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AGE-LENGTH AND LENGTH-WEIGHT RELATIONSHIP OF BULLHEADS  
FROM LITTLE LAKE BUTTE DES MORTS, 1959

By

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## INTRODUCTION

In 1959, a study was initiated to evaluate the commercial removal of bullheads in several Wisconsin lakes. The age and growth of bullheads removed commercially was to be followed to determine if an increase in growth occurred due to population thinning. This paper pertains to the study conducted on Little Lake Butte des Morts, located in east central Wisconsin. This 1,306-acre lake is a widening of the Lower Fox River just below the outlet of Lake Winnebago. The maximum depth is 12 feet.

## MATERIALS AND METHODS

Bullhead samples were taken from Little Lake Butte des Morts on October 15 and 19, 1959 from commercially fished hoop and trap nets. The sample consisted of 565 black bullheads, Ictalurus melas (Rafinesque); 348 brown bullheads, Ictalurus nebulosus (LeSueur); and, 31 yellow bullheads, Ictalurus natalis (LeSueur). All of the fish were measured to the nearest tenth of an inch in total length and weighed to the nearest hundredth of a pound. Dorsal and pectoral spines were taken from 5 to 10 bullheads in each one-inch size group.

After the spines had dried sufficiently, a fine-toothed jewelers saw was used to cut a thin cross section for aging. When placed in alcohol, these thin cross sections could easily be read with a microscope. The age was obtained from each cross section, but no measurements for growth calculations were taken. It is difficult to obtain a good cross section from the dorsal spine because of the hollow center in the spine. If a good cross section is obtained, however, it is easier to age than one from a pectoral spine. Most cross sections from the pectoral spine can be aged, and the lack of a well-developed hollow center makes sectioning quite easy.

## SELECTIVITY OF GEAR

During the 1959 season, one commercial fisherman fished 7 hoop and 3 trap nets from April 11 to November 3rd. Webbing in all nets consisted of 2-1/2-inch pots, 3-inch wings, 3-inch hearts, and 4-inch leads (all stretch measurements). A total of 75 trap and 126 hoop net lifts were made. Bullheads were taken in 58 percent of the hoop net lifts and in 52 percent of the trap net lifts. A total of 1,994 pounds of bullheads were taken -- 204 pounds of No. 1 bullheads (2 or less fish per pound); 1,274 pounds of No. 2 bullheads (3-4 fish per pound); and 516 pounds of No. 3 bullheads (5 or more fish per pound).

During the 1960 season, 5 hoop and 4 trap nets were fished by one commercial fisherman from September 28 to December 1. Webbing in all nets consisted of 2-1/2-inch pots and 4-inch wings, hearts, and leads. A total of 42 trap and 53 hoop net lifts were made; bullheads were taken in 80 percent of the former and 90 percent of the latter. There were 7,357 pounds of bullheads removed (1,755 pounds of No. 1; 497 pounds of No. 2; and 5,105 pounds of No. 3 bullheads).

Hoop nets were slightly more effective in taking bullheads than trap nets; however, each piece of gear is capable of taking all species of bullheads present except those under 6 inches, due to selectivity of mesh size.

#### LENGTH-FREQUENCY OF SAMPLE

The length-frequency distribution of black, brown, and yellow bullheads sampled from Little Lake Butte des Morts are given in Table 1. The black bullheads ranged in total length from 5.8 - 11.6 inches, the brown bullheads from 6.0 - 11.5 inches, and the yellow bullheads from 7.0 - 11.7 inches. The average total length for the black and brown bullheads was 8.1 inches, while it was 9.2 inches for the yellow bullheads.

#### GROWTH IN LENGTH

The age of the black, brown and yellow bullheads is expressed as the average age from length measurements, since no measurements for growth calculations were taken (Table 2). Growth of the yellow bullheads for each age group was greater than for the brown and black bullheads. The yellow bullheads averaged 10.7 inches at the end of the fourth year, while the black bullheads were 10.5 inches at the end of the fourth year, and the brown bullheads first reached 10.5 inches at the end of the fifth year.

