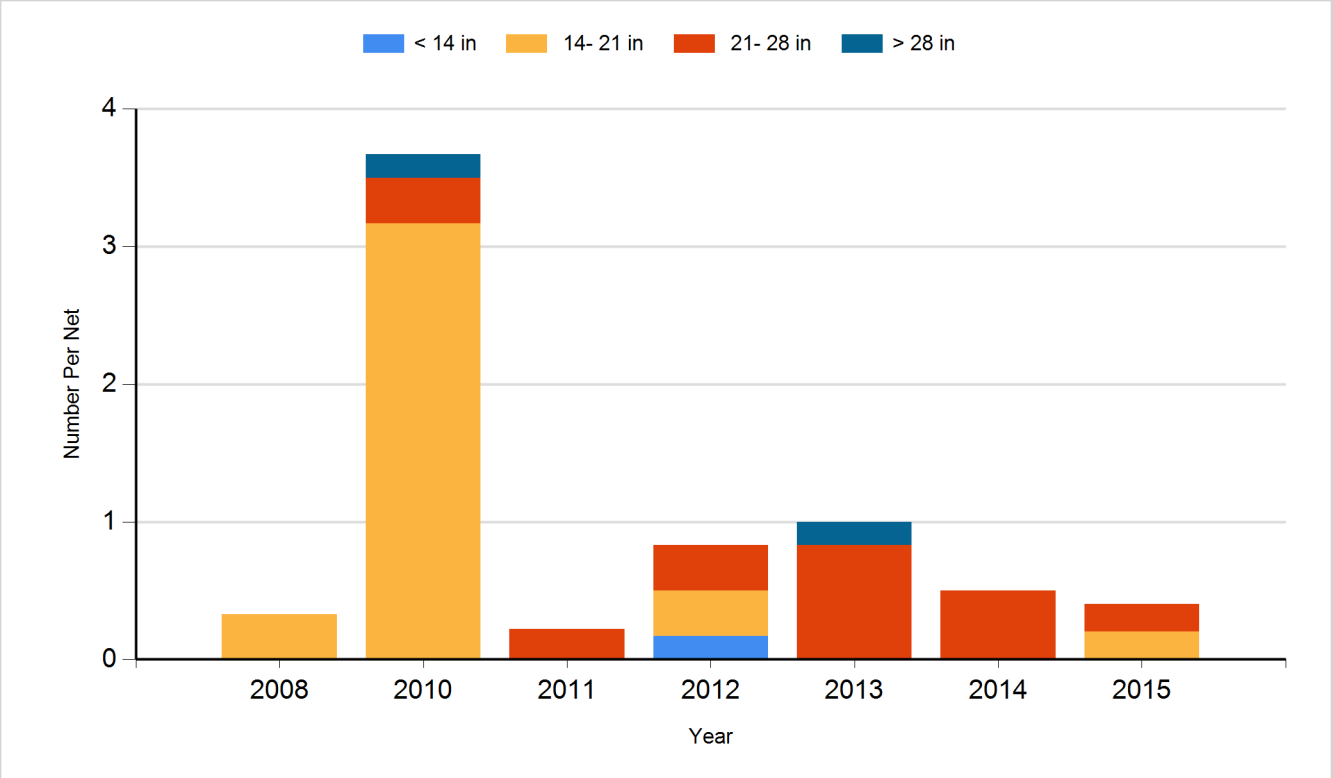
Historic Fish Sizes and Relative Abundance

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

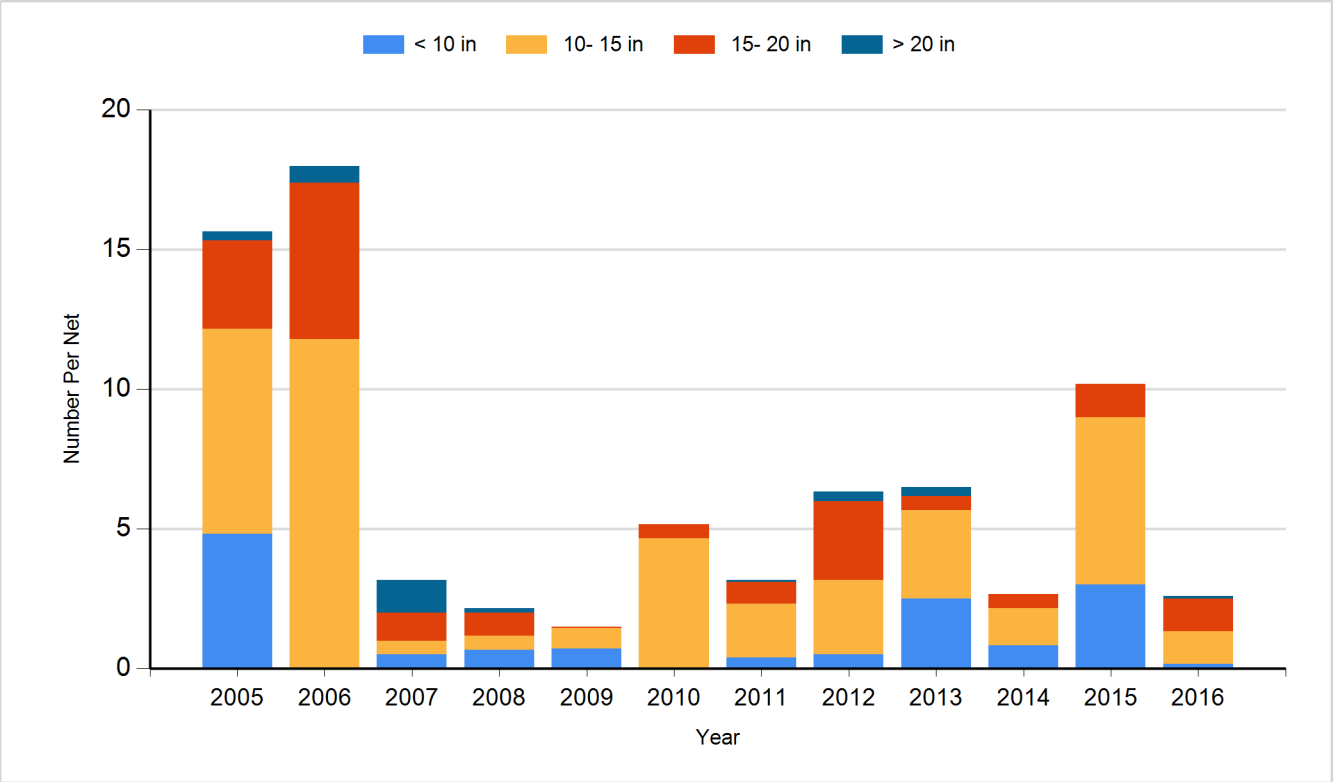
Species: Black Crappie
Gear: Frame Net



Species: Northern Pike
Gear: Gill Net



Species: Walleye
Gear: Gill Net



Species: Yellow Perch
Gear: Gill Net