SOUTH DAKOTA STATEWIDE FISHERIES SURVEY
Spirit, Kingsbury County
LKT-Lake-95-801
2019

Lake Information

Name: Spirit

County: Kingsbury

Legal Description: T112-R57-Sec. 13, 24-25 and T112- R56- Sec. 18-19, 30

Surface Area: 1,245 Acres

Maximum Depth: 11 Feet

Mean Depth: 9 Feet

Surveys and Investigations

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

Gear	Date	Effort
AFS std gill net	Aug 21, 2019	6 net-nights

Common Fish Species Present

Yellow Perch

Walleye

Northern Pike

Black Bullhead

Common Carp

White Sucker

Bigmouth Buffalo

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	Bigmouth Buffalo	4	0.7	0.5	0		0			
	Black Bullhead	10	1.7	1.2	30		0			
	Common Carp	8	1.0	0.9	67		0			
	Northern Pike	17	2.8	0.7	35	19	6		93	2
	Walleye	43	7.2	1.8	81	9	5		93	1
	White Sucker	4	0.7	0.3	100		50			
	Yellow Perch	179	29.8	4.8	48	5	27	5	105	1

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	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Avg
AFS std gill net	Bigmouth Buffalo								0.0	0.0	0.7	0.23
	Black Bullhead								0.3	2.7	1.7	1.57
	Common Carp								1.0	0.2	1.0	0.73
	Northern Pike								1.8	0.3	2.8	1.63
	Walleye								1.2	7.8	7.2	5.40
	White Sucker								4.3	2.3	0.7	2.43
	Yellow Perch								18.2	29.5	29.8	25.83
frame net (std 3/4 in)	Bigmouth Buffalo			0.0	0.2							0.10
	Black Bullhead			1.4	34.0							17.70
	Common Carp			5.0	8.6							6.80
	Northern Pike			10.8	2.4							6.60
	Walleye			9.8	10.8							10.30
	White Sucker			1.2	3.8							2.50
	Yellow Perch			0.4	1.6							1.00
std exp gill net	Black Bullhead			1.3	1.3	13.7	10.7	1.3				5.66
	Common Carp			0.7	1.3	1.3	0.7	1.0				1.00
	Northern Pike			4.0	1.0	0.7	3.0	1.7				2.08
	Walleye			19.3	12.7	8.7	1.3	6.0				9.60
	White Sucker			3.0	8.7	3.0	6.3	6.0				5.40
	Yellow Perch			12.7	43.0	17.3	46.7	19.3				27.80

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	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
AFS std gill net	Bigmouth Buffalo	PSD									0	0
		PSD-P									0	0
	Black Bullhead	PSD								100	81	30
		PSD-P								100	6	0
	Common Carp	PSD								100	100	67
		PSD-P								83	100	0
	Northern Pike	PSD								100	100	35
		PSD-P								27	50	6
		Wr								73	85	93
	Walleye	PSD								29	15	81
		PSD-P								0	2	5
		Wr								73	88	93
	White Sucker	PSD								100	100	100
		PSD-P								100	100	50
	Yellow Perch	PSD								61	66	48
		PSD-P								49	44	27
		Wr								114	101	105
frame net (std 3/4 in)	Bigmouth Buffalo	PSD				100						
		PSD-P				100						
		Wr				80						
	Black Bullhead	PSD			43	35						
		PSD-P			29	12						
		Wr			87	68						
	Common Carp	PSD			100	100						
		PSD-P			76	91						
		Wr			92	86						
	Northern Pike	PSD			70	75						
		PSD-P			4	25						
		Wr			78	63						
	Walleye	PSD			10	30						
		PSD-P			0	0						
		Wr			85	74						
	White Sucker	PSD			100	100						

			Year									
Gear	Species	Index	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
frame net (std 3/4 in)	White Sucker	PSD-P			100	100						
		Wr			99	81						
	Yellow Perch	PSD			50	63						
		PSD-P			50	63						
		Wr			102	81						
std exp gill net	Black Bullhead	PSD			50	25	5	81	100			
		PSD-P			25	0	2	0	0			
		Wr			86	82						
	Common Carp	PSD			100	100	100	100	100			
		PSD-P			100	75	100	100	100			
		Wr			98	89						
	Northern Pike	PSD			50	67	100	33	100			
		PSD-P			0	33	0	0	0			
		Wr			73	63	104	79	83			
	Walleye	PSD			9	29	96	100	0			
		PSD-P			0	0	0	0	0			
		Wr			83	77	92	87	86			
	White Sucker	PSD			100	100	89	100	100			
		PSD-P			100	100	78	95	100			
		Wr			101	91						
	Yellow Perch	PSD			82	57	4	78	76			
		PSD-P			76	20	4	6	62			
		Wr			106	86	116	107	110			

Fish Condition

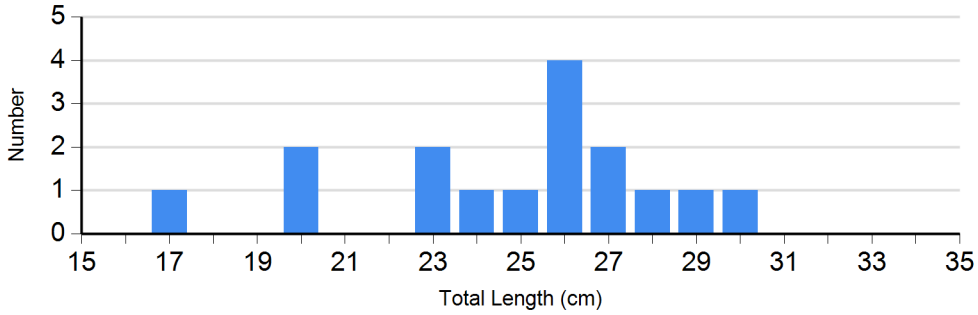
Mean relative weight (Wr) by sample size (N), length category stock to quality (S-Q), quality to preferred (Q-P), preferred to memorable (P-M), and memorable (M) for species collected across survey years with standard error (SE).

		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	2015	6	77 (2.6)	3	83 (5.3)	0		0	
	2016	0		5	83 (4.4)	0		0	
	2017	0		8	71 (1.6)	1	68	2	81 (3.5)
	2018	0		1	93	1	76	0	
	2019	11	92 (2.0)	5	96 (3.2)	1	85	0	
Walleye Gill Net	2015	0		4	87 (1.8)	0		0	
	2016	18	86 (1.1)	0		0		0	
	2017	5	72 (12.2)	2	77 (0.6)	0		0	
	2018	40	88 (0.8)	6	88 (1.7)	1	98	0	
	2019	8	90 (3.1)	33	94 (0.9)	2	101 (0.9)	0	
Yellow Perch Gill Net	2015	31	111 (1.0)	100	107 (1.0)	4	105 (3.7)	5	90 (2.9)
	2016	14	114 (2.5)	8	114 (3.1)	36	107 (1.8)	0	
	2017	43	119 (1.4)	13	111 (2.6)	41	112 (1.2)	12	110 (2.4)
	2018	61	108 (1.4)	39	100 (1.4)	57	100 (0.9)	20	98 (1.0)
	2019	93	104 (0.9)	37	105 (1.5)	43	105 (1.7)	6	

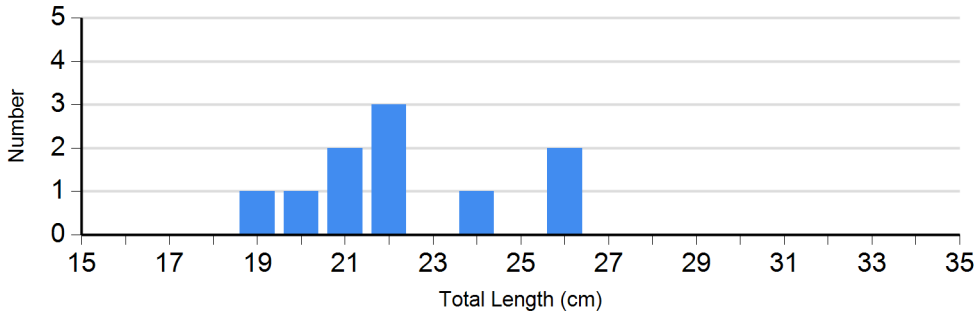
Length Frequency Distribution

Length frequency histogram of species sampled by year.

