SOUTH DAKOTA STATEWIDE FISHERIES SURVEY
Belle Fourche Reservoir, Butte County
LBF-Lake-768-000
2018

Lake Information

Name: Belle Fourche Reservoir

County: Butte

Surface Area: 6,570 Acres

Surveys and Investigations

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

Gear	Date	Effort
AFS std gill net	Aug 14, 2018	5 net-nights
AFS std gill net	Aug 15, 2018	5 net-nights

Common Fish Species Present

Walleye

Channel Catfish

Black Crappie

Gizzard Shad

White Crappie

White Bass

Yellow Perch

Freshwater Drum

Common Carp

Shorthead Redhorse

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 Crappie	2	0.2	0.2	100		50		110	2
	Channel Catfish	26	2.6	0.8	100		31	14	92	2
	Common Carp	7	0.7	0.2	100		0		87	3
	Freshwater Drum	14	1.4	0.7	100		79		96	4
	Gizzard Shad	11	0.9	0.7	100				99	2
	Northern Pike	1	0.1	0.1	100		0		96	
	River Carpsucker	3	0.3	0.3	100		100		95	4
	Shorthead Redhorse	3	0.3	0.2	100		33		96	12
	Smallmouth Bass	2	0.2	0.3	100		0		94	2
	Walleye	102	9.2	2.6	55	7	0		81	1
	White Bass	29	2.9	1.4	100		100		95	1
	Yellow Perch	17	1.7	0.6	59	20	12		96	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	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Avg
AFS std gill net	Black Crappie									0.1	0.2	0.2
	Channel Catfish									4.1	2.6	3.4
	Common Carp									0.6	0.7	0.7
	Freshwater Drum									1.0	1.4	1.2
	Gizzard Shad									0.2	0.9	0.6
	Northern Pike										0.1	0.1
	River Carpsucker									0.6	0.3	0.5
	Shorthead Redhorse									0.8	0.3	0.6
	Smallmouth Bass									0.2	0.2	0.2
	Walleye									12.7	9.2	11.0
	White Bass									1.3	2.9	2.1
	White Crappie									0.2		0.2
	Yellow Perch									1.3	1.7	1.5
frame net (std 3/4 in)	Black Bullhead				0.1							0.1
	Black Crappie	2.7	1.0	0.7	1.5	1.0	0.8					1.3
	Channel Catfish	0.0	0.1	15.1	0.1	0.1	0.1	0.1				2.2
	Common Carp	0.1	0.3	9.9		1.4	6.1	1.3				3.2
	Freshwater Drum		0.1	0.1								0.1
	Gizzard Shad					0.2	0.3					0.3
	Green Sunfish	0.0					0.3					0.2
	Northern Pike		0.1									0.1
	Rainbow Trout						0.1					0.1
	River Carpsucker	2.6	0.4	1.2	0.4	0.6	0.4					0.9
	Rudd					0.1	0.1					0.1
	Shorthead Redhorse	0.1	0.6	0.6		0.2	0.1					0.3
	Smallmouth Bass	0.0					0.1					0.1
	Walleye	2.4	2.6	1.4	1.3	1.3	2.0	1.5				1.8
	White Bass	1.7	2.0	2.0	0.3	1.7	11.0	1.8				2.9
	White Crappie	1.0	0.3	2.1	3.8	19.8	16.9	15.0				8.4
	Yellow Perch	1.0	1.0		0.5		0.4	0.1				0.6
std exp gill net	Black Crappie	0.0	0.0						0.5			0.2
	Channel Catfish	1.6	3.9	2.9	4.0	3.8	1.8	3.3	4.0			3.2
	Common Carp	1.0	1.5	0.9	1.1	1.4	0.3	0.7	1.0			1.0
	Freshwater Drum	0.1	0.6	0.5	0.9	1.4	2.0	0.2	0.3			0.8

		CPUE										
Gear	Species	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Avg
std exp gill net	Gizzard Shad	0.0	0.0		2.4	0.4	0.7		0.3			0.6
	Northern Pike				0.4							0.4
	River Carpsucker	0.1	0.3		0.4	0.6	0.7		0.8			0.5
	Shorthead Redhorse	0.5	0.8	1.1	0.7	3.0	0.8	0.7	0.5			1.0
	Smallmouth Bass		0.3	0.8	0.9	1.2	0.7	0.8				0.8
	Spottail Shiner	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			0.0
	Walleye	6.1	9.0	8.0	16.3	24.6	8.5	20.3	23.0			14.5
	White Bass	1.1	2.3	1.1	2.1	3.4	3.5	6.7	5.8			3.3
	White Crappie	0.0		0.4	0.4				0.2			0.3
	White Sucker						0.2					0.2
	Yellow Perch	10.9	14.9	7.3	8.6	3.4	3.2	9.5	14.8			9.1

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 gill net	Black Crappie	PSD									100	100
		PSD-P									0	50
		Wr									123	110
	Channel Catfish	PSD									97	100
		PSD-P									30	31
		Wr									86	92
	Common Carp	PSD									100	100
		PSD-P									0	0
		Wr									93	87
	Gizzard Shad	PSD									100	100
		Wr									106	99
	Shorthead Redhorse	PSD									100	100
		PSD-P									86	33
		Wr									99	96
	Walleye	PSD									56	55
		PSD-P									0	0
		Wr									83	81
	White Bass	PSD									100	100
		PSD-P									100	100
		Wr									94	95
	White Crappie	PSD									100	
		PSD-P									100	
		Wr									104	
	Yellow Perch	PSD									67	59
		PSD-P									17	12
		Wr									91	96
frame net (std 3/4 in)	Black Crappie	PSD	26	25	100	92	100	100				
		PSD-P	21	13	71	83	80	83				
		Wr	109	106	98	99	90	98				
	Channel Catfish	PSD	0	0	98	100	100	100	100			
		PSD-P	0	0	3	0	0	0	0			
		Wr		87	88	84	81	89	80			
	Common Carp	PSD	100	100	100		100	100	100			

			Year									
Gear	Species	Index	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
frame net (std 3/4 in)	Common Carp	PSD-P	0	50	36		50	33	50			
		Wr		90			88	80	87			
	Gizzard Shad	PSD					100	100				
		Wr					116	86				
	Shorthead Redhorse	PSD	100	40	100		100	100				
		PSD-P	100	40	100		100	100				
		Wr	92	95	99		85	83				
	Walleye	PSD	82	52	100	90	100	100	100			
		PSD-P	18	0	44	0	31	63	58			
		Wr	82	76	73	88	74	74	70			
	White Bass	PSD	100	100	100	100	100	99	100			
		PSD-P	100	94	100	100	100	99	57			
		Wr	86	80	89	80	87	96	96			
	White Crappie	PSD	43	100	100	100	100	100	100			
		PSD-P	29	0	46	100	99	100	100			
		Wr	99	92	99	86	93	98	98			
	Yellow Perch	PSD	0	38		25		67	100			
		PSD-P	0	0		0		67	0			
		Wr	96	85		92		67	82			
std exp gill net	Black Crappie	PSD	0	0						67		
		PSD-P	0	0						0		
		Wr								129		
	Channel Catfish	PSD	77	84	87	96	84	100	90	96		
		PSD-P	0	6	13	7	5	36	40	29		
		Wr	91	88	86	87	90	89	96	87		
	Common Carp	PSD	100	100	86	100	100	50	25	67		
		PSD-P	0	33	14	13	29	0	0	0		
		Wr	84	83	80	88	84	84	95	80		
	Gizzard Shad	PSD	0	0		6	100	100		100		
		Wr				117	117	96		102		
	Shorthead Redhorse	PSD	100	67	100	100	73	80	100	100		
		PSD-P	50	67	89	60	40	40	50	100		
		Wr	100	102	99	103	100	102	101			
	Walleye	PSD	71	68	50	44	44	76	18	20		
		PSD-P	0	1	3	1	1	10	1	0		
		Wr	83	77	77	78	85	81	84	81		
	White Bass	PSD	89	100	100	80	100	81	100	100		

			Year									
Gear	Species	Index	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
std exp gill net	White Bass	PSD-P	89	83	100	80	82	52	100	100		
		Wr	91	82	84	85	101	96	103	94		
	White Crappie	PSD	0		100	100				100		
		PSD-P	0		67	100				100		
		Wr			93	89				91		
	Yellow Perch	PSD	3	45	81	55	76	58	16	29		
		PSD-P	0	6	9	10	6	5	2	1		
		Wr	99	96	97	94	97	86	90	85		

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+
2012	24		138 (2)		254 (6)	299 (16)					

Species: Walleye

		Mean Length (expanded sample number) at capture by age									
Year	N	1	2	3	4	5	6	7	8	9	10+
2018	102	243 (16)	340 (29)	384 (13)	403 (15)	425 (25)	462 (1)		462 (2)	453 (1)	
2017	126	241 (21)	321 (15)	363 (23)	401 (62)	441 (3)			494 (1)		494 (2)
2016	292	241 (26)	318 (75)	365 (174)	397 (4)	437 (13)					
2015	252	226 (8)	310 (200)	393 (2)	440 (21)	435 (9)	441 (2)		473 (7)	525 (2)	
2014	196	217 (102)	331 (8)	390 (36)	413 (4)	466 (17)	476 (11)	538 (6)	513 (4)		482 (9)
2013	242	201 (2)	290 (75)	355 (20)	381 (63)	402 (39)	446 (8)	465 (24)	424 (2)		461 (10)
2012	238	196 (10)	287 (21)	331 (47)	373 (106)	463 (4)	462 (35)			453 (7)	465 (8)
2011	124		259 (10)	312 (54)	417 (9)	440 (30)	404 (3)		488 (12)	473 (2)	504 (4)
2010	150		270 (46)	382 (12)	439 (64)	435 (4)	476 (4)	443 (9)	454 (4)	499 (4)	454 (2)
2009	118	201 (20)	331 (28)	399 (46)	455 (4)		458 (10)	449 (8)	485 (2)		

Species: White Crappie

		Mean Length (expanded sample number) at capture by age									
Year	N	1	2	3	4	5	6	7	8	9	10+
2012	60				275 (58)	332 (2)					
2011	52			240 (36)	286 (4)	324 (12)					

Species: Yellow Perch

		Mean Length (expanded sample number) at capture by age									
Year	N	1	2	3	4	5	6	7	8	9	10+
2011	128	120 (16)	170 (12)	208 (39)	234 (56)	234 (5)					

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).

