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WISCONSIN DEPARTMENT OF NATURAL RESOURCES

RESEARCH REPORT 153

March 1992

Comparative Growth of Eight Species of Fish in Fifty-five Northwestern Wisconsin Lakes

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Abstract

This report documents length-at-age for 8 species of fish in 55 northwestern Wisconsin lakes. The purpose of this report is to supplement the existing data base with a more recent publication on fish growth from a large number of Wisconsin lakes and to provide fisheries managers with a growth standard as an aid to recognizing problem fisheries. Fish species covered include northern pike, rock bass, pumpkinseed, bluegill, largemouth bass, black crappie, yellow perch, and walleye.

Fyke nets were the primary sampling gear, supplemented by electrofishing samples in order to collect all sizes and species of fish. Samples were collected before 1 June and after 1 September, and age was recorded in completed growing seasons. All data are presented as the mean empirical total length for each species in each lake. These lake means were used to determine a regional (northwestern Wisconsin) mean for each species. Statistics determined in addition to the mean were the minimum, median, and maximum lengths and the 10th, 25th, 75th, and 90th quantiles.

We found considerable variation in growth of fish between lakes and often found that growth for different species in the same lake fell into different quantiles. Therefore, for management purposes, all major sport fish species should be considered when making growth comparisons. Our results are reasonably close to those reported from other studies in Wisconsin, Michigan, and Minnesota; thus they may be useful as a standard for growth comparisons over a wider geographical area than northwestern Wisconsin.

These results can be used to determine the growth status of the species sampled in relation to the northwestern Wisconsin means. We recommend that fisheries management goals be directed toward maintaining growth at approximately the 75th quantile for target species. Since growth is a relative measure of density, growth in this range should provide more desirable sizes of fish than very fast-growing, sparse populations or slow-growing, overabundant populations.

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Contents

Introduction

Age and growth information is critical to most fishery investigations. Estimation of growth rate can provide valuable clues about the status of the population in question. Because changes in growth often correspond to changes in species density, forage availability, and/or exploitation, knowledge of growth rate is important to the wise management of our fishery resources. Despite its importance, information on fish growth in Wisconsin consists primarily of unpublished material (Klingbiel and Ananthanarayanan 1986) and older publications (Bennett 1937, Van Engel 1940, Hile 1941).

A previous study reported on the growth of 8 species of fish in 13 northwestern Wisconsin lakes (Snow 1969). Here we present a more comprehensive report covering the same 8 species in 55 northwestern Wisconsin lakes. This report is based on data collected during 1974-82 as part of a research project on fast- and slow-growing bluegill populations. Besides bluegill, 4 other panfish species and 3 predator species were targeted for growth analysis. The objectives of this report are to (1) report the age and growth information collected from this large sample of lakes in northwestern Wisconsin, (2) supplement the existing data base with a more recent publication on fish growth in Wisconsin, and (3) provide managers with a comparative growth reference that may aid in recognizing problem fisheries.

Study Area

The 55 lakes studied lie in a 9-county area of northwestern Wisconsin (Fig. 1). A brief description of the study lakes, which exhibit a wide range of morphometric and chemical characteristics, can be found in Table 1 and Appendix A. While the information in these tables is presented for the reader to use in interpreting growth data, it is not covered in the Results section of this report.

The study lakes are inhabited by a variety of panfish and game fish species. Species considered in this report are: northern pike (*Esox lucius*), largemouth bass (*Micropterus salmoides*), walleye (*Stizostedion vitreum*), yellow perch (*Perca flavescens*), black crappie (*Pomoxis nigromaculatus*), rock bass (*Ambloplites rupestris*), bluegill (*Lepomis macrochirus*) and pumpkinseed (*Lepomis gibbosus*). These 8 species are the most common sport fish found in northwestern Wisconsin lakes.

Methods

Background

During 1974-82, data on fish populations and lake characteristics were collected from 115 northwestern Wisconsin lakes throughout the open-water seasons (April-October) in an attempt to identify possible factors related to fish growth (Snow and Staggs, in review). The wealth of age and growth information generated by that study afforded a unique opportunity to subsample the data set to assess fish growth in northwestern Wisconsin. Because growth data in this report are based on empirical lengths at age, only the 55 lakes sampled after 1 September and before 1 June are included in the subsample. Since little growth occurs for most species during this period, lakes sampled before and after these dates provide a more reliable estimate of length-at-age than samples collected in June, July, and August, when most

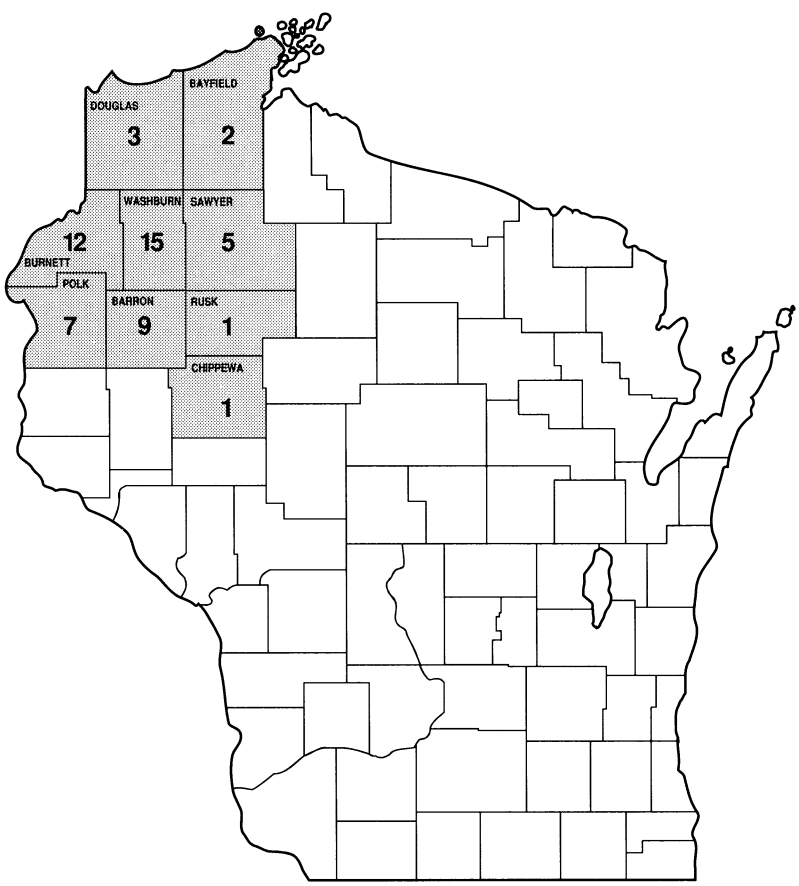


Figure 1. *Location of the 55 study lakes, by county.*

Table 1. *Summary statistics of the study lakes.*

Parameter	Sample (N)	Average	Standard Deviation	Miniumum	Maximum
Area (acres)	55	162.0	126.2	12	719
Max. depth (ft)	55	28.7	12.5	10	67
Avg. depth (ft)	50	12.9	4.4	3	25
Alkalinity (mg/L)	55	38.4	30.2	3	110
MEI*	50	5.1	5.0	0.3	25.3
SDF**	54	1.9	0.5	1.1	3.1

* Morphoedaphic Index (Ryder et al. 1974).
** Shoreline Development Factor (Lind 1979).

growth occurs and when it is difficult to determine whether post-annular circuli represent the current or previous year's growth. Thus a fish sampled in the fall was assigned the same age as it would have been if sampled the following spring. Because of the inherent errors associated with back calculation, we believe using empirical lengths before and after the growing season as described above provides more reliable estimates of growth.

Lake Selection

Lakes were selected, when possible, to include slow to fast bluegill growth, a wide range of alkalinity, varying combinations of the 3 major predator species (largemouth bass, northern pike, and walleye), varying amounts of macrophytes, and good access. Information from Wisconsin Department of Natural Resources (DNR) files, discussions with fisheries managers and local residents, and on-site observations were used to make the final selection of study lakes. Based on these selection methods, the lakes surveyed cannot be considered a random sample. However, because of a rather large sample size and attempts to select lakes and fish populations covering a wide range of physical and biological characteristics, we assume that this is a representative sample.

Sampling Gear and Aging Methods

Fyke nets (0.5-inch square mesh) were the primary sampling gear. Four to 6 nets were fished for 2 days in each of the study lakes. This gear was supplemented by a 230-v AC electrofishing unit for the catch of target species and sizes not susceptible to capture with nets. Electrofishing was usually conducted within 10-15 days of the net sampling.

All fish were measured to the nearest 0.10 inch of total length. When possible, scales were collected from 10 fish in each 0.5-inch group for panfish and from 5 fish per 0.5-inch group for game fish species. Scale samples were taken from the area of the body at the tip of the pectoral fin for spiny-rayed fish and just below the anterior margin of the dorsal fin for northern pike. Scale impressions were made on plastic acetate slides and viewed under a microscope or microprojector. Age was recorded as the number of completed growing seasons, and sexes were combined.

All fish were aged by experienced personnel who followed annuli recognition procedures described by Ambrose (1983). Age determinations were not validated by other methods.

Sample Size

All sample sizes of fish aged using scales were included in the calculation of all age statistics for each lake. Gear selectivity for moderately sized fish often precluded obtaining large samples of younger age groups, and therefore mean length-at-age data for age group 1 and sometimes age group 2 may be based on small sample sizes. Similarly, length data for older age groups may also be based on small sample sizes due to the low number of larger fish collected. If an age group was represented by only one fish, the length of that fish was used as the mean for that age group for that lake. Inclusion of the small sample sizes made it possible to present age data for more age groups, especially for older fish, than would otherwise be possible. Although some sample sizes were small, the total number of fish aged was large, ranging from a few hundred to several thousand for each species.

Data Analysis

The data presented in this report represent the mean empirical total length for each age group for each species in each lake. From these lake means a regional (northwestern Wisconsin) mean was determined for each species. The regional means are unweighted means of lakes, and therefore

sample size is the number of lakes in which the specified age group was found rather than the number of fish sampled. Statistics calculated in addition to the mean include the minimum, median, and maximum lengths and the 10th, 25th, 75th, and 90th quantiles. A quantile is the value at or below which lies a given fraction of the data set. For example, the 25th quantile includes the smallest or slowest-growing 25% of the means for the indicated species. All statistics were computed using the mean and univariate procedure on the Statistical Analysis System (SAS Inst. 1982).

Number of Lakes Sampled

All 55 lakes included in this report contained bluegills. In 3 lakes, however, the netting sample occurred before 1 September while the electrofishing sample occurred after 1 September. For these lakes, growth data for bluegills and other species sampled with fyke nets were excluded from this report. As a result, growth data are reported for 52 lakes for bluegills, 49 lakes for largemouth bass, 42 lakes for pumpkinseed, 41 lakes for northern pike, 37 lakes for black crappie and yellow perch, respectively, 36 lakes for walleyes, and 21 lakes for rock bass. Because all lakes were not represented for any age group for all species, the number of lakes used to determine the means varies considerably.