Species: Black Bullhead
Gear: AFS std gill net

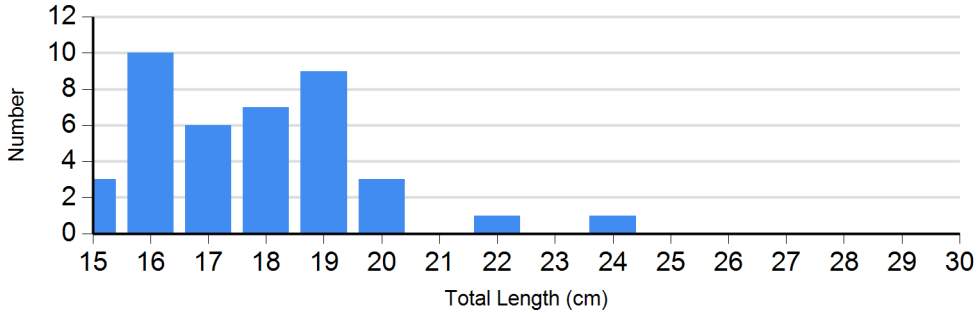


2018



2019

Species: Black Bullhead
Gear: std exp gill net



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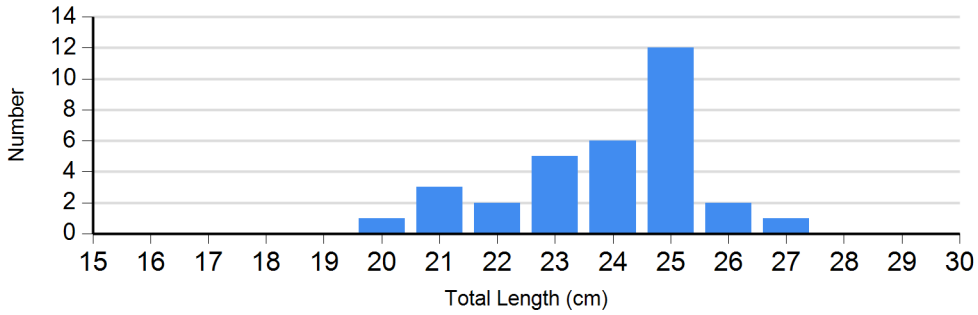
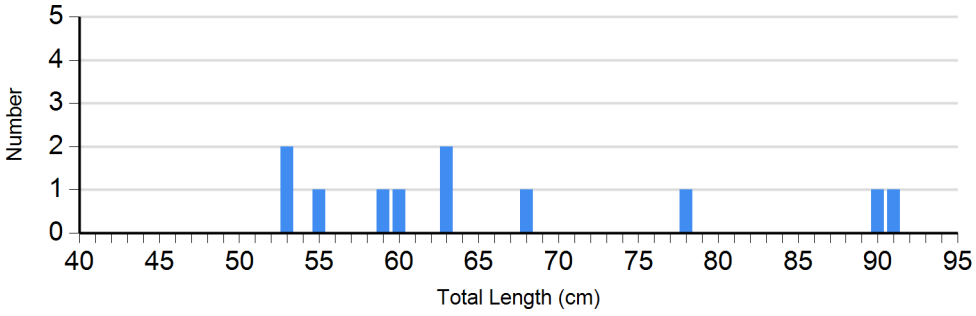


2015

Species: Northern Pike
Gear: AFS std gill net

2017



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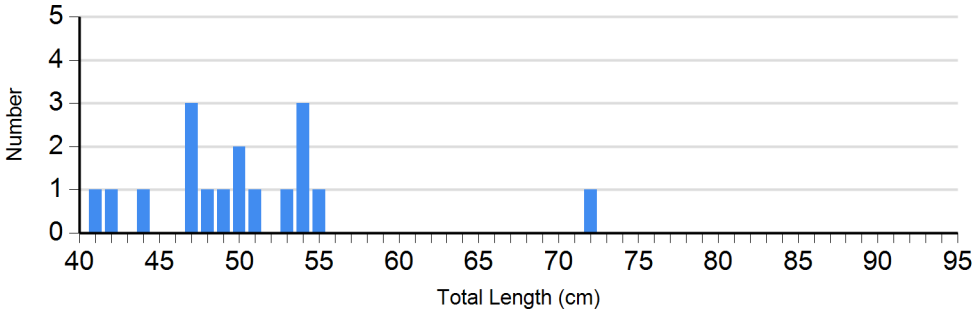
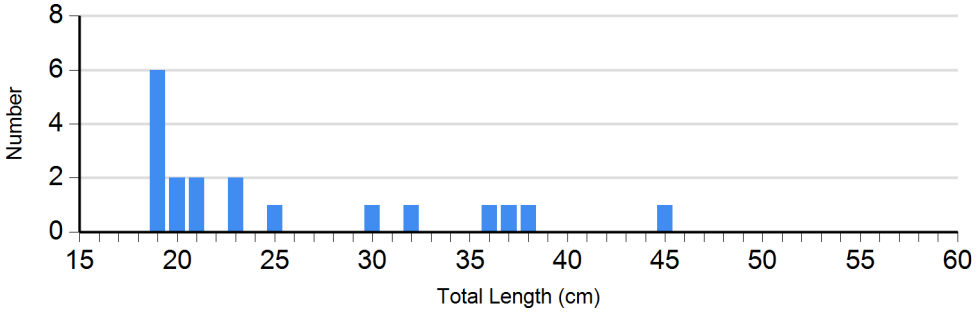
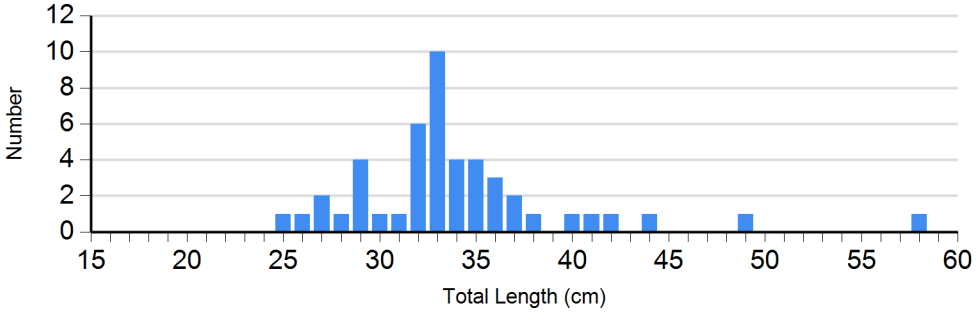


Species: Walleye
Gear: AFS std gill net

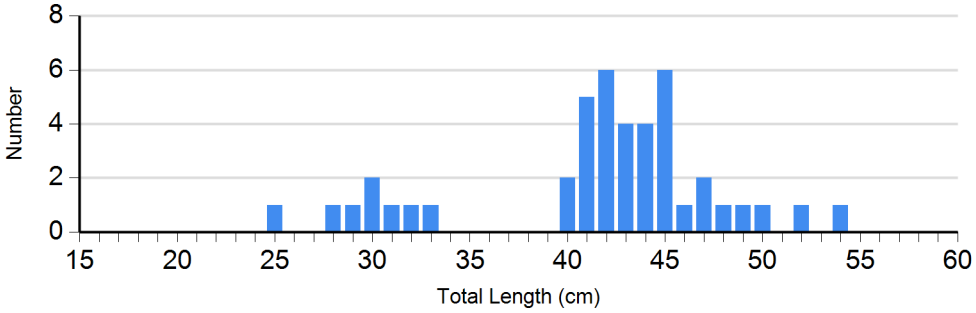
2017



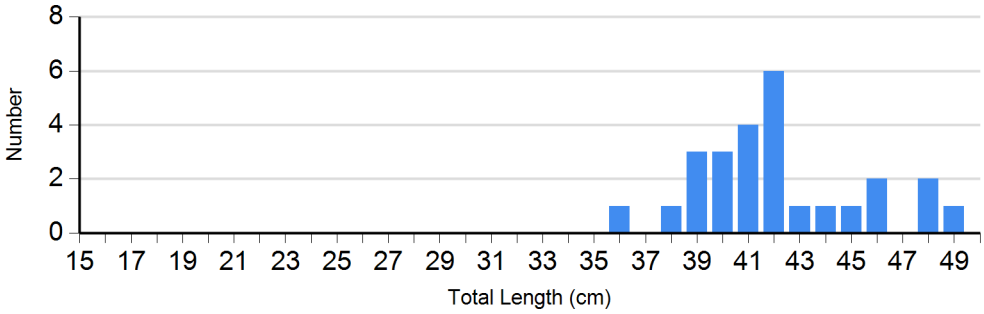
2018



2019



Species: Walleye
Gear: std exp gill net



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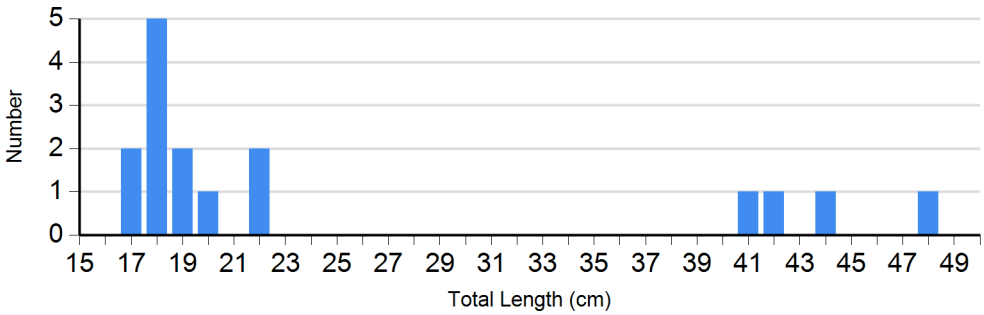