There is very little information published on growth rates of bullheads which can be compared with that found in Little Lake Butte des Morts. Houser and Collins (1962) reported on growth for the black bullhead in Oklahoma for reservoirs (500 acres and over) through the first 6 years to be 3.0, 7.1, 9.5, 10.6, 11.0 and 13.8 inches (total length) and for large lakes (151-500 acres) to be 4.2, 7.4, 9.4, 12.1 and 13.2 inches (total length) through the first 5 years. Carlander (1950) indicates growth through the first 6 years to be 3.4, 5.1, 6.5, 6.9, 7.5 and 7.7 inches (total length) for the black bullhead. Lewis (1950), on two artificial lakes in southern Iowa, indicates growth of 8.5 and 9.7 inches (total length) for Age Group 2 and 3 brown bullheads. Jenkins, Leonard and Hall (1952) reported on growth through the first 5 years to be 2.6, 5.6, 7.5, 9.8 and 12.7 inches (total length) for the yellow bullhead in the Illinois River, Oklahoma. The available information would indicate that the growth rate of the black, brown, and yellow bullheads in Little Lake Butte des Morts is respectable.

#### LENGTH-WEIGHT RELATIONSHIP

Length and weight measurements of the black, brown and yellow bullheads provided the data from which a logarithmic equation was calculated to express the relationship between length and weight were  $W$  = weight in grams and  $L$  = total length in inches, as follows:

Brown bullhead:

$$\text{Log W} = -0.75489 + 3.06475 \text{ Log L}$$

Black bullhead:

$$\text{Log W} = -0.60180 + 2.92398 \text{ Log L}$$

Yellow bullhead:

$$\text{Log W} = -0.61464 + 2.97314 \text{ Log L}$$

Lengths at each 0.5-inch interval for each species were averaged to obtain the empirical data from which the equations were calculated. Weights in grams were obtained from conversion tables.

The agreement of the calculated and empirical weights for all species was satisfactory. The calculated weights based on the length-weight relationships are given in Table 3. The average weight and condition factors are greater for the yellow bullhead, while the black bullhead is in better condition than the brown bullhead.

SUMMARY

A pectoral and dorsal spine should be taken for aging. It is difficult to obtain a good cross-section from the dorsal spine because of the hollow center in the spine. If a good cross-section of the dorsal spine is obtained, it is easier to age than one from a pectoral spine. Most cross-sections from the pectoral spine can be aged, and the lack of a well-developed, hollow center makes sectioning quite easy.

Nets with webbing of 2-1/2-inch pots, 3- or 4-inch wings, 3- or 4-inch hearts, and 4-inch leads are not capable of capturing bullheads under 6 inches.

The average total length in the commercial catch for the black and brown bullheads was 8.1 inches and 9.2 inches for the yellow bullhead in Little Lake Butte des Morts.

The yellow bullhead averaged 10.7 inches at the end of the fourth year, while the black bullhead was 10.5 inches at the end of the fourth year, and the brown bullhead first attained 10.5 inches at the end of the fifth year. The maximum age was 5 years for the brown bullhead and 4 years for the black and yellow bullheads,

The relation between the total length in inches (L) and the weight in grams (W) was described satisfactorily by the equations:  $\text{Log W} = -0.75489 + 3.06475 \text{ Log L}$  (brown bullhead);  $\text{Log W} = -0.60180 + 2.92398 \text{ Log L}$  (black bullhead); and,  $\text{Log W} = -0.61464 + 2.97314 \text{ Log L}$  (yellow bullhead).

Since the growth and condition of the bullheads in Little Lake Butte des Morts is similar or better than growth in other waters, and no stunting problem existed, the commercial removal of bullheads should not be regarded as a "thinning" operation.

The commercial removal of bullheads in this lake is considered practical as a lack of harvest would result in a waste of a natural resource. Sport anglers expressed no interest in the bullhead fishery in this lake and at a public hearing in Neenah on July 15, 1958, voted in support of commercial bullhead removal.

#### MANAGEMENT RECOMMENDATIONS

It would seem essential that any lake in which a commercial fishery was to be initiated for thinning purposes should first be investigated by fishery personnel to determine: (1) if a given fish species actually needs harvesting because the population is slow-growing and abundant, or (2) if harvest is only desired to remove a portion of a population not utilized by the sport fisherman.

A commercial fishery for bullheads if established should be concerned with the removal of all sizes of fish. For the bullhead that would mean using nets with stretch mesh size under 2-1/2 inches in the pots to effectively remove bullheads under 6 inches.

