SOUTH DAKOTA STATEWIDE FISHERIES SURVEY

Diamond, Minnehaha County

LBS-Lake-223-800

2018

Lake Information

Name: Diamond

County: Minnehaha

Legal Description: T104N-R52W-Sec. 5

Surface Area: 295 Acres

Maximum Depth: 12 Feet

Mean Depth: 8 Feet

Surveys and Investigations

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

Gear	Date	Effort
AFS std gill net	May 23, 2018	6 net-nights

Common Fish Species Present

Yellow Perch

Walleye

Black Bullhead

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).

A statewide effort to help make netting efforts comparable to all waters sampled across the state, occurred in 2017, with a switch to American Fisheries Society gill nets. Past gill netting efforts were completed with different style/types of nets and are not comparable side by side.

- **AFS std gill net** – 80 ft experimental gill net containing eight panels (10 ft each) of varying monofilament meshes of 0.75, 1.00, 1.25, 1.50, 1.75, 2.00, 2.25 and 2.50 inches.
- **std experimental gill net for non-Missouri River waters** - 150 ft experimental gill net containing six panels (25 ft each) of varying monofilament meshes of 0.5, 0.75, 1.00, 1.25, 1.50 and 2.00 inches.
- s**td experimental gill net for Missouri River reservoirs** – 300 ft experimental gill net containing six panels (50 ft each) of varying multifilament meshes of 0.5, 0.75, 1.00, 1.25, 1.50 and 2.00 inches.

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

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)
Black Bullhead	6	15	9	23	12	30	15	38	18	46
Black Crappie	5	13	8	20	10	25	12	30	15	38
Bluegill	3	8	6	15	8	20	10	25	12	30
Brown Trout	8	20	12	30	16	40	20	50	18	46
Channel Catfish	11	28	16	41	24	61	28	71	36	91
Freshwater Drum	8	20	12	30	15	38	20	51	25	63
Lake Trout	12	30	20	50	26	65	31	80	39	100
Largemouth Bass	8	20	12	30	15	38	20	51	25	63
Muskellunge	20	51	30	76	38	97	42	107	50	127
Northern Pike	14	35	21	53	28	71	34	86	44	112
Pumpkinseed	3	8	6	15	8	20	10	25	12	30
Rainbow Trout	10	25	16	40	20	50	26	65	31	80
Rudd	6	15	10	25	12	30	15	38	19	48
Sauger	8	20	12	30	15	38	20	51	25	63
Smallmouth Bass	7	18	11	28	14	35	17	43	20	51
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
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).

*** Methods/Species that ignore stock length**

			Abundance		Stock Density Indices				Condition	
Gear	Species	Sample Size (n)	CPUE	CI-80	PSD	CI-80	PSD-P	CI-80	Wr	CI-80
AFS std gill net	Black Bullhead	51	8.5	3.0	53	10	14	8		
	Common Carp	29	4.7	0.9	82	12	64	14		
	Walleye	29	4.8	2.1	86		10		98	2
	Yellow Perch	38	6.0	2.5	19	10	3		106	6

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	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Avg
AFS std frame net	Black Bullhead									2.4		2.4
	Common Carp									1.2		1.2
	Walleye									3.0		3.0
	White Sucker									0.2		0.2
AFS std gill net	Black Bullhead									13.7	8.5	11.1
	Common Carp									2.8	4.7	3.8
	Walleye									2.2	4.8	3.5
	Yellow Perch									0.8	6.0	3.4
frame net (std 3/4 in)	Black Bullhead	17.1		140.4		90.8						82.8
	Black Crappie	1.1		1.0		3.8						2.0
	Common Carp	3.3		2.4		2.6						2.8
	Green Sunfish	0.4		0.6		0.8						0.6
	Orangespotted Sunfish					0.0						0.0
	Sunfish Hybrid	0.0		0.0		0.0						0.0
	Walleye	3.4		0.2								1.8
	White Sucker	0.3										0.3
	Yellow Perch	2.6		3.6		10.8						5.7
std exp gill net	Black Bullhead	6.0		58.0		93.0	148.7	76.0	50.3			72.0
	Black Crappie	0.0		1.0								0.5
	Common Carp	8.0		0.5		13.7	14.3	7.7	12.0			9.4
	Sunfish Hybrid							0.0	0.0			0.0
	Walleye	5.7		0.5			0.0	4.3	6.7			3.4
	Yellow Perch	11.0		13.0		6.0	22.3	7.0	14.3			12.3

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	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
AFS std frame net	Black Bullhead	PSD									100	
		PSD-P									17	
	Common Carp	PSD									83	
		PSD-P									67	
	Walleye	PSD									33	
		PSD-P									13	
		Wr									80	
AFS std gill net	Black Bullhead	PSD									99	53
		PSD-P									4	14
	Common Carp	PSD									100	82
		PSD-P									53	64
	Walleye	PSD									46	86
		PSD-P									8	10
		Wr									84	98
	Yellow Perch	PSD									100	19
		PSD-P									40	3
		Wr									92	106
frame net (std 3/4 in)	Black Bullhead	PSD	100		9		17					
		PSD-P	0		0		3					
		Wr	86		98		79					
	Common Carp	PSD	97		67		0					
		PSD-P	30		8		0					
		Wr	86		93		87					
	Walleye	PSD	9		0							
		PSD-P	9		0							
		Wr	78		97							
	Yellow Perch	PSD	42		11		2					
		PSD-P	0		6		0					
		Wr	104		109		98					
std exp gill net	Black Bullhead	PSD	72		12		0	4	63	74		
		PSD-P	0		0		0	0	0	1		
		Wr	90		103		91					

			Year									
Gear	Species	Index	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
std exp gill net	Common Carp	PSD	92		100		2	84	13	83		
		PSD-P	0		100		0	2	4	25		
		Wr	90		100		90					
	Walleye	PSD	6		0			0	8	20		
		PSD-P	6		0			0	8	0		
		Wr	81		96				77	79		
	Yellow Perch	PSD	85		38		0	0	57	70		
		PSD-P	12		0		0	0	0	35		
		Wr	102		110		104	105	100	93		

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+
2018	29			386 (10)	392 (9)	451 (7)	611 (1)	575 (1)			591 (1)
2017	13		265 (1)	350 (8)	460 (3)	520 (1)					
2009	20	216 (3)	281 (8)	302 (8)			525 (1)				

Species: Yellow Perch

		Mean Length (expanded sample number) at capture by age									
Year	N	1	2	3	4	5	6	7	8	9	10+
2018	11		188 (11)								
2017	5			226 (3)	266 (1)		301 (1)				
2014	67	147 (67)									
2009	33	136 (1)	211 (27)		236 (1)	260 (4)					

Fish Condition

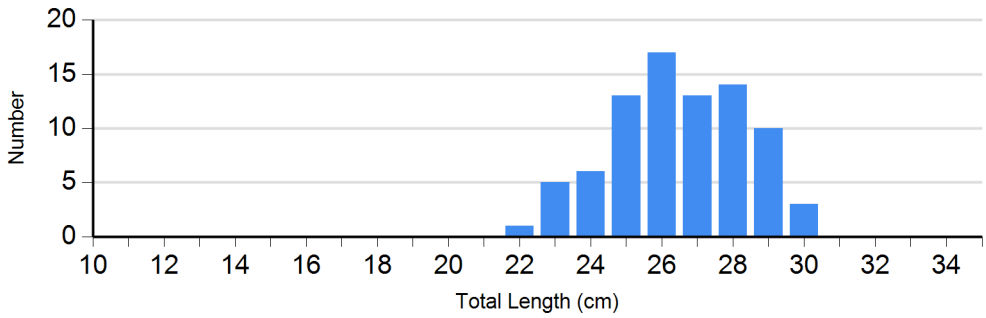
Mean relative weight (Wr) by sample size (N), length category stock to quality (S-Q), quality to preferred (Q-P), preferred to memorable (P-M), and memorable (M) for species collected across survey years with standard error (SE).