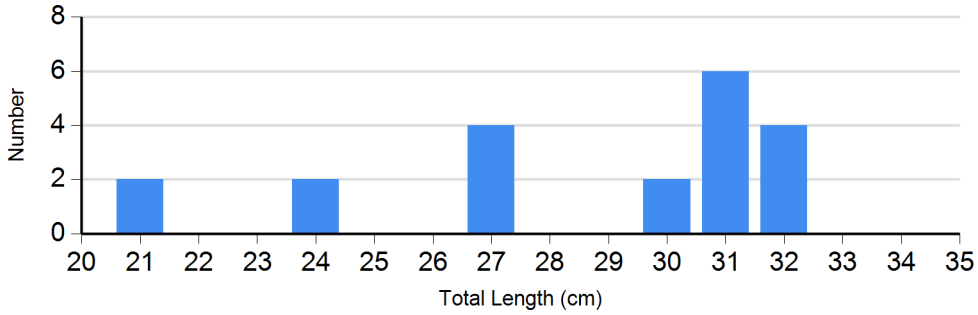
		Length Groups							
		S-Q		Q-P		P-M		M	
Species	Year	N	Wr (SE)	N	Wr (SE)	N	Wr (SE)	N	Wr (SE)
Black Crappie Frame Net	2014	0		2	104 (0.0)	4	101 (0.3)	6	94 (1.9)
Channel Catfish Gill Net	2014	0		14	86 (2.3)	8	94 (2.1)	0	
	2015	4	81 (0.2)	20	98 (3.9)	16	98 (2.2)	0	
	2016	2	86 (0.0)	32	86 (1.7)	14	89 (5.2)	0	
	2017	1	75	25	85 (1.3)	11	90 (2.5)	0	
	2018	0		18	91 (1.7)	8	95 (1.5)	0	
Common Carp Gill Net	2014	2	89 (0.0)	2	79 (0.0)	0		0	
	2015	6	93 (2.5)	2	100 (0.0)	0		0	
	2016	4		8	80 (0.0)	0		0	
	2017	0		5	93 (1.1)	0		0	
	2018	0		7	87 (2.0)	0		0	
Walleye Gill Net	2014	24	85 (1.3)	68	80 (0.6)	10	79 (0.7)	0	
	2015	200	85 (0.5)	42	81 (0.8)	2	76 (0.0)	0	
	2016	222	82 (0.3)	54	79 (0.7)	0		0	
	2017	50	87 (1.1)	64	80 (0.6)	0		0	
	2018	41	84 (0.8)	51	79 (0.8)	0		0	
White Bass Gill Net	2018	0		0		14	96 (1.5)	15	93 (1.4)
White Bass Gill Net	2014	8	99 (1.7)	12	97 (4.0)	14	99 (1.2)	8	89 (1.7)
	2015	0		0		66	106 (0.6)	14	93 (3.8)
	2016	0		0		50	97 (0.6)	20	88 (1.8)
	2017	0		0		8	97 (1.3)	4	89 (1.4)
White Crappie Frame Net	2014	0		0		58	99 (0.6)	212	98 (0.5)

		Length Groups							
		S-Q		Q-P		P-M		M	
Species	Year	N	Wr (SE)	N	Wr (SE)	N	Wr (SE)	N	Wr (SE)
White Crappie Frame Net	2015	0		0		18	100 (0.8)	222	98 (0.4)
Yellow Perch Gill Net	2014	16	84 (1.9)	20	86 (1.4)	2	98 (0.0)	0	
	2015	96	90 (0.8)	16	87 (0.9)	2	83 (0.0)	0	
	2016	126	87 (0.6)	50	82 (0.7)	2		0	
	2017	4	96 (0.2)	6	90 (2.2)	1	94	1	83
	2018	7	96 (2.8)	8	98 (2.6)	2	93 (2.3)	0	

Length Frequency Distribution

Length frequency histogram of species sampled by year.

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



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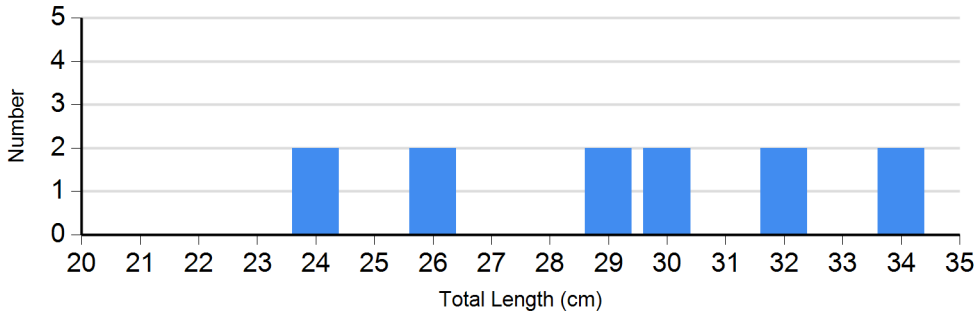
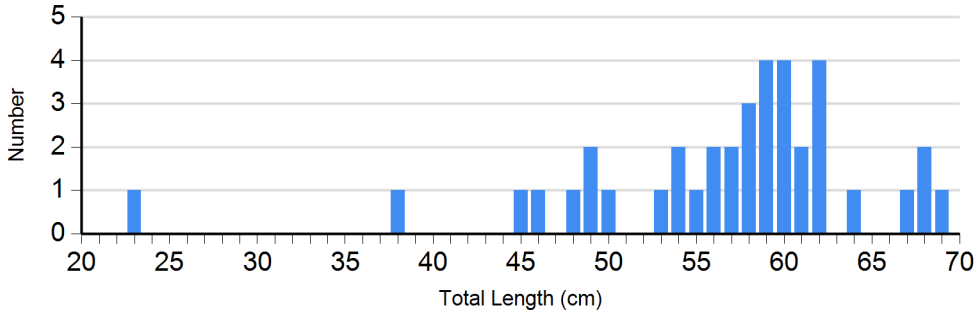
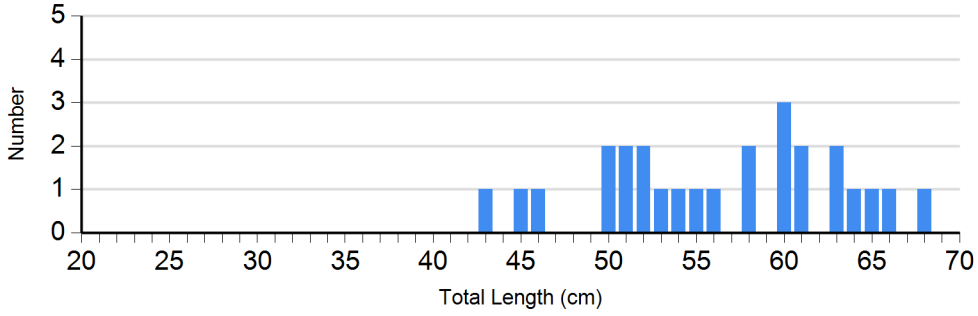


2014

Species: Channel Catfish
Gear: AFS std gill net

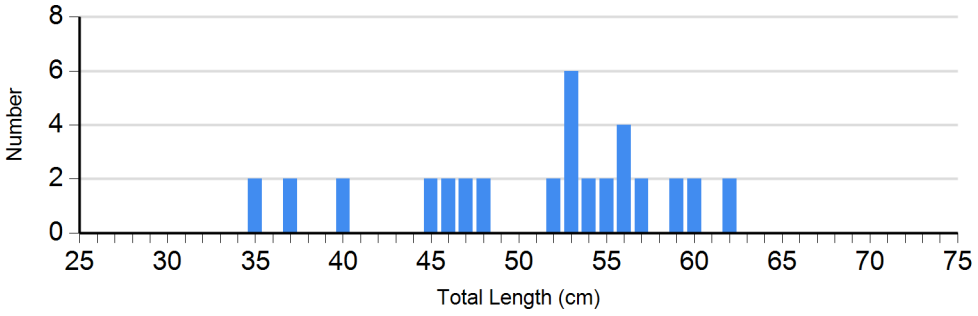


2017



2018

Species: Channel Catfish
Gear: std exp gill net



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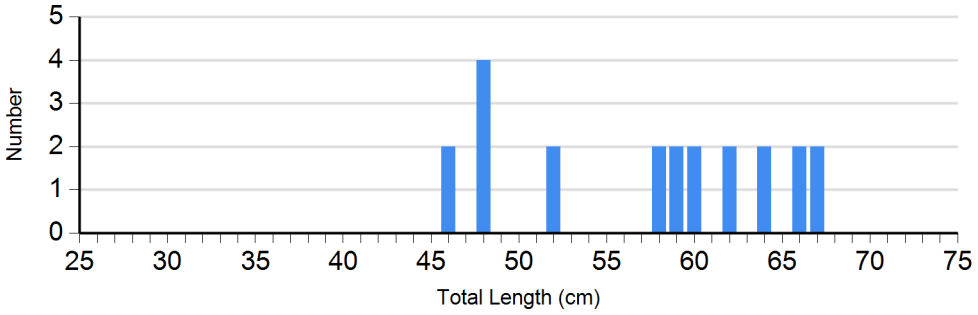

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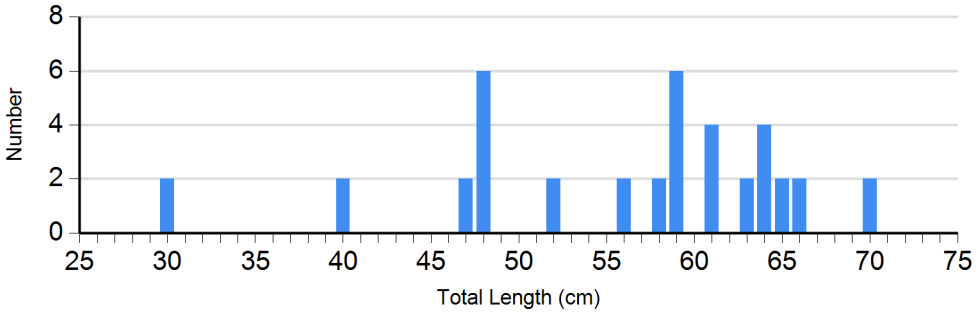

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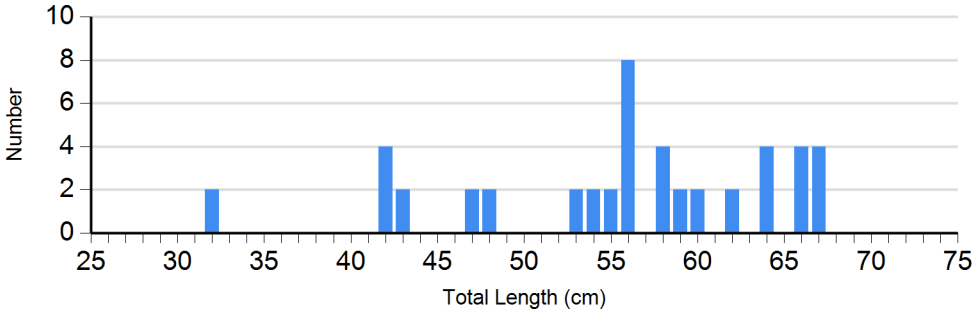
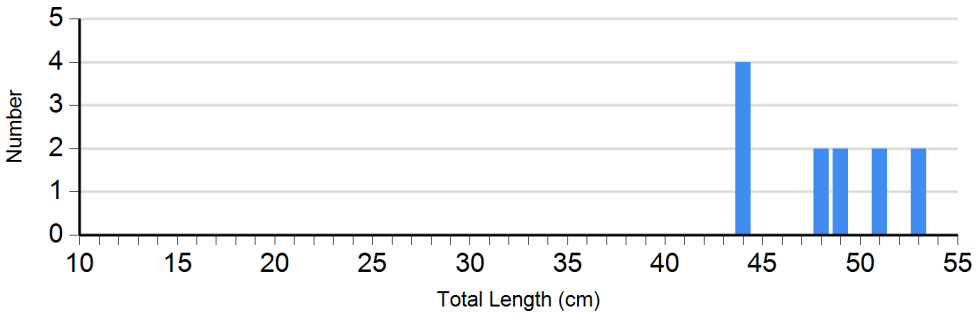
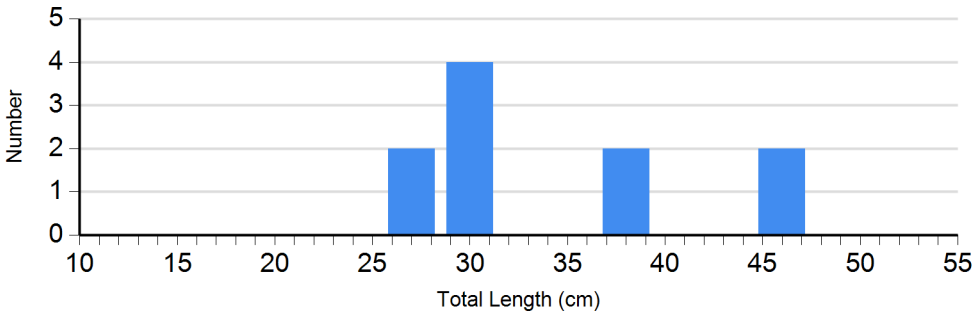