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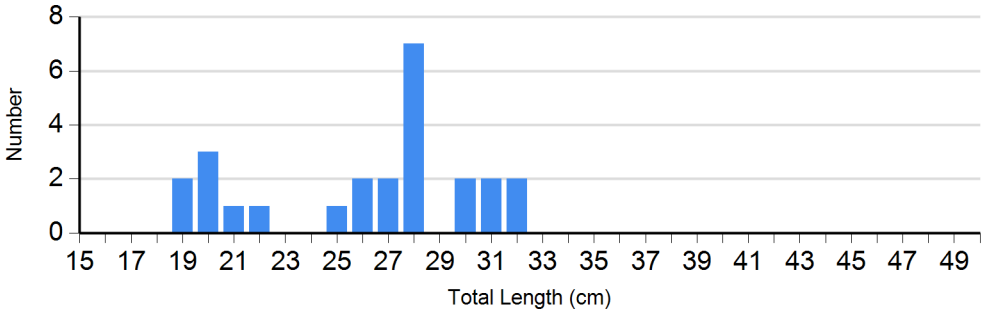
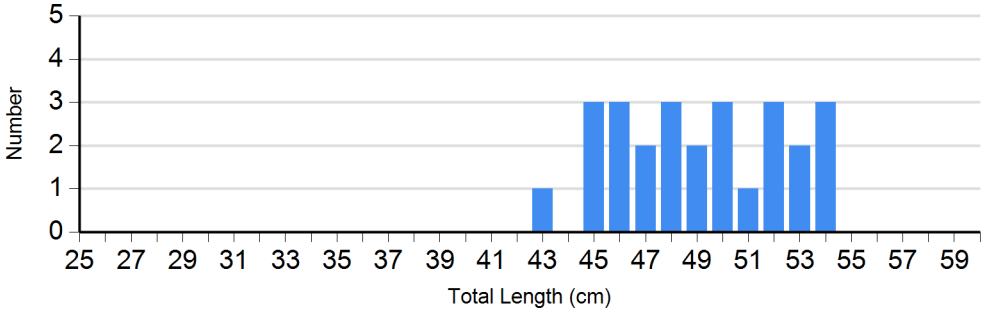
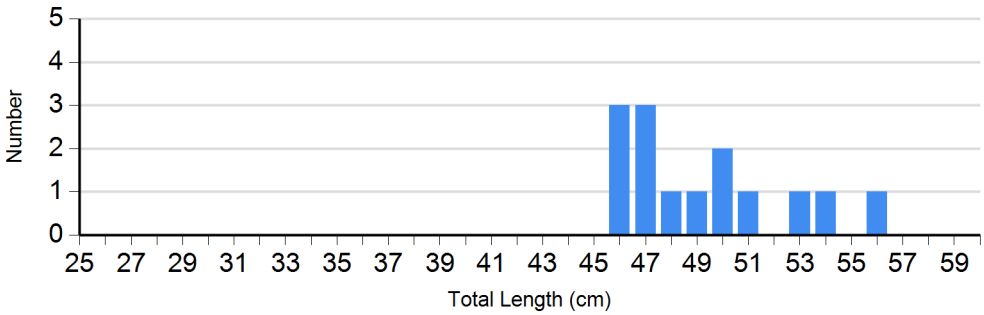