		Length Groups							
		S-Q		Q-P		P-M		M	
Species	Year	N	Wr (SE)	N	Wr (SE)	N	Wr (SE)	N	Wr (SE)
Walleye Gill Net	2014	0		0		0		0	
	2015	12	76 (0.9)	0		1	86	0	
	2016	16	77 (1.3)	4	83 (1.6)	0		0	
	2017	7	82 (1.7)	5	85 (3.8)	1	92	0	
	2018	4	94 (2.9)	22	99 (1.4)	3	95 (2.7)	0	
Yellow Perch Gill Net	2014	67	105 (1.5)	0		0		0	
	2015	9	103 (1.9)	12	97 (0.9)	0		0	
	2016	13	98 (2.6)	15	93 (1.8)	10	92 (1.0)	5	81 (3.5)
	2017	0		3	98 (3.2)	1	84	1	84
	2018	29	108 (5.7)	6	102 (4.1)	1	87	0	

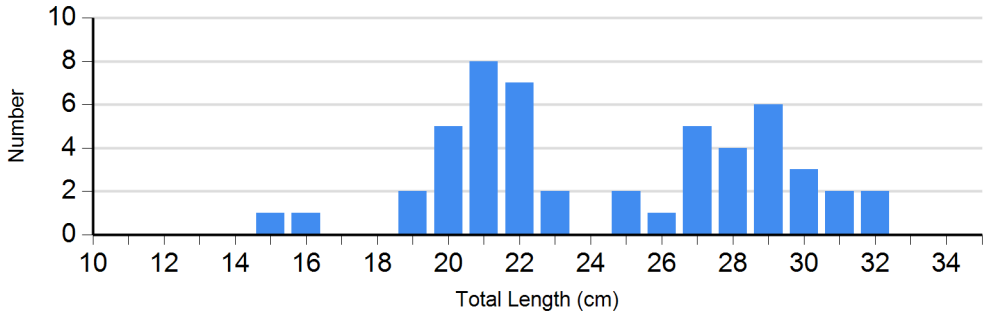
Length Frequency Distribution

Length frequency histogram of species sampled by year.

Species: Black Bullhead
Gear: AFS std gill net

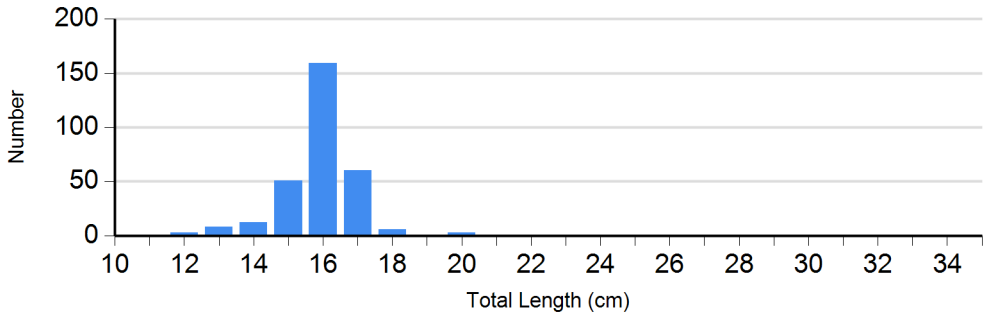


2017

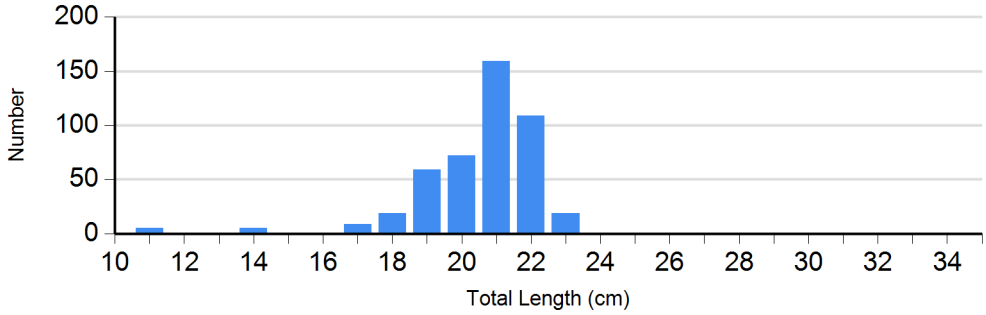


2018

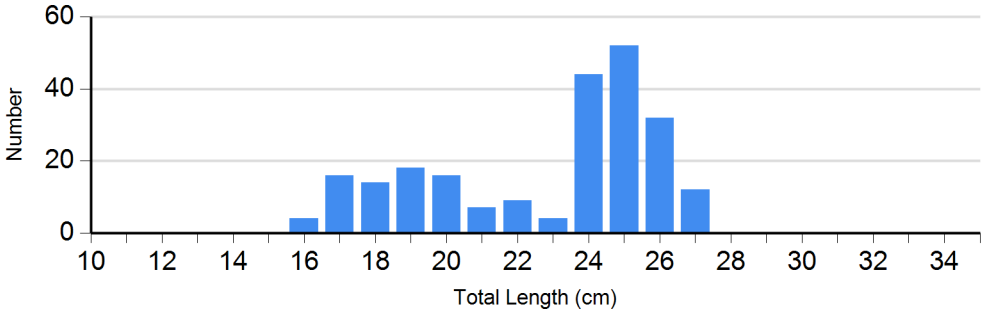
Species: Black Bullhead
Gear: std exp gill net