2016

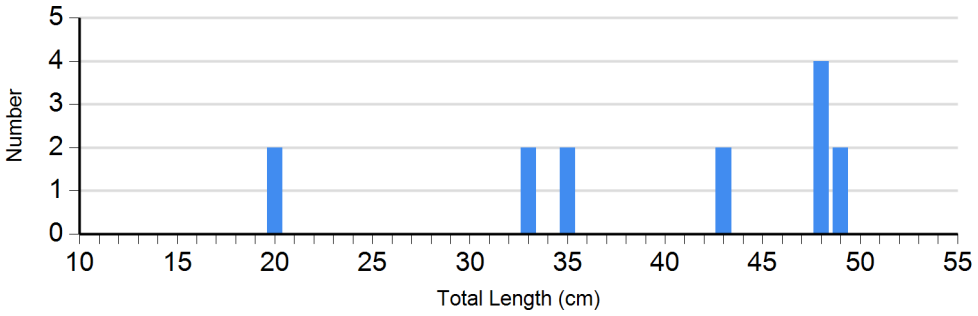
Species: Common Carp
Gear: std exp gill net



2013

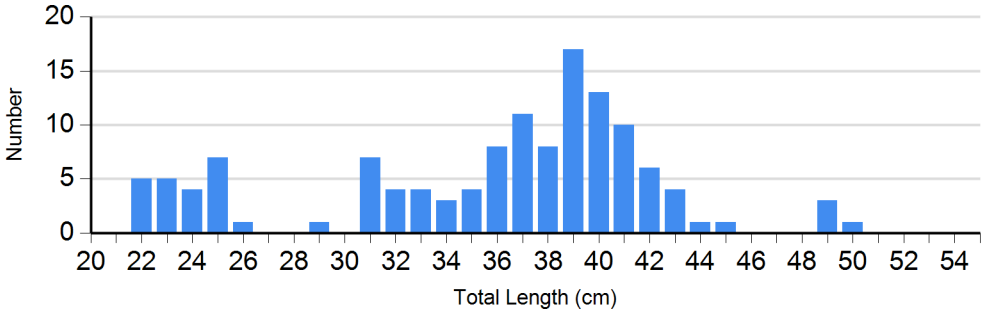


2015

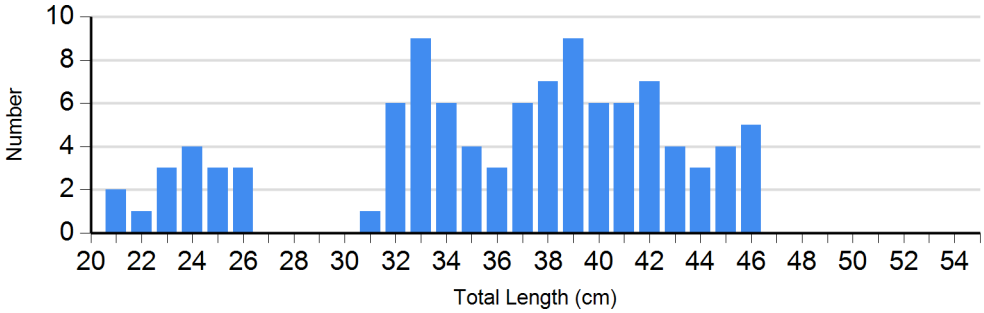


2016

Species: Walleye
Gear: AFS std gill net

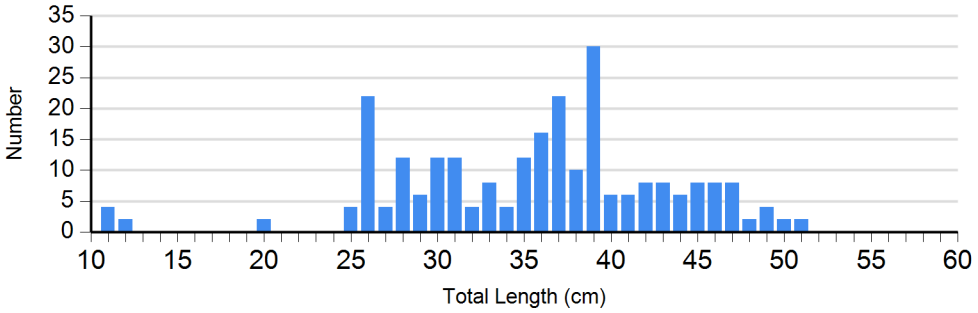


2017

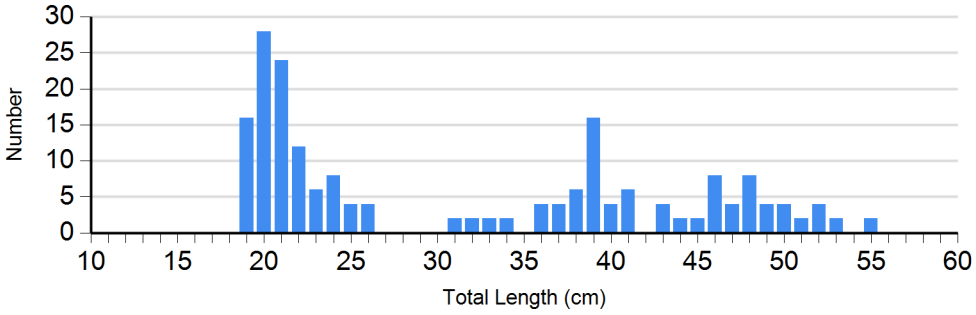


2018

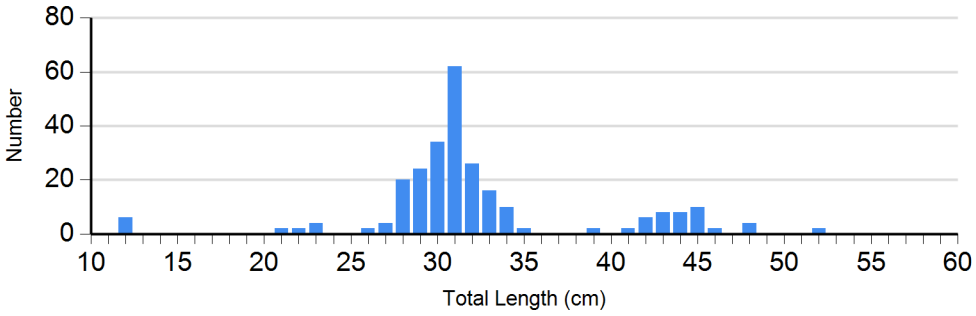
Species: Walleye
Gear: std exp gill net



2013



2014



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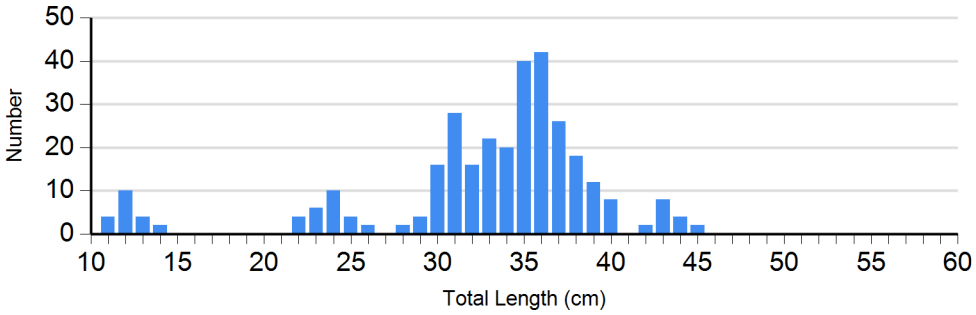
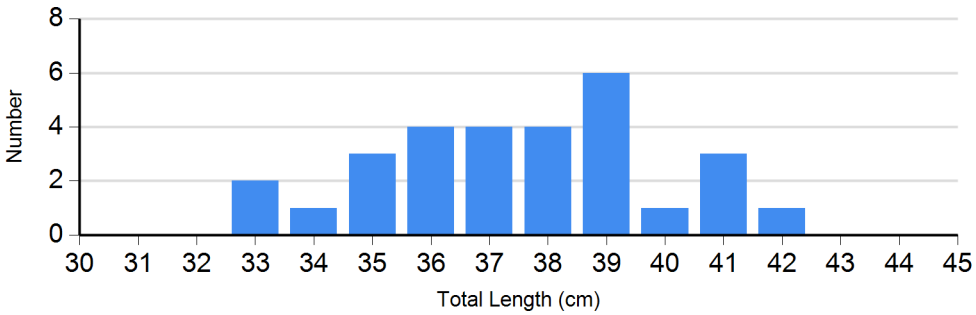