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TABLE 1

Length-Frequency Distribution of Black, Brown and Yellow Bullheads from Little Lake Butte des Morts, October 15 and 19, 1959.

Length Range (T.L. in Inches)	Black	Brown	Yellow
5.8 - 5.9	1		
6.0 - 6.1	3	4	
6.2 - 6.3	7	6	
6.4 - 6.5	12	7	
6.6 - 6.7	20	18	
6.8 - 6.9	27	13	
7.0 - 7.1	36	10	1
7.2 - 7.3	36	27	
7.4 - 7.5	52	21	
7.6 - 7.7	38	27	2
7.8 - 7.9	54	36	4
8.0 - 8.1	44	26	1
8.2 - 8.3	28	18	1
8.4 - 8.5	30	31	3
8.6 - 8.7	31	13	2
8.8 - 8.9	32	19	1
9.0 - 9.1	27	16	2
9.2 - 9.3	21	11	
9.4 - 9.5	16	11	
9.6 - 9.7	13	7	4
9.8 - 9.9	15	6	1
10.0 -10.1	9	6	1
10.2 -10.3	2	6	1
10.4 -10.5	5	3	
10.6 -10.7	1	2	1
10.8 -10.9		1	2
11.0 -11.1		1	2
11.2 -11.3	4		
11.4 -11.5		2	1
11.6 -11.7	1		1
Total Sample	565	348	31
Average Total Lengths	8.1	8.1	9.2

TABLE 2

Average Growth in Inches (Total Length) of Bullheads in Little Lake Butte des Morts, 1959. (Data Based on Age-Length Relations)

Age Group	Brown Bullhead			Black Bullhead			Yellow Bullhead		
	No.	Size Range	Avg. Size	No.	Size Range	Avg. Size	No.	Size Range	Avg. Size
2	1	6.0	6.0	5	6.2- 8.5	7.8	4	7.1- 9.6	8.1
3	30	6.2- 9.7	7.6	41	5.9-10.5	8.3	18	7.6-10.8	8.9
4	20	8.0-11.4	9.5	12	9.4-11.6	10.5	7	8.9-11.6	10.7
5	5	10.1-11.4	10.5						

NOTE: The average sizes for Age Group 2 are probably over-estimated since the nets are not capable of taking bullheads under 6 inches.

TABLE 3

Length-Weight Relationship of Bullheads From Little Lake Butte des Morts.

Length Groups in Inches (T.L.)	Black Bullhead			Brown Bullhead			Yellow Bullhead		
	Avg. Weight Grams	Avg. Weight Pounds	Avg. "C" Factor	Avg. Weight Grams	Avg. Weight Pounds	Avg. "C" Factor	Avg. Weight Grams	Avg. Weight Pounds	Avg. "C" Factor
5.5- 5.9	45	0.10	53.7						
6.0- 6.4	54	0.12	46.6	47	0.10	44.0			
6.5- 6.9	65	0.14	46.1	60	0.13	43.3			
7.0- 7.4	81	0.18	46.8	75	0.17	44.8	82	0.18	47.5
7.5- 7.9	98	0.22	46.7	92	0.20	43.7	105	0.23	50.5
8.0- 8.4	117	0.26	45.7	111	0.24	42.8	127	0.28	50.9
8.5- 8.9	140	0.31	45.5	133	0.30	42.3	142	0.31	50.8
9.0- 9.4	165	0.36	47.4	158	0.35	44.3	172	0.38	49.2
9.5- 9.9	192	0.42	46.7	186	0.41	44.8	208	0.46	59.9
10.0-10.4	222	0.49	46.9	217	0.48	45.8	242	0.53	55.0
10.5-10.9	242	0.53	52.4	258	0.57	46.8	279	0.62	49.6
11.0-11.4	292	0.64	44.1	297	0.66	48.3	337	0.74	49.4
11.5-11.9	316	0.70	43.6						50.3

Black Bullhead:  $\text{Log } W = -0.60180 + 2.92398 \text{ Log } L$   
 Brown Bullhead:  $\text{Log } W = -0.75489 + 3.06475 \text{ Log } L$   
 Yellow Bullhead:  $\text{Log } W = -0.61464 + 2.97314 \text{ Log } L$

