SOUTH DAKOTA STATEWIDE FISHERIES SURVEY

Carthage, Miner County

MJA-Lake-598-000

2018

Lake Information

Name: Carthage

County: Miner

Surface Area: 211 Acres

Surveys and Investigations

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

Gear	Date	Effort
AFS std gill net	Jun 19, 2018	6 net-nights
frame net (std 3/4 in)	Jun 19, 2018	5 net-nights

Common Fish Species Present

Black Bullhead

White Sucker

Black Crappie

Channel Catfish

Common Carp

Yellow Perch

Walleye

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	349	57.7	23.3	1		0			
	Black Crappie	1	0.2	0.2	100		0		92	
	Channel Catfish	37	6.2	0.9	73	11	0		95	2
	Common Carp	16	2.3	1.2	79		7			
	Walleye	1	0.2	0.2	100		100		103	
	White Sucker	23	3.8	1.4	96		96			
	Yellow Perch	4	0.7	0.5	25		0		99	4
frame net (std 3/4 in)	Black Bullhead	3370	640.4	449.7	1	0	1	0		
	Black Crappie	39	6.8	4.1	59	13	9		110	2
	Channel Catfish	9	1.6	1.2	38		0		86	4
	White Sucker	73	14.6	12.8	100		100			

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									18.4		18.4
	Black Crappie									7.8		7.8
	Bluegill									1.4		1.4
	Channel Catfish									0.2		0.2
	Common Carp									2.4		2.4
	Gizzard Shad									0.6		0.6
	Northern Pike									0.4		0.4
	Orangespotted Sunfish									0.0		0.0
	Pumpkinseed									0.4		0.4
	Sunfish Hybrid									0.0		0.0
	Walleye									2.0		2.0
	White Sucker									4.4		4.4
AFS std gill net	Black Bullhead									80.8	57.7	69.3
	Black Crappie									0.8	0.2	0.5
	Channel Catfish									12.3	6.2	9.3
	Common Carp									4.5	2.3	3.4
	Gizzard Shad									2.3		2.3
	Northern Pike									0.3		0.3
	Walleye									5.5	0.2	2.9
	White Sucker									7.5	3.8	5.7
	Yellow Perch									0.3	0.7	0.5
boat shocker (night)	Largemouth Bass	6.0		6.0								6.0
frame net (std 3/4 in)	Black Bullhead	665.1		441.7		810.6	100.4	377.4	1,495.6		640.4	647.3
	Black Crappie	8.8		1.1		0.1	2.6	6.0	9.4		6.8	5.0
	Bluegill	3.6		3.8			1.0	0.8	1.4			2.1
	Channel Catfish	0.7		2.8		0.7	3.8	0.4	6.2		1.6	2.3
	Common Carp	3.9		20.0		1.5	1.8	0.8	3.8			5.3
	Green Sunfish							0.2				0.2
	Northern Pike	1.5		3.0		0.4	2.0	3.0	3.4			2.2
	Sunfish Hybrid	0.0		0.0								0.0
	Walleye	0.1		0.1			0.2	1.4	0.6			0.5
	White Sucker	1.2		3.1		8.4	38.0	7.8	5.4		14.6	11.2
	Yellow Perch			0.2		0.1			0.2			0.2

		CPUE										
Gear	Species	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Avg
std exp gill net	Black Bullhead						189.3	148.3	249.7			195.8
	Black Crappie							3.0	1.7			2.4
	Channel Catfish						6.3	5.0	17.3			9.5
	Common Carp						5.3	9.0	1.7			5.3
	Northern Pike						1.7	2.0	1.7			1.8
	Walleye						12.0	7.3	3.3			7.5
	White Sucker						2.0	1.7	10.3			4.7
	Yellow Perch						1.0	0.7				0.9

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									1	
		PSD-P									0	
	Black Crappie	PSD									85	
		PSD-P									13	
		Wr									98	
	Channel Catfish	PSD									100	
		PSD-P									0	
		Wr									107	
	Common Carp	PSD									92	
		PSD-P									75	
	Walleye	PSD									30	
		PSD-P									0	
		Wr									80	
	White Sucker	PSD									100	
		PSD-P									100	
AFS std gill net	Black Bullhead	PSD									0	1
		PSD-P									0	0
	Black Crappie	PSD									100	100
		PSD-P									0	0
		Wr									102	92
	Channel Catfish	PSD									31	73
		PSD-P									2	0
		Wr									94	95
	Common Carp	PSD									56	79
		PSD-P									11	7
	Walleye	PSD									59	100
		PSD-P									0	100
		Wr									85	103
	White Sucker	PSD									100	96
		PSD-P									100	96
	Yellow Perch	PSD									100	25
		PSD-P									0	0

			Year									
Gear	Species	Index	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
AFS std gill net	Yellow Perch	Wr									84	99
frame net (std 3/4 in)	Black Bullhead	PSD	1		5		8	23	2	0		1
		PSD-P	0		0		0	0	0	0		1
		Wr	85		85		87					
	Black Crappie	PSD	18		9		100	46	73	83		59
		PSD-P	1		0		0	31	20	15		9
		Wr	111		116		126	122	108	96		110
	Channel Catfish	PSD	14		36		14	11	0	0		38
		PSD-P	14		7		0	5	0	0		0
		Wr	82		84		87	84	72	83		86
	Common Carp	PSD	92		2		47	100	50	95		
		PSD-P	3		2		13	33	50	42		
		Wr	81		92		85					
	Walleye	PSD	100		100			0	57	67		
		PSD-P	100		0			0	0	0		
		Wr	89		87			83	78	67		
	White Sucker	PSD	100		100		100	100	97	100		100
		PSD-P	75		81		99	100	90	100		100
		Wr	87		92		95					
	Yellow Perch	PSD			100		100			100		
		PSD-P			0		0			0		
		Wr			87		115			87		
std exp gill net	Black Bullhead	PSD						23	11	0		
		PSD-P						0	0	0		
	Black Crappie	PSD							33	100		
		PSD-P							0	0		
		Wr							102	98		
	Channel Catfish	PSD						42	13	17		
		PSD-P						5	0	0		
		Wr						85	80	92		
	Common Carp	PSD						81	48	100		
		PSD-P						25	7	20		
	Walleye	PSD						0	32	70		
		PSD-P						0	0	0		
		Wr						94	81	78		
	White Sucker	PSD						100	100	100		

			Year									
Gear	Species	Index	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
std exp gill net	White Sucker	PSD-P						83	60	61		
	Yellow Perch	PSD						100	50			
		PSD-P						100	50			
		Wr						94	87			

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+
2018	39	107 (5)	175 (14)	228 (6)	235 (6)	241 (8)					
2013	1				241 (1)						
2011	11	154 (10)		246 (1)							
2009	92	119 (4)	168 (63)	206 (24)	233 (1)						

Species: Walleye

		Mean Length (expanded sample number) at capture by age									
Year	N	1	2	3	4	5	6	7	8	9	10+
2018	1								662 (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	4		195 (4)								

Fish Condition

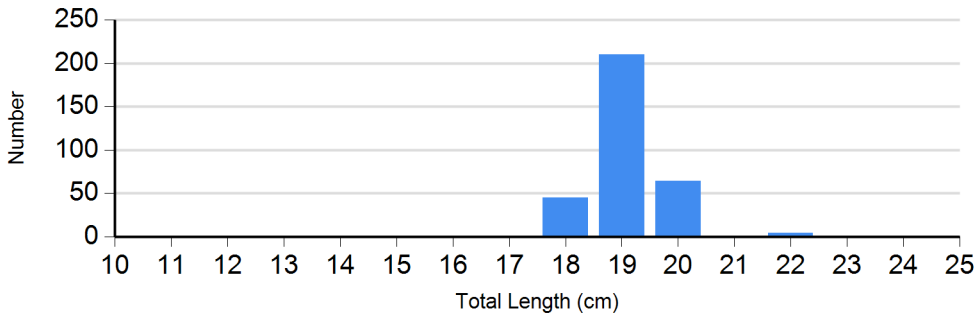
Mean relative weight (Wr) by sample size (N), length category stock to quality (S-Q), quality to preferred (Q-P), preferred to memorable (P-M), and memorable (M) for species collected across survey years with standard error (SE).

		Length Groups							
		S-Q		Q-P		P-M		M	
Species	Year	N	Wr (SE)	N	Wr (SE)	N	Wr (SE)	N	Wr (SE)
Black Crappie Frame Net	2014	7	119 (2.6)	2	122 (3.0)	4	125 (1.3)	0	
	2015	8	121 (7.6)	16	106 (1.5)	6	98 (3.2)	0	
	2016	8	102 (2.9)	32	97 (1.8)	6	89 (2.1)	1	73
	2017	6	107 (1.4)	28	98 (1.5)	5	87 (7.0)	0	
	2018	14	118 (1.6)	17	104 (1.7)	3	103 (3.0)	0	
Channel Catfish Gill Net	2014	11	84 (1.9)	7	89 (2.1)	0		1	78
	2015	13	79 (1.8)	2	85 (2.7)	0		0	
	2016	43	93 (4.0)	9	88 (4.2)	0		0	
	2017	34	95 (2.0)	14	95 (3.2)	1	83	0	
	2018	10	91 (3.1)	27	96 (1.8)	0		0	
Walleye Gill Net	2014	36	94 (1.3)	0		0		0	
	2015	15	80 (1.5)	7	82 (2.1)	0		0	
	2016	3	81 (2.6)	7	76 (2.1)	0		0	
	2017	9	82 (2.0)	13	87 (1.5)	0		0	
	2018	0		0		0		1	103
Yellow Perch Gill Net	2014	0		0		3	94 (0.5)	0	
	2015	1	98	0		1	75	0	
	2017	0		1	84	0		0	
	2018	3	102 (2.2)	1	91	0		0	

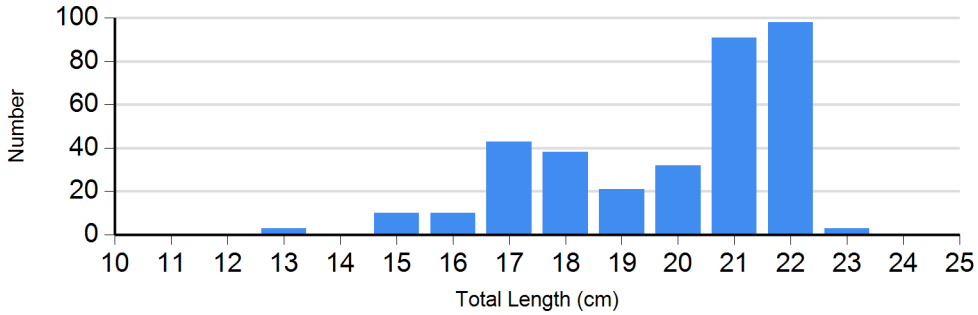
Length Frequency Distribution

Length frequency histogram of species sampled by year.