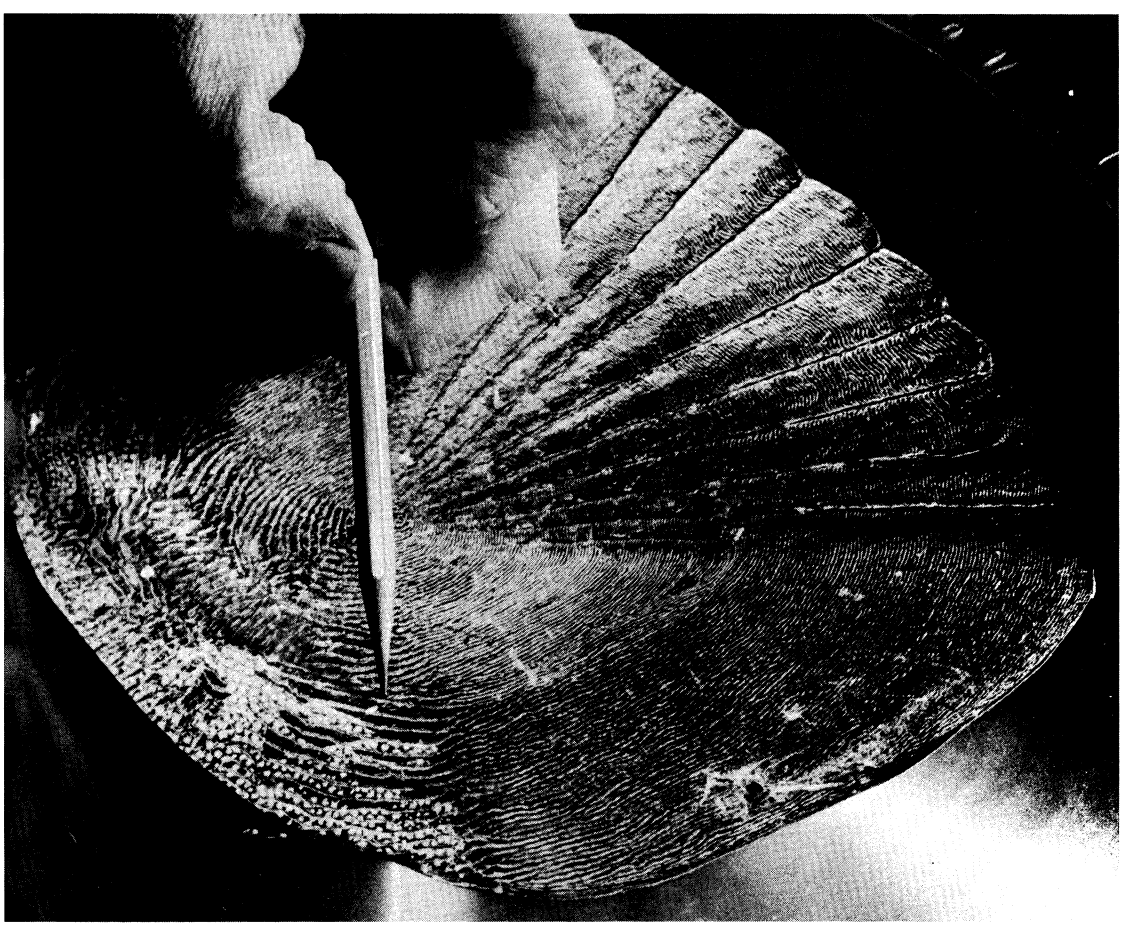
Results and Discussion

Growth Data

Growth data for each lake are presented by species in Appendix B. All the statistics calculated from the species data in Appendix B are summarized in Table 2, including sample size (number of lakes); mean, median, minimum, and maximum lengths; and the 10th, 25th, 75th, and 90th quantiles. Species plots of the minimum, mean, and maximum lengths and the 25th and 75th quantiles are shown for all 8 species in Figures 2-9.

Growth Standard

Growth is one of the most important characteristics that can be used to describe a fish stock or population and to give direction to fisheries management goals. The growth data presented in this



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Typical scale showing a growth annulus.

Table 2. *Age in completed summers of growth; number of lakes; and mean, median, minimum, maximum, and 10th, 25th, 75th, and 90th quantiles of length-at-age for each species.*

Species and Age	No. Lakes Sampled	Length (inches)							
		Mean	Median	Min.	Max.	Q10	Q25	Q75	Q90
Northern Pike									
1	26	10.2	10.1	6.4	15.3[c]	7.5	8.8	11.2	12.9
2	34	14.7	15.4	7.8	19.0	11.6	12.7	16.2	17.9
3	40	18.0	17.3	11.5	23.8	14.9	15.6	20.0	22.5
4	34	21.2	20.4	16.5	30.1	17.4	18.5	23.7	25.9
5	30	24.1	23.9	18.7	31.4	19.2	20.1	28.0	29.7
6	22	27.2	26.7	18.9	34.5	20.0	22.9	32.2	33.8
7	14	29.7	32.0	19.6	36.0	19.7	24.8	33.7	35.6
8	7	32.3	34.1	22.1	41.5	22.1	27.7	36.5	41.5
9	6	34.8	33.5	29.2	41.8	29.2	29.6	41.2	41.8
10	2	36.5	36.5	36.0	37.0	36.0	36.0	37.0	37.0
11	1	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0
Rock Bass									
2	9	3.4	3.1	2.8	4.3	2.8	3.0	3.8	4.3
3	15	4.9	4.7	3.7	6.3	3.8	4.2	5.6	6.1
4	19	6.3	6.3	4.3	8.8	5.2	5.6	7.1	7.6
5	17	7.1	7.2	5.8	8.9	5.9	6.5	7.6	8.3
6	9	7.3	8.0	6.0	8.2	6.0	6.4	8.0	8.2
7	7	8.5	8.6	6.9	9.7	6.9	8.2	8.8	9.7
8	5	9.3	9.2	8.0	10.7	8.0	8.6	10.0	10.7
9	4	9.9	9.8	9.0	11.0	9.0	9.1	10.8	11.0
Pumpkinseed									
2	26	3.3	3.1	2.6	4.1	2.7	3.0	3.6	3.9
3	38	4.3	4.3	3.0	5.8	3.4	3.6	5.0	5.4
4	38	5.3	5.4	3.7	6.7	4.1	4.8	6.0	6.3
5	35	6.1	6.1	3.7	7.6	5.1	5.8	6.4	7.0
6	22	6.5	6.7	4.7	7.2	5.2	6.0	7.0	7.2
7	17	7.0	7.1	5.2	7.8	5.8	6.6	7.5	7.7
8	5	7.5	7.8	6.0	8.6	6.0	6.3	8.4	8.6
9	4	7.2	7.1	6.2	8.4	6.2	6.4	8.1	8.4
Bluegill									
1	5	1.6	1.5	1.2	2.3	1.2	1.4	2.0	2.3
2	41	3.3	3.1	1.8	4.9	2.5	2.8	3.5	4.3
3	50	4.3	4.1	2.6	7.0	3.0	3.2	5.3	5.7
4	51	5.4	5.4	3.2	8.9	3.6	4.2	6.4	7.1
5	52	6.4	6.5	3.5	9.5	4.6	5.3	7.2	8.0
6	48	6.9	6.9	4.2	10.3	5.2	6.1	7.8	8.4
7	39	7.3	7.2	4.5	10.3	5.7	6.3	8.1	9.0
8	34	7.8	7.8	5.3	9.9	6.0	6.9	8.7	9.3
9	19	8.0	7.6	5.6	10.9	6.2	7.1	8.7	10.6
10	14	7.9	7.8	6.1	10.5	6.1	7.0	8.9	9.9
11	4	7.5	7.4	6.2	8.9	6.2	6.4	8.7	8.9
12	3	8.0	7.7	6.8	9.6	6.8	6.8	9.6	9.6
13	1	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8
14	1	11.3	11.3	11.3	11.3	11.3	11.3	11.3	11.3

Table 2. *Continued.*

Species and Age	No. Lakes Sampled	Length (inches)							
		Mean	Median	Min.	Max.	Q10	Q25	Q75	Q90
Largemouth Bass									
1	31	4.2	4.4	3.1	5.3	3.4	3.8	4.6	5.0
2	37	6.9	6.7	4.4	9.8	5.5	5.8	7.7	9.3
3	40	9.9	9.6	6.7	13.5	7.8	8.6	11.3	13.1
4	34	12.2	12.1	8.7	15.0	9.6	11.0	13.4	14.7
5	31	14.0	13.6	10.4	17.2	12.2	12.7	15.6	16.7
6	25	16.3	16.5	13.9	18.6	14.2	15.1	17.3	18.3
7	17	17.1	17.0	14.2	19.6	15.2	16.3	18.1	19.1
8	16	18.4	18.5	15.9	19.9	16.6	17.6	19.0	19.6
9	9	19.3	19.1	17.9	20.3	17.9	18.8	20.1	20.3
10	7	19.7	20.0	18.9	20.3	18.9	19.0	20.1	20.3
11	2	20.5	20.5	20.0	21.1	20.0	20.0	21.1	21.1
12	3	20.3	20.5	19.2	21.2	19.2	19.2	21.2	21.2
13	1	21.3	21.3	21.3	21.3	21.3	21.3	21.3	21.3
Black Crappie									
1	11	3.5	3.4	2.8	4.9	2.8	3.1	3.6	4.8
2	23	5.1	5.1	3.5	7.5	4.3	4.5	5.6	6.5
3	30	7.4	7.5	5.1	9.9	6.0	6.5	8.2	9.3
4	32	8.8	8.7	6.0	12.0	6.9	7.7	9.9	10.2
5	29	9.7	10.0	6.3	12.9	7.9	8.6	10.7	11.4
6	23	10.6	11.0	6.5	12.9	7.8	9.8	11.6	12.1
7	18	11.4	12.0	7.2	14.5	7.7	10.2	12.7	14.0
8	10	11.0	11.0	7.4	14.0	7.5	9.0	13.0	13.9
9	6	11.9	12.8	8.0	14.0	8.0	9.9	13.5	14.0
10	2	11.1	11.1	8.4	13.9	8.4	8.4	13.9	13.9
11	1	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9
Yellow Perch									
1	4	3.6	4.0	2.2	4.4	2.2	2.5	4.4	4.4
2	28	4.8	4.7	3.5	6.0	4.0	4.4	5.2	5.7
3	34	6.0	5.8	4.3	7.7	4.7	5.0	6.7	7.3
4	30	7.2	7.1	5.2	9.1	5.6	6.4	8.0	8.9
5	27	8.1	8.0	5.7	10.6	6.6	6.9	8.9	10.3
6	21	9.1	8.8	6.7	12.3	7.9	8.1	10.1	11.2
7	13	9.8	9.7	7.2	12.0	7.7	8.8	10.9	11.7
8	8	10.3	10.2	8.2	12.8	8.2	8.6	11.7	12.8
9	5	10.5	10.9	7.6	12.4	7.6	8.7	12.2	12.4
10	3	10.1	10.7	7.5	12.0	7.5	7.5	12.0	12.0
11	1	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5
12	2	10.3	10.3	8.5	12.1	8.8	8.5	12.1	12.1
Walleye									
1	21	6.8	6.8	4.4	8.2	5.6	6.0	7.6	8.2
2	24	10.6	10.7	8.1	14.2	8.5	9.4	11.9	12.3
3	25	13.3	13.2	10.9	17.4	11.0	11.9	14.1	15.8
4	24	15.2	15.0	12.4	19.5	12.9	13.7	16.2	18.3
5	24	17.1	16.7	14.3	21.5	14.3	15.9	18.2	20.1
6	30	19.1	19.0	16.3	23.7	16.9	18.1	20.2	21.1
7	28	20.9	20.6	17.4	24.0	19.1	19.8	22.0	23.1
8	24	22.6	22.4	19.2	27.0	19.7	20.3	24.8	26.1
9	20	23.7	24.0	19.5	27.3	19.7	21.5	25.8	26.5
10	16	25.0	26.0	18.5	28.0	20.8	23.3	26.8	27.6
11	7	26.5	26.5	25.4	27.3	25.4	26.0	27.2	27.3
12	6	27.3	27.7	25.2	28.8	25.2	25.4	28.8	28.8
13	1	22.9	22.9	22.9	22.9	22.9	22.9	22.9	22.9
14	1	24.7	24.7	24.7	24.7	24.7	24.7	24.7	24.7

report, especially in Table 2 and Figures 2-9, can be used to assess the growth status of a sampled fish species in relation to northwestern Wisconsin means. However, we recommend that fisheries managers use the 75th quantile as the standard for maintaining growth of target species.