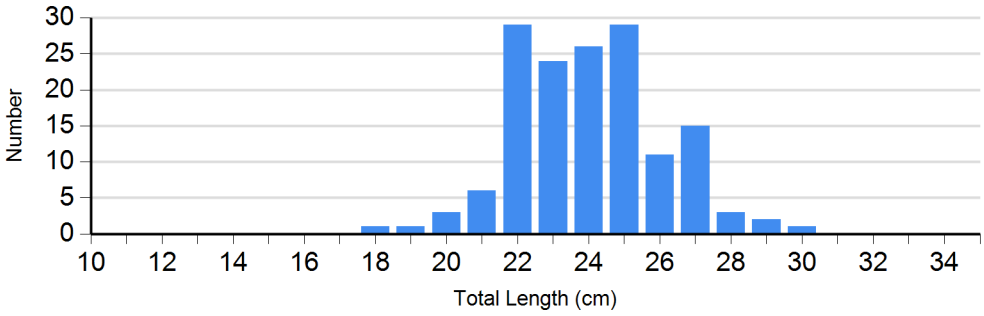
2013



2014

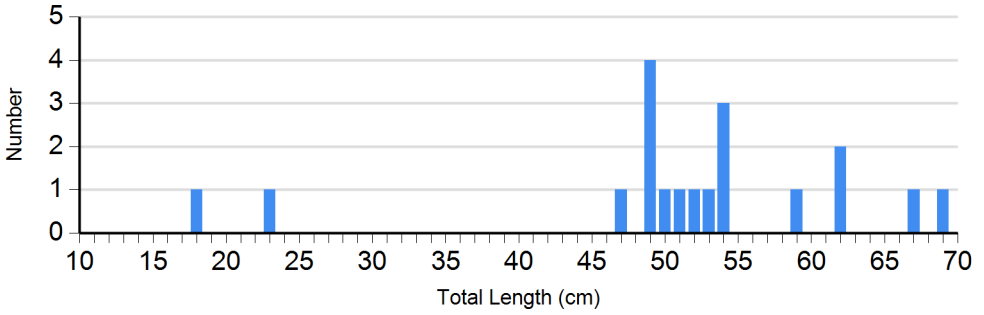


2015

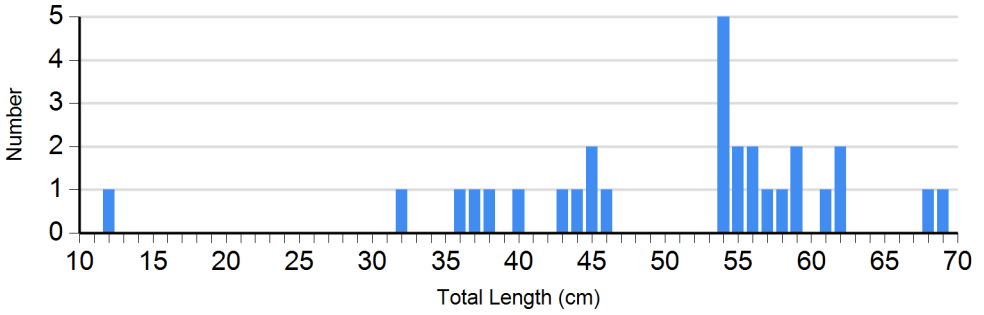


2016

Species: Common Carp
Gear: AFS std gill net

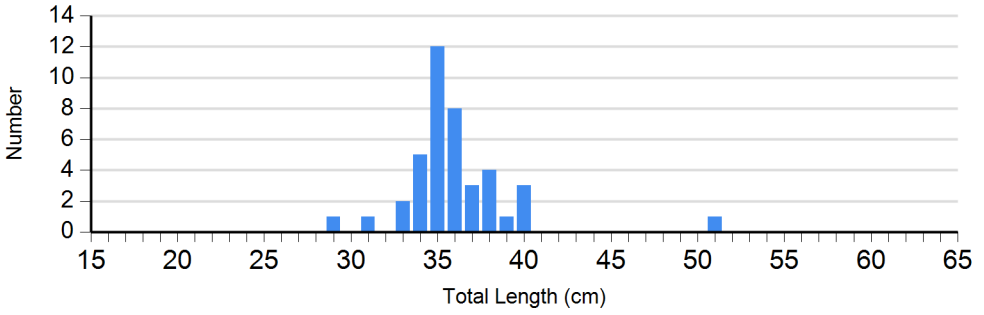


2017

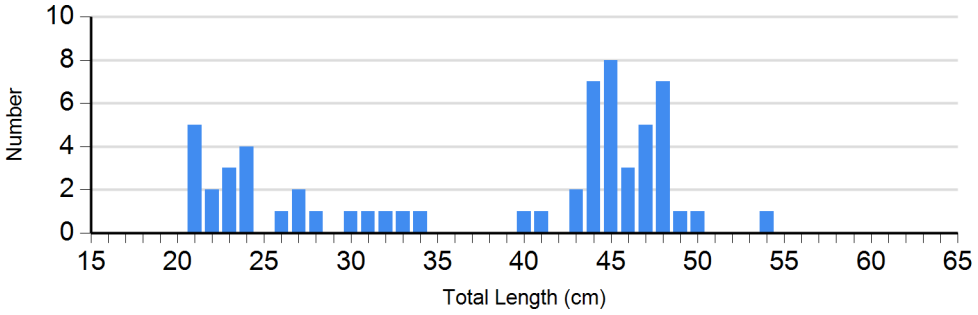


2018

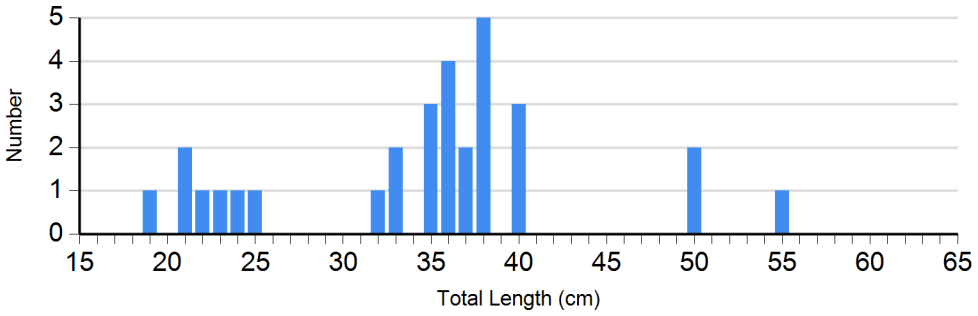
Species: Common Carp
Gear: std exp gill net