Species: Black Bullhead
Gear: AFS std gill net



2017



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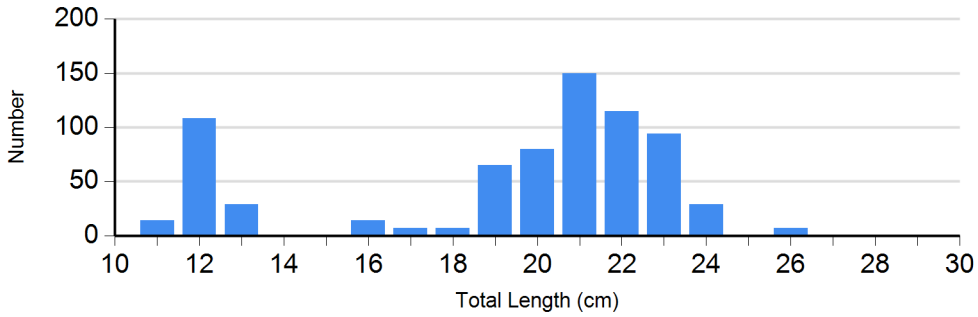
Species: Black Bullhead
Gear: std exp gill net



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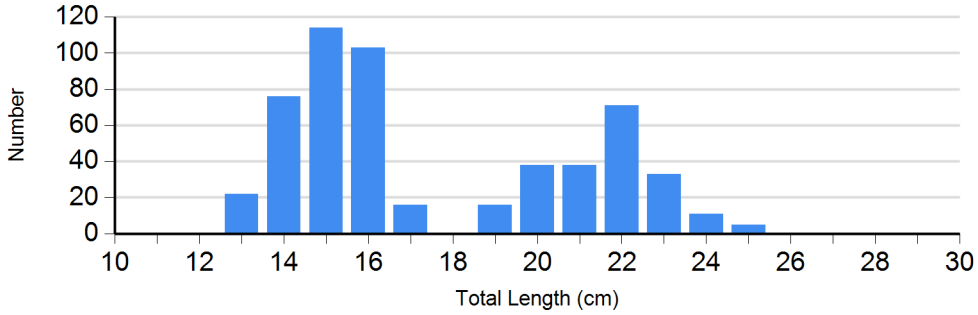

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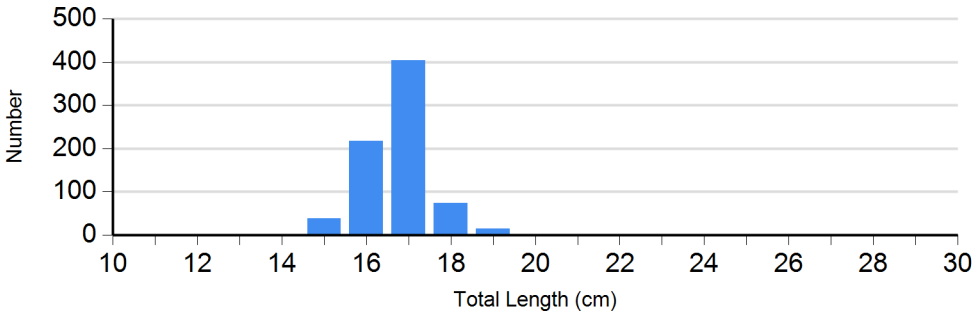
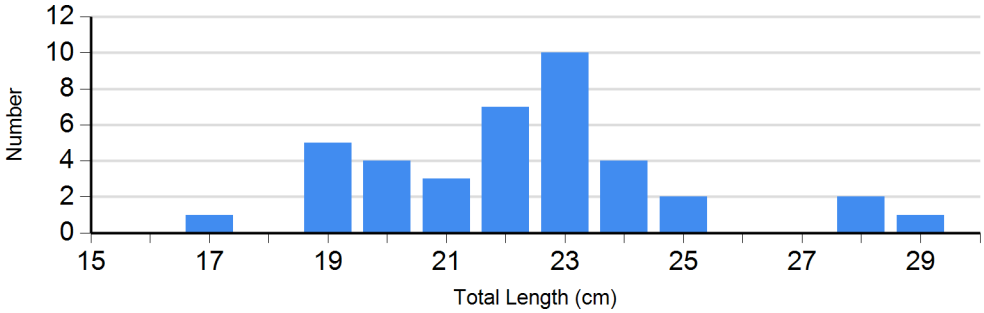


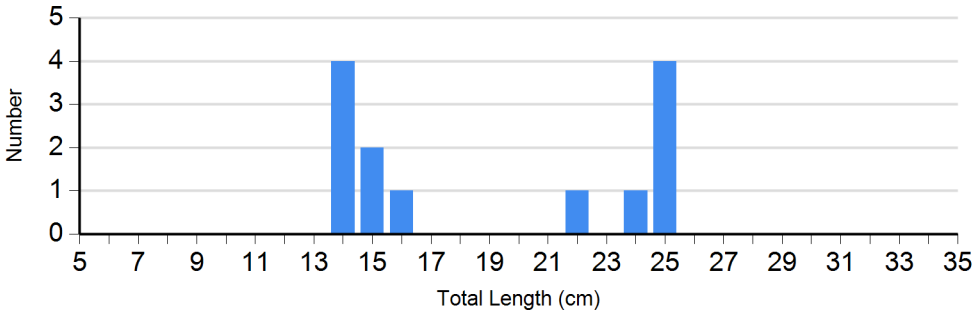
2016

Species: Black Crappie
Gear: AFS std frame net



2017

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



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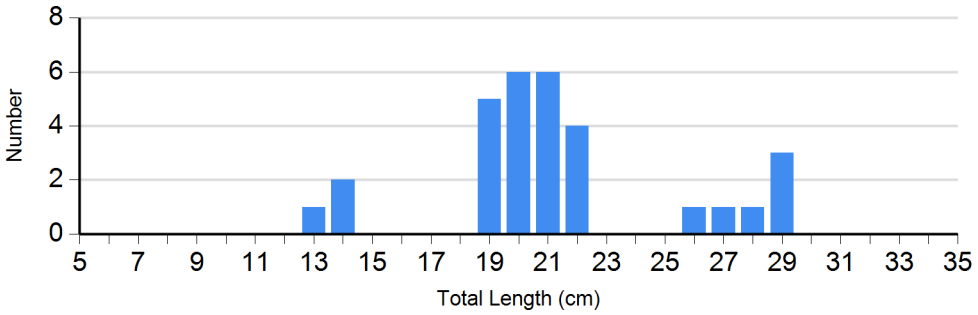

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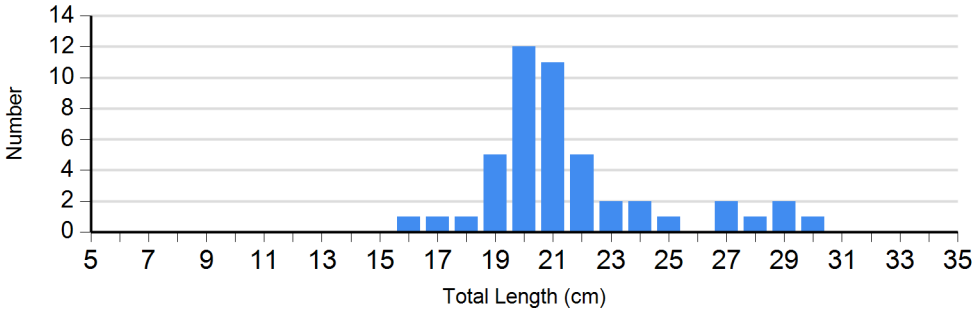

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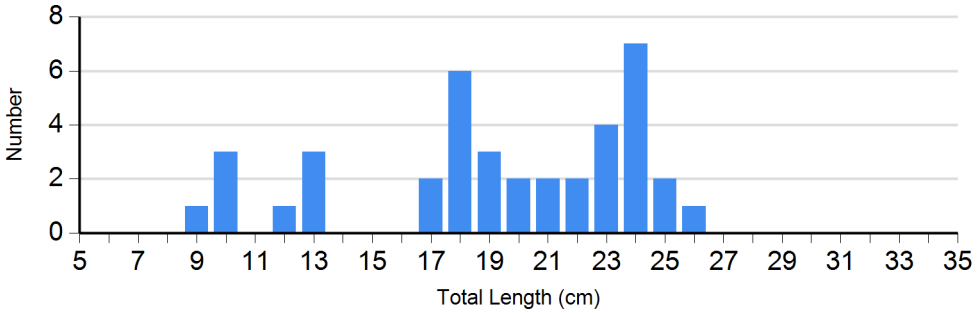
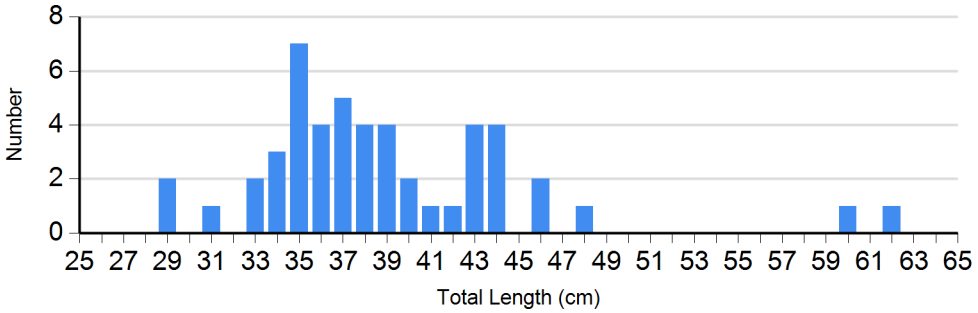
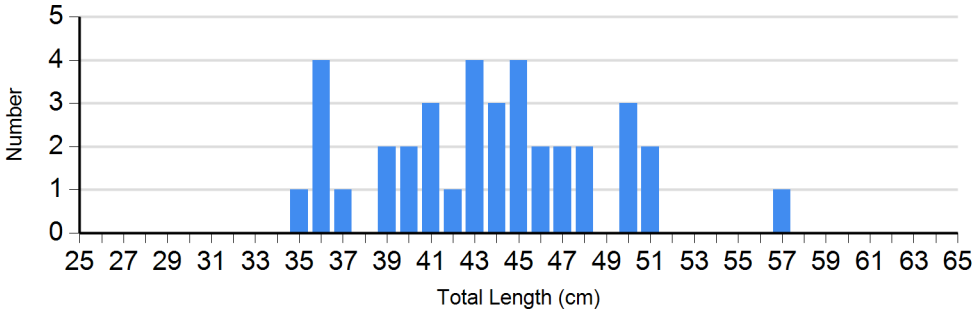