Management strategies for target species that fall in quantiles of slower growth (below the 75th) should be directed toward improving growth by standard fisheries management practices (stocking, biomanipulation of the predator/prey ratio, etc.). Although it is probably neither practical nor possible to maintain growth of all sport fish species in a population at the 75th quantile, we believe that it is an obtainable standard for the major 3 or 4 target species of game fish and panfish in a lake.

Management strategies for target species that fall in quantiles of faster growth (above the 75th) should be directed toward maintaining the status quo. Exceptionally fast-growing populations usually are low density and often cannot provide a sustained fishery. However, they may produce trophy fish and thus provide exceptional angling opportunities that would not exist if management strategies were directed toward reducing growth to the 75th quantile.

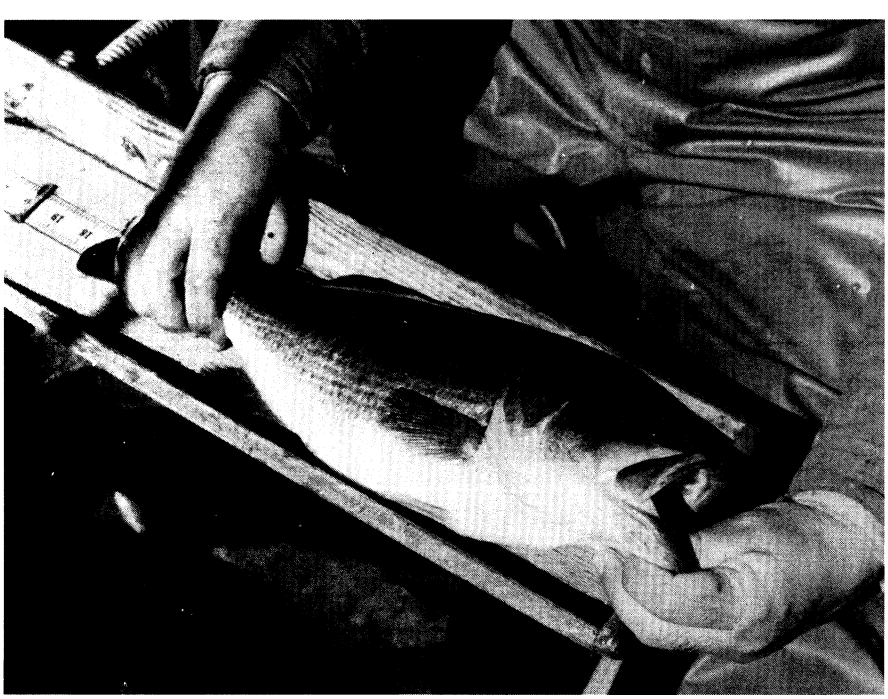
Difficulties in Age Determination and Accuracy of Aging

Despite efforts to obtain accurate data, errors in age determination do occur. Investigators have shown that scale interpretation oftentimes underestimates the age of older fish (Beamish and McFarlane 1987, Carlander 1987). Also, sampling biases for faster-growing members of juvenile age groups inflates length estimates. These problems and their potential effects should be recognized when making growth comparisons. From a management standpoint, therefore, it's probably best to compare middle age groups in order to obtain the most accurate comparisons.

Growth Variation and Comparison

Variation in growth is a normal characteristic of all fish species. Differences between fast- and slow-growing populations are usually not apparent until after the first summer of growth. For example, length of age 1 bluegills in both Silver and Iron lakes averaged 1.5 inches, while length of age 5 bluegills averaged 4.1 inches in Silver Lake and 8.5 inches in Iron Lake, respectively (Append. Table B.4).

Characterizing a species growth rate as slow or fast cannot always be accomplished by simple comparison to regional or statewide means. Difficulties arise, for example, when the length for one age group falls in a different quantile than lengths for other age groups, as shown for Bladder Lake bluegills (Fig. 10). In these situations, comparing age groups only with total length equal to the normal quality size (≥ 6.0 inches for bluegills) may provide more straightforward or meaningful results (Anderson and Gutreuter 1983). Using this guideline, growth of age 4-7 bluegills in Bladder Lake would be at about the 75th quantile and therefore could



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A lunker largemouth bass.

be considered as meeting the standard growth rate. Using Anderson and Gutreuter's (1983) quality-size recommendations, similar comparisons can be made for all 7 of the other species covered in this report.

Different species in the same lake often exhibit different comparative growth characteristics. Bucks Lake, for example, contains fast-growing bluegills but slow-growing northern pike (Append. Tables B.1, B.4). Different growth characteristics for different species increase the difficulty of formulating management strategies; i.e., a regulation imposed to improve the growth of one species could negatively impact other species. Thus, managers need to consider the whole sport fish community when making growth comparisons and management recommendations.

Regional Growth Comparisons

We compared our growth data with statewide averages for fish ages 3-7 from Michigan (Laarman et al. 1981), Minnesota (Scidmore 1960), and Wisconsin (Klingbiel and Ananthanarayanan 1986). Length-at-age data for all 3 states were either very close to our means or within the 25th-75th quantiles. Therefore, our results may have wider application than just in northwestern Wisconsin.

When comparing our means with averages for the 5 age groups (3-7) for Michigan, Minnesota, and Wisconsin, only 14 of the 75 comparisons for the 5 species of panfish exceeded a difference of 0.5 inch, while 10 of the 45 comparisons for the 3 species of game fish exceeded a difference of 1.0 inch. Despite overall similarity, there were noteworthy trends. Our mean length-at-age data were consistently lower for bluegills and higher for largemouth bass for all 3 statewide comparisons (Table 3). Wisconsin statewide averages for northern pike and walleye were consistently lower than our means (Table 3). Statewide averages for Wisconsin are drawn from a relatively large number of lakes, a majority of which are in the northern part of the state, with many from the same region covered in this report. Reasons for these differences are not known but could be due to differences in aging methods and unequal geographical distribution of study lakes. Variations of this type could be minimized by comparing growth data to a regional average based on more consistent aging procedures.

Table 3. *Average difference between mean length of ages 3-7 for the present study and corresponding statewide averages reported for Michigan, Minnesota, and Wisconsin.*

	Average Difference (inches) Per Age Group Compared to Present Study*		
Species	**Michigan**	**Minnesota**	**Wisconsin**
Northern pike	+0.9	-0.3	-1.5
Rock bass	+0.1	+0.1	0.0
Pumpkinseed	+0.2	+0.4	+0.2
Bluegill	+0.6	+0.8	+0.5
Largemouth bass	-0.9	-0.8	-1.0
Black crappie	-0.3	-0.1	-0.1
Yellow perch	+0.4	+0.2	-0.1
Walleye	+0.3	-0.2	-1.1

*Example: The average lengths for ages 3-7 northern pike in Wisconsin were 1.5 inches less per age group than the mean lengths of ages 3-7 northern pike for the present study.

Conclusions and Management Implications

Knowledge of fish growth is critical to the adequate management of our fishery resources. This report provides baseline growth data for 8 species of fish in northwestern Wisconsin. These data can be used by managers to make growth comparisons and formulate management strategies. We suggest that management goals for fish populations in most lakes should be directed towards maintaining growth rates near the 75th quantile as an optimum standard. Since growth is usually a relative measure of abundance (Hofstede 1974), growth in this range should provide more desirable sizes of fish than very fast-growing, sparse populations or slow-growing, overabundant populations.

If growth is below the 75th quantile (in the 10th, 25th, 50th, or between the 50th and 75th quantiles) the management strategy for target species should be to improve growth. If growth is above the 75th quantile for the target species (at the 90th quantile or near or at the maximum), the management strategy should be to maintain the status quo. Very fast-growing populations are usually low-density populations that cannot provide a large, sustained fishery; however, they may produce trophy fish and thus provide angling opportunities that would not otherwise exist.

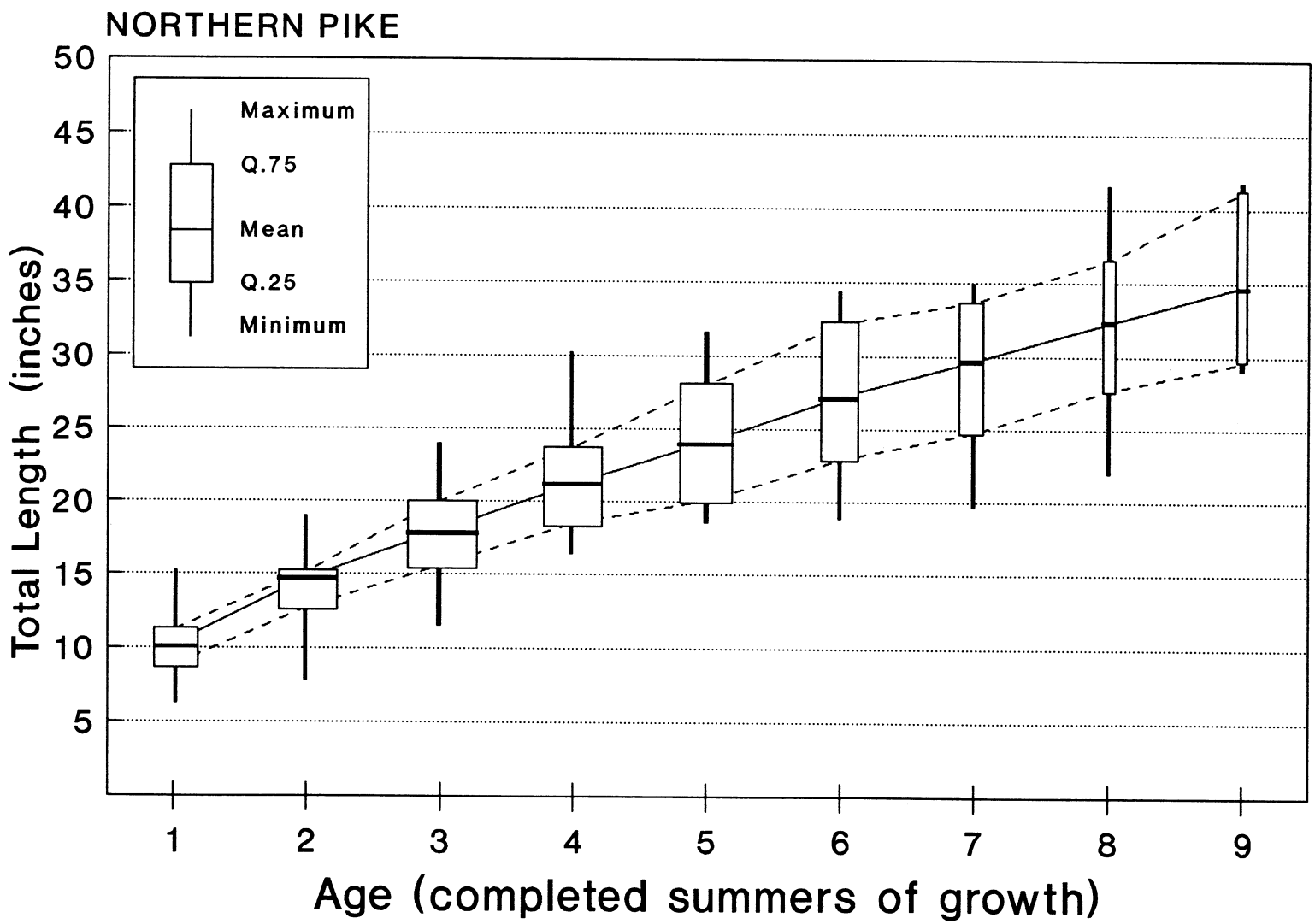

Figure 2. *Plot of mean, maximum, minimum, and 25th and 75th quantiles length-at-age for northern pike. The width of the box is proportional to the sample size for each age group.*