2016

Species: White Sucker
Gear: AFS std gill net



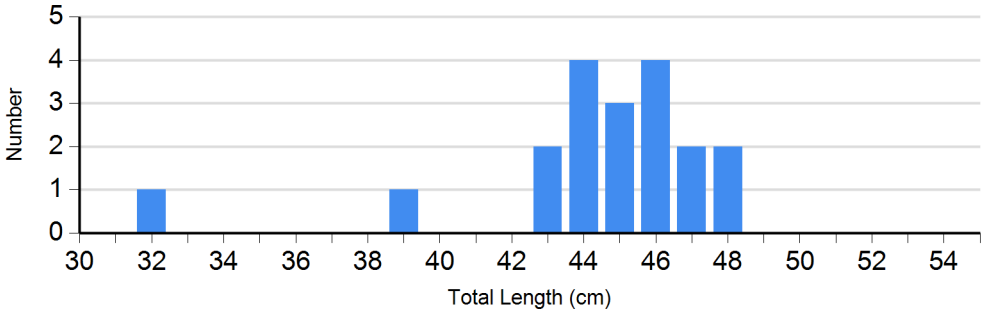
2017



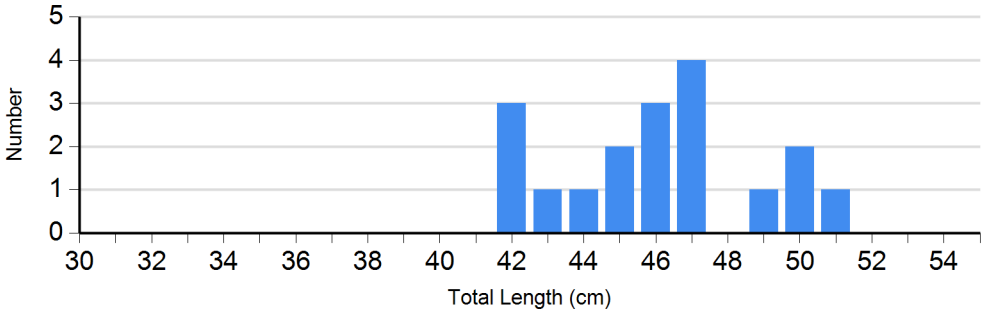
2018

Species: White Sucker
Gear: std exp gill net

2015

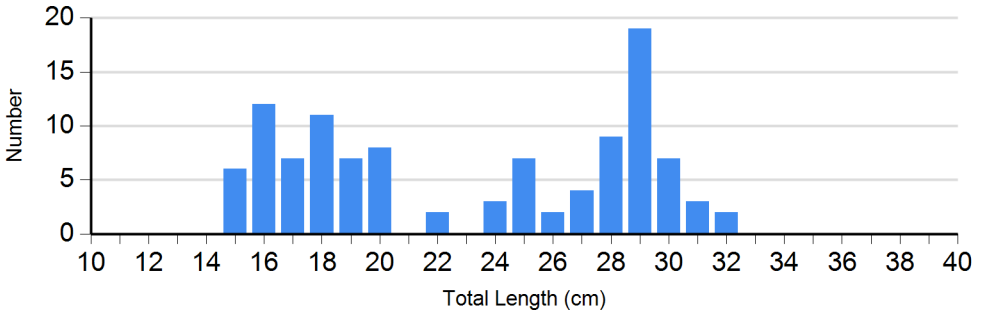


2016

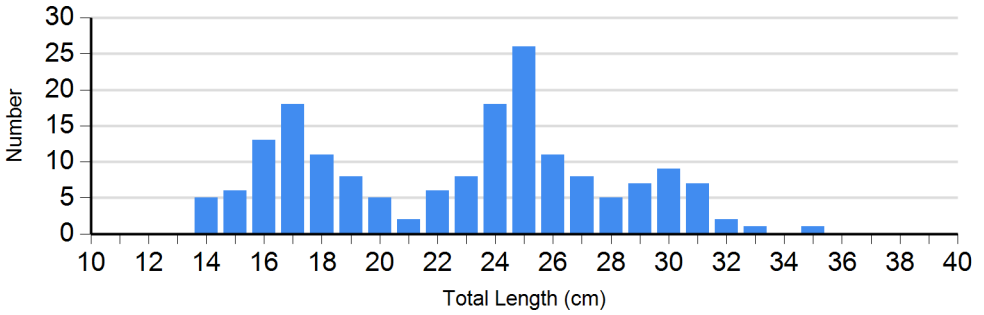


Species: Yellow Perch
Gear: AFS std gill net

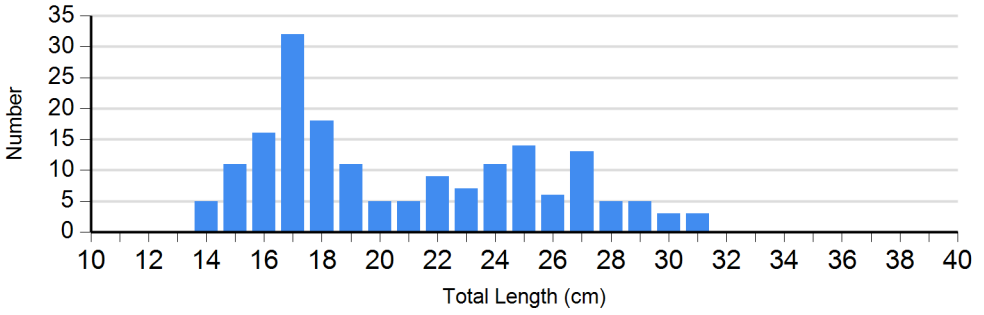
2017



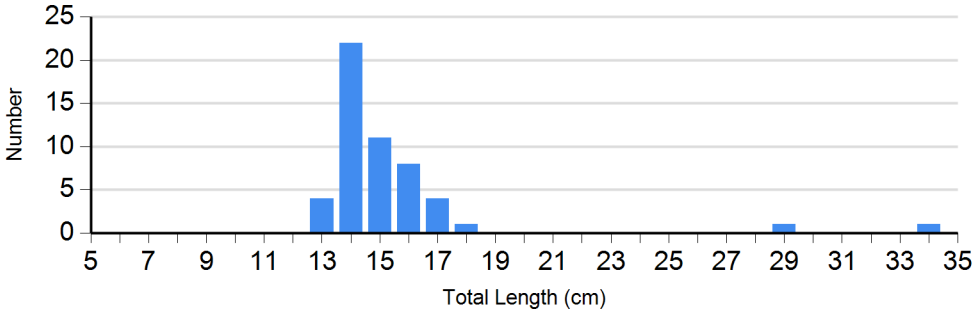
2018



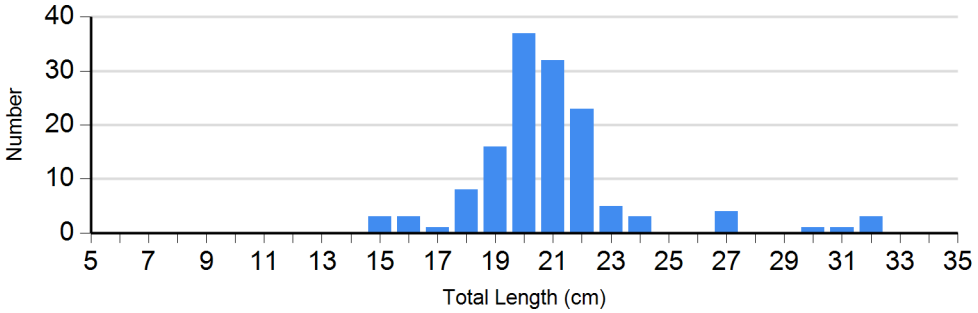
2019



Species: Yellow Perch
Gear: std exp gill net



2014



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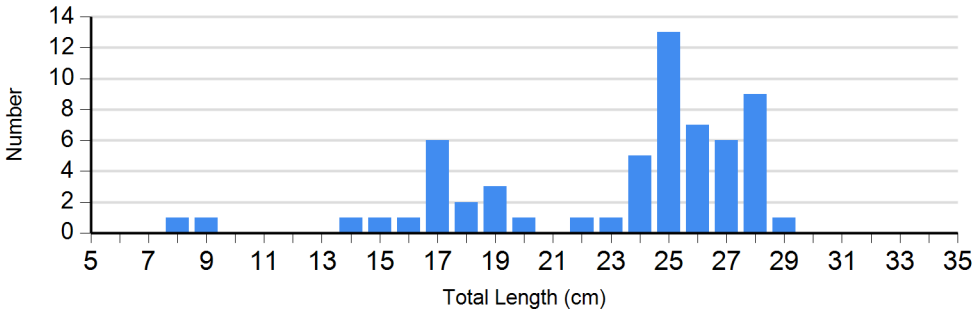
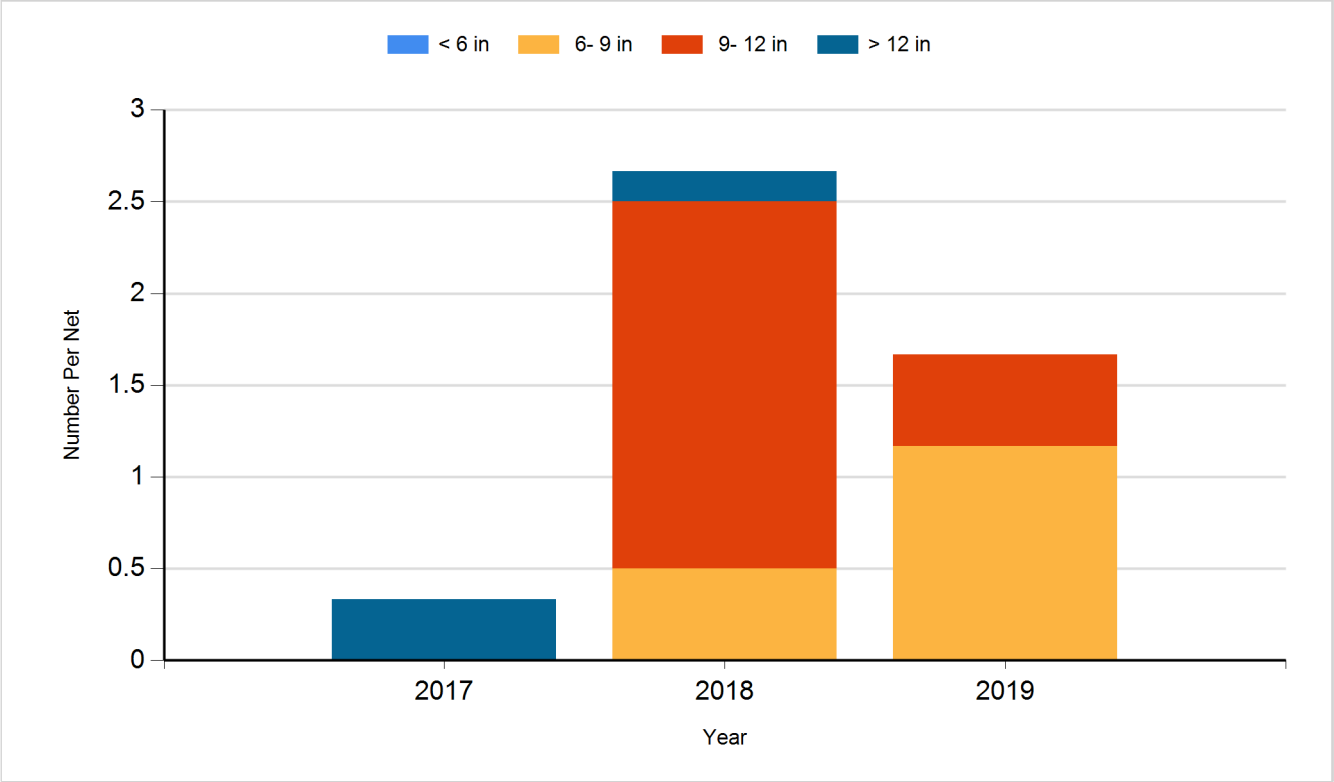