2018

Species: Channel Catfish
Gear: AFS std gill net

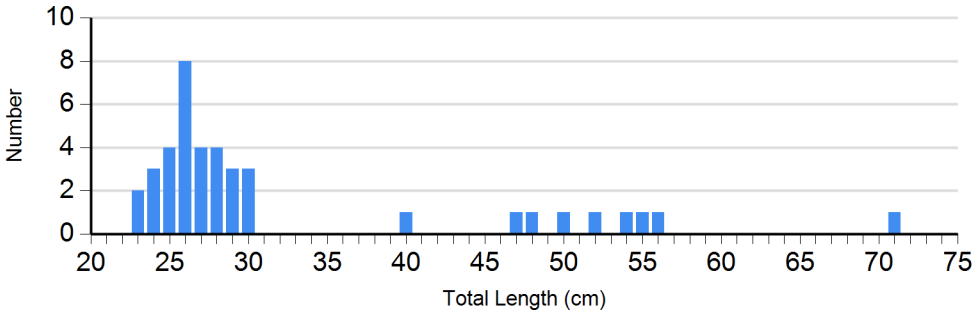


2017



2018

Species: Channel Catfish
Gear: std exp gill net



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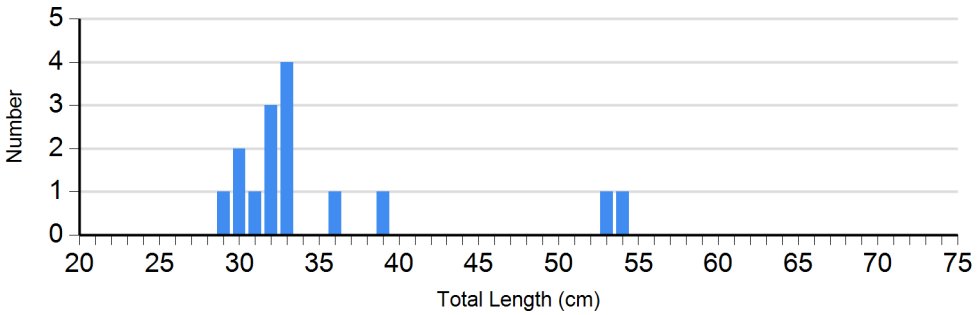

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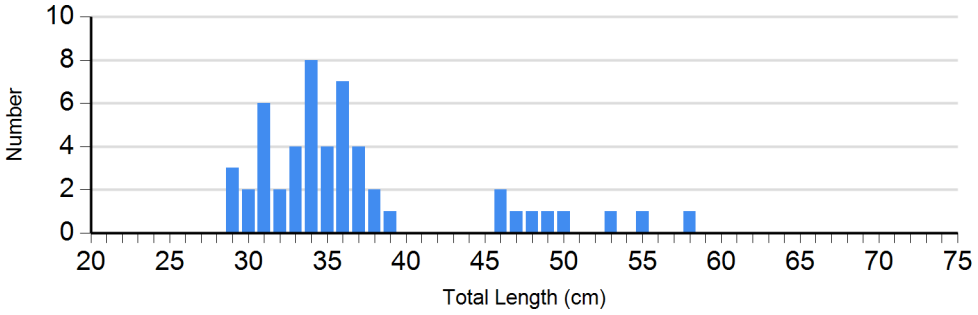
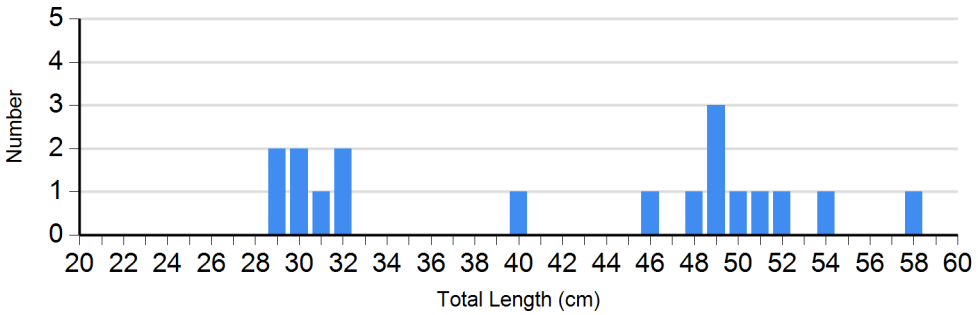
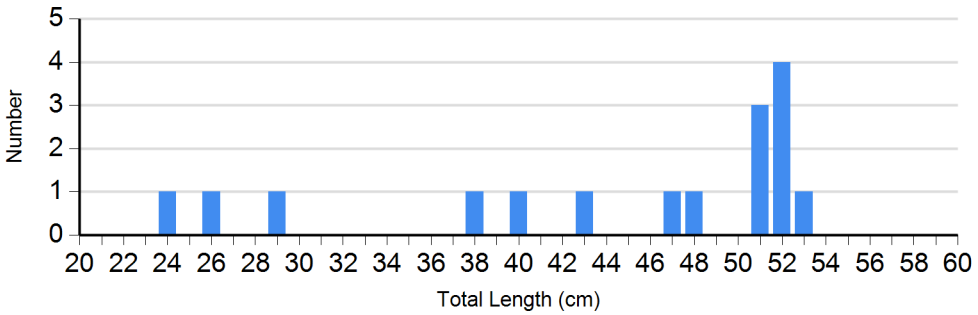