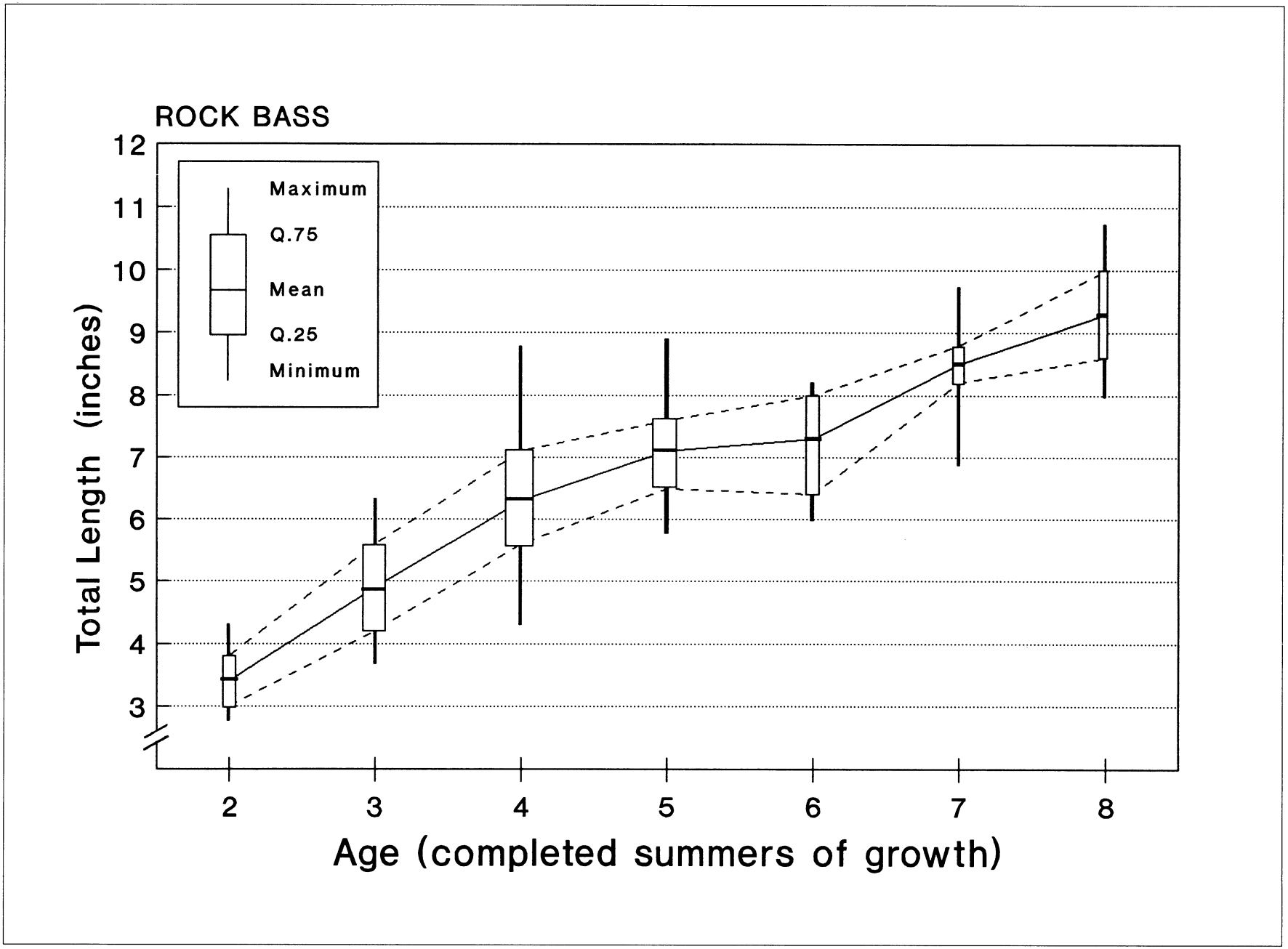

Figure 3. *Plot of mean, maximum, minimum, and 25th and 75th quantiles length-at-age for rock bass. The width of the box is proportional to the sample size for each age group.*

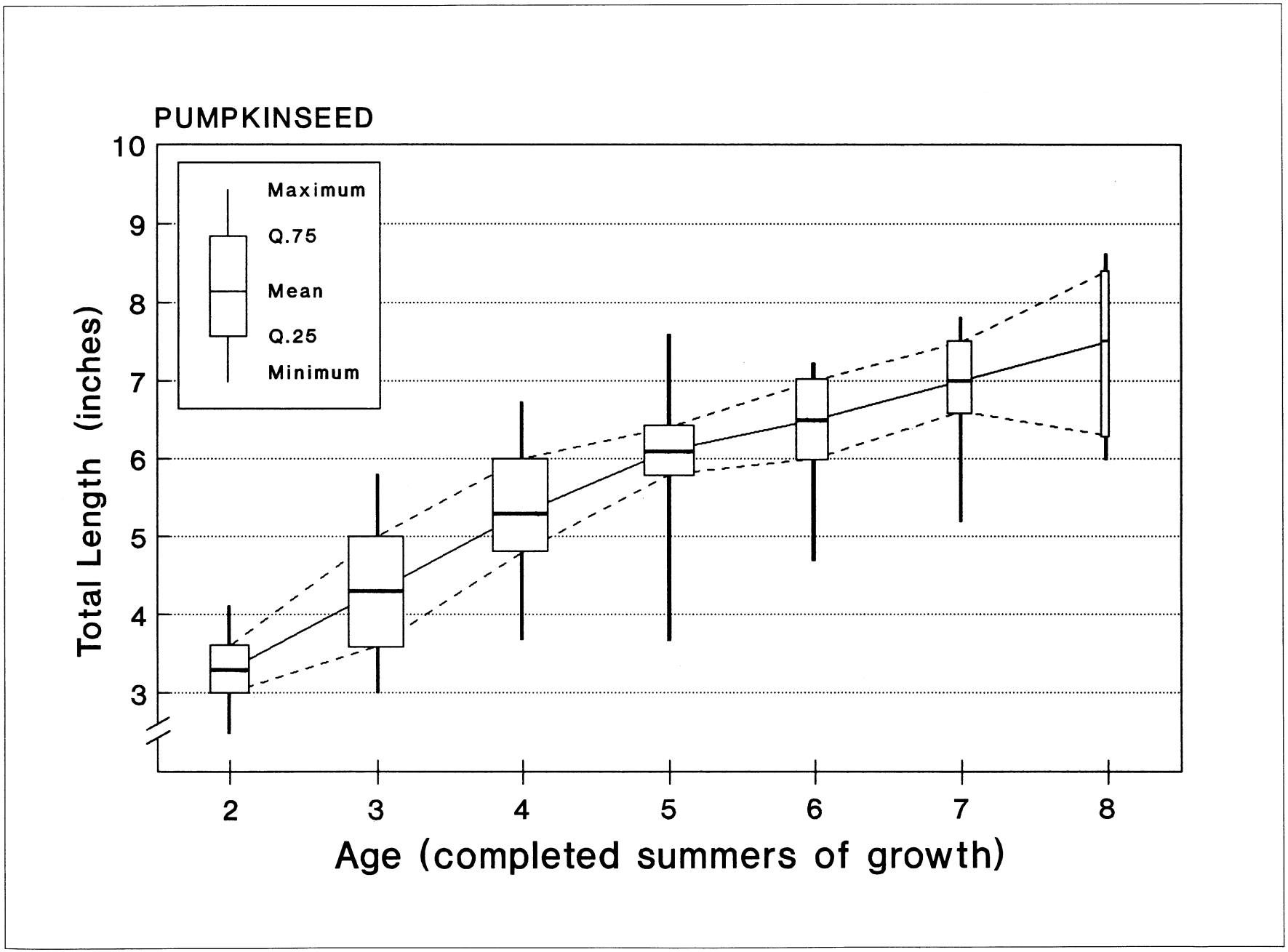

Figure 4. *Plot of mean, maximum, minimum, and 25th and 75th quantiles length-at-age for pumpkinseed. The width of the box is proportional to the sample size for each age group.*