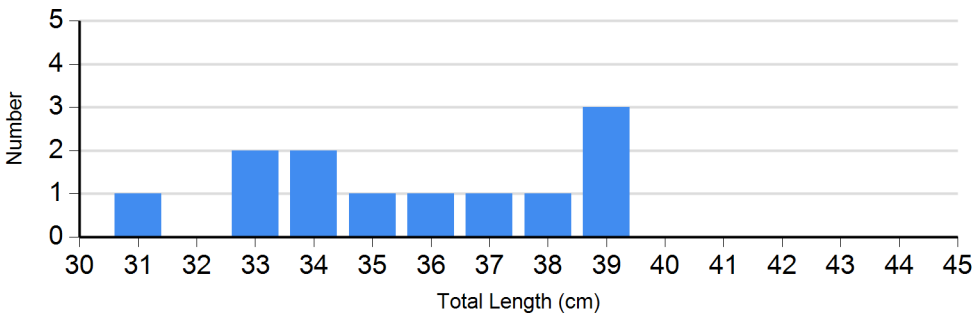
2016

Species: White Bass
Gear: AFS std gill net



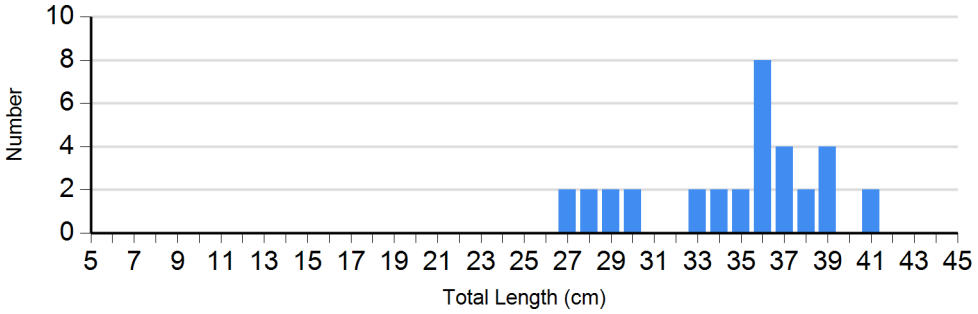
2018

Species: White Bass
Gear: AFS std gill net

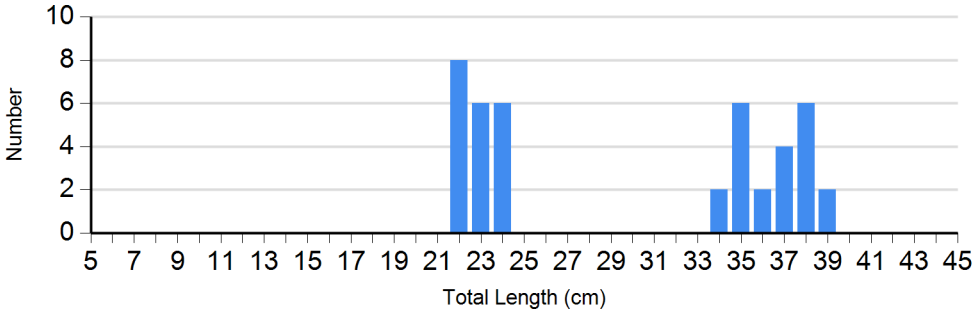


2017

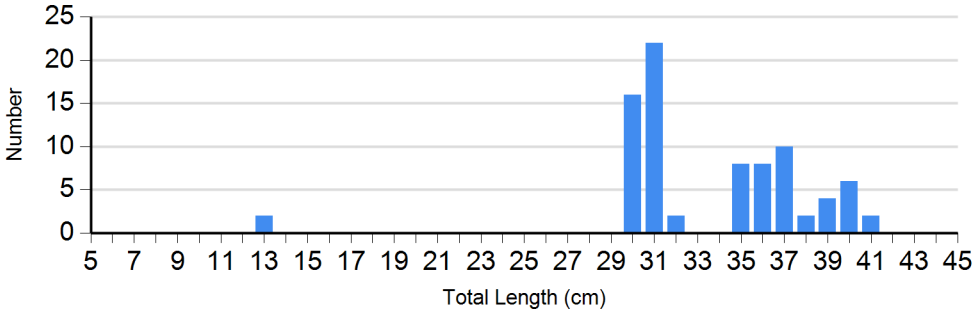
Species: White Bass
Gear: std exp gill net



2013



2014



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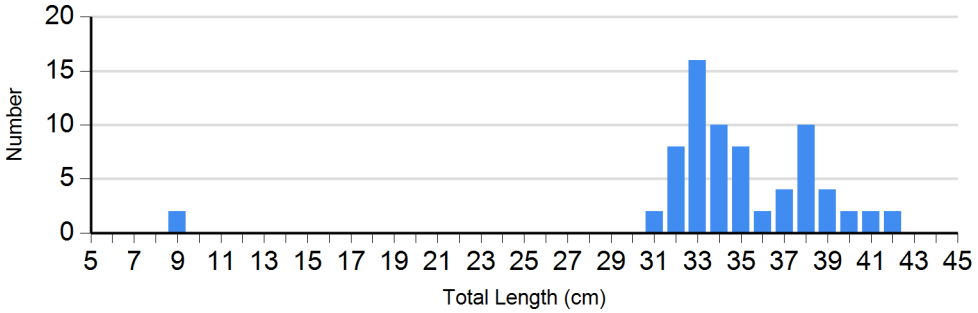
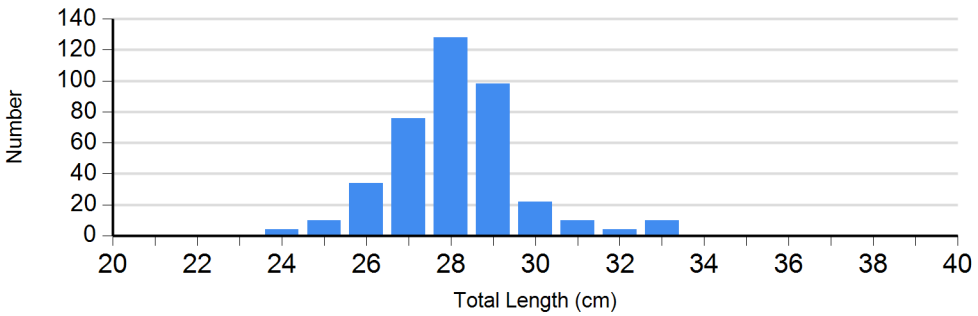
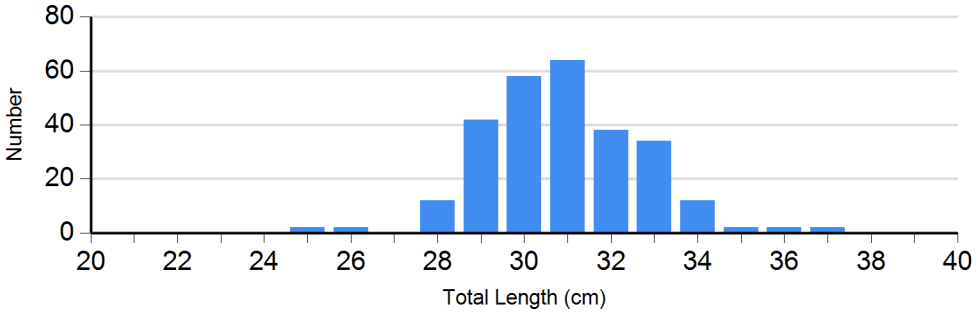


2016

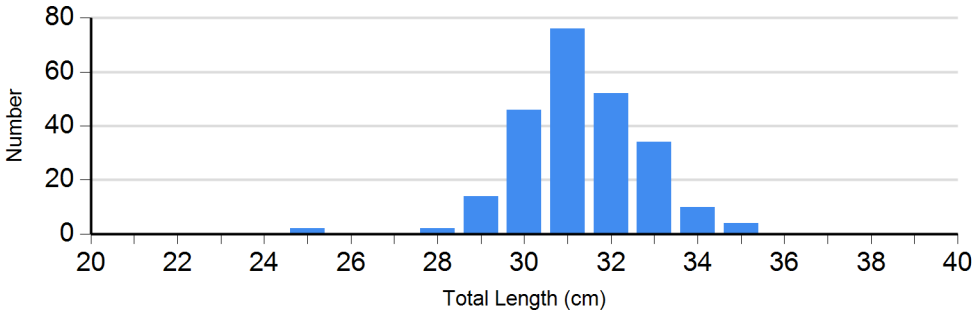
Species: White Crappie
Gear: frame net (std 3/4 in)