2016

Species: Common Carp
Gear: AFS std gill net

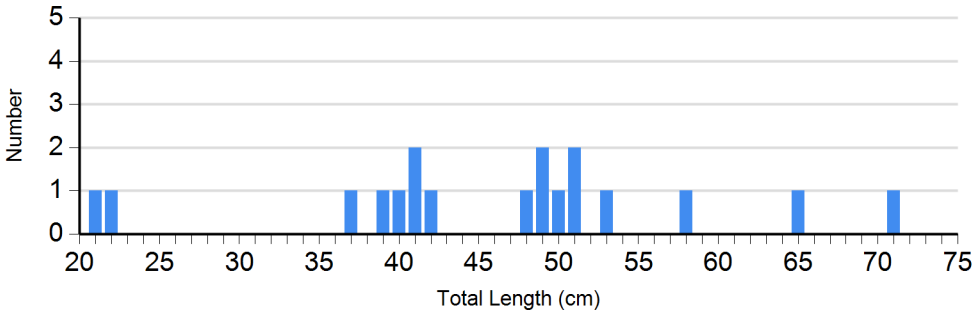


2017

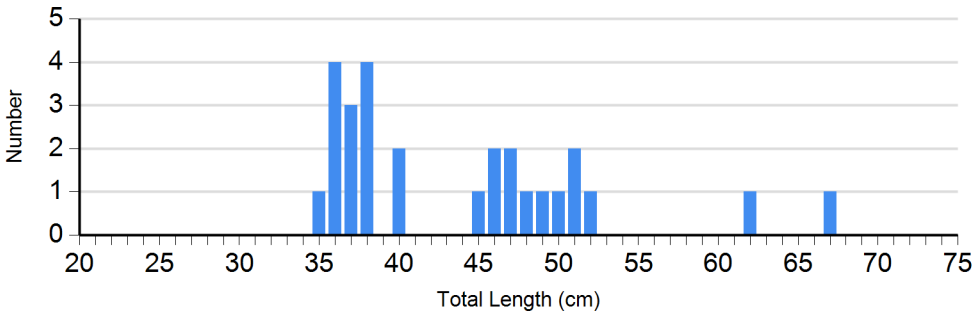


2018

Species: Common Carp
Gear: std exp gill net

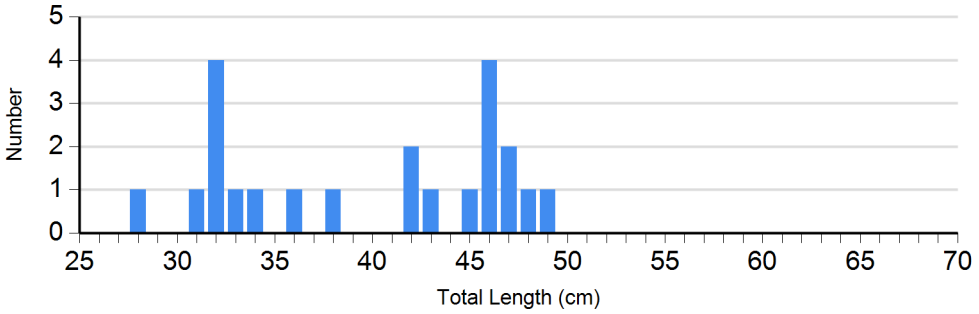


2014



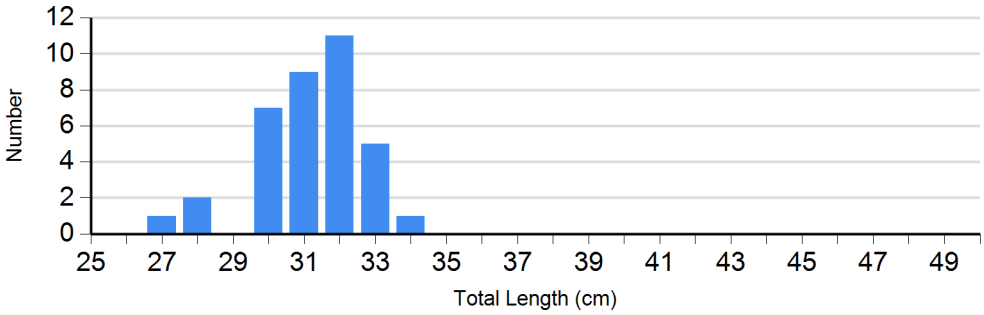
2015

Species: Walleye
Gear: AFS std gill net

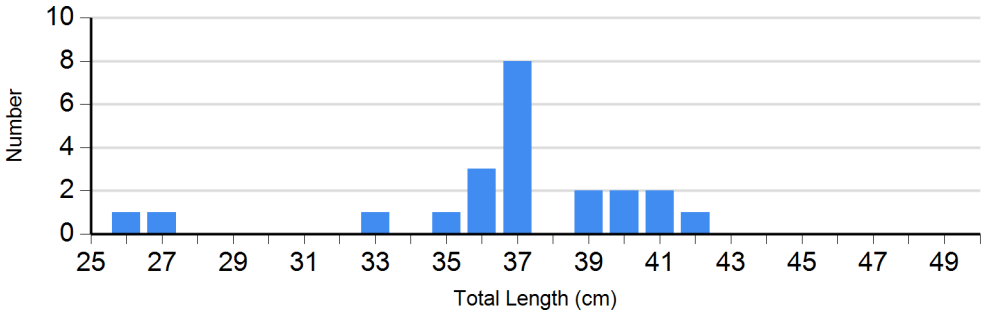


2017

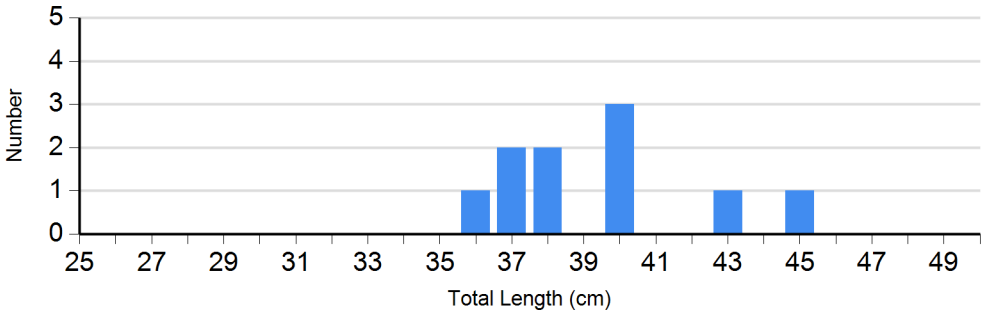
Species: Walleye
Gear: std exp gill net



2014

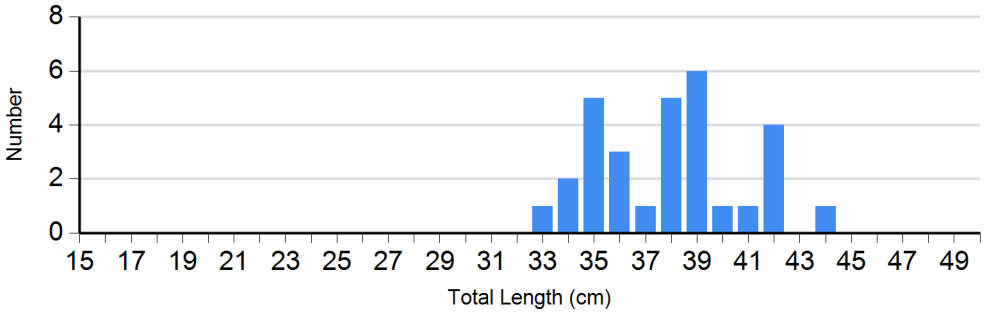


2015

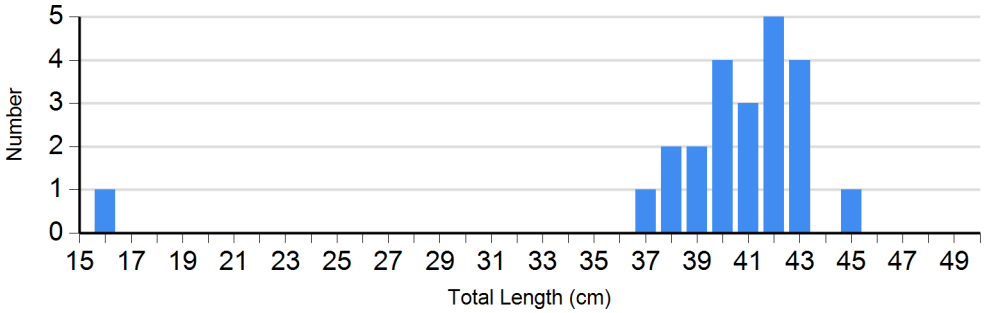


2016

Species: White Sucker
Gear: AFS std gill net

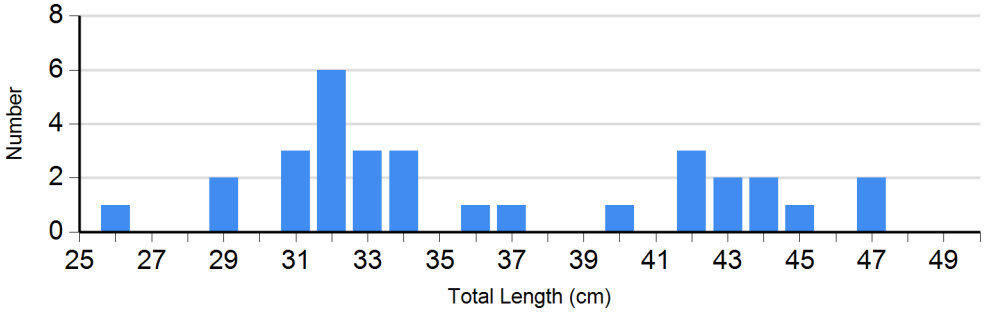


2017



2018

Species: White Sucker
Gear: std exp gill net

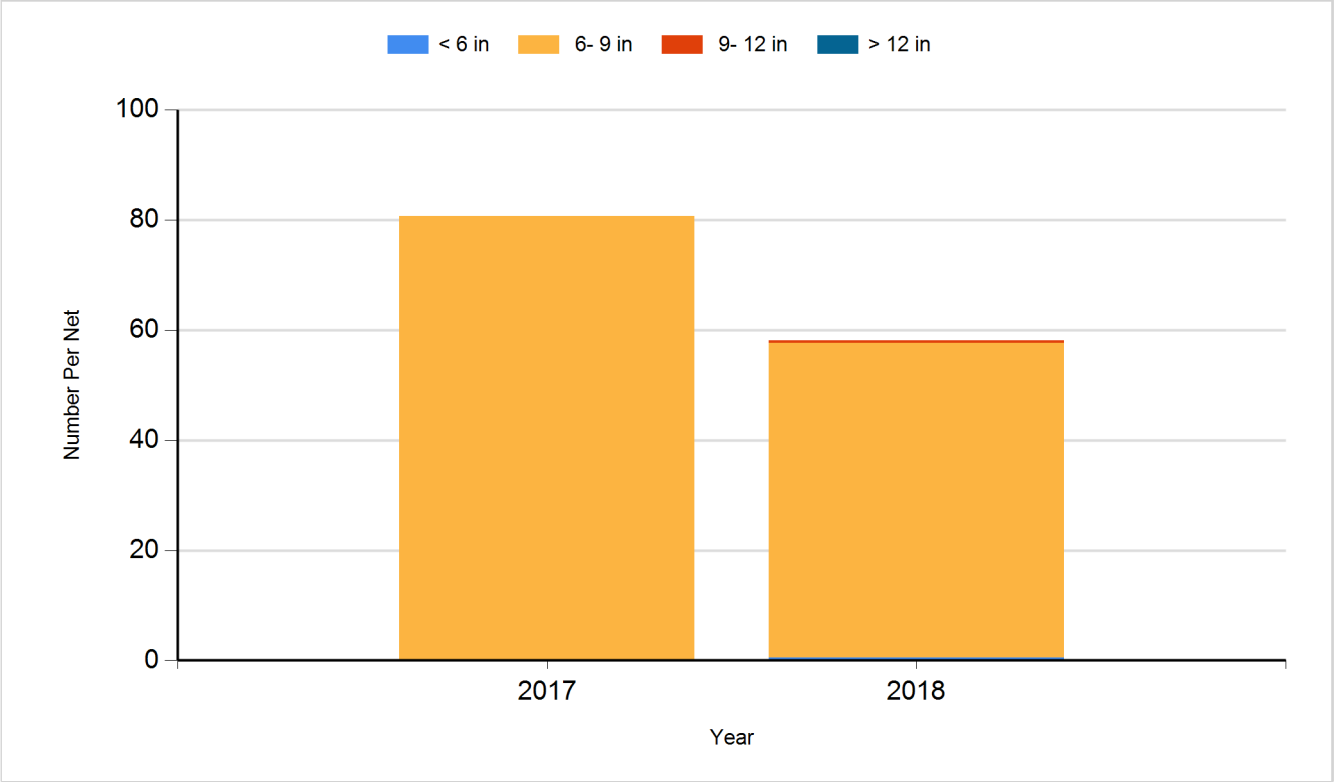


2016

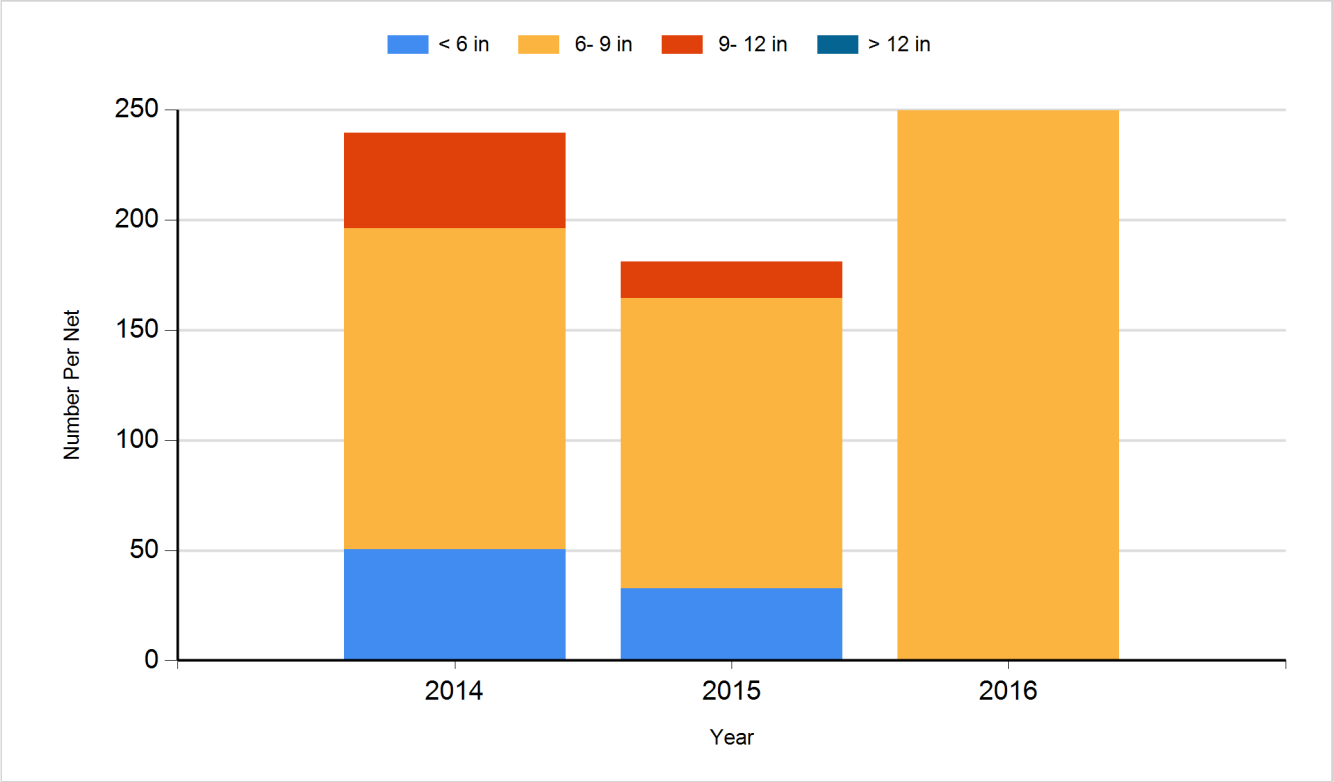
Historic Fish Sizes and Relative Abundance