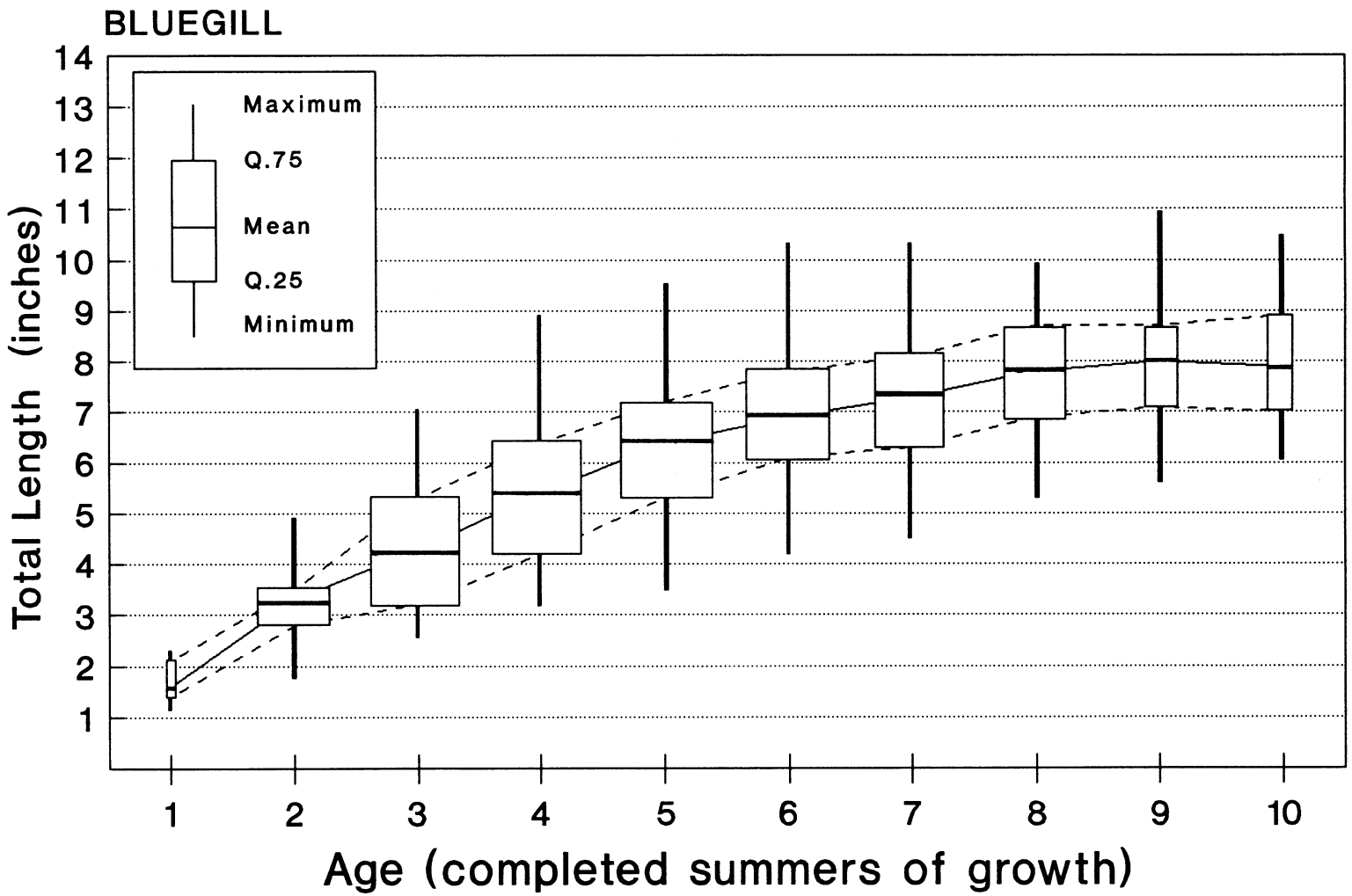

Figure 5. *Plot of mean, maximum, minimum, and 25th and 75th quantiles length-at-age for bluegill. The width of the box is proportional to the sample size for each age group.*

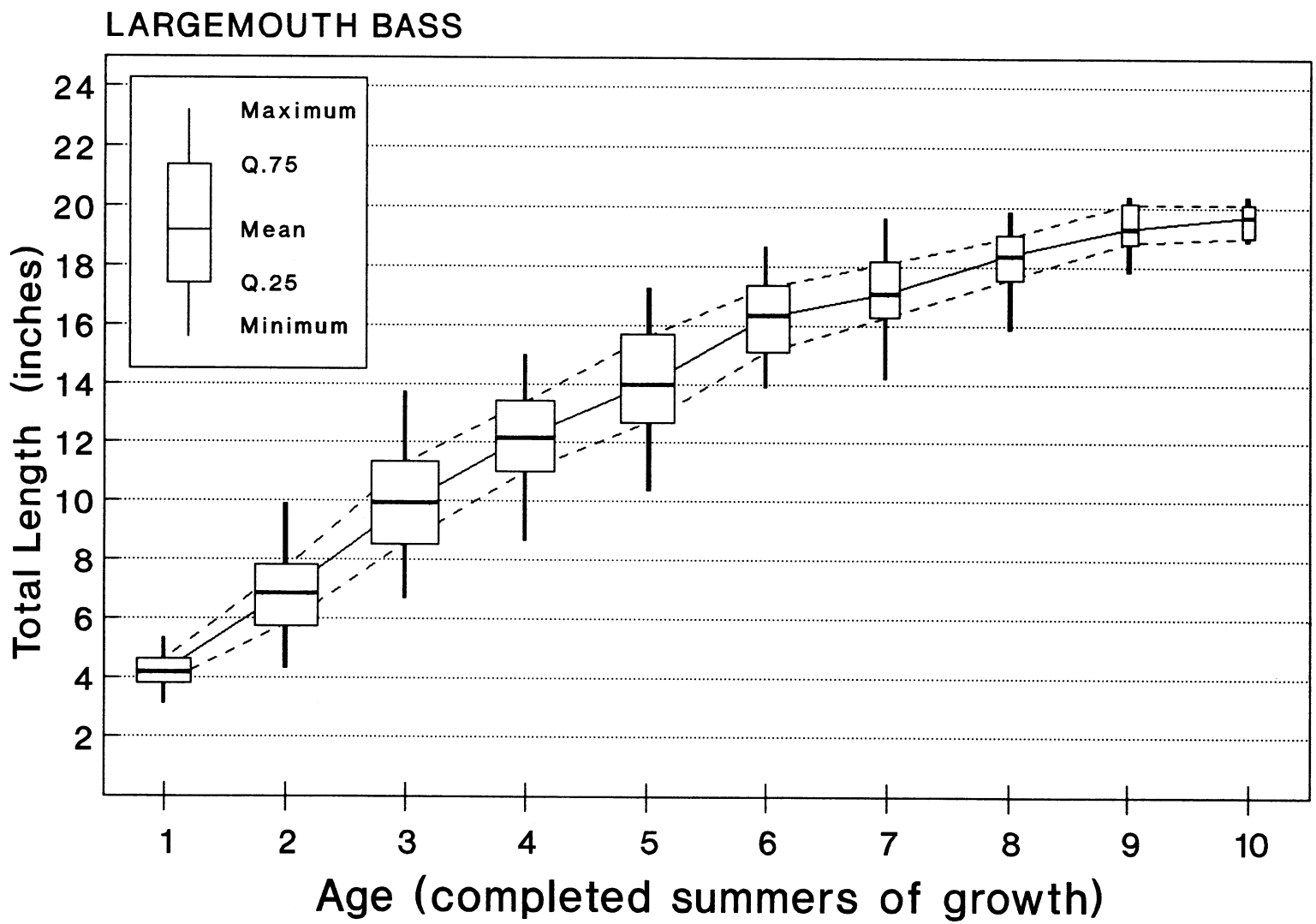

Figure 6. *Plot of mean, maximum, minimum, and 25th and 75th quantiles length-at-age for largemouth bass. The width of the box is proportional to the sample size for each age group.*

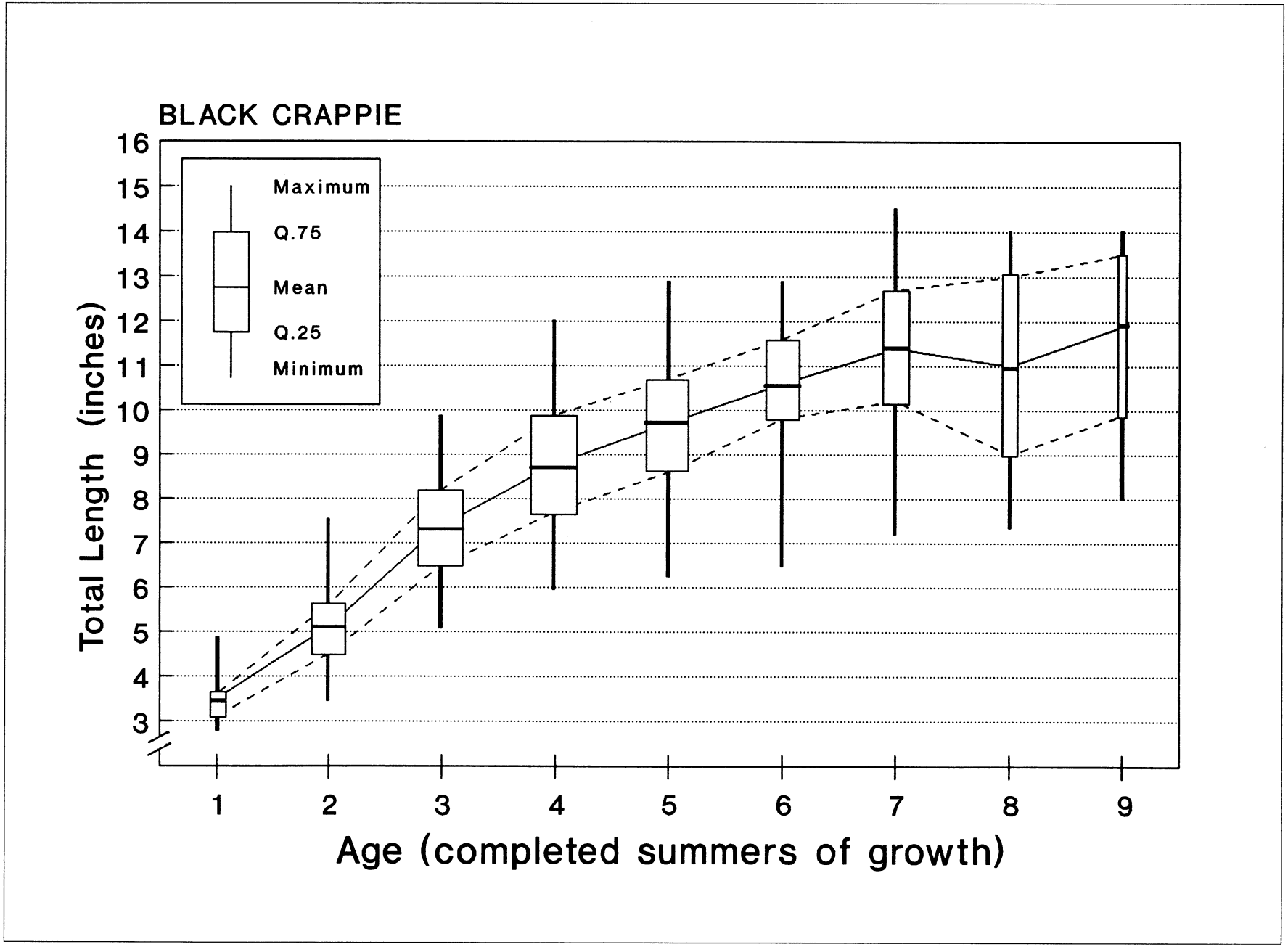

Figure 7. *Plot of mean, maximum, minimum, and 25th and 75th quantiles length-at-age for black crappie. The width of the box is proportional to the sample size for each age group.*