2013

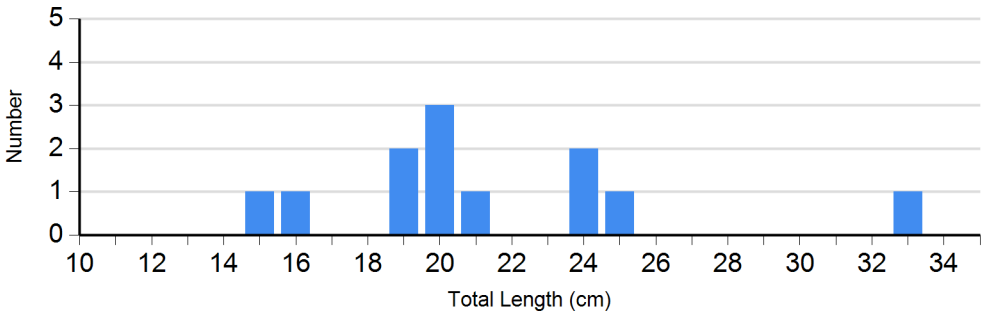


2014

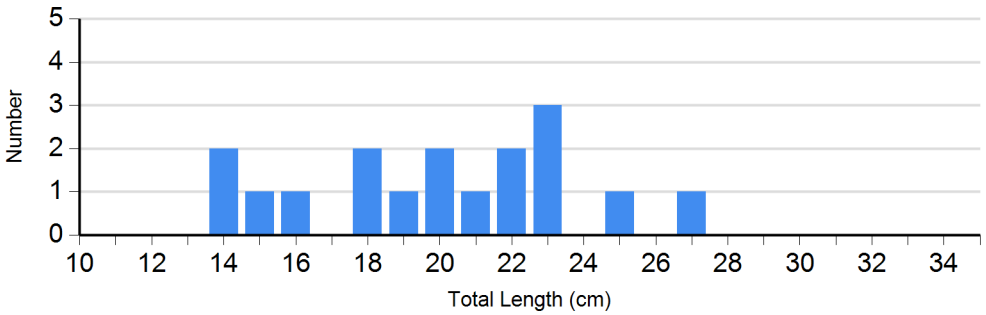


2015

Species: Yellow Perch
Gear: AFS std gill net

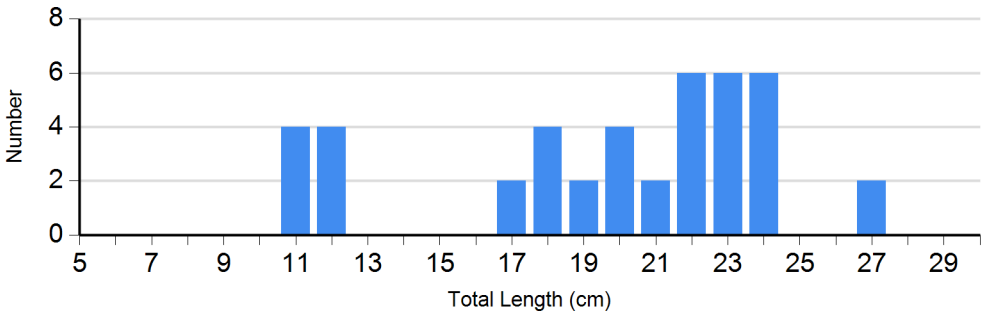


2017



2018

Species: Yellow Perch
Gear: std exp gill net



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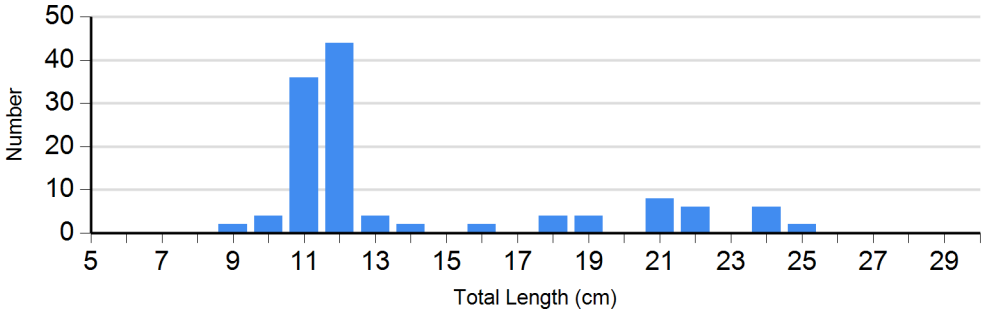
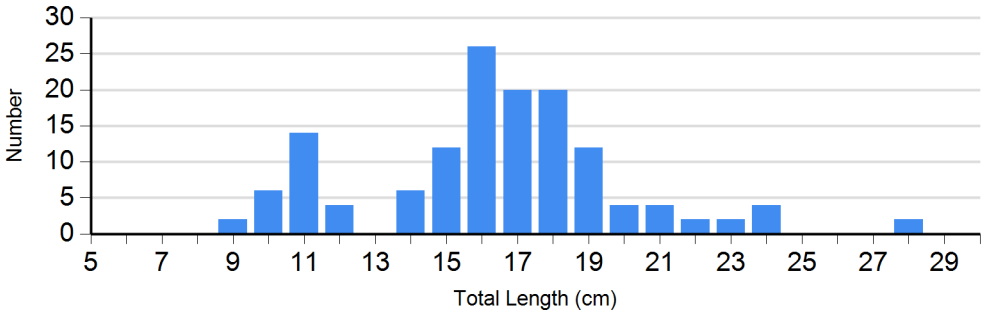
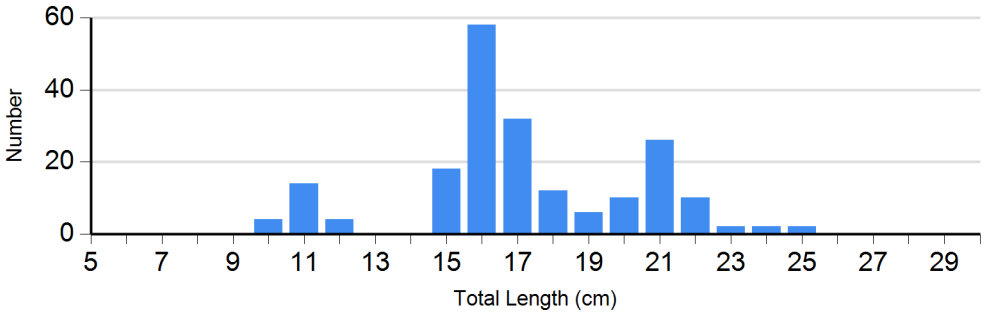


2014



2015

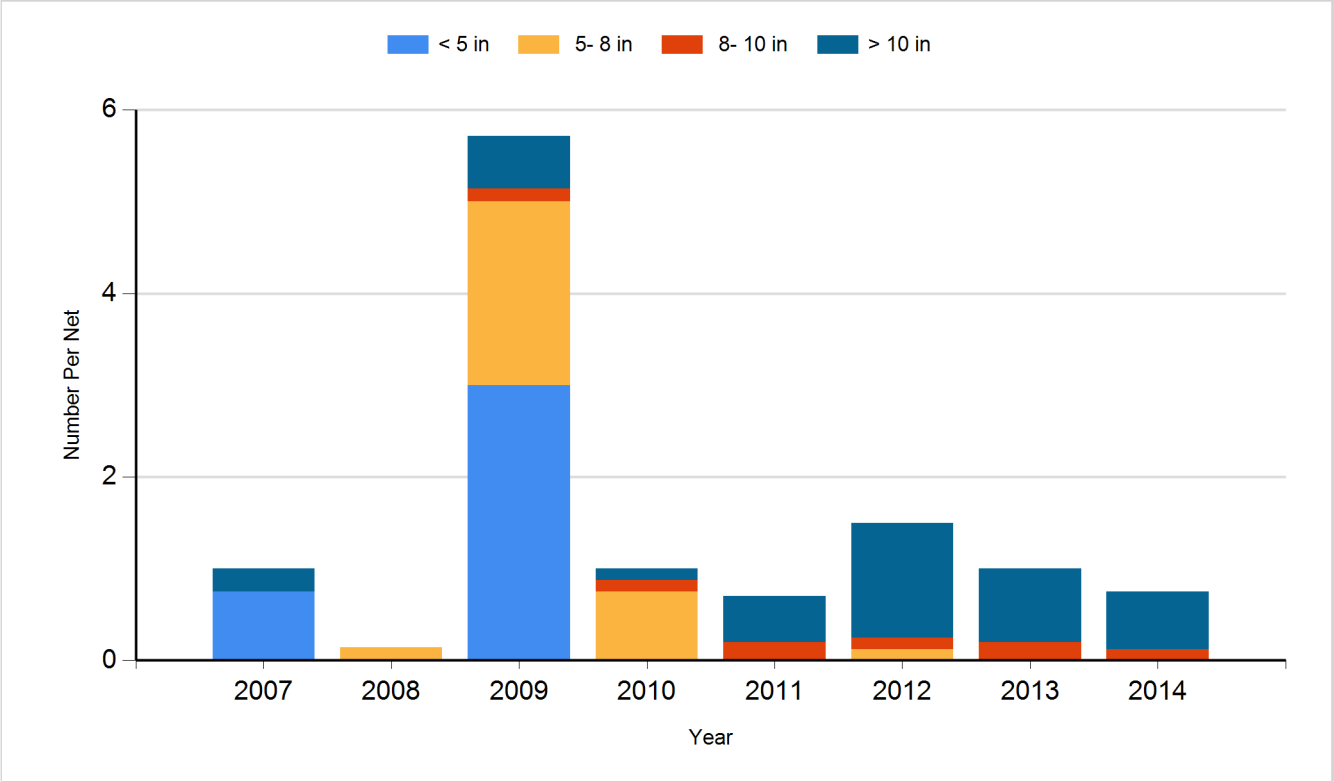


2016

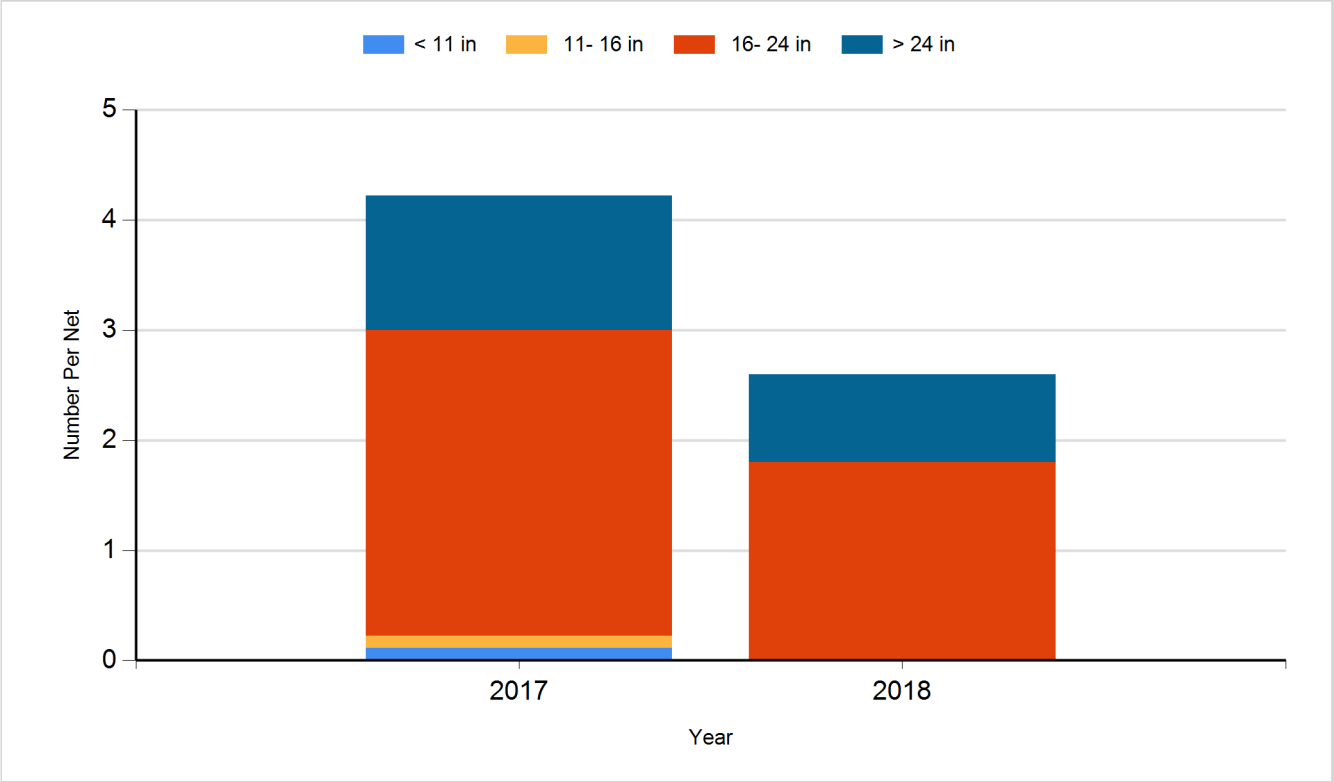
Historic Fish Sizes and Relative Abundance

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

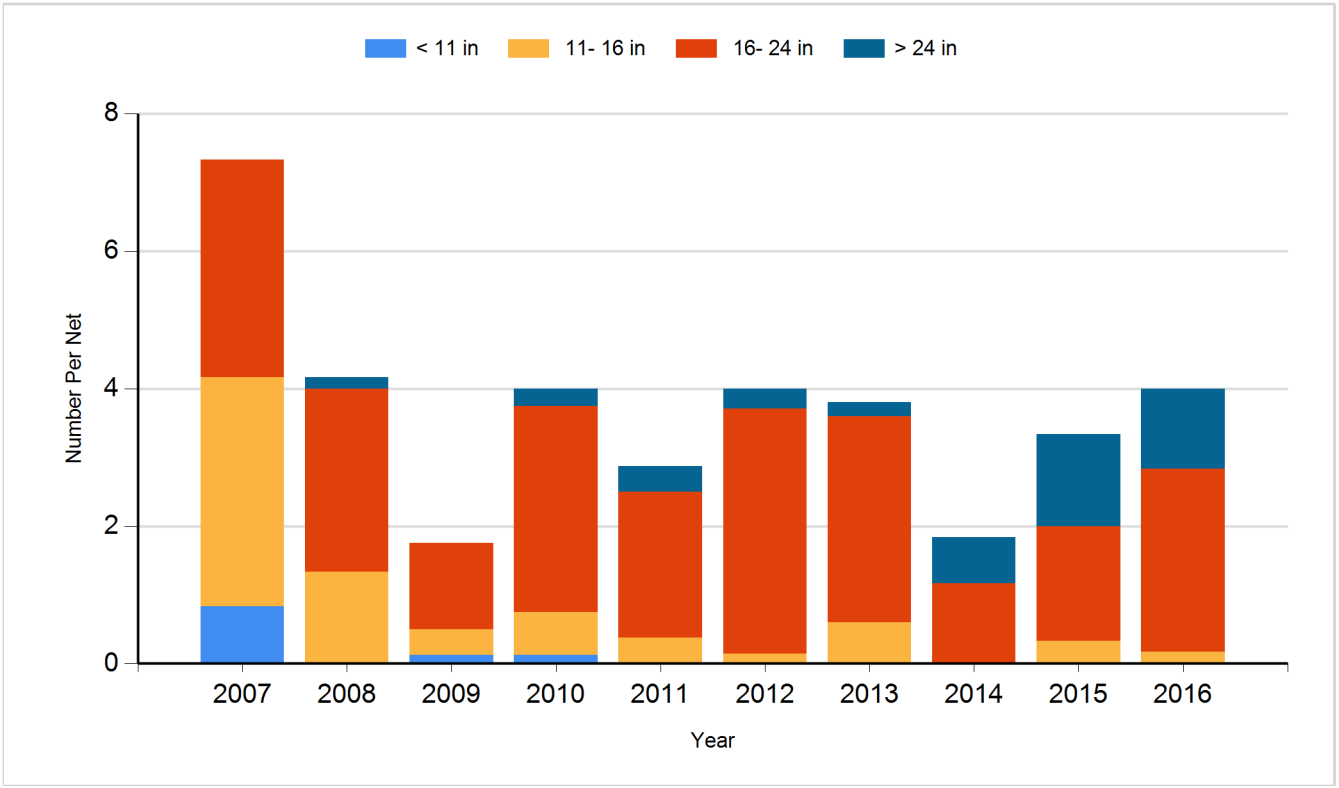
Species: Black Crappie
Gear: frame net (std 3/4 in)