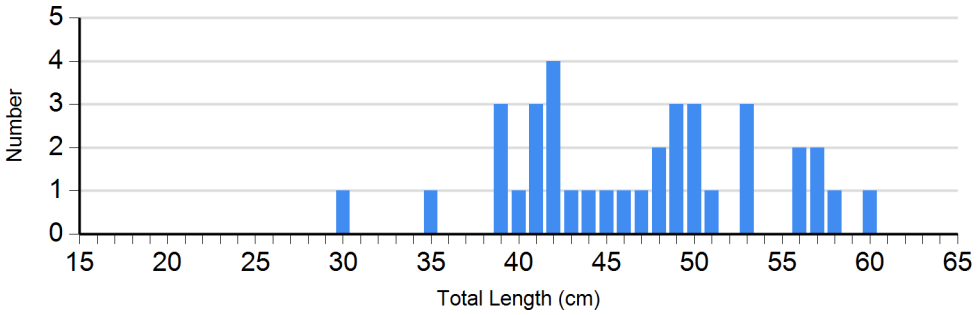
2013



2014

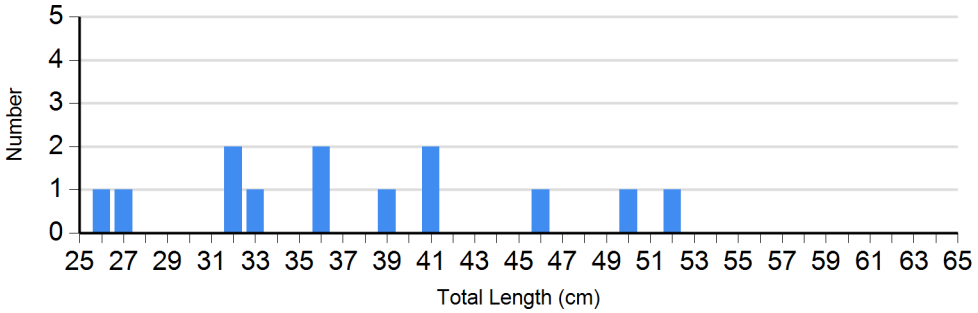


2015

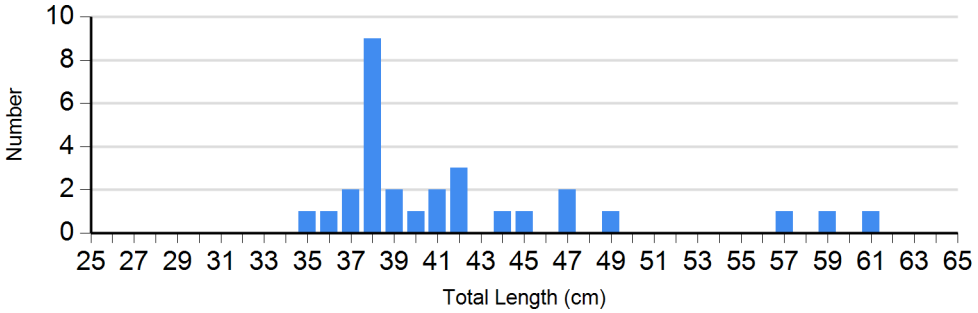


2016

Species: Walleye
Gear: AFS std gill net

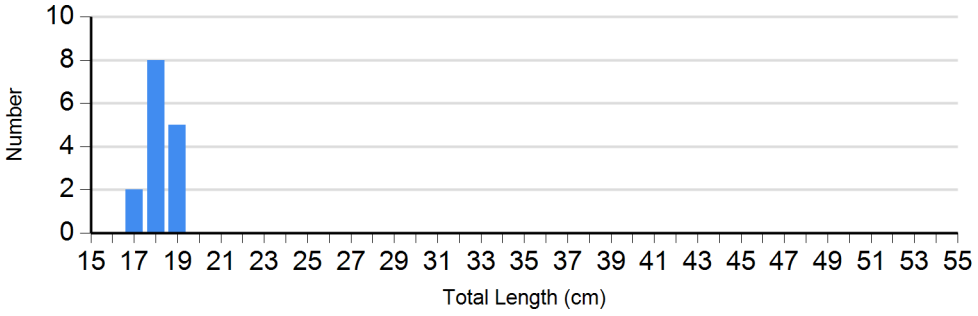


2017

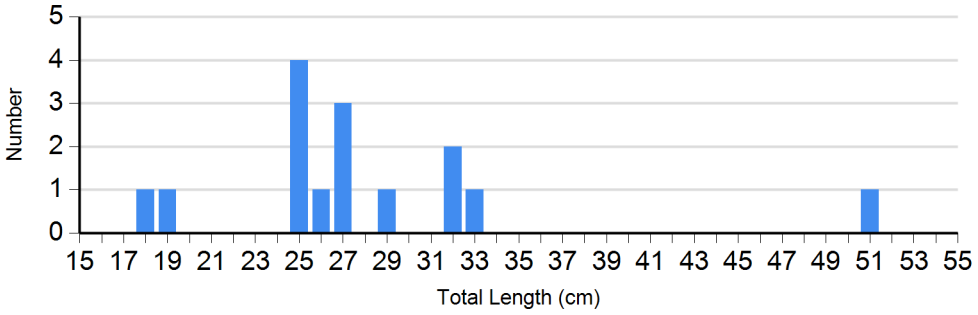


2018

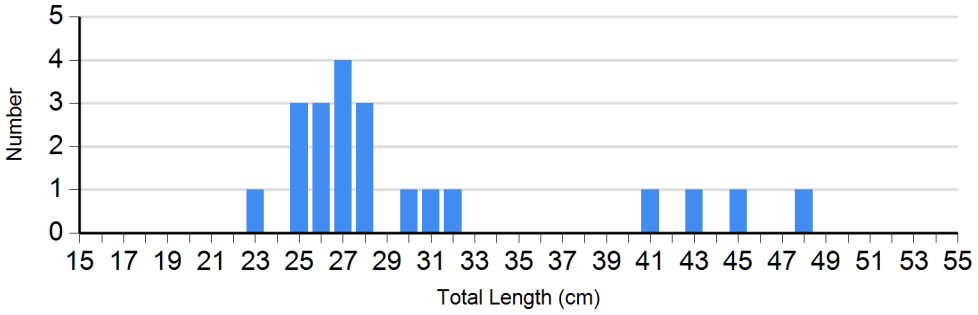
Species: Walleye
Gear: std exp gill net



2014

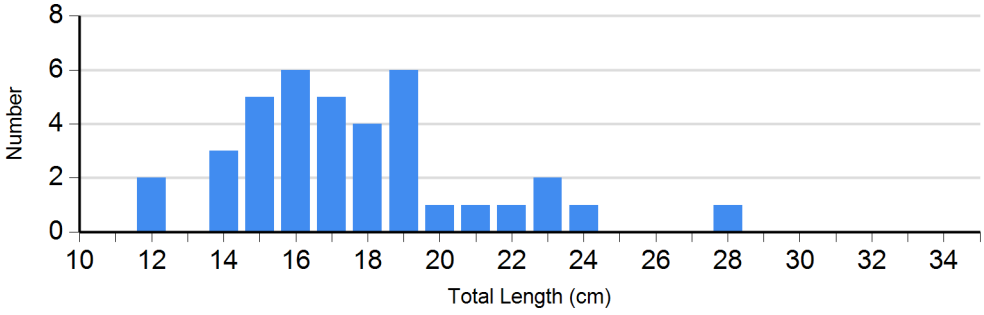


2015



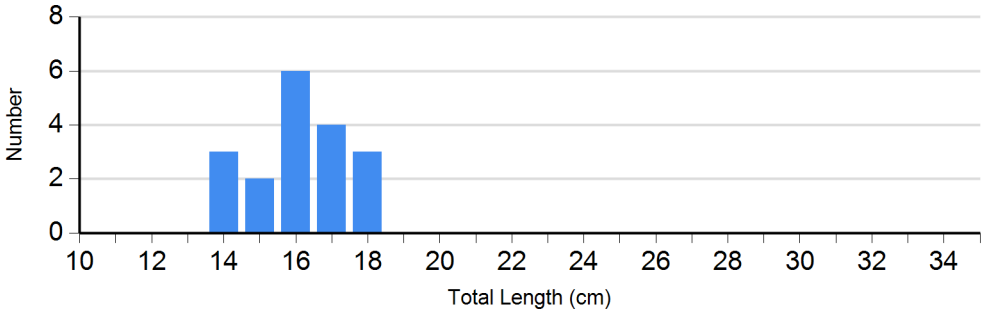
2016

Species: Yellow Perch
Gear: AFS std gill net

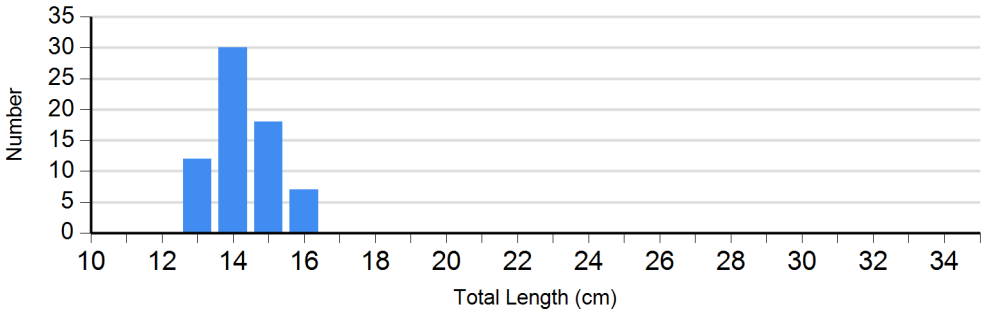


2018

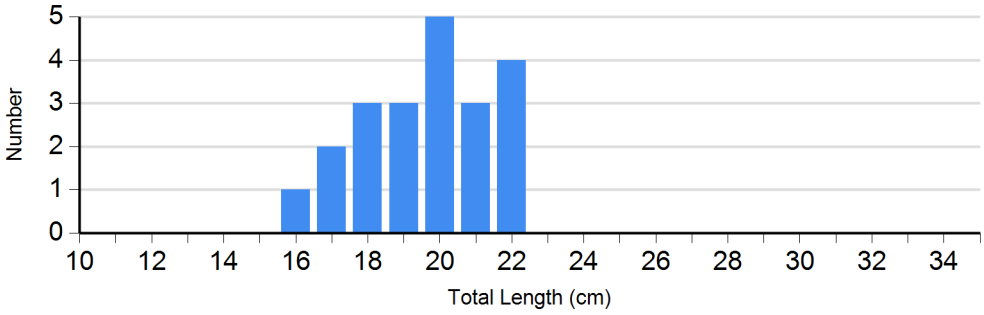
Species: Yellow Perch
Gear: std exp gill net