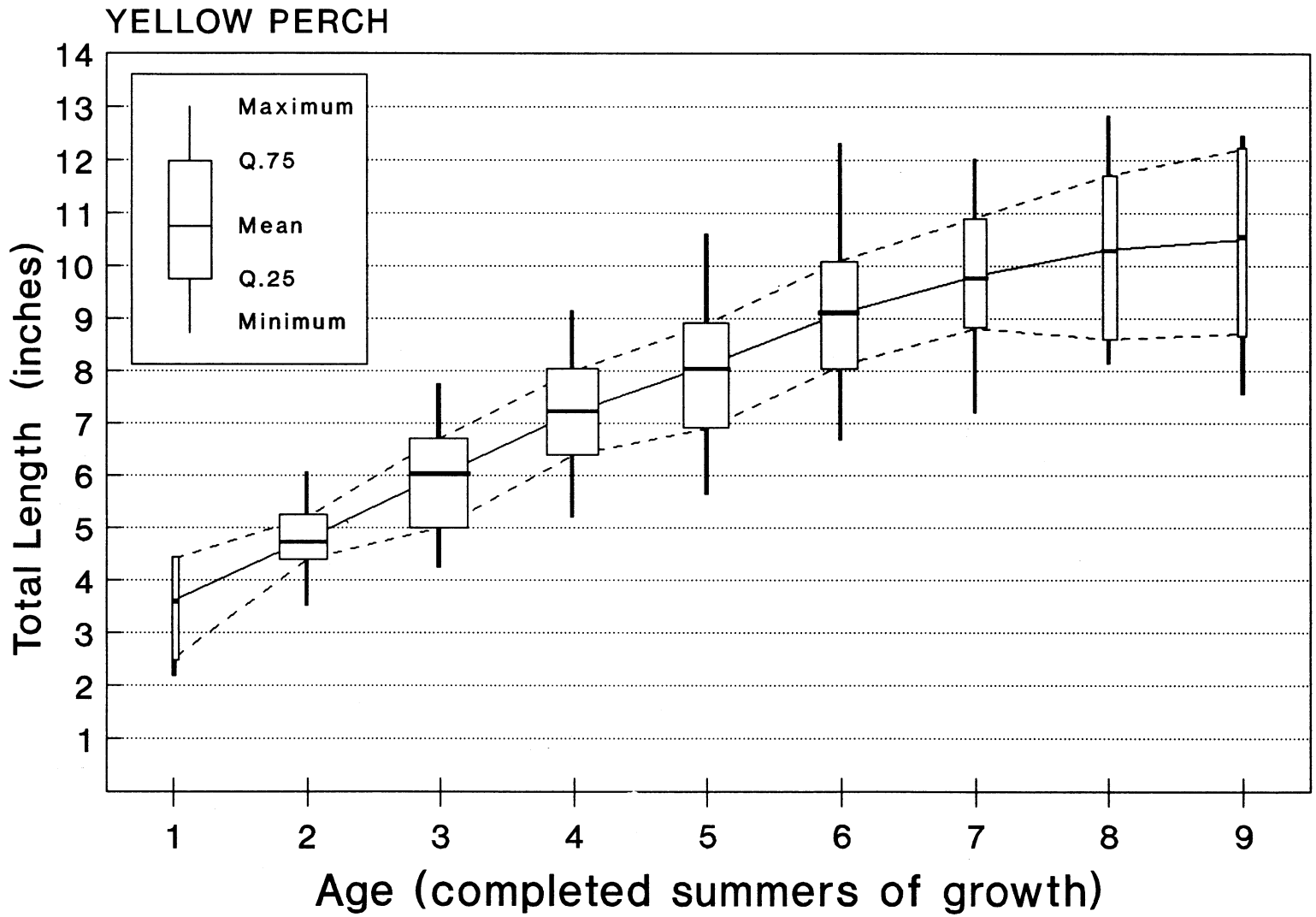

Figure 8. *Plot of mean, maximum, minimum, and 25th and 75th quantiles length-at-age for yellow perch. The width of the box is proportional to the sample size for each age group.*

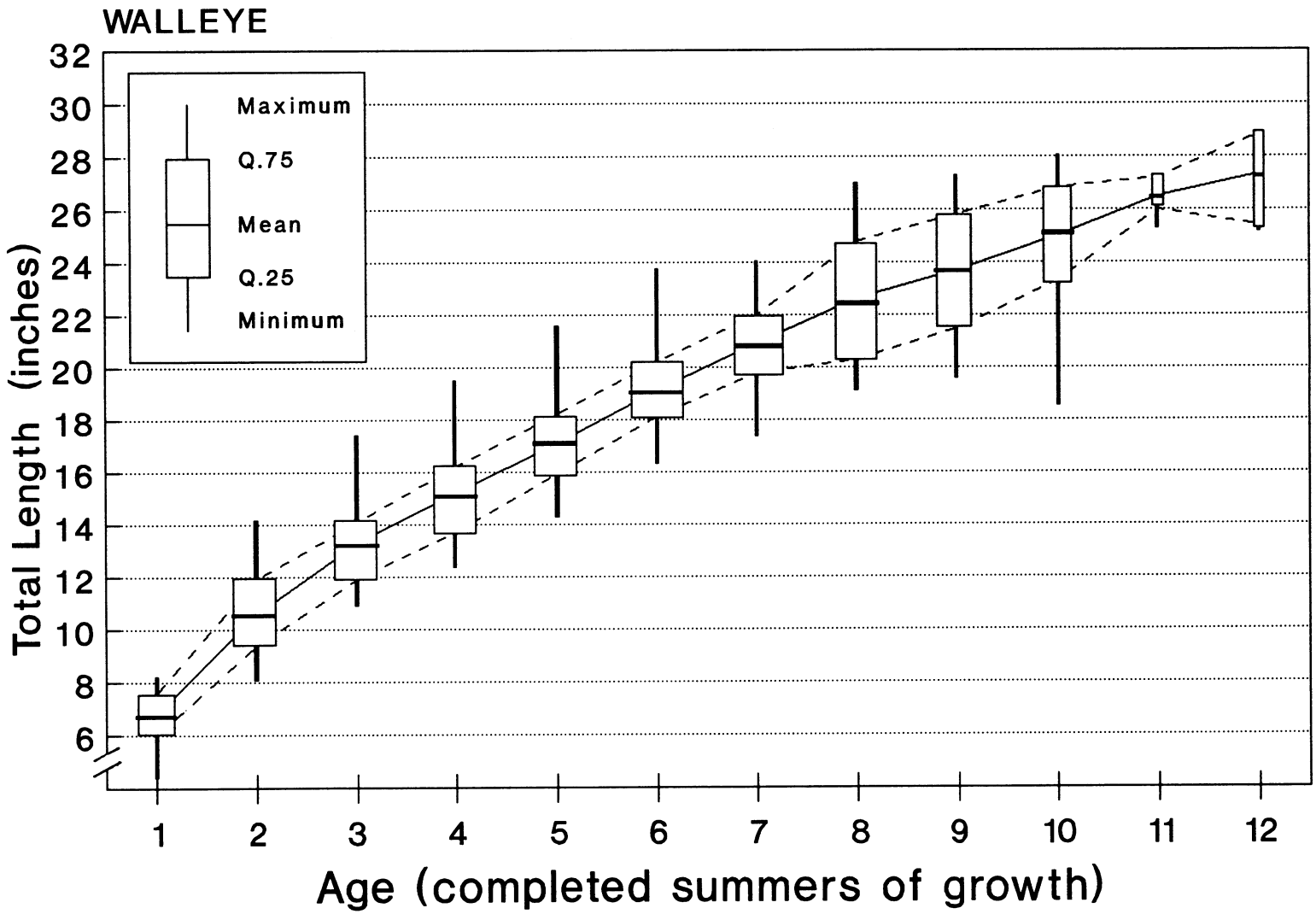

Figure 9. *Plot of mean, maximum, minimum, and 25th and 75th quantiles length-at-age for walleye. The width of the box is proportional to the sample size for each age group.*

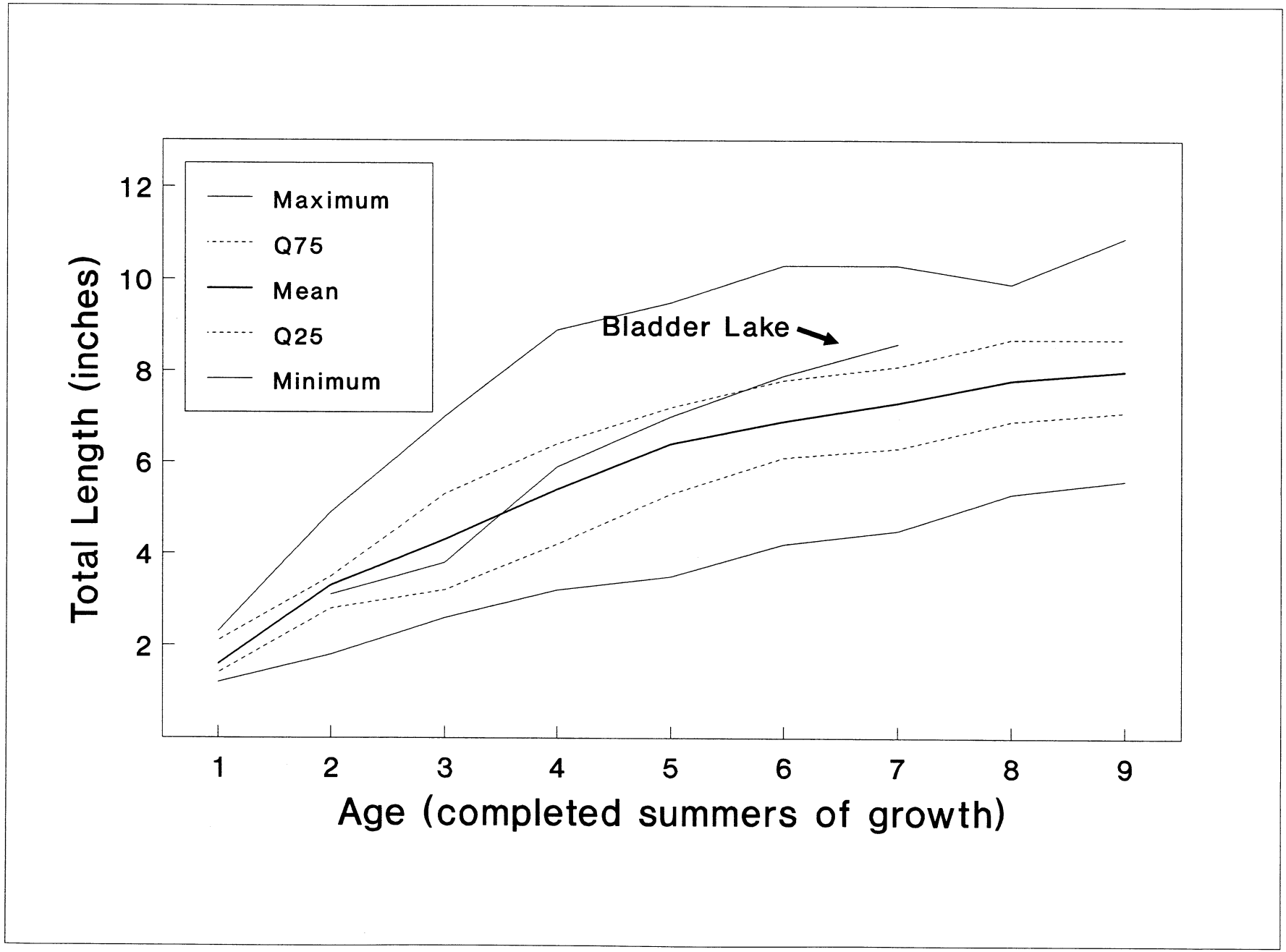

Figure 10. *The variable growth of Bladder Lake bluegills in relation to growth statistics determined from the present study.*