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

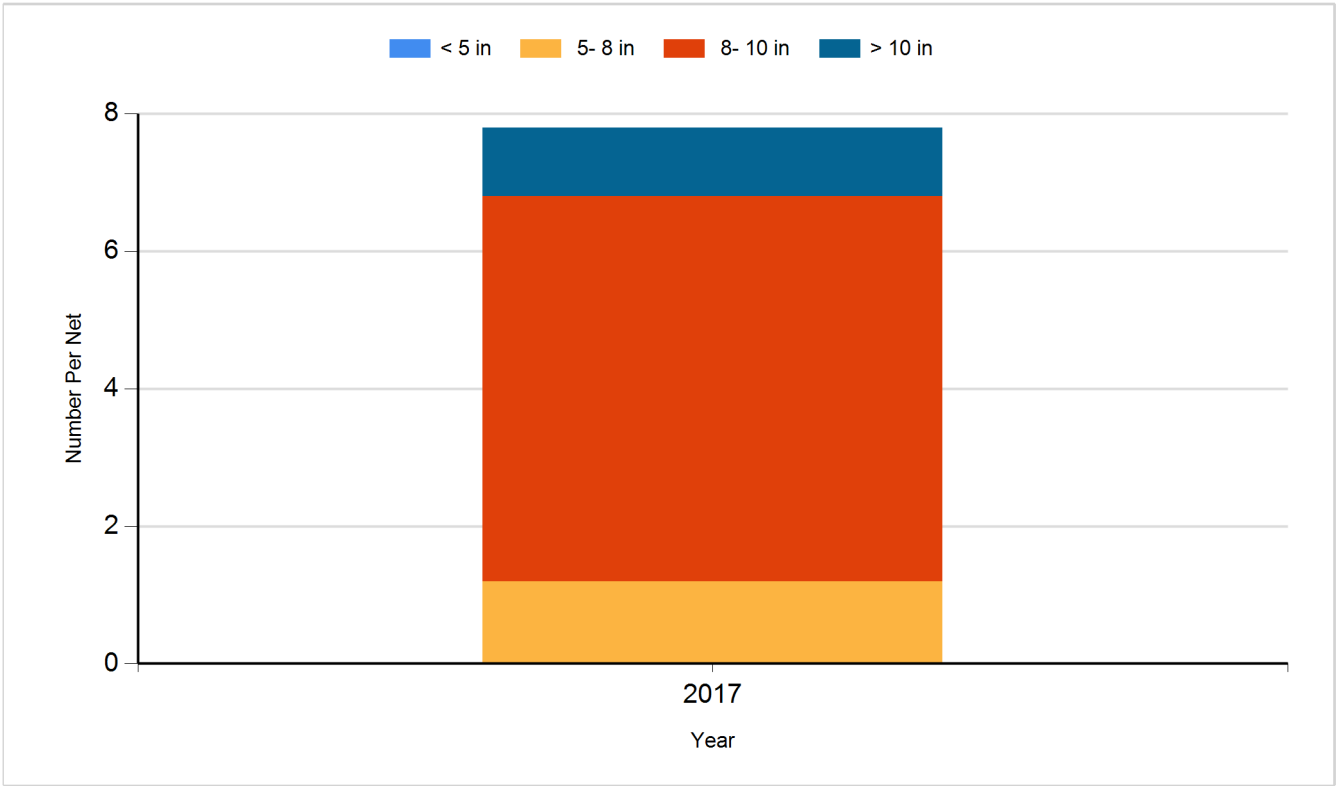
Species: Black Bullhead
Gear: AFS std gill net



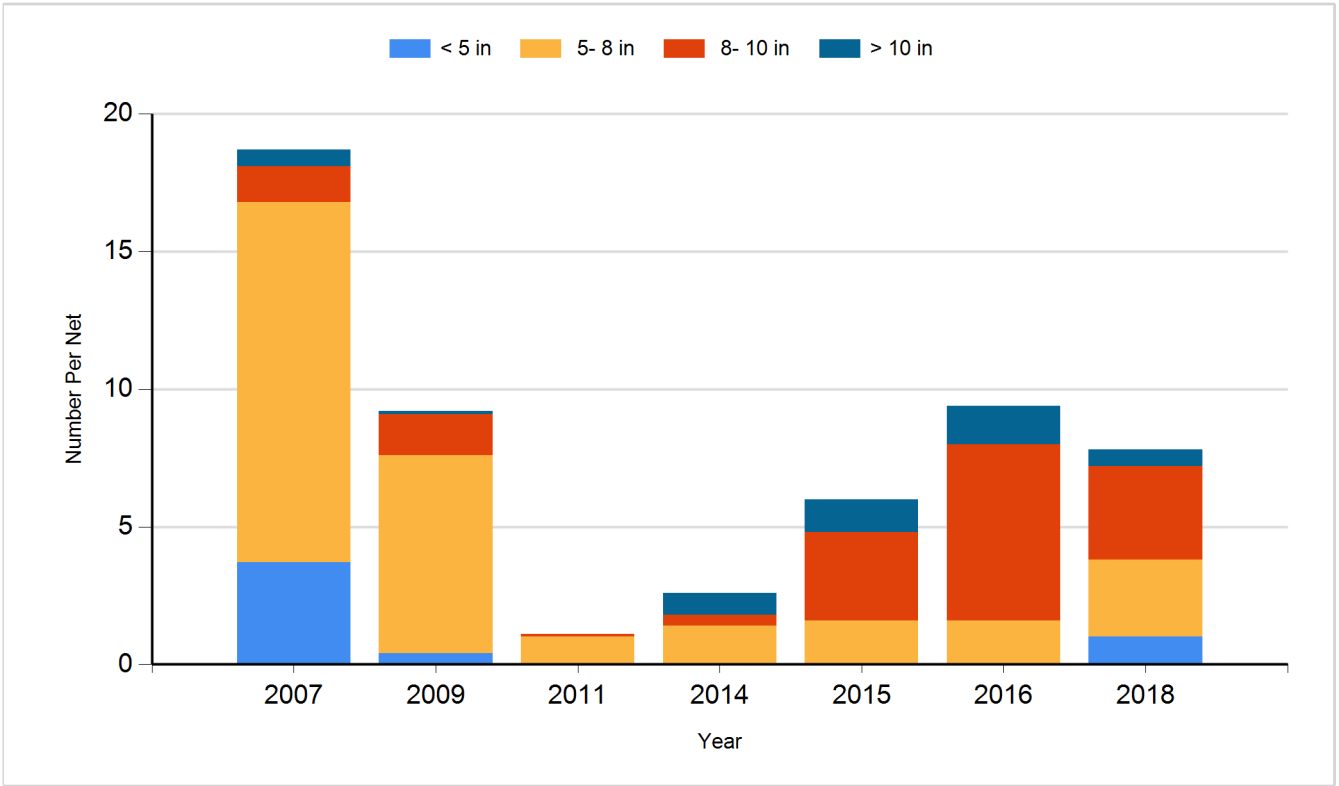
Species: Black Bullhead
Gear: std exp gill net



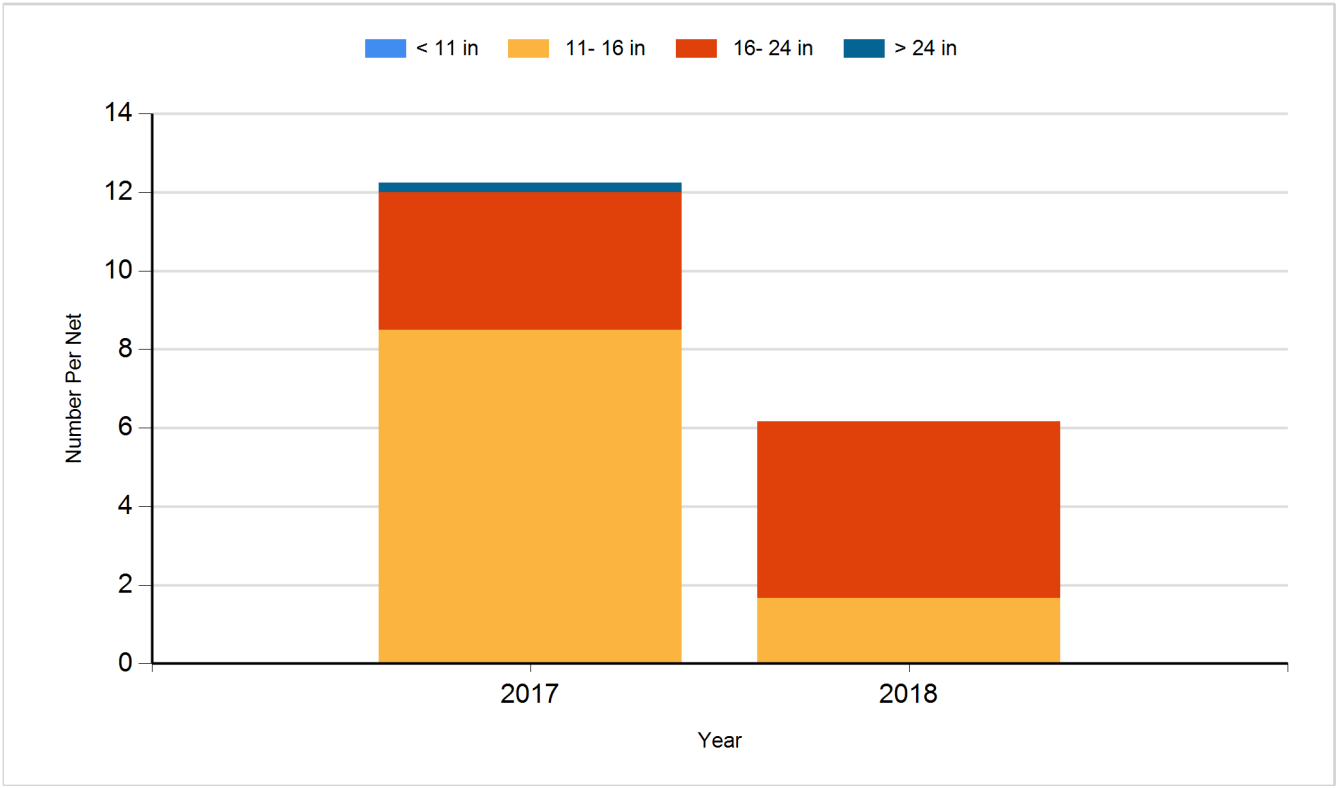
Species: Black Crappie
Gear: AFS std frame net