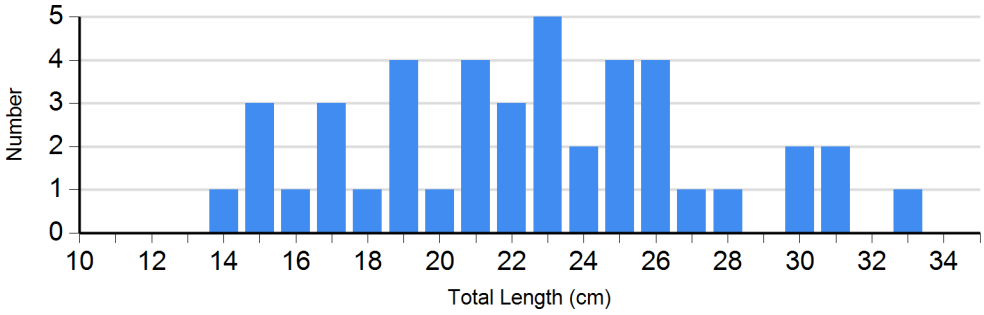
2013



2014



2015

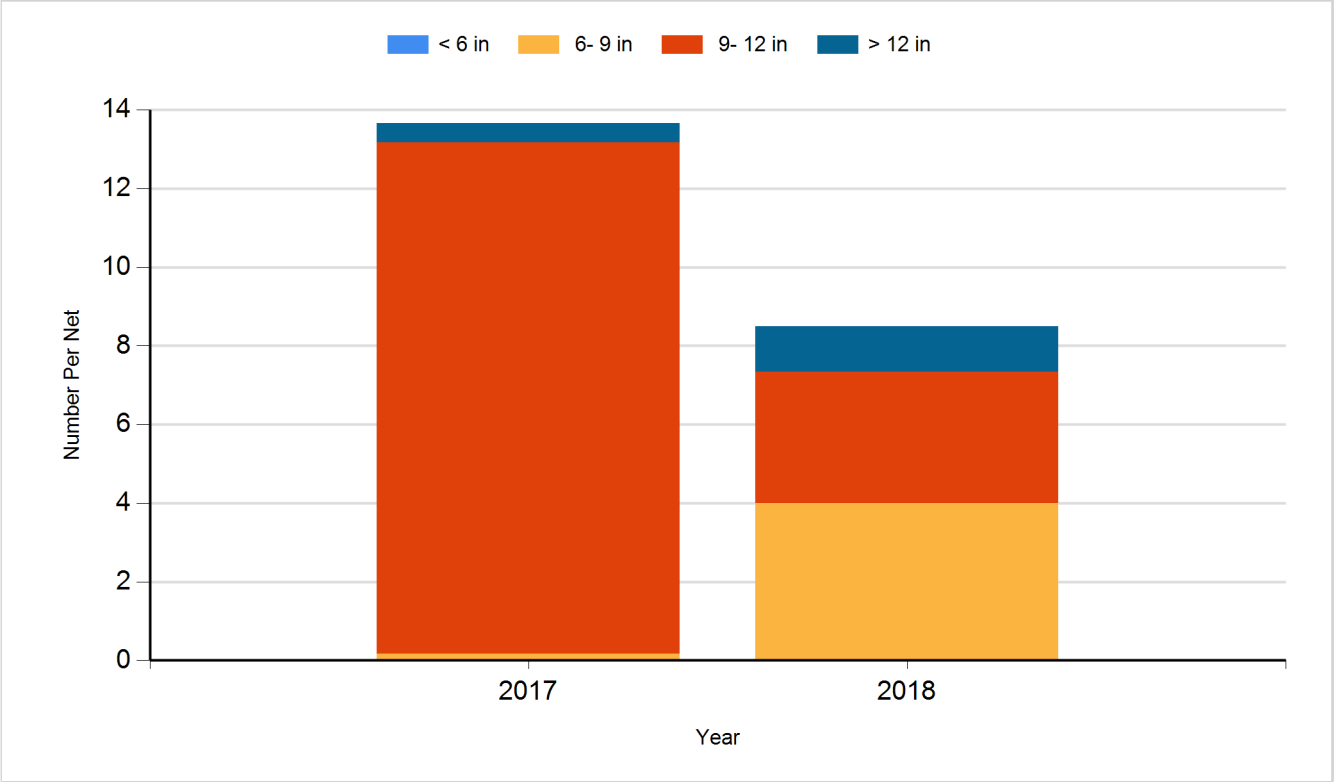


2016

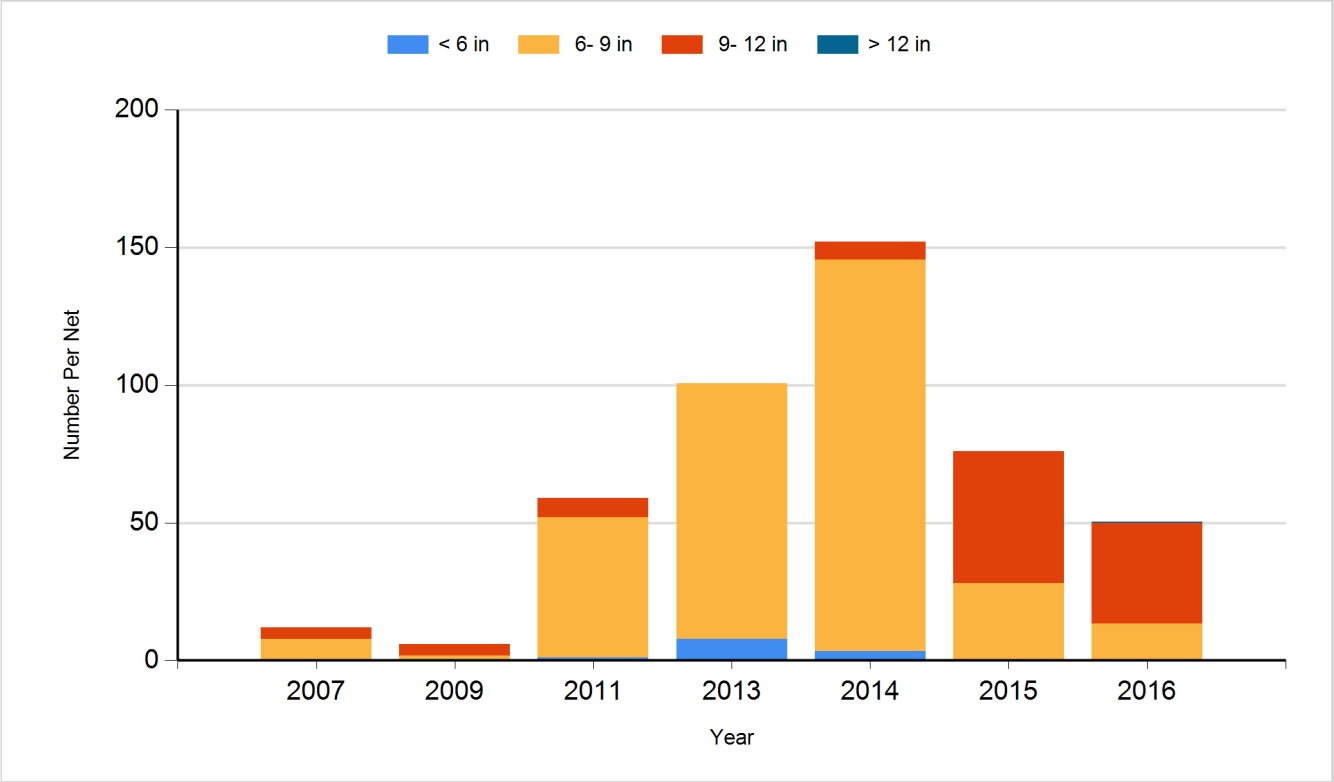
Historic Fish Sizes and Relative Abundance