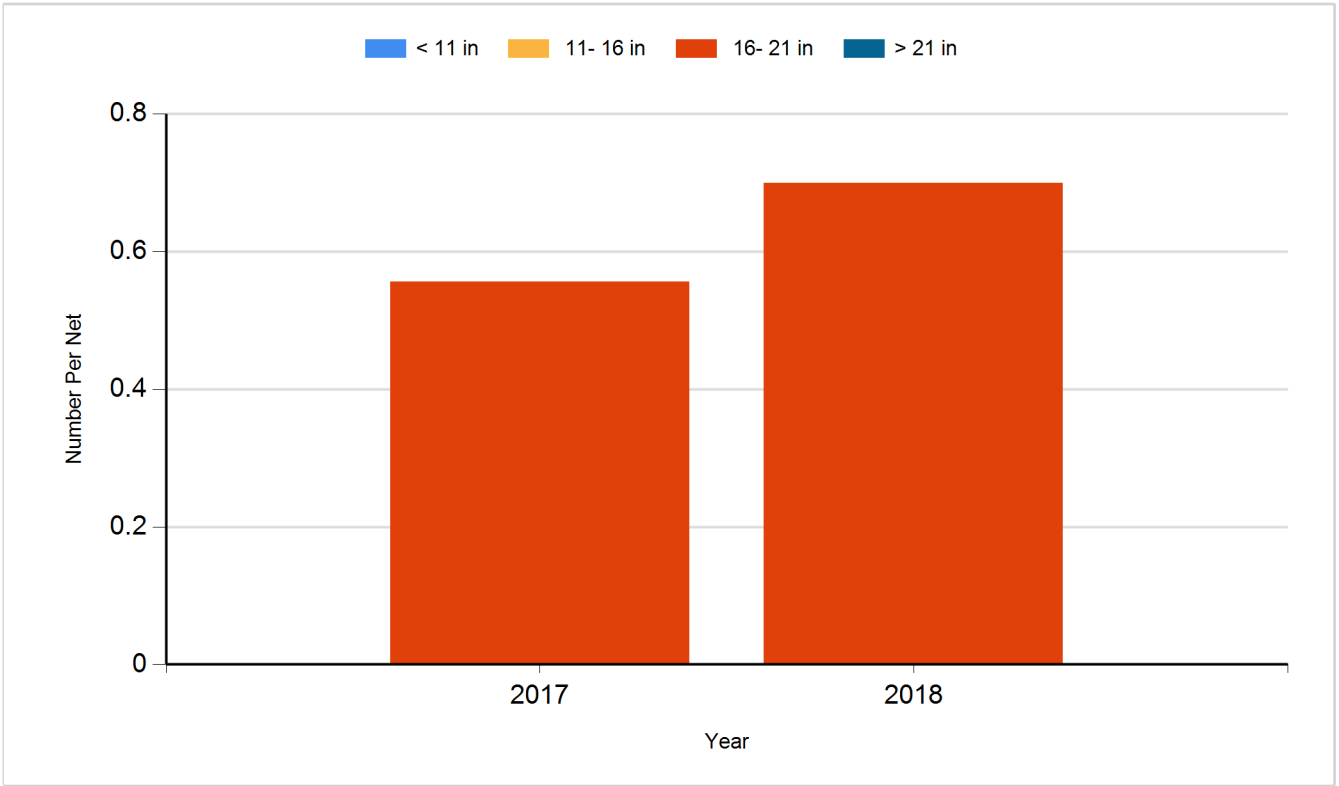
Species: Channel Catfish
Gear: AFS std gill net



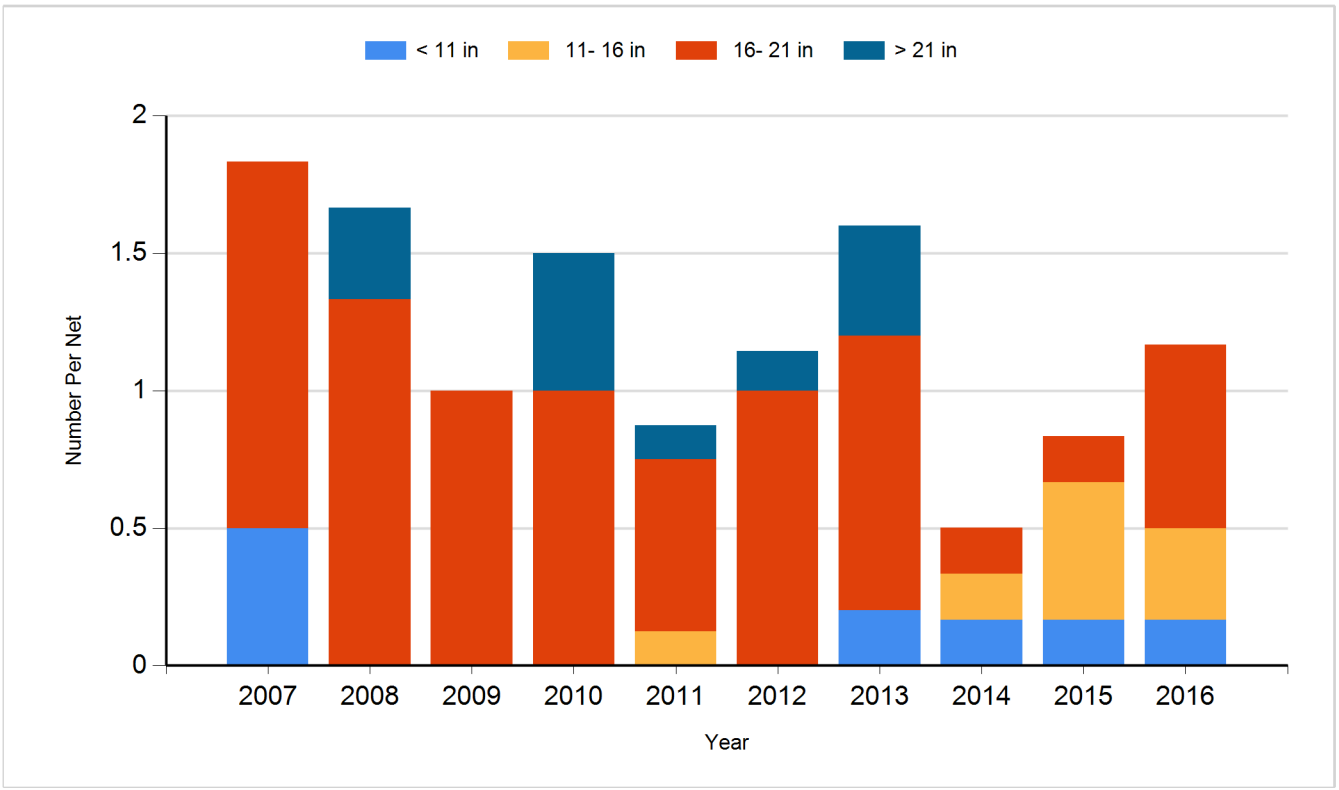
Species: Channel Catfish
Gear: std exp gill net



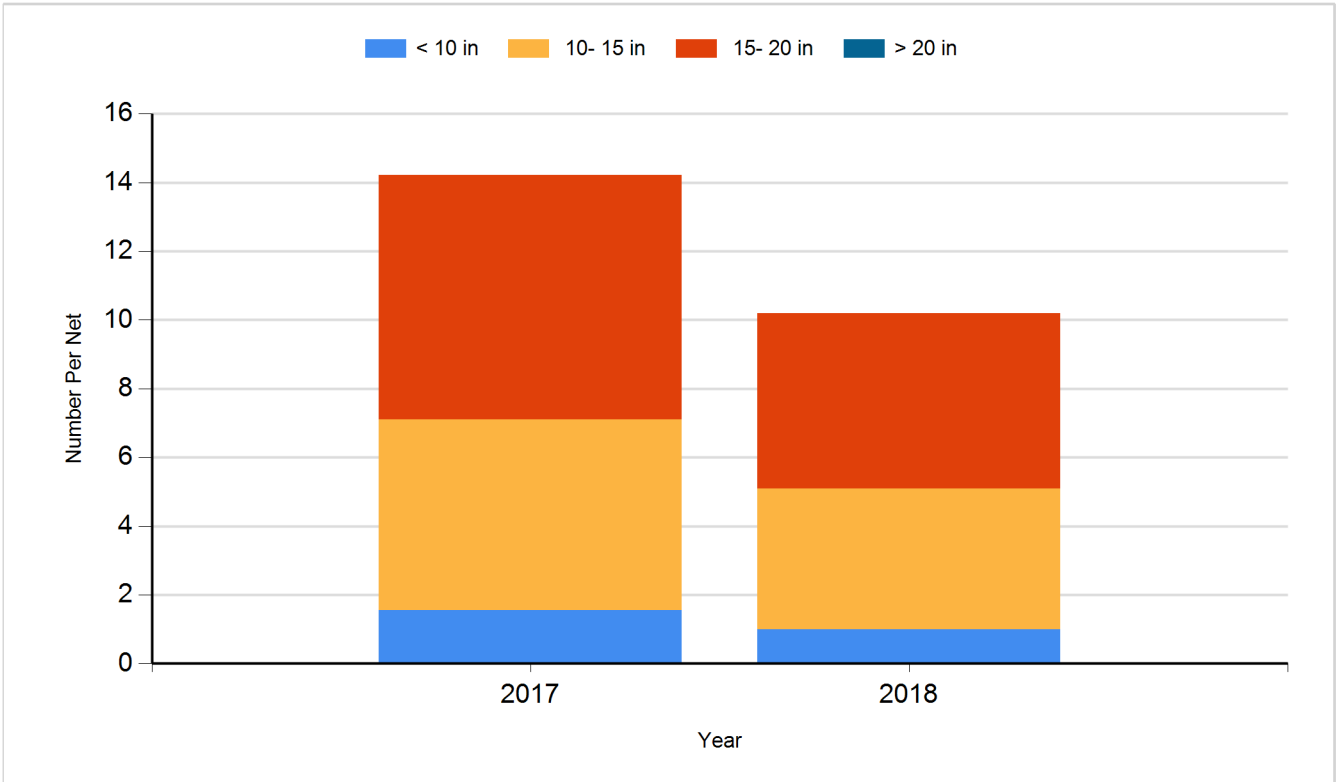
Species: Common Carp
Gear: AFS std gill net