2016

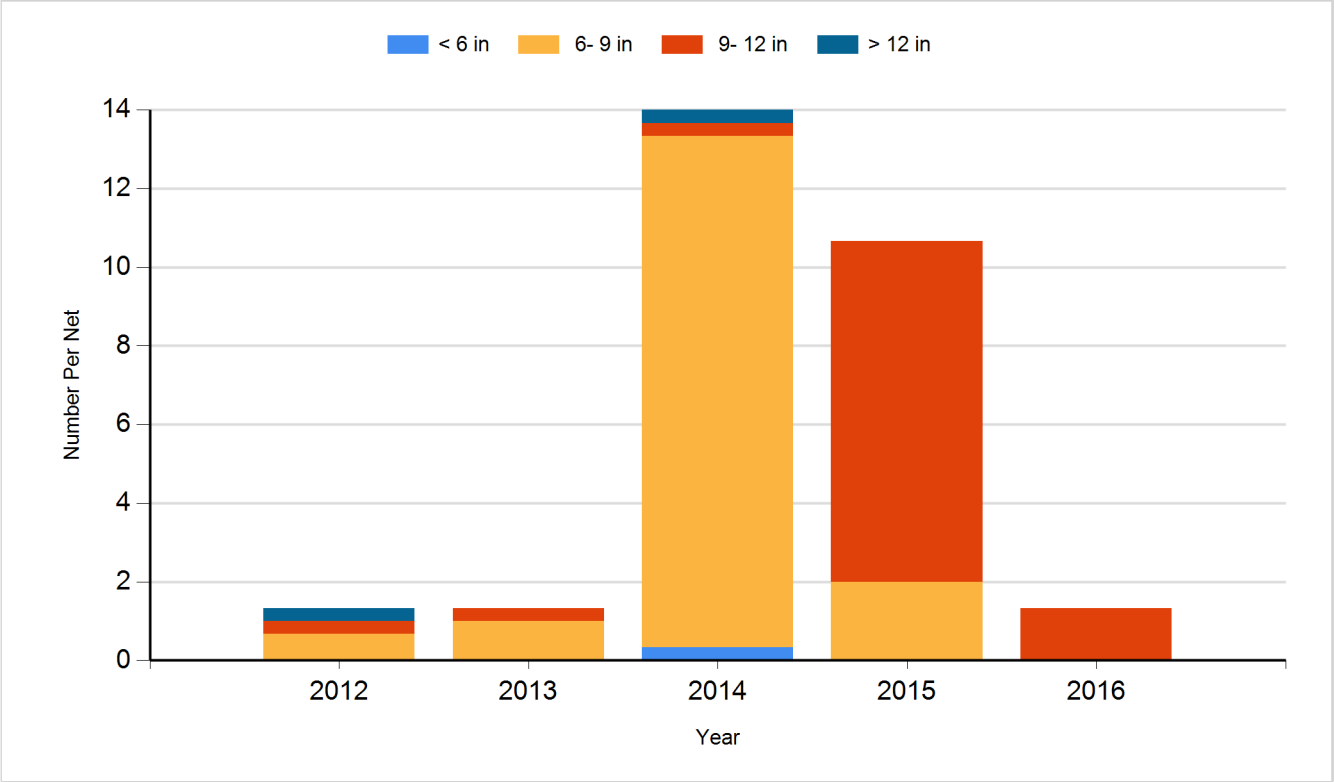
Historic Fish Sizes and Relative Abundance

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

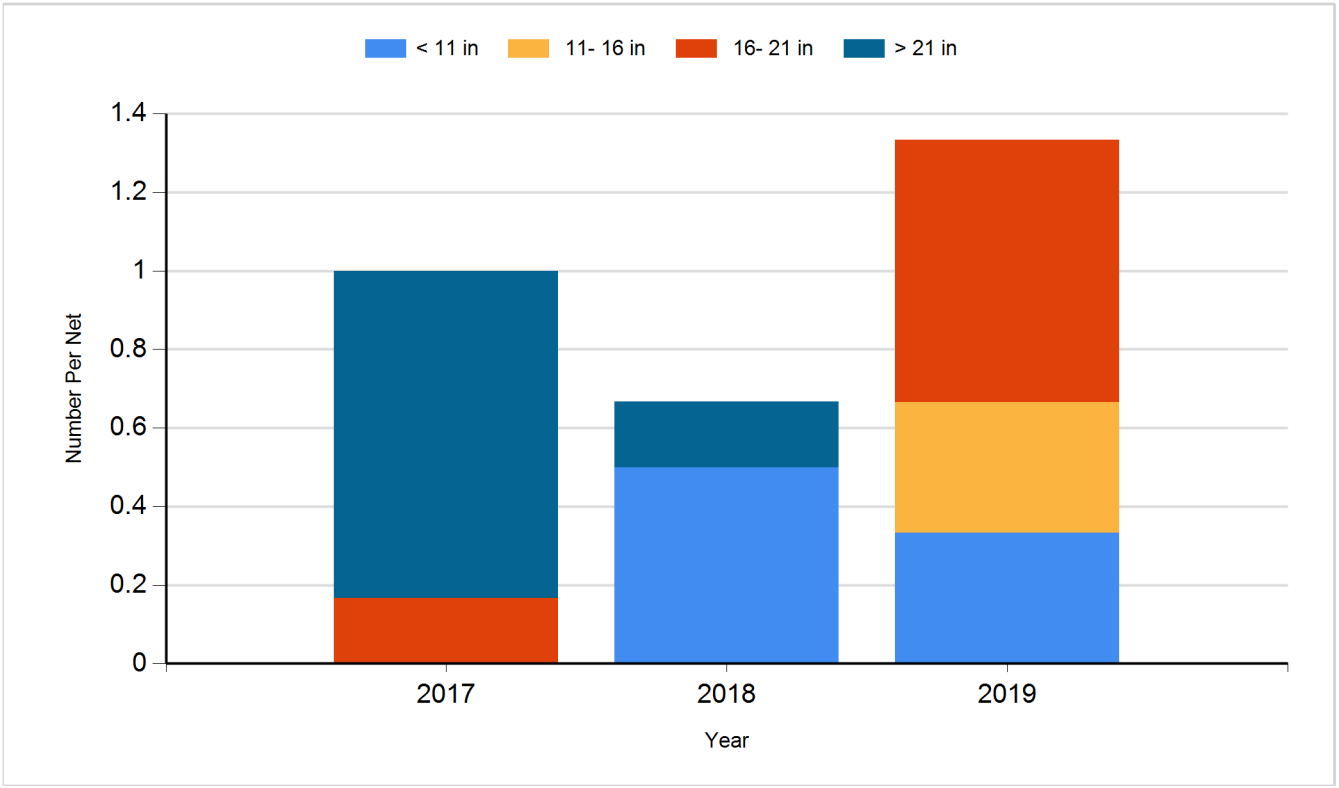
Species: Black Bullhead
Gear: AFS std gill net



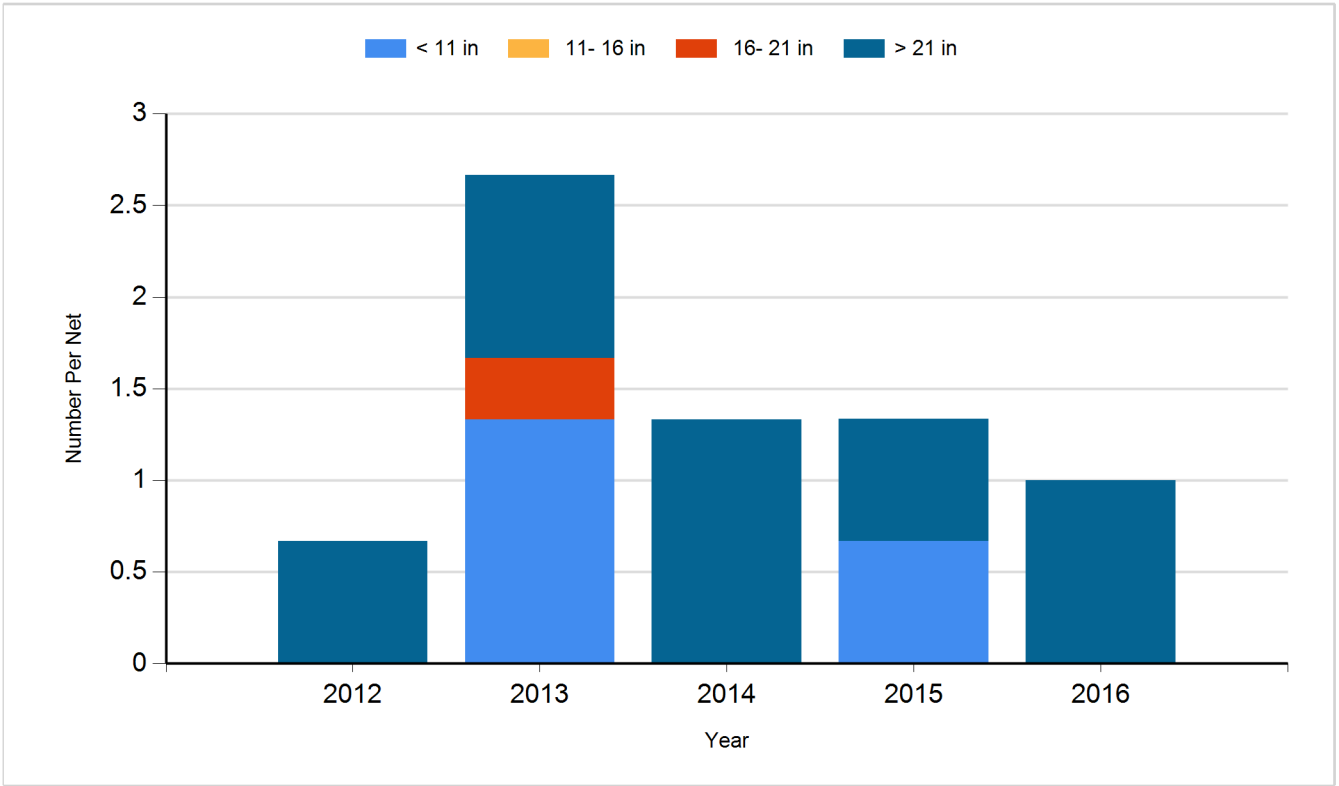
Species: Black Bullhead
Gear: std exp gill net