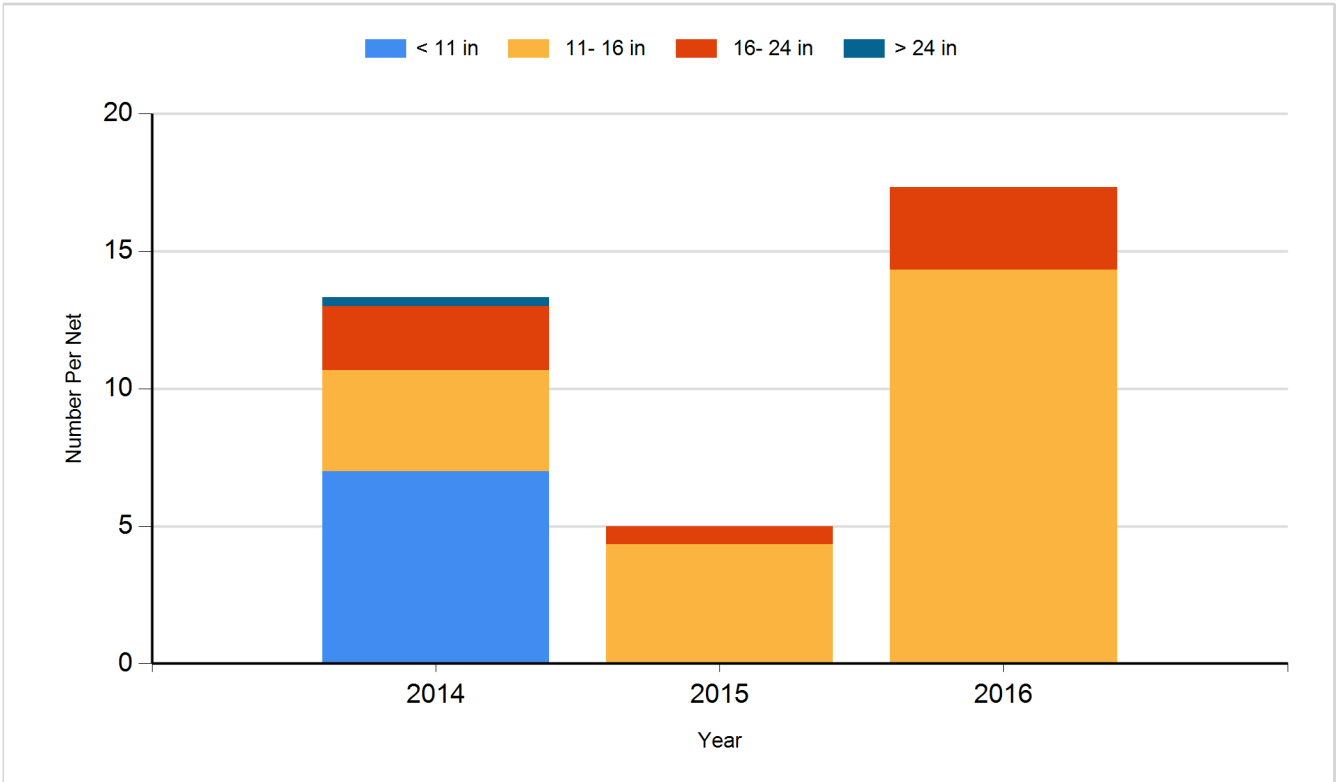
Species: Black Crappie
Gear: frame net (std 3/4 in)



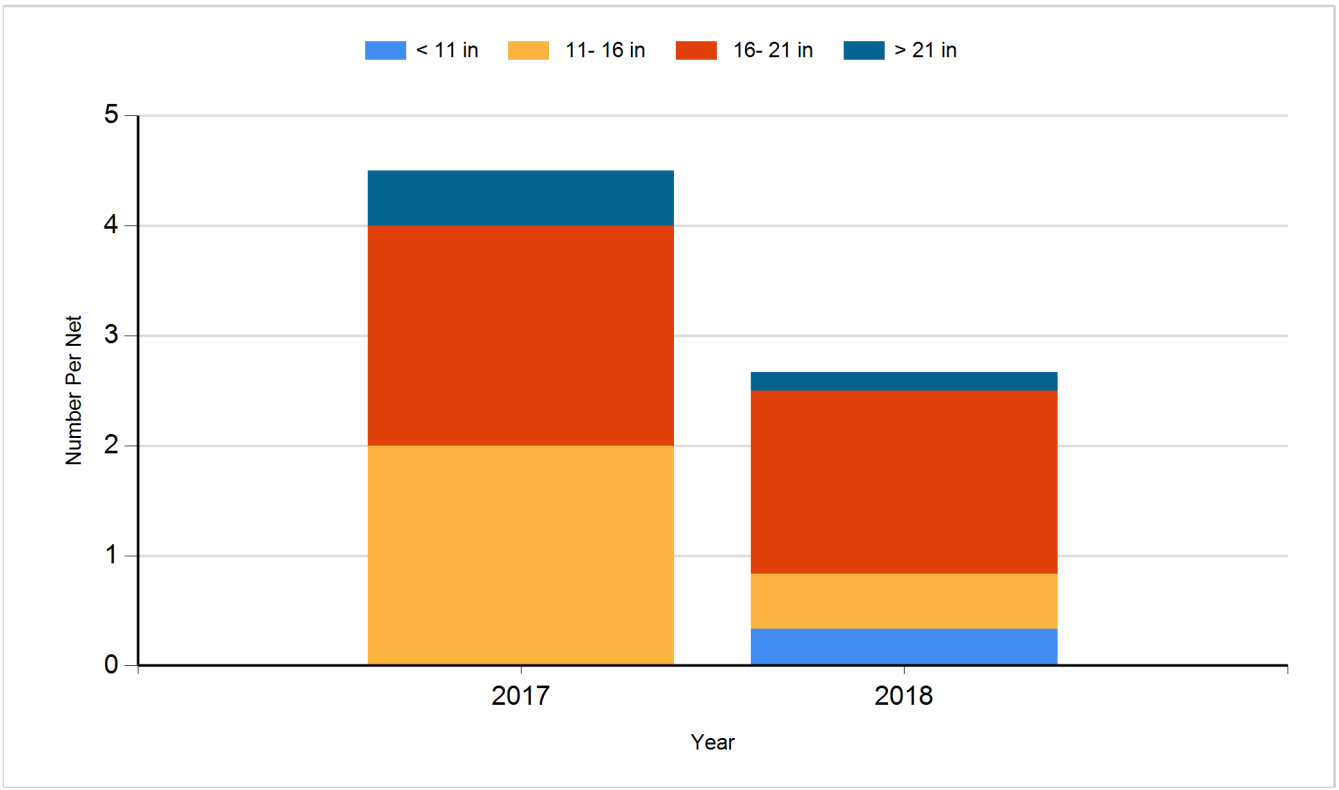
Species: Channel Catfish
Gear: AFS std gill net



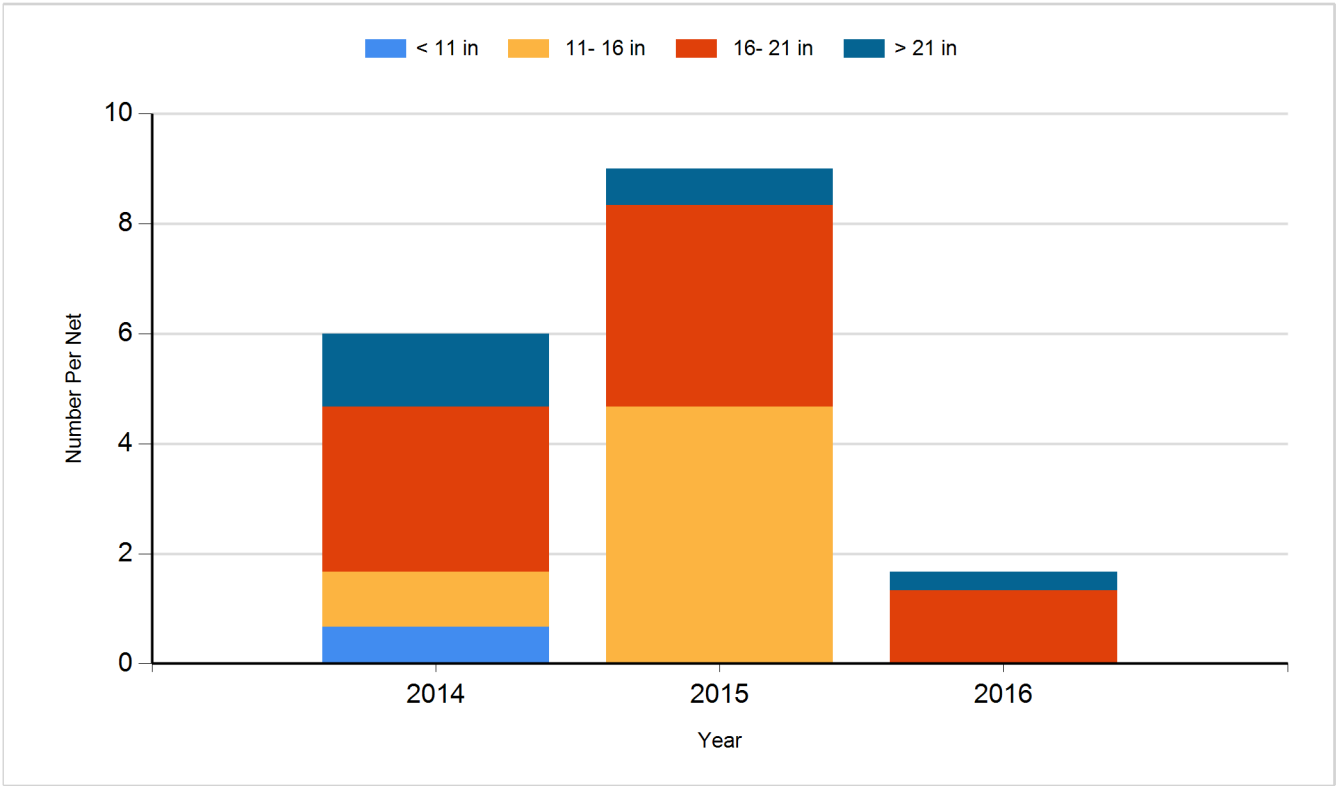
Species: Channel Catfish
Gear: std exp gill net