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

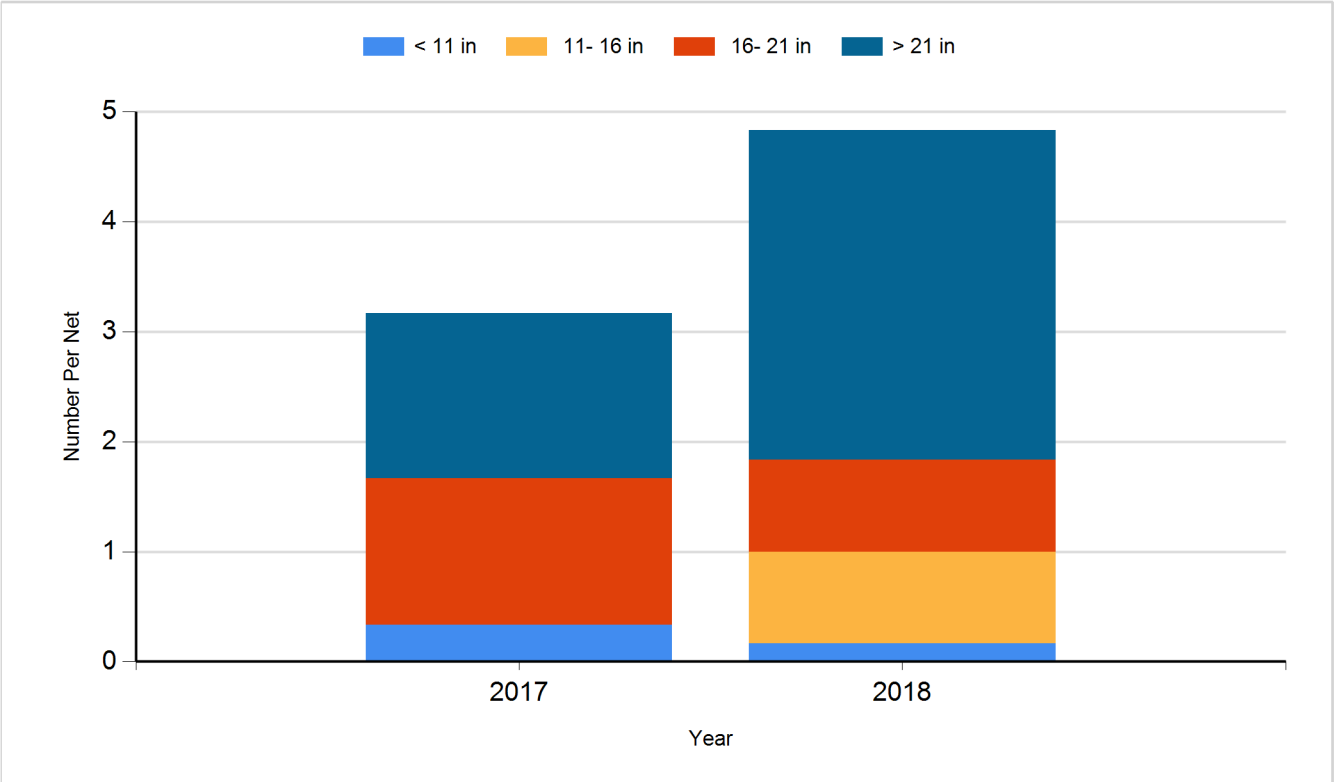
Species: Black Bullhead
Gear: AFS std gill net



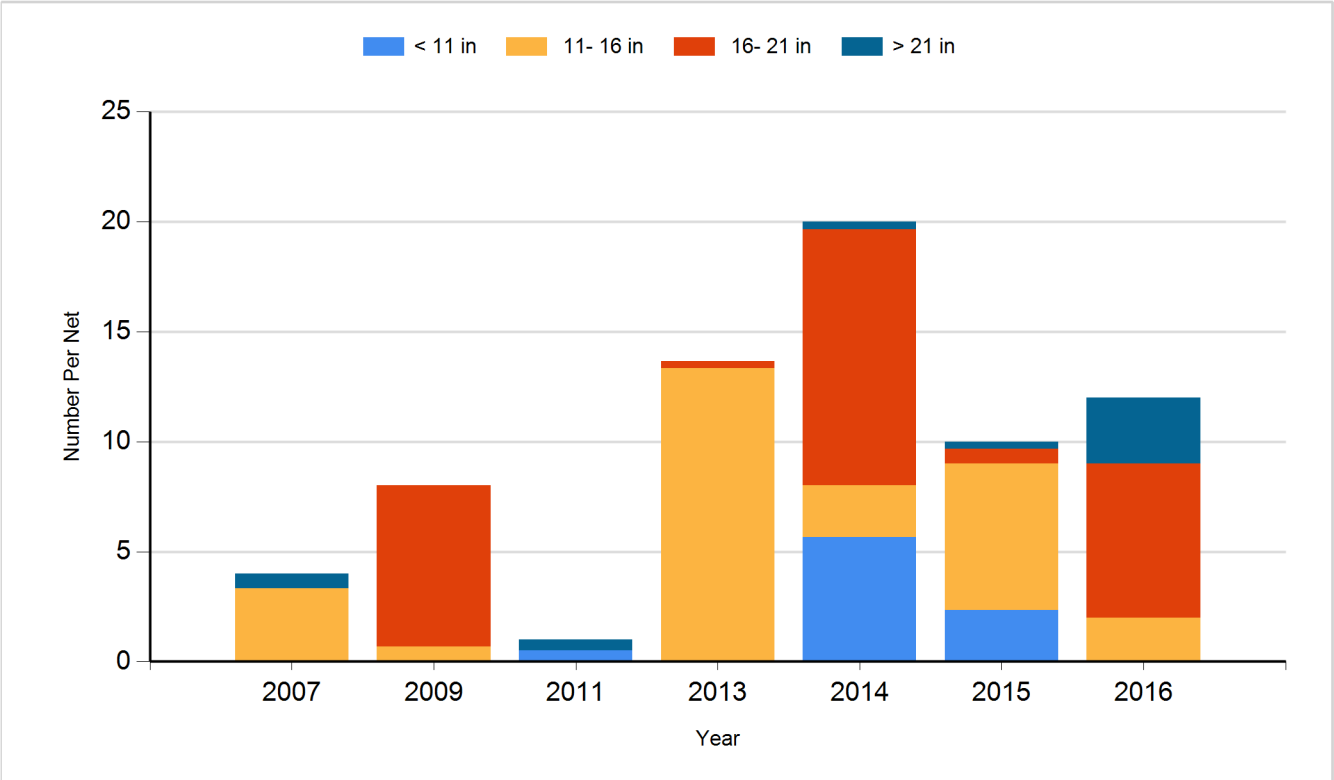
Species: Black Bullhead
Gear: std exp gill net