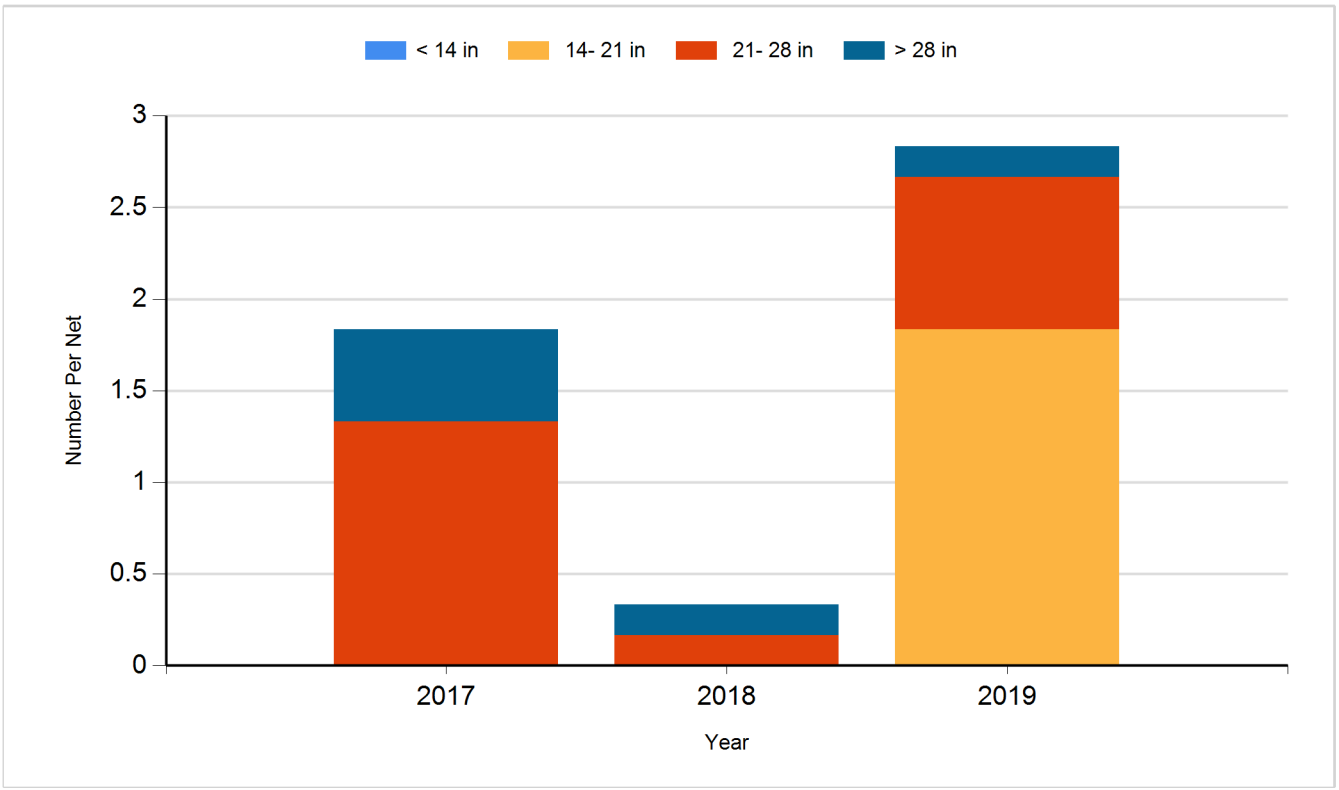
Species: Common Carp
Gear: AFS std gill net



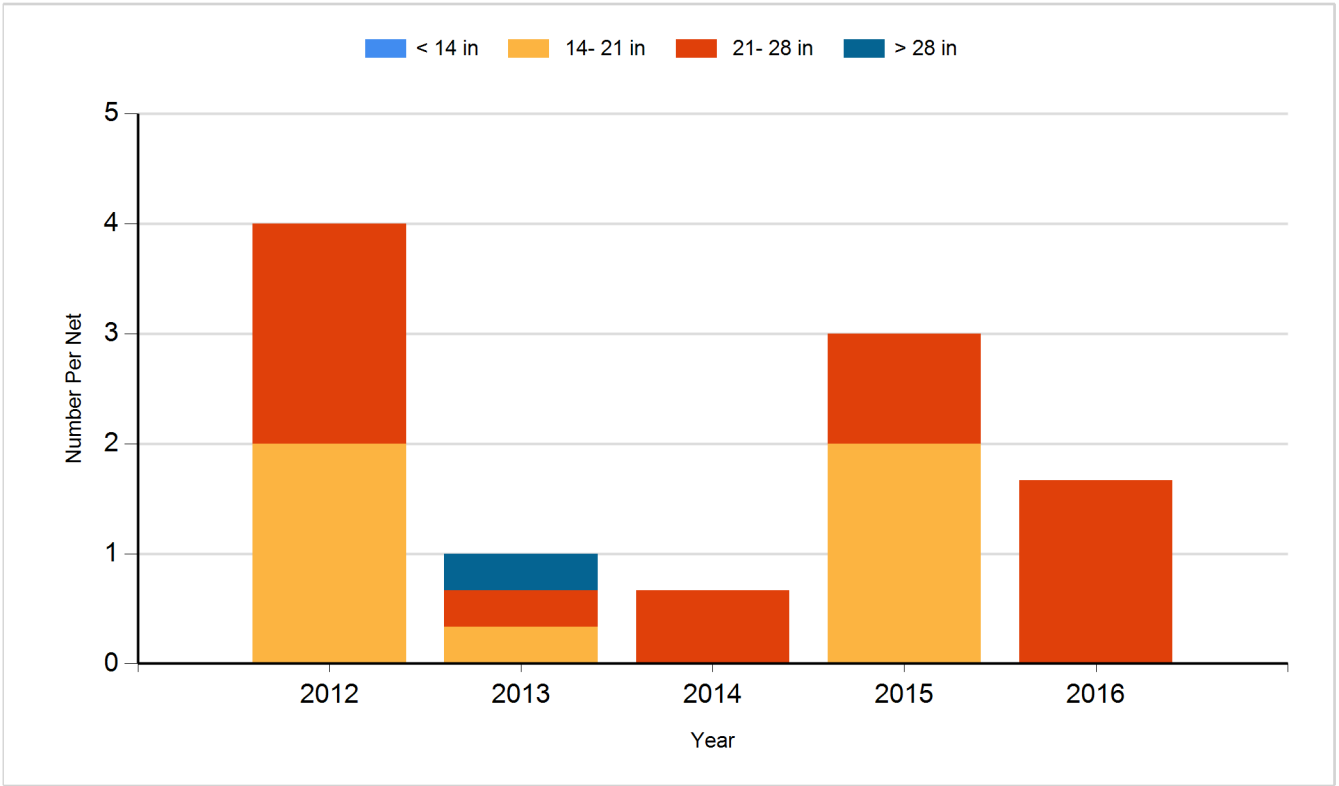
Species: Common Carp
Gear: std exp gill net