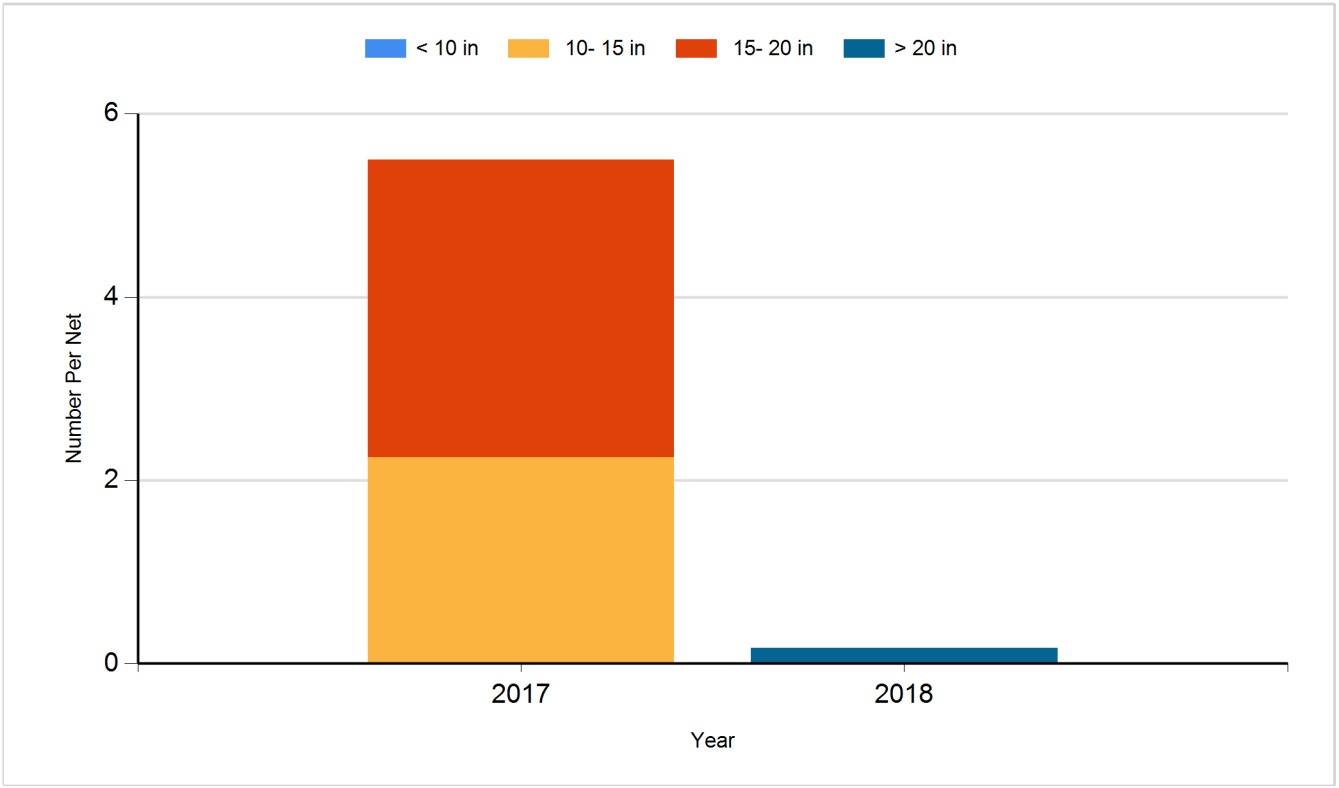
Species: Common Carp
Gear: AFS std gill net



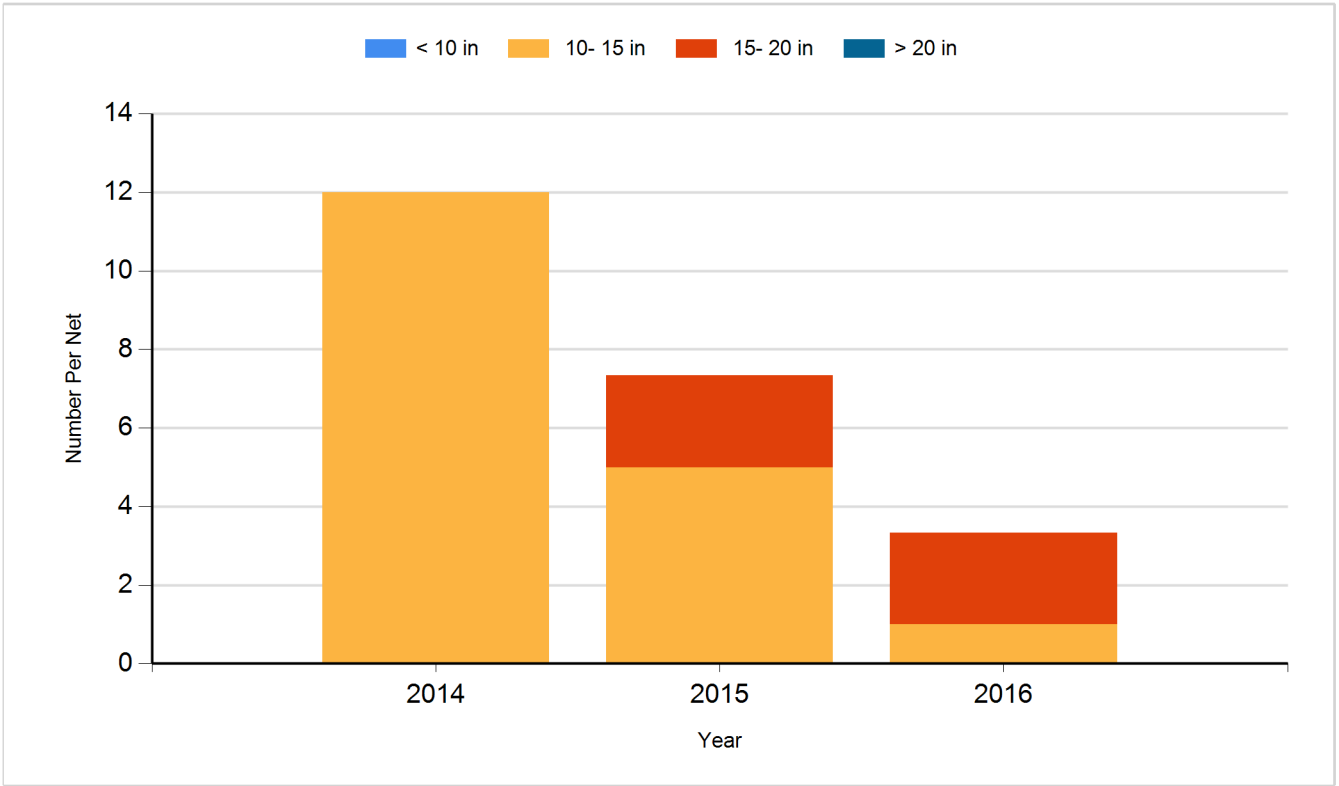
Species: Common Carp
Gear: std exp gill net