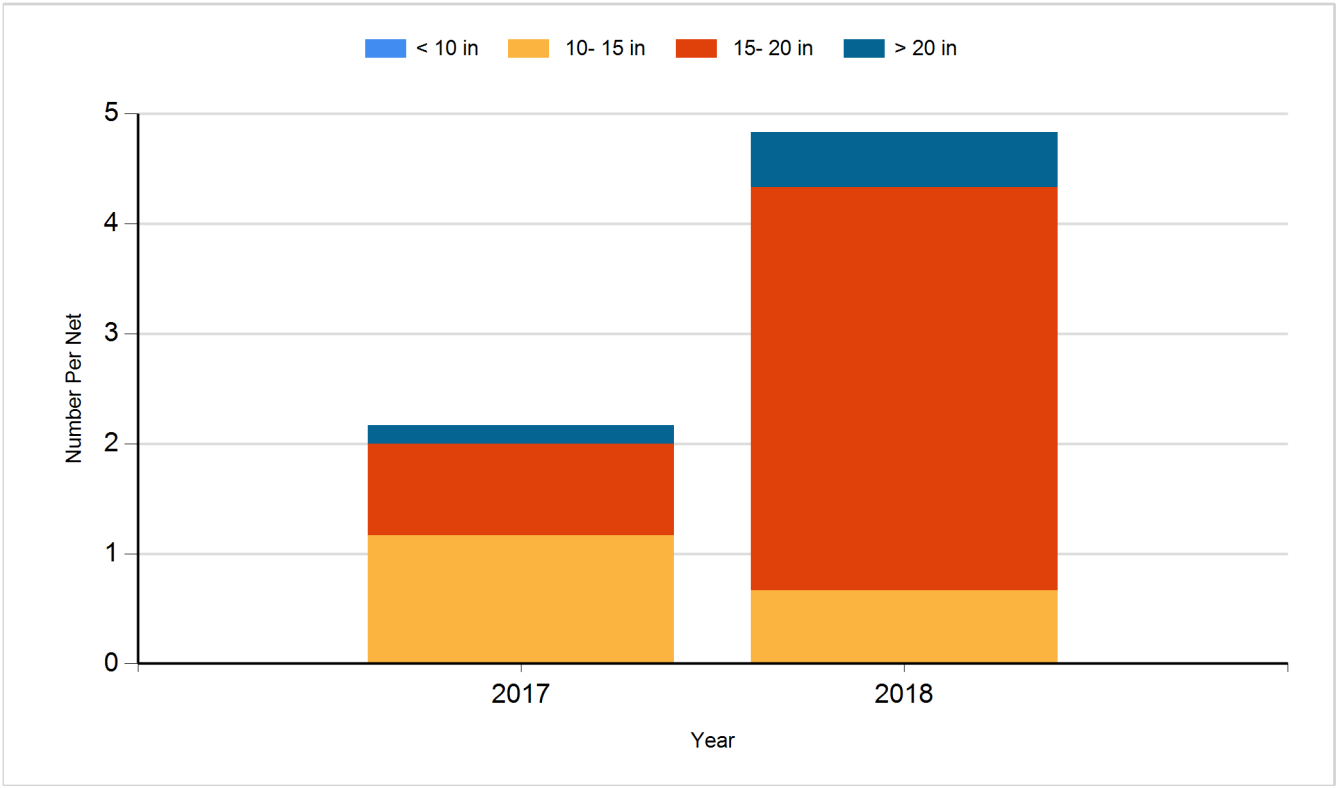
Species: Common Carp
Gear: AFS std gill net



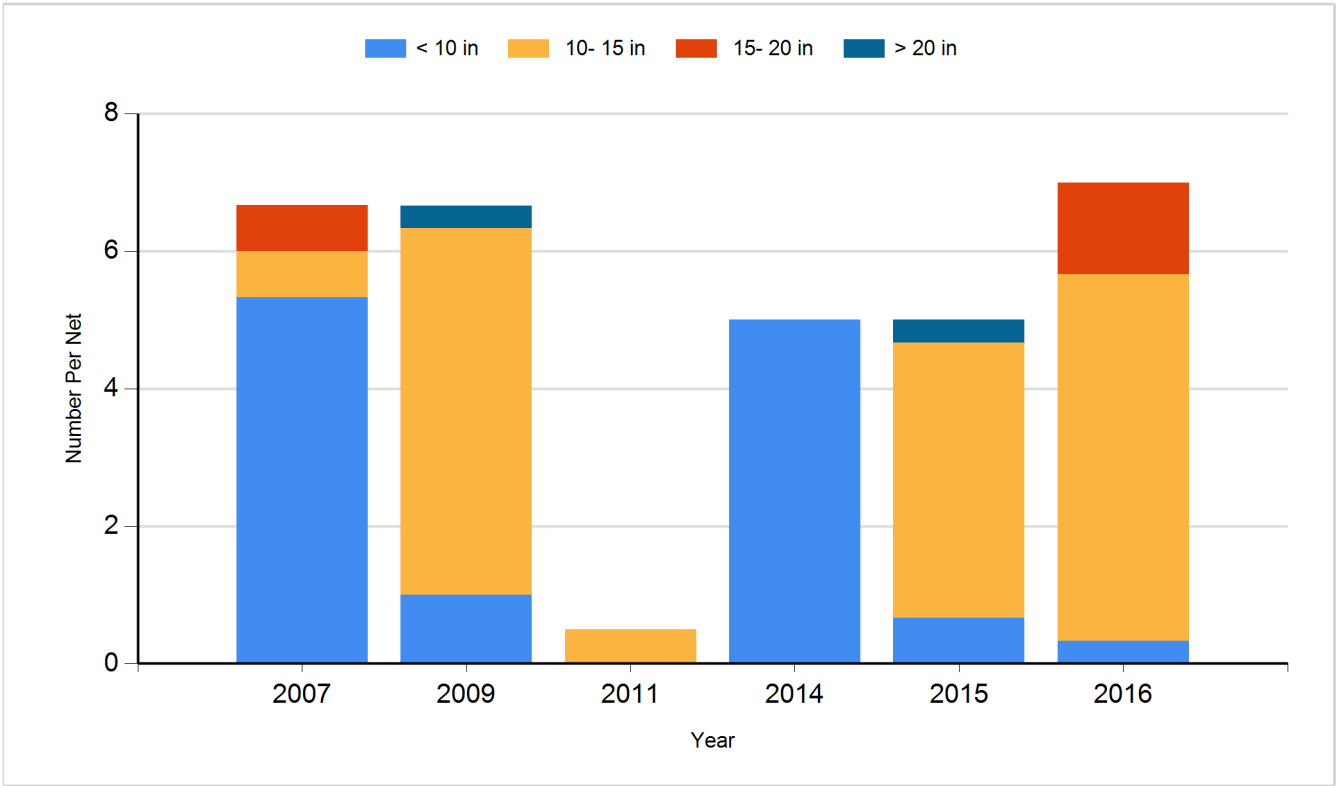
Species: Common Carp
Gear: std exp gill net