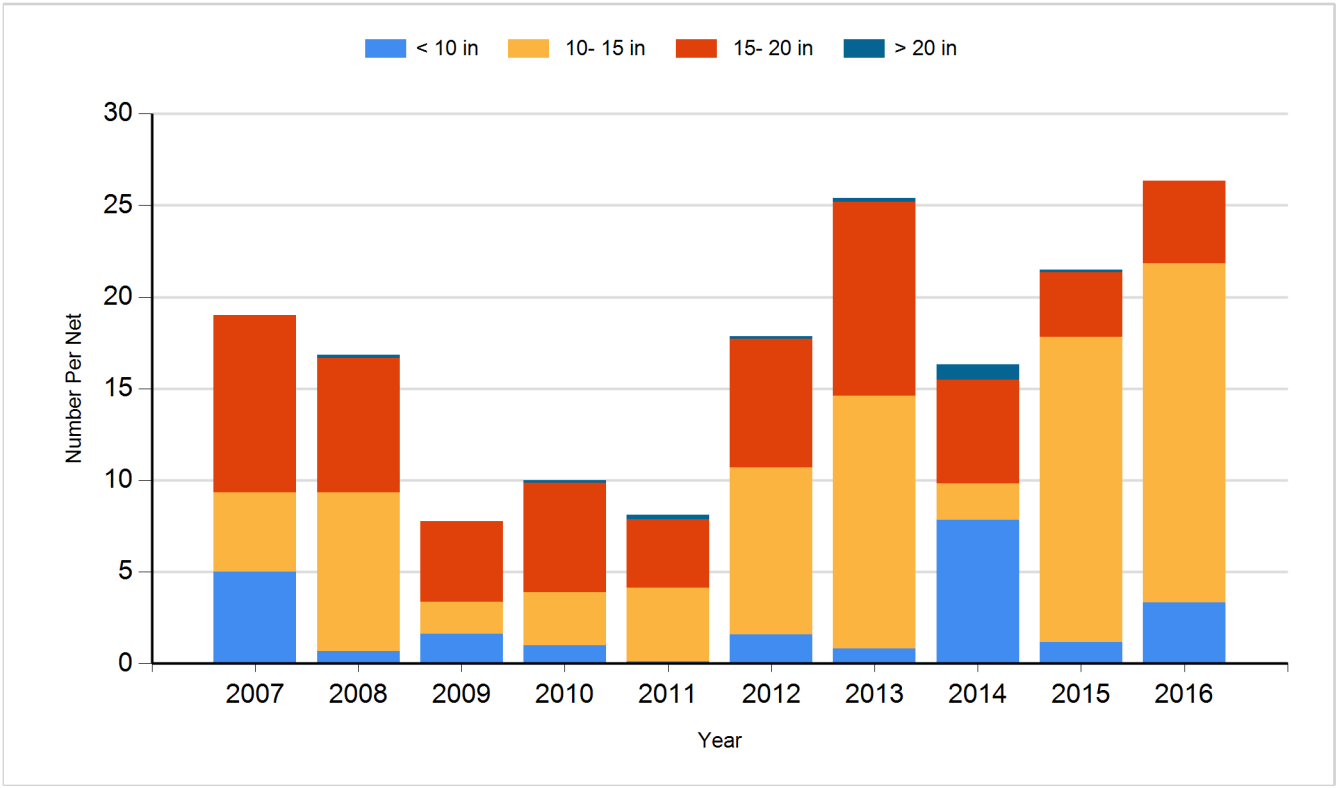
Species: Common Carp
Gear: std exp gill net