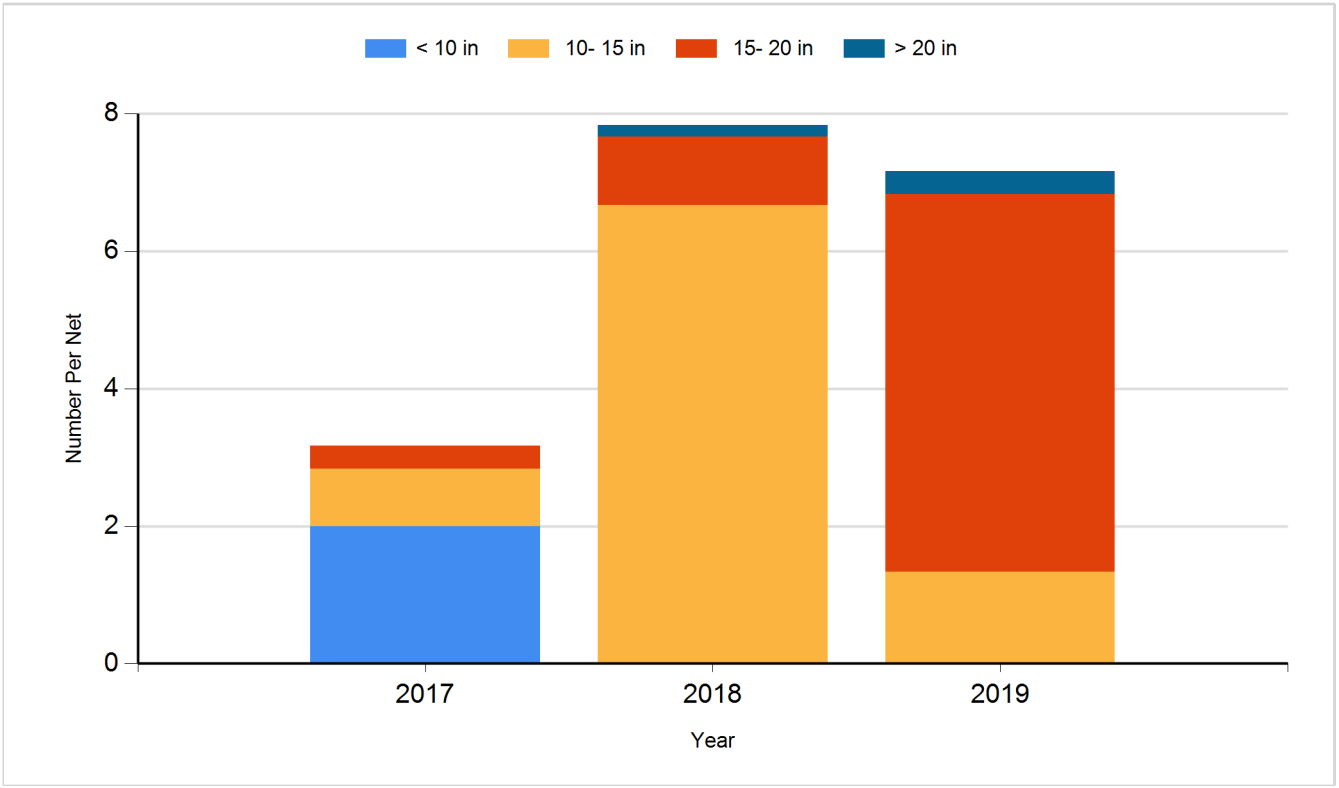
Species: Northern Pike
Gear: AFS std gill net



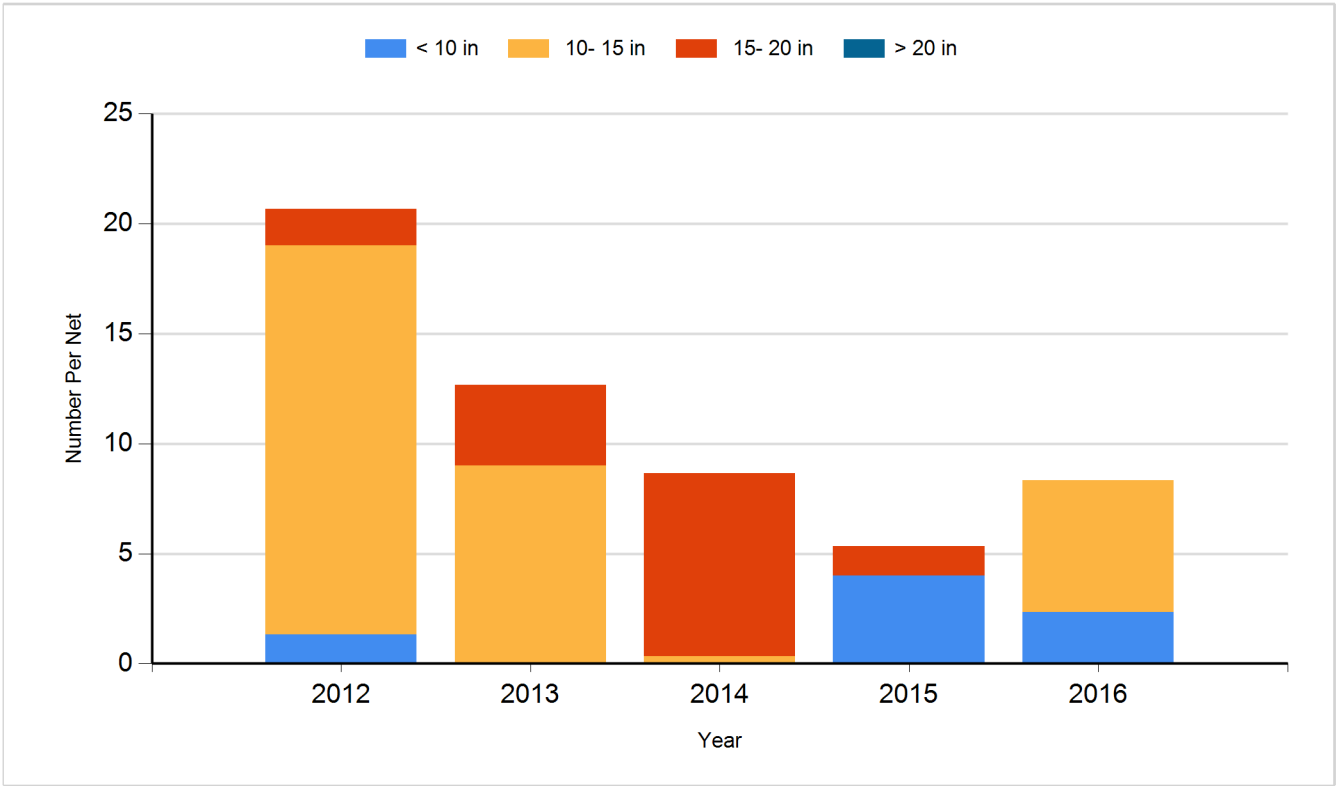
Species: Northern Pike
Gear: std exp gill net