Appendix A. *Sampling dates and characteristics of study lakes.*

Lake Name, County	Sample Date	Area (acres)	Lake Type*	Depth (ft) Mean	Depth (ft) Max.	Alk. (ppm)	MEI**	SDF[a]
Anderson, Barron	04/27/76	14	2	10	17	12	1.9	1.5
Bashaw, Burnett	09/21/77	171	1	7	16	102	18.1	1.8
Bass T31R8S2-4, Chippewa	09/17/74	12	2	—	41	5	—	1.8
Bass T40R10S17, Washburn	09/28/77	188	2	20	35	20	1.4	1.5
Bass T40R13S29, Washburn	10/05/77	144	2	18	31	40	3.1	1.6
Bean, Washburn	10/11/78	100	1	16	35	67	5.6	1.5
Bear Track, Washburn	05/02/78	65	2	14	36	15	1.7	1.7
Big Butternut, Polk	10/11/80	378	1	13	19	83	9.3	1.2
Big, Polk	09/16/80	259	1	17	24	85	7.3	1.3
Bladder, Bayfield	10/18/78	81	2	16	35	16	1.2	1.7
Bucks, Rusk	09/06/79	83	1	3	18	50	25.3	3.1
Cable, Washburn	09/09/78	185	2	7	24	25	5.3	1.5
Clear, Sawyer	09/12/75	77	2	14	32	32	2.9	1.8
Currier, Sawyer	05/21/75	19	2	18	39	3	0.3	1.5
Deep T38R11S18, Washburn	04/25/78	43	2	13	29	5	0.6	1.9
Dowling, Douglas	10/13/78	154	1	7	13	22	5.2	1.1
Falk, Burnett	09/26/79	82	1	11	31	50	5.4	2.1
Fenton, Washburn	09/18/78	139	2	15	52	8	1.	2.5
Gibson, Polk	09/15/76	43	2	—	12	14	—	—
Granite, Barron	09/30/78	154	1	18	34	34	2.7	2
Greenquist, Polk	04/28/80	58	2	13	30	10	1.7	1.4
Gull, Burnett	09/07/78	182	1	4	19	55	16.6	2.6
Iron, Bayfield	09/15/82	248	1	—	13	63	—	1.5
Kekegama, Washburn	10/24/78	110	1	12	24	82	10.1	2.1
Lincoln, Washburn	10/12/77	101	1	13	27	35	4.1	1.4
Little Long, Burnett	09/09/79	97	2	10	40	5	0.9	1.5
Little Mirror, Polk	05/01/79	33	2	10	13	99	17.4	1.2
Little Sand, Washburn	10/04/78	74	2	12	21	24	2.4	1.1
Long T41R14S28, Burnett	09/22/79	251	2	18	41	42	2.8	2.1
Loon, Barron	09/13/80	94	2	11	26	9	1.8	1.8
Love, Burnett	09/26/79	253	1	—	63	62	—	2.4
Loveless, Polk	05/28/79	141	2	15	20	69	8.3	1.6
Lower Turtle, Barron	10/04/80	276	1	14	24	108	8.9	1.6
Magnor, Polk	10/15/78	231	1	10	15	21	—	1.2
McGraw, Burnett	09/13/77	135	2	13	25	44	4.6	1.6
Minerva, Burnett	09/19/79	222	1	—	22	24	—	2.8
Minnesuing, Douglas	09/04/80	432	1	18	43	48	3.5	2.4
Pear, Washburn	05/16/79	49	2	17	32	34	4.7	1.4
Pokegama, Burnett	10/10/79	224	2	19	56	62	4.3	2.4
Poskin, Barron	09/12/78	150	1	16	30	81	6.8	2.4
Red, Douglas	05/24/78	258	2	11	37	40	4.5	1.6
Round T37R18S27, Burnett	09/15/79	204	1	15	27	86	8.2	1.6
Scott, Barron	04/27/80	81	2	9	26	9	2.4	1.7
Silver, Washburn	09/06/78	188	2	10	28	14	2.9	1.7
Sissabagama, Sawyer	05/15/80	719	1	16	48	34	3.1	2.2
Smith, Sawyer	09/26/80	323	1	15	29	51	4.3	1.8
Spring T39R10S36, Washburn	05/06/75	42	2	8	13	6	2.9	2.1
Spring T40R11S25, Washburn	09/30/78	211	2	12	24	30	3.4	1.2
Spring, Barron	10/02/79	60	2	25	67	13	0.3	2.1
Sunfish, Washburn	09/24/75	68	2	11	27	12	1.7	1.6
Taylor, Burnett	09/09/76	80	2	6	10	9	1.9	1.3
Upper Devils, Barron	09/25/78	87	2	4	10	10	3.9	3.1
Upper Turtle, Barron	09/06/80	438	1	14	25	110	9.3	1.6
Viola, Burnett	09/12/79	285	2	13	33	10	1.5	1.8
Windfall, Sawyer	05/31/78	102	2	12	16	15	1.6	1.1

* 1 = Drainage Lake; 2 = Seepage Lake.

** Morphoedaphic Index (Ryder et al. 1974).

[a] Shoreline Development Factor (Lind 1979).

Appendix B. *Length-at-age by species and lake, based on sampling before 1 June and after 1 September.*

Table B.1. *Length-at-age by lake for northern pike.*

	Length-at-age										
Lake Name, County	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
ANDERSON, BARRON	15.3	19.0	22.1	-	25.1	-	-	-	29.2	-	-
BASHAW, BURNETT	-	13.8	-	17.6	19.2	25.4	36.0	-	-	-	-
BASS T40R13S29, WASHBURN	-	12.8	14.6	19.0	22.4	18.9	25.1	-	-	-	-
BEAN, WASHBURN	9.5	15.9	15.0	20.9	-	-	-	-	-	-	-
BEAR TRACK, WASHBURN	12.5	18.2	21.8	-	29.1	-	-	-	-	-	-
BIG BUTTERNUT, POLK	11.0	18.4	23.8	24.3	28.5	32.7	32.6	-	-	-	-
BIG, POLK	12.0	-	22.6	24.8	-	-	-	-	-	-	-
BUCKS, RUSK	8.7	13.7	17.5	19.8	-	-	-	36.5	-	-	40.0
FALK, BURNETT	-	11.6	14.9	18.1	21.1	-	-	-	-	-	-
FENTON, WASHBURN	12.4	16.6	22.7	23.6	20.2	32.1	34.7	-	-	-	-
GRANITE, BARRON	10.4	15.8	19.6	21.5	-	24.7	-	-	35.5	-	-
GREENQUIST, POLK	10.7	17.6	19.7	26.0	28.9	30.5	32.1	-	-	-	-
GULL, BURNETT	9.3	15.6	15.8	19.0	-	-	-	-	-	-	-
KEKEGAMA, WASHBURN	9.6	16.2	18.8	21.8	25.8	-	-	-	-	-	-
LINCOLN, WASHBURN	-	-	14.9	16.7	19.2	23.2	23.8	-	29.8	-	-
LITTLE LONG, BURNETT	-	-	17.9	22.3	26.2	31.0	-	-	41.0	-	-
LITTLE MIRROR, POLK	11.8	16.0	19.3	20.6	21.6	24.2	32.0	35.9	-	-	-
LONG T41R14S28, BURNETT	-	11.5	17.6	19.9	23.7	22.1	-	-	-	-	-
LOON, BARRON	10.0	16.0	17.1	23.2	28.6	-	-	-	-	-	-
LOVE, BURNETT	7.5	11.7	15.6	18.6	24.2	-	-	-	-	-	-
LOVELESS, POLK	-	-	23.7	26.0	31.4	32.5	35.3	41.5	41.8	-	-
LOWER TURTLE, BARRON	13.8	17.5	21.5	25.4	-	33.5	-	-	-	-	-
MAGNOR, POLK	8.2	15.6	17.9	22.5	26.5	31.0	33.4	-	-	36.0	-
MCGRAW, BURNETT	-	7.8	11.5	-	18.7	-	-	-	-	-	-
MINERVA, BURNETT	6.4	12.7	15.4	18.3	20.3	23.0	-	28.5	-	-	-
MINNESUING, DOUGLAS	10.6	14.9	18.9	20.2	29.8	-	-	-	-	-	-
PEAR, WASHBURN	8.8	12.7	15.8	18.8	20.0	23.7	27.5	-	-	37.0	-
POKEGAMA, BURNETT	-	13.8	16.9	17.7	23.7	28.1	31.4	-	-	-	-
POSKIN, BARRON	-	17.4	17.2	-	-	33.9	-	-	-	-	-
RED, DOUGLAS	8.1	11.8	15.1	17.6	20.0	19.6	-	27.7	31.5	-	-
ROUND T37R18S27, BURNETT	-	14.1	16.3	24.1	27.8	-	-	34.1	-	-	-
SCOTT, BARRON	9.8	16.4	20.1	25.8	25.8	34.5	-	-	-	-	-
SILVER, WASHBURN	-	-	15.8	19.3	19.1	22.5	19.9	22.1	-	-	-
SMITH, SAWYER	10.4	15.7	18.0	-	-	-	-	-	-	-	-
SPRING T40R11S25, WASHBURN	10.2	12.5	16.5	19.4	21.0	-	-	-	-	-	-
SPRING, BARRON	7.4	13.9	15.2	-	-	-	-	-	-	-	-
SUNFISH, WASHBURN	-	-	16.0	-	25.3	-	-	-	-	-	-
TAYLOR, BURNETT	-	-	16.7	16.5	-	20.9	19.6	-	-	-	-
UPPER DEVILS, BARRON	9.3	15.3	21.8	23.6	-	-	-	-	-	-	-
UPPER TURTLE, BARRON	10.3	16.0	21.6	30.1	31.1	30.1	32.0	-	-	-	-
VIOLA, BURNETT	-	12.5	15.6	17.3	19.3	-	-	-	-	-	-
MEAN	10.2	14.7	18.0	21.2	24.1	27.2	29.7	32.3	34.8	36.5	40.0

Table B.2. *Length-at-age by lake for rock bass.*

Lake Name, County	Length-at-age							
	2	3	4	5	6	7	8	9
BASS T40R10S17, WASHBURN	3.1	4.4	5.3	5.9	6.9	-	-	-
BASS T40R13S29, WASHBURN	3.1	4.8	6.1	7.4	8.0	9.7	-	-
CABLE, WASHBURN	3.9	5.6	6.2	-	-	-	-	-
CLEAR, SAWYER	2.8	3.7	5.2	6.6	6.5	6.9	-	-
DOWLING, DOUGLAS	3.8	-	-	7.3	8.0	-	9.2	-
GIBSON, POLK	-	-	8.8	8.9	-	-	-	-
LITTLE SAND, WASHBURN	-	4.7	6.4	-	-	-	-	-
LONG T41R14S28, BURNETT	-	3.9	5.4	7.0	8.2	8.8	10.7	11.0
LOON, BARRON	-	-	7.4	-	-	-	-	-
LOVE, BURNETT	3.4	6.3	7.1	-	-	-	-	-
LOWER TURTLE, BARRON	-	-	6.7	7.4	-	-	-	-
MAGNOR, POLK	-	5.6	7.3	8.2	-	-	-	-
MINERVA, BURNETT	-	-	-	6.2	6.3	-	-	-
MINNESUING, DOUGLAS	-	-	6.3	7.2	-	8.2	-	-
PEAR, WASHBURN	3.0	4.1	4.3	5.8	6.0	-	8.0	9.0
RED, DOUGLAS	3.0	4.2	5.6	7.0	8.1	8.8	9.2	9.6
ROUND T37R18S27, BURNETT	-	5.8	7.6	7.8	-	-	-	-
SISSABAGAMA, SAWYER	-	4.7	5.7	6.6	8.0	8.6	9.3	-
SMITH, SAWYER	-	4.8	6.3	7.8	-	8.2	-	-
SUNFISH, WASHBURN	-	4.3	5.6	6.5	-	-	-	10.0
WINDFALL, SAWYER	4.3	6.0	6.3	7.2	-	-	-	-
MEAN	3.4	4.9	6.3	7.1	7.3	8.5	9.3	9.9