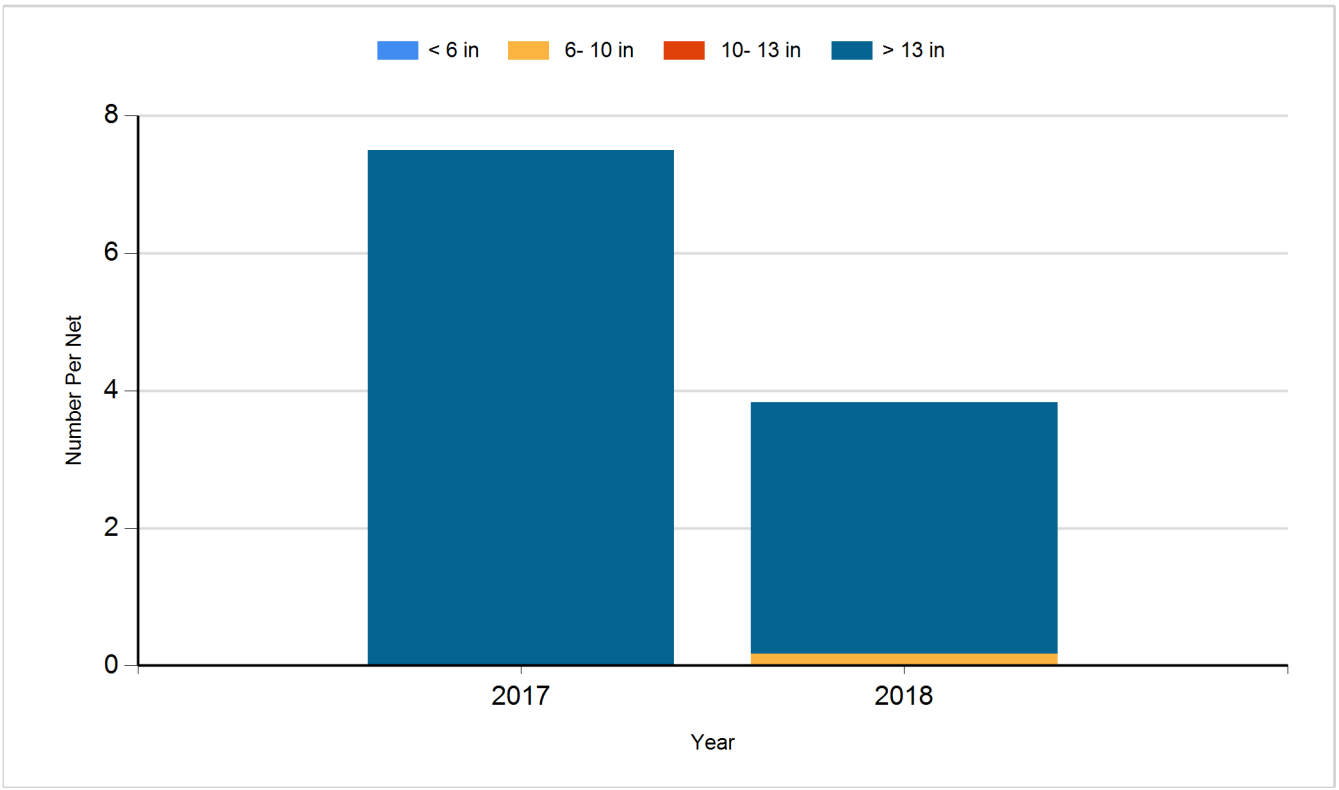
Species: Walleye
Gear: AFS std gill net



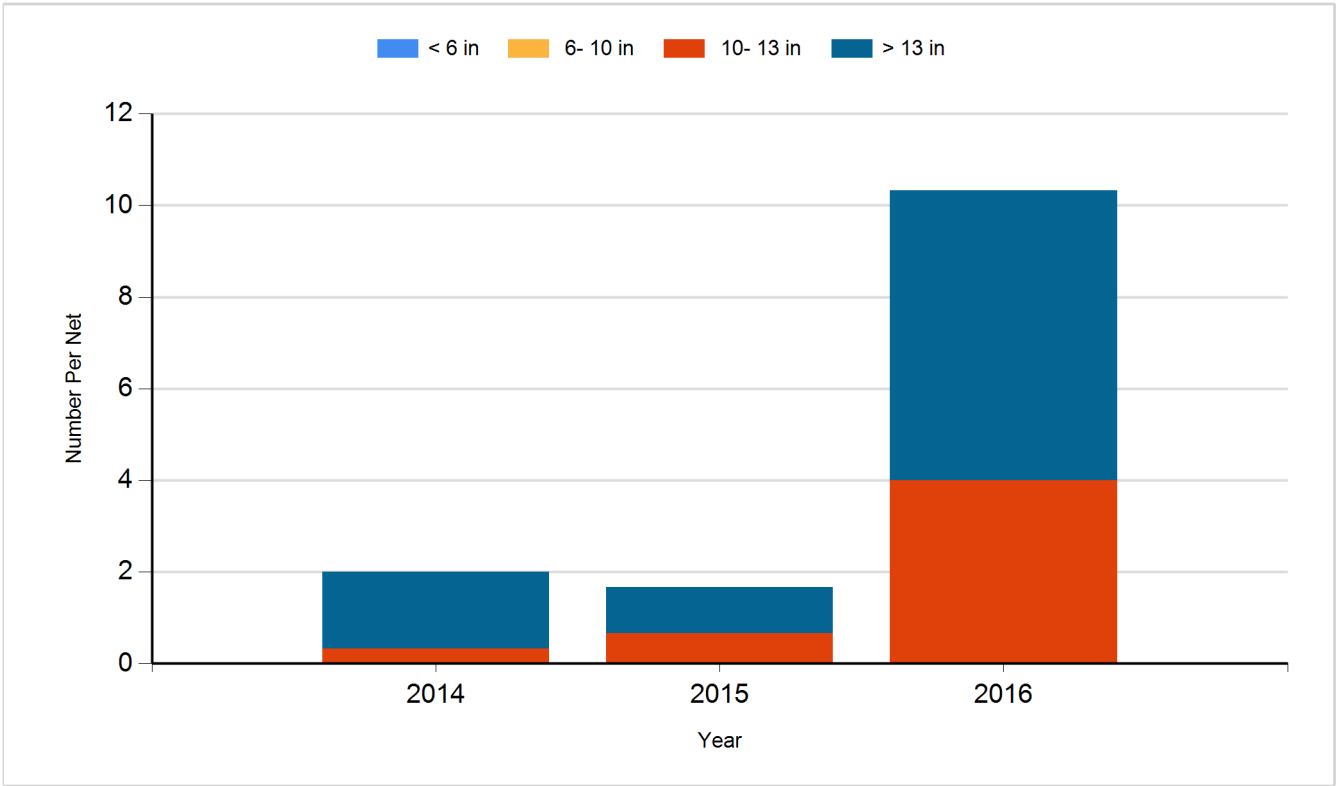
Species: Walleye
Gear: std exp gill net



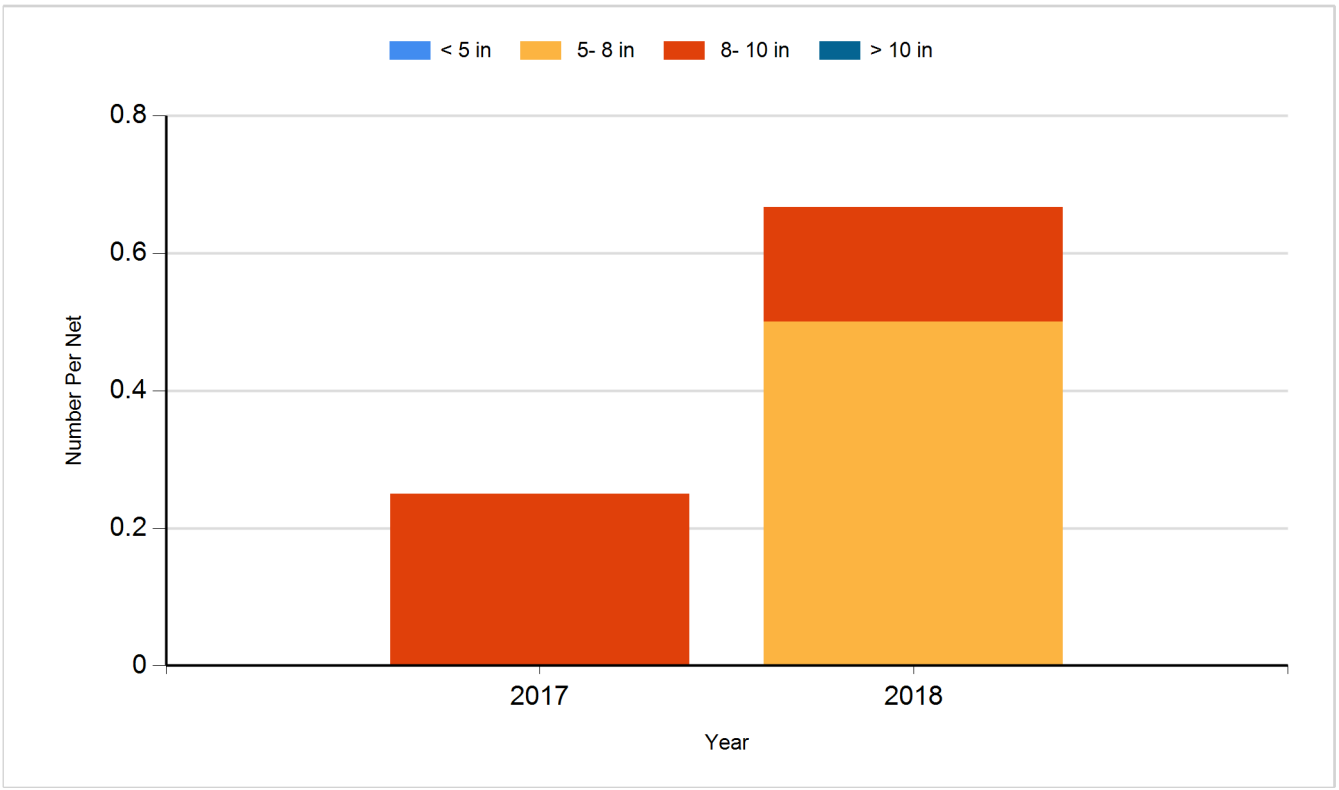
Species: White Sucker
Gear: AFS std gill net



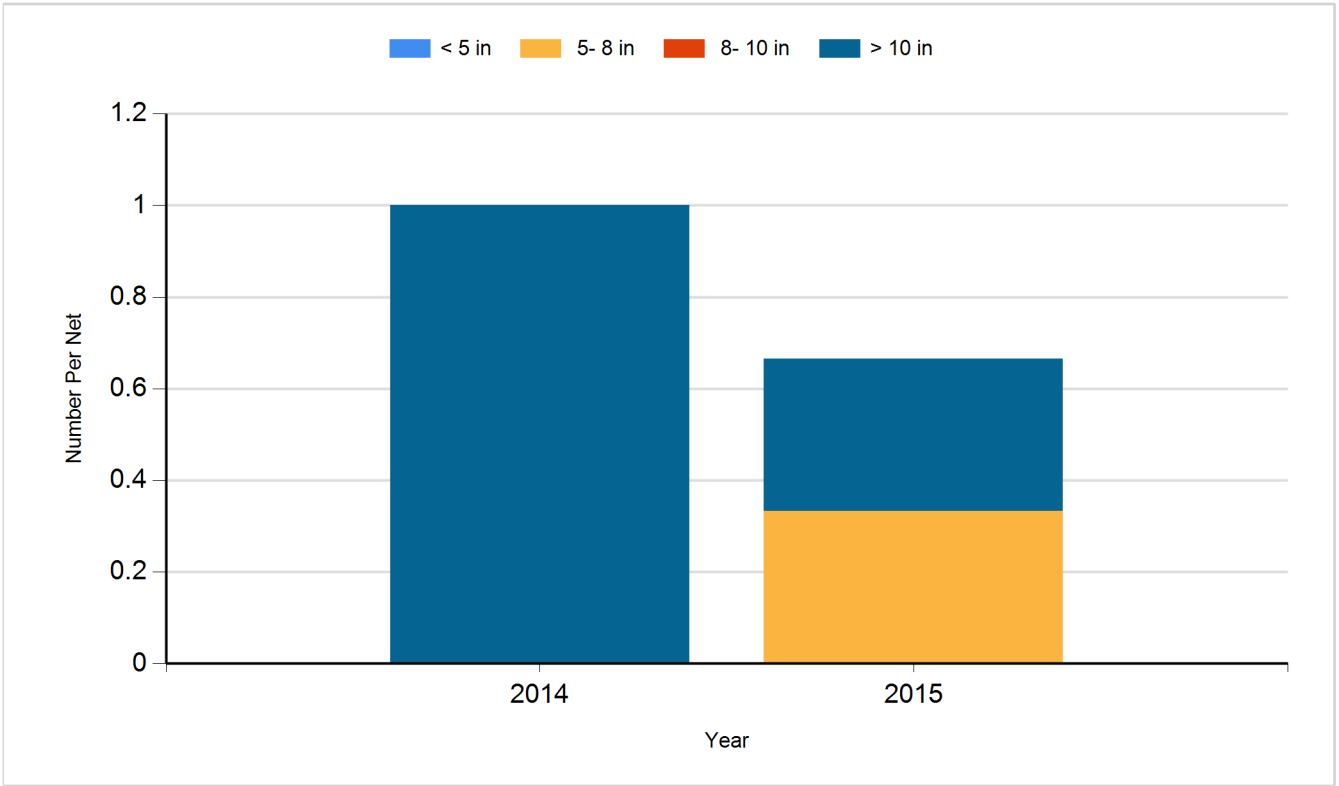
Species: White Sucker
Gear: std exp gill net



Species: Yellow Perch
Gear: AFS std gill net



Species: Yellow Perch
Gear: std exp gill net



Fish Stocking

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

Year	Species	Size	Number
2007	Walleye	Adult	692
2011	Largemouth Bass	Fingerling	2,890
2012	Largemouth Bass	Juvenile	1,739
2015	Walleye	Small Fingerling	14,080
2016	Gizzard Shad	Adult	437
2016	Walleye	Fingerling	680
2016	Walleye	Juvenile	467
2017	Yellow Perch	Adult	6,953