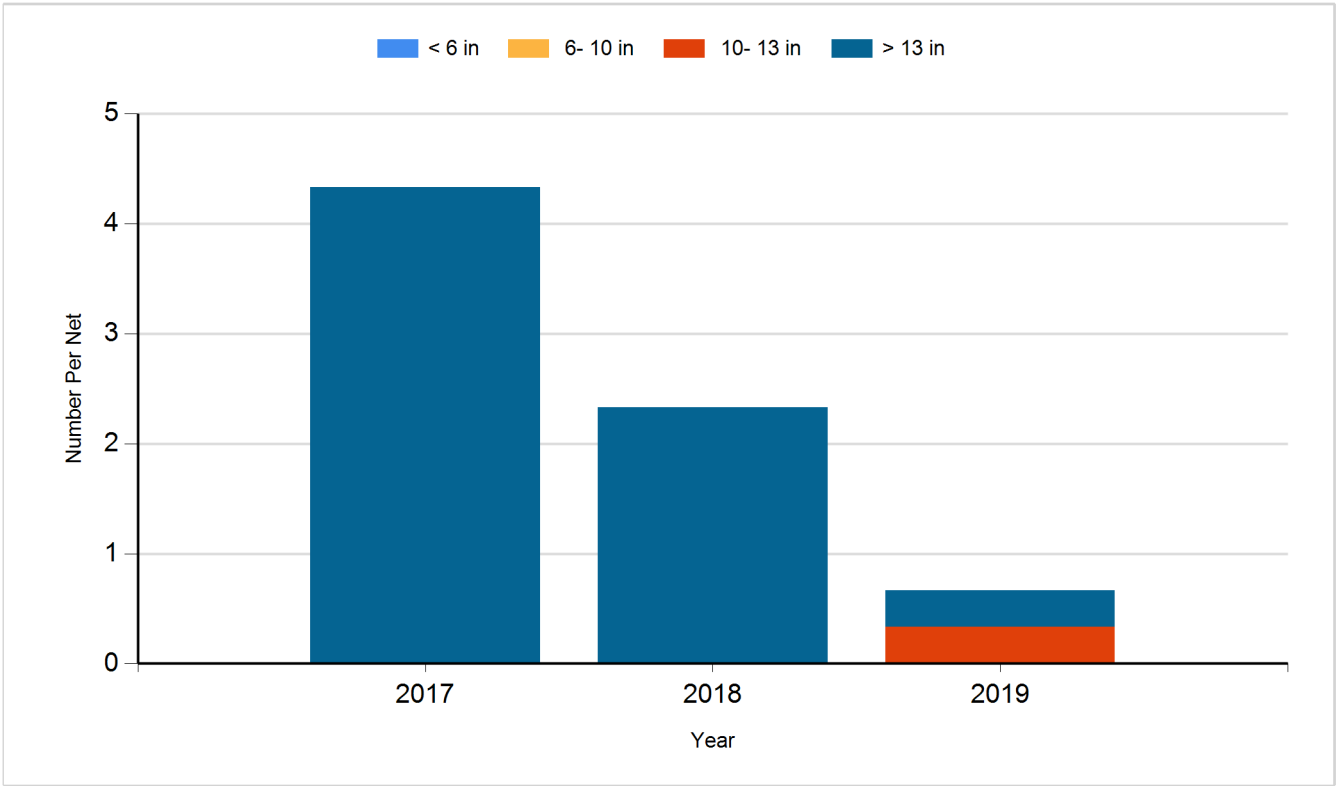
Species: Walleye
Gear: AFS std gill net



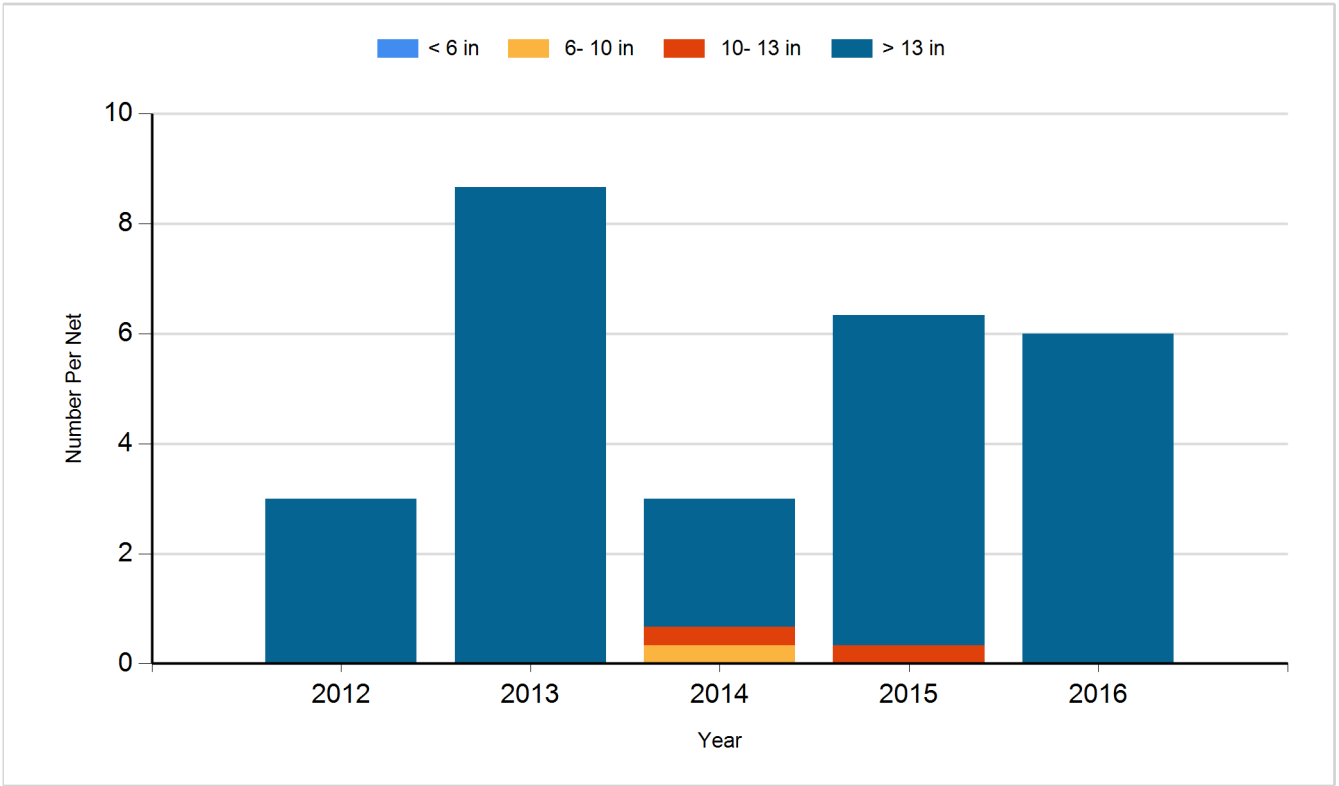
Species: Walleye
Gear: std exp gill net



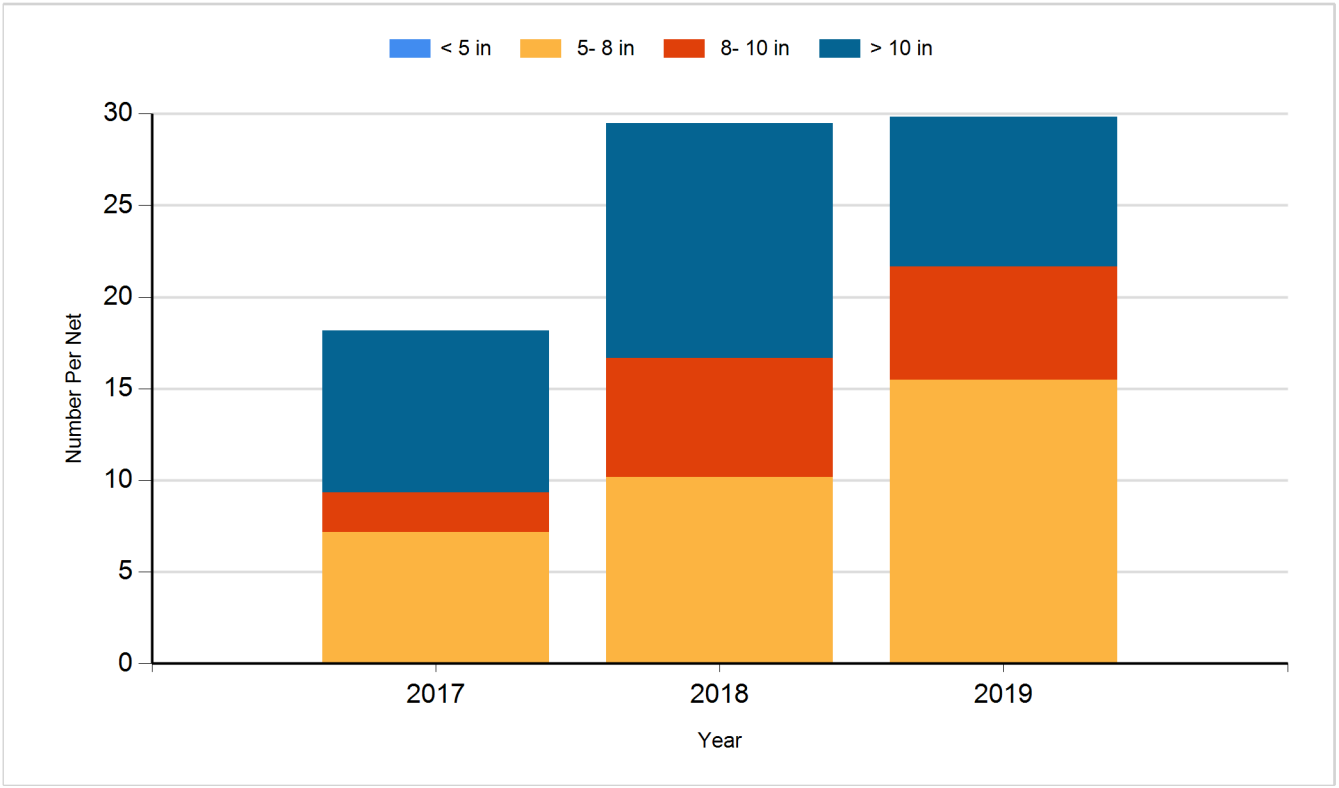
Species: White Sucker
Gear: AFS std gill net



Species: White Sucker
Gear: std exp gill net



Species: Yellow Perch
Gear: AFS std gill net



Species: Yellow Perch
Gear: std exp gill net