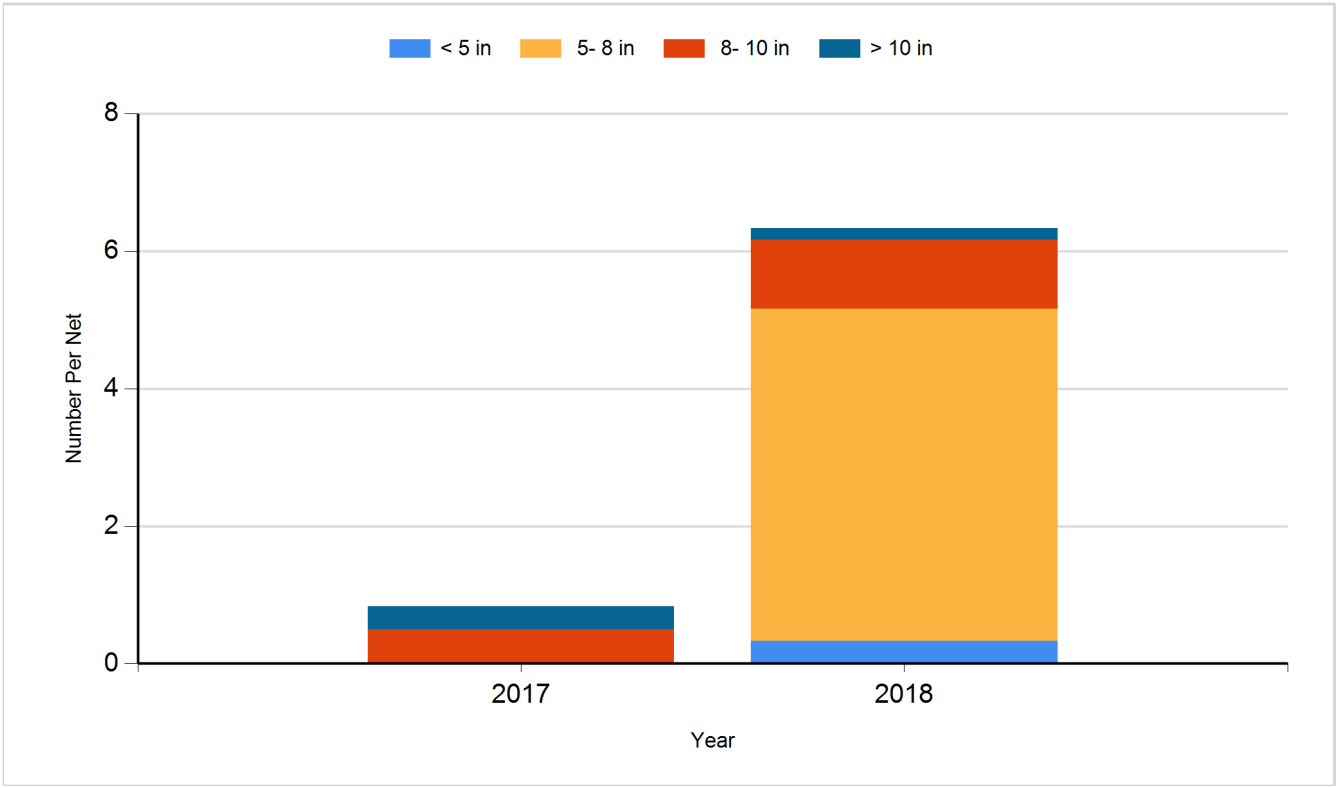
Species: Walleye
Gear: AFS std gill net



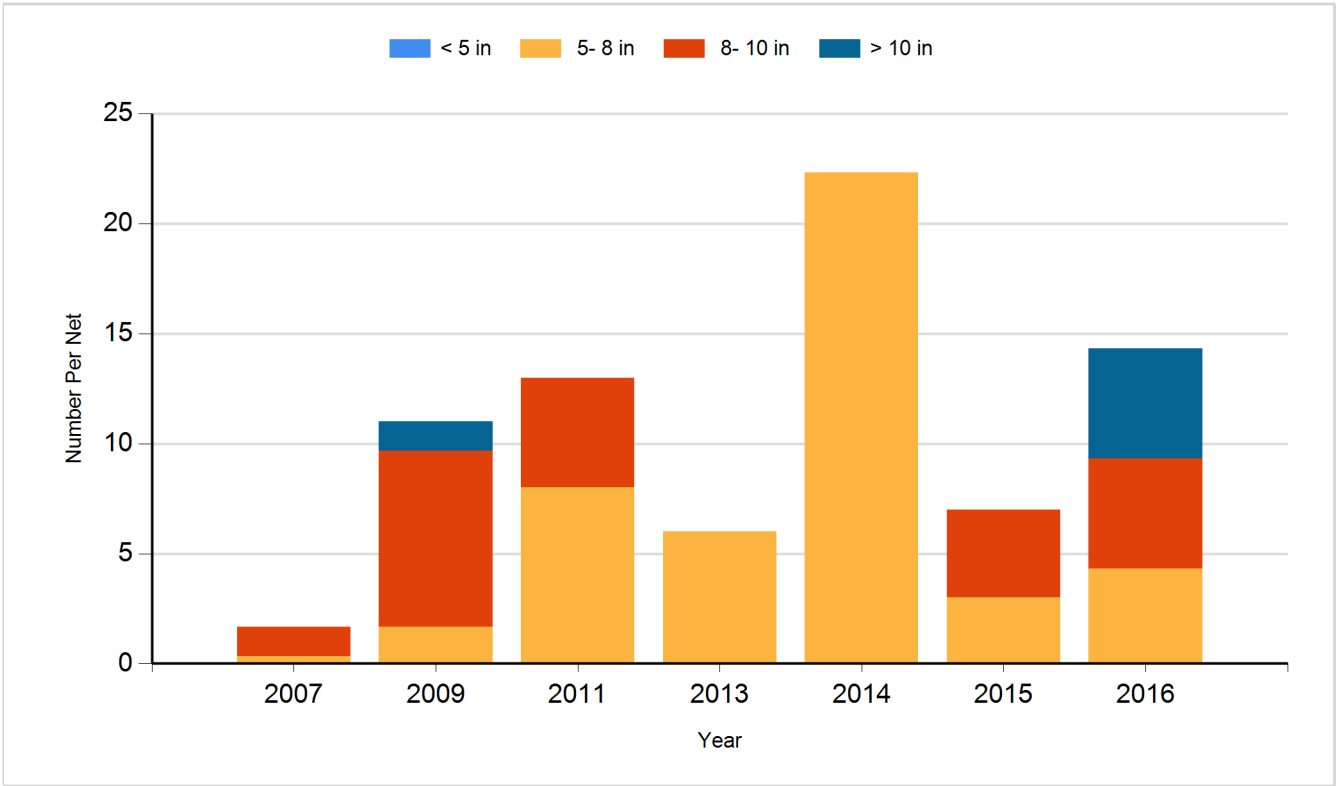
Species: Walleye
Gear: std exp gill net



Species: Yellow Perch
Gear: AFS std gill net



Species: Yellow Perch
Gear: std exp gill net



Fish Stocking

Number of fish stocked by year, species, and size.

Year	Species	Size	Number
2018	Walleye	Large Fingerling	2,023