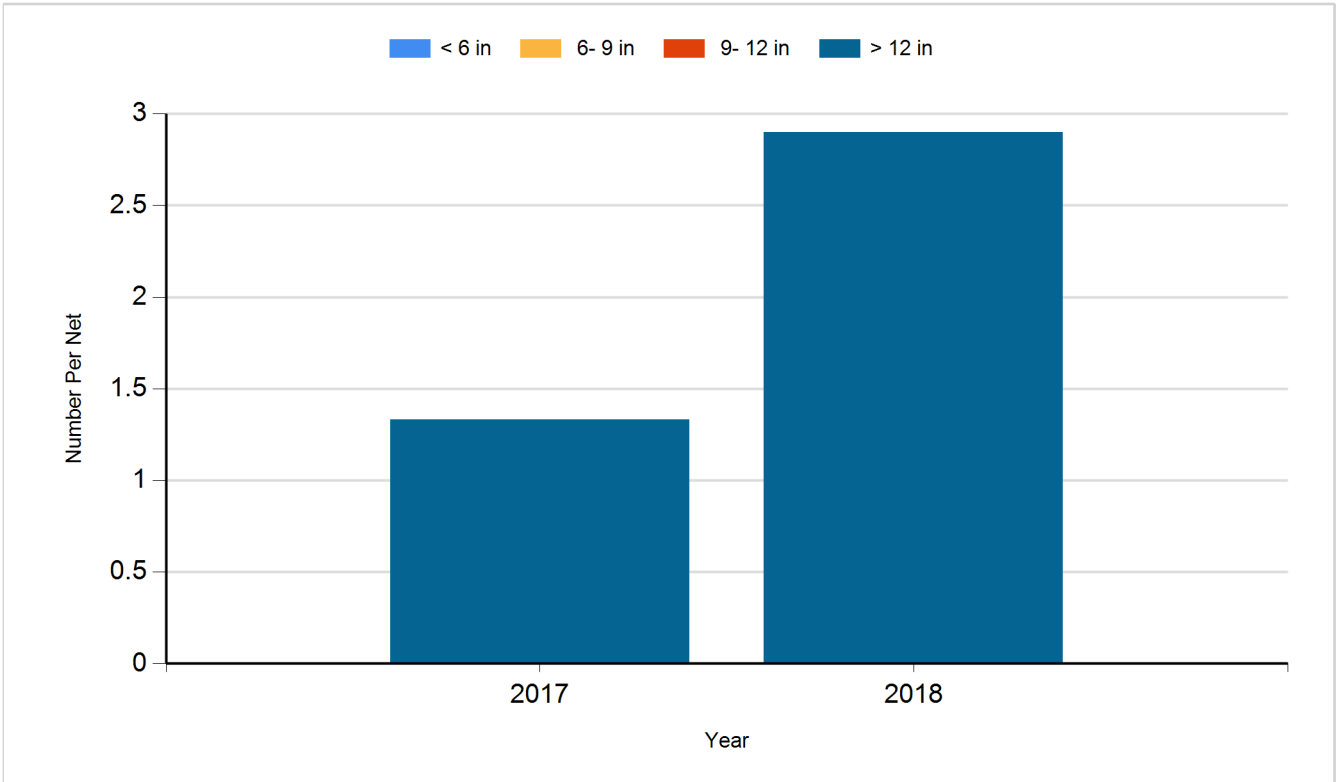
Species: Walleye
Gear: AFS std gill net



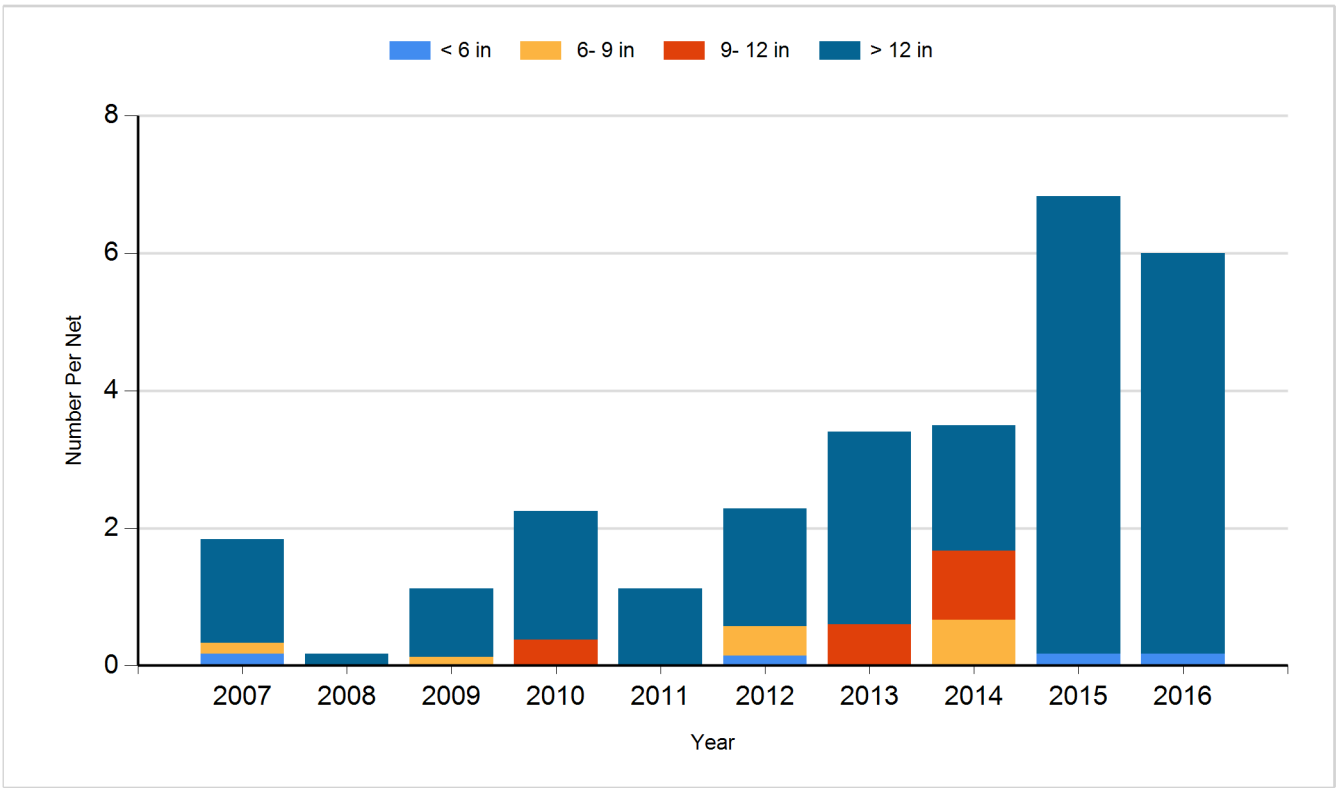
Species: Walleye
Gear: std exp gill net



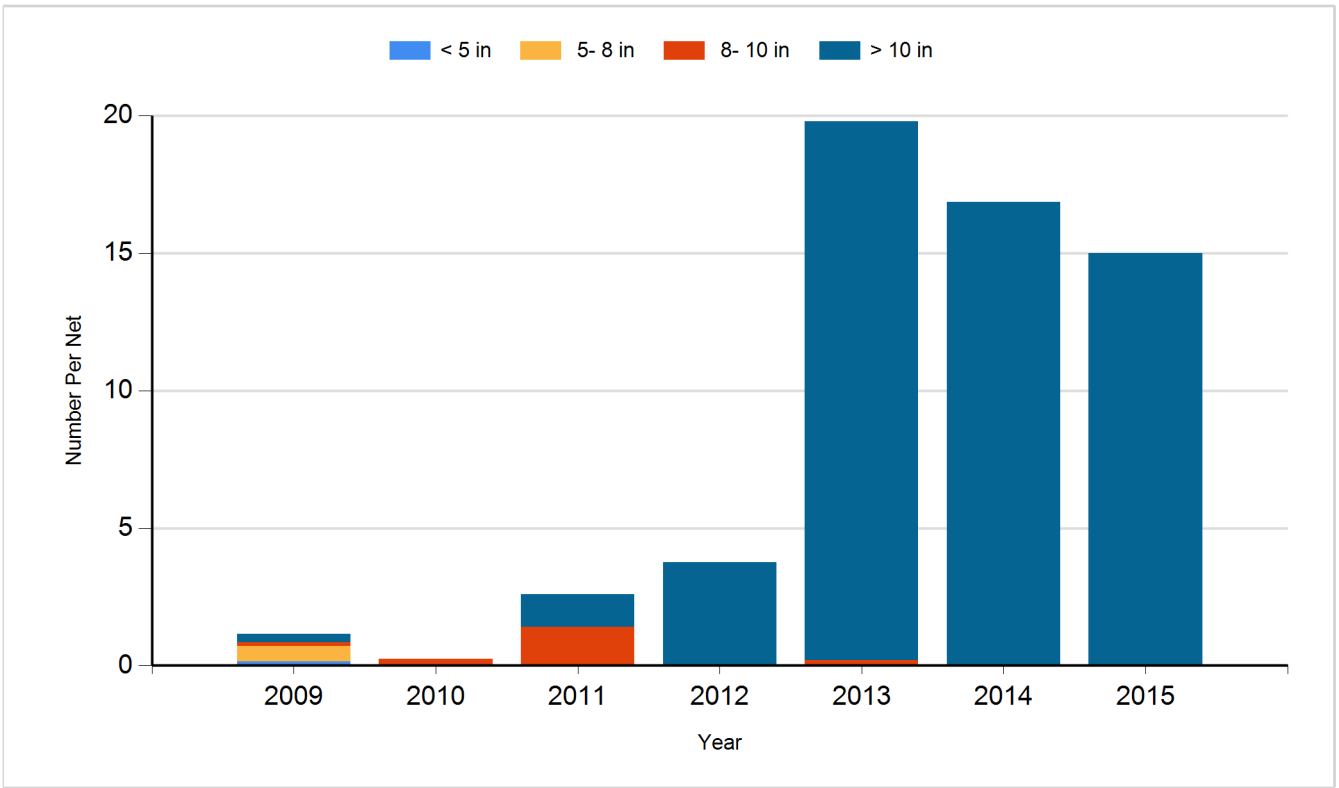
Species: White Bass
Gear: AFS std gill net



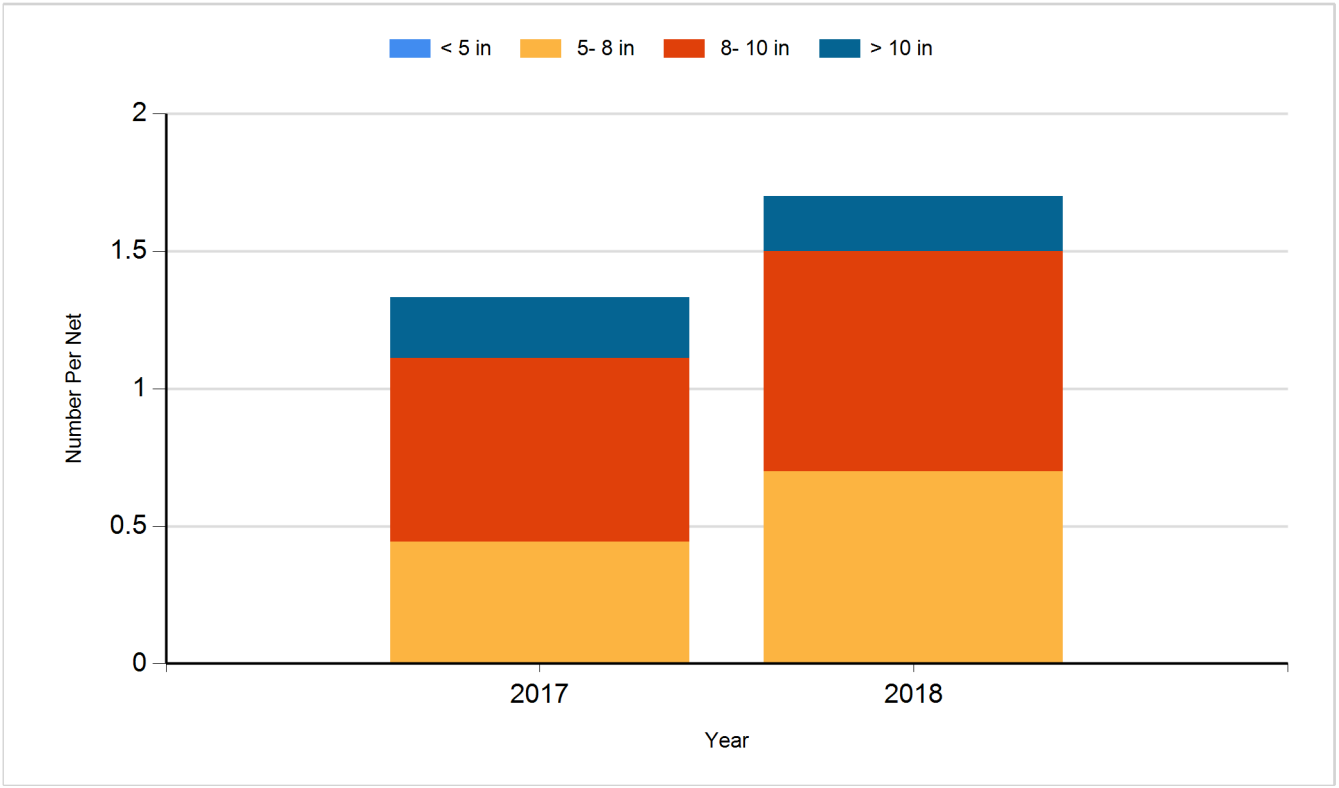
Species: White Bass
Gear: std exp gill net



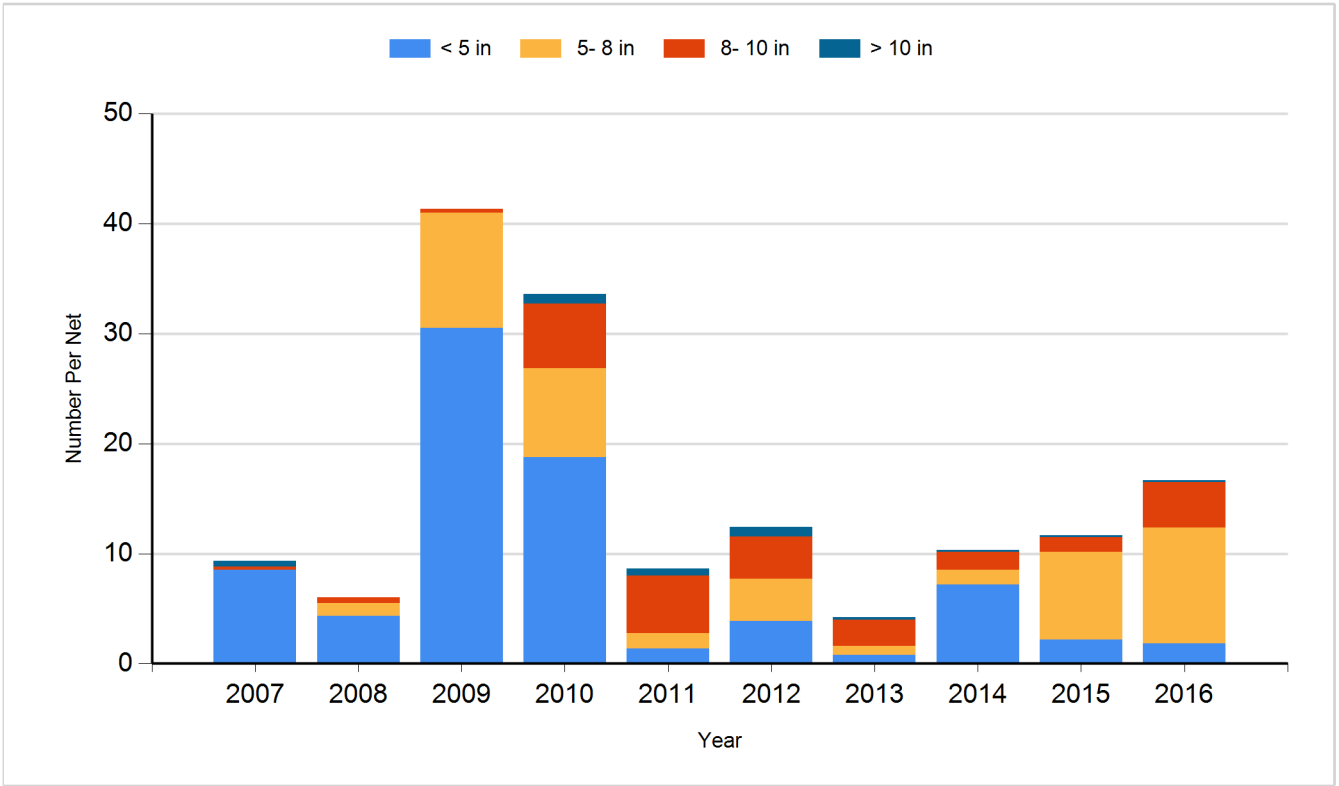
Species: White Crappie
Gear: frame net (std 3/4 in)



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	Rainbow Trout (McConaugRainbow Trout	Fingerling	33,300
2007	Rainbow Trout (Shasta)	Fingerling	19,500
2008	Gizzard Shad	Adult	59
2008	Rainbow Trout (Shasta)	Fingerling	4,600
2009	Gizzard Shad	Adult	74
2010	Gizzard Shad	Adult	18
2010	Walleye	Fingerling	415,406
2011	Gizzard Shad	Adult	175
2012	Gizzard Shad	Adult	37
2012	Yellow Perch	Adult	2,507
2013	Bluegill	Adult	660
2013	Gizzard Shad	Adult	111
2014	Gizzard Shad	Adult	220
2014	Yellow Perch	Adult	2,150
2015	Yellow Perch	Adult	1,600