Table B.3. *Length-at-age by lake for pumpkinseed.*

Lake Name, County	Length-at-age							
	2	3	4	5	6	7	8	9
BASHAW, BURNETT	3.7	5.1	6.3	6.5	-	-	-	-
BASS T40R13S29, WASHBURN	-	3.5	4.9	6.1	7.1	7.0	-	-
BEAR TRACK, WASHBURN	3.2	5.8	6.7	7.6	-	-	-	-
BIG BUTTERNUT, POLK	3.9	5.4	6.3	-	-	-	-	-
BIG, POLK	3.5	4.4	5.6	6.4	6.4	7.4	-	-
BLADDER, BAYFIELD	-	4.6	6.2	6.2	-	-	-	-
BUCKS, RUSK	2.7	3.5	4.7	6.1	6.7	7.7	-	-
CABLE, WASHBURN	-	-	-	7.4	-	-	-	-
CLEAR, SAWYER	-	3.2	3.9	4.5	4.7	5.2	-	-
CURRIER, SAWYER	3.4	4.3	5.9	6.3	-	-	-	-
DOWLING, DOUGLAS	-	4.6	5.2	6.0	6.7	-	-	-
FALK, BURNETT	2.6	3.5	5.0	6.0	6.8	-	-	6.2
GIBSON, POLK	3.4	4.2	-	5.1	5.6	6.1	-	-
GREENQUIST, POLK	2.9	4.6	5.9	6.3	6.8	7.6	-	-
GULL, BURNETT	2.8	4.0	5.4	6.1	6.5	7.1	-	-
IRON, BAYFIELD	3.0	5.8	6.3	6.9	-	-	-	-
LINCOLN, WASHBURN	-	3.7	-	5.2	-	-	-	-
LITTLE MIRROR, POLK	3.0	3.4	4.7	6.2	7.0	-	-	-
LITTLE SAND, WASHBURN	-	-	5.4	6.2	-	7.3	-	-
LONG T41R14S28, BURNETT	2.7	3.8	4.1	5.6	6.5	-	8.6	-
LOON, BARRON	3.0	4.7	5.9	7.0	-	-	-	-
LOVE, BURNETT	-	3.4	5.0	6.3	7.2	-	-	-
LOWER TURTLE, BARRON	3.8	5.3	6.0	6.5	-	-	-	-
MAGNOR, POLK	3.7	5.4	5.3	-	-	-	-	-
MCGRAW, BURNETT	3.0	3.8	4.6	5.7	5.9	6.6	-	-
MINERVA, BURNETT	2.8	3.7	5.0	6.0	6.1	7.1	-	-
MINNESUING, DOUGLAS	3.0	4.8	-	6.3	-	-	-	-
PEAR, WASHBURN	3.0	3.9	4.8	6.0	6.8	7.4	-	-
POKEGAMA, BURNETT	-	-	4.8	5.8	6.8	6.6	-	-
RED, DOUGLAS	-	3.5	4.2	5.6	6.4	7.4	7.8	-
ROUND T37R18S27, BURNETT	3.6	5.8	6.4	-	-	-	-	-
SCOTT, BARRON	3.1	3.6	4.6	6.0	-	-	-	-
SILVER, WASHBURN	-	3.0	3.7	3.7	5.0	6.7	6.0	7.1
SISSABAGAMA, SAWYER	3.6	5.0	6.2	7.1	7.1	-	-	-
SMITH, SAWYER	-	5.4	5.8	-	-	-	-	-
SPRING T40R11S25, WASHBURN	-	-	5.2	6.0	7.1	7.8	8.3	8.4
SPRING, BARRON	-	4.5	5.5	-	-	-	-	-
TAYLOR, BURNETT	3.4	4.4	5.5	6.4	7.2	7.7	-	-
UPPER DEVILS, BARRON	4.1	4.6	6.2	-	-	-	-	-
UPPER TURTLE, BARRON	-	4.2	5.5	5.9	-	-	-	-
VIOLA, BURNETT	-	3.4	3.9	5.0	5.9	6.0	6.7	7.1
WINDFALL, SAWYER	3.9	5.1	6.0	-	-	-	-	-
MEAN	3.3	4.3	5.3	6.1	6.5	7.0	7.5	7.2

Table B.4. *Length-at-age by lake for bluegill.*

Lake Name, County	Length-at-age													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
ANDERSON, BARRON	-	3.2	4.0	4.4	5.0	5.4	6.0	6.5	7.1	7.2	6.9	7.7	7.8	-
BASHAW, BURNETT	-	3.4	5.3	6.6	7.5	8.0	-	8.6	-	-	-	-	-	-
BASS T31R8S2-4, CHIPPEWA	2.3	4.4	-	5.6	6.4	6.6	6.9	7.4	7.6	-	-	-	-	-
BASS T40R10S17, WASHBURN	-	3.2	4.9	6.4	7.5	8.2	9.0	8.7	10.4	-	-	-	-	-
BASS T40R13S29, WASHBURN	-	-	3.3	4.3	5.2	6.4	7.0	7.9	8.4	-	8.0	-	-	-
BEAR TRACK, WASHBURN	-	3.0	4.4	5.9	7.4	8.2	9.6	9.9	10.6	10.5	-	-	-	11.3
BIG BUTTERNUT, POLK	-	4.1	-	7.1	7.0	8.4	-	-	-	-	-	-	-	-
BIG, POLK	-	3.1	3.9	5.2	6.5	7.2	8.2	8.4	-	-	-	-	-	-
BLADDER, BAYFIELD	-	3.1	3.8	5.9	7.0	7.9	8.6	-	8.7	-	-	-	-	-
BUCKS, RUSK	-	-	5.7	7.6	8.9	8.6	-	-	-	-	-	-	-	-
CABLE, WASHBURN	-	3.5	5.5	-	6.8	-	-	9.9	10.9	-	-	-	-	-
CLEAR, SAWYER	1.2	1.8	2.6	3.2	3.5	4.3	5.0	5.3	5.6	6.1	6.2	6.8	-	-
CURRIER, SAWYER	-	-	4.8	5.1	6.5	-	7.6	7.7	-	-	-	-	-	-
DEEP T38R11S18, WASHBURN	-	3.4	4.2	5.4	6.6	7.7	8.6	8.8	-	-	-	-	-	-
DOWLING, DOUGLAS	-	4.9	5.5	6.5	7.1	7.5	7.2	8.7	-	-	-	-	-	-
FALK, BURNETT	-	2.5	3.2	4.2	5.8	6.1	6.5	-	-	-	-	-	-	-
GIBSON, POLK	-	3.9	5.7	6.6	7.4	7.7	-	-	-	-	-	-	-	-
GRANITE, BARRON	1.6	3.5	5.4	6.4	6.6	6.5	-	-	-	-	-	-	-	-
GREENQUIST, POLK	-	-	3.7	5.3	5.9	6.4	7.8	8.3	-	-	-	-	-	-
GULL, BURNETT	-	3.1	4.2	5.5	7.1	6.9	7.1	8.0	7.7	-	-	-	-	-
IRON, BAYFIELD	1.5	3.0	5.6	6.6	8.5	9.4	10.2	-	-	-	-	-	-	-
LINCOLN, WASHBURN	-	2.7	3.8	4.4	5.3	5.8	6.3	6.6	7.5	-	-	-	-	-
LITTLE LONG, BURNETT	-	2.8	3.4	4.1	5.1	5.5	6.6	6.9	-	9.3	-	-	-	-
LITTLE MIRROR, POLK	-	-	3.0	4.2	5.3	6.2	7.2	8.0	8.3	-	-	-	-	-
LITTLE SAND, WASHBURN	-	-	3.6	5.4	7.1	7.7	8.3	9.1	-	-	-	-	-	-
LONG T41R14S28, BURNETT	-	2.8	3.0	3.7	5.3	6.6	7.2	7.9	-	-	-	-	-	-
LOON, BARRON	-	-	3.2	4.1	5.4	6.7	7.7	-	-	-	-	-	-	-
LOVE, BURNETT	-	2.5	3.2	4.4	5.8	6.3	6.6	-	-	-	-	-	-	-
LOVELESS, POLK	-	3.1	4.5	5.9	6.5	6.9	7.4	-	-	-	-	-	-	-
LOWER TURTLE, BARRON	-	3.6	5.6	7.4	8.1	-	-	-	-	-	-	-	-	-
MAGNOR, POLK	-	3.0	5.2	7.1	8.0	8.4	-	-	-	-	-	-	-	-
MCGRAW, BURNETT	-	2.8	3.6	4.3	4.8	5.7	5.7	6.8	7.5	7.5	-	-	-	-
MINERVA, BURNETT	-	2.8	3.5	4.5	5.6	6.2	6.7	7.2	-	8.0	-	-	-	-
MINNESUING, DOUGLAS	-	3.0	4.3	5.3	6.8	7.6	8.0	-	-	-	-	-	-	-
PEAR, WASHBURN	-	-	2.8	3.6	4.5	5.2	6.3	6.5	7.0	7.0	-	-	-	-
POKEGAMA, BURNETT	-	2.8	3.2	5.0	5.7	6.4	6.7	7.8	-	9.3	-	-	-	-
POSKIN, BARRON	-	3.3	4.7	5.9	6.6	7.2	7.6	7.7	-	-	-	-	-	-
RED, DOUGLAS	-	3.0	3.2	3.8	4.7	5.4	6.1	7.3	7.4	8.8	8.9	9.6	-	-
ROUND T37R18S27, BURNETT	-	4.1	6.2	6.9	7.3	7.8	8.1	-	-	-	-	-	-	-
SCOTT, BARRON	-	2.9	3.0	4.1	5.6	7.0	8.1	8.8	9.2	-	-	-	-	-
SILVER, WASHBURN	1.5	2.2	3.1	3.5	4.1	4.2	4.5	5.3	6.2	6.1	-	-	-	-
SISSABAGAMA, SAWYER	-	3.5	4.7	6.1	7.5	7.8	-	-	-	-	-	-	-	-
SMITH, SAWYER	-	3.7	5.4	6.6	7.9	8.4	-	8.7	-	-	-	-	-	-
SPRING T39R10S36, WASHBURN	-	4.5	7.0	8.9	9.5	10.3	10.3	-	-	-	-	-	-	-
SPRING T40R11S25, WASHBURN	-	-	2.9	3.9	5.1	5.7	6.3	7.3	7.2	8.3	-	-	-	-
SPRING, BARRON	-	2.8	3.8	6.0	6.8	7.6	-	-	-	-	-	-	-	-
SUNFISH, WASHBURN	-	-	3.0	3.4	3.9	5.2	5.8	6.0	-	7.3	-	-	-	-
TAYLOR, BURNETT	-	3.4	4.3	5.0	6.1	6.8	7.0	7.7	8.2	8.8	-	-	-	-
UPPER DEVILS, BARRON	-	4.3	6.9	7.3	-	-	-	-	-	-	-	-	-	-
UPPER TURTLE, BARRON	-	3.2	5.1	6.4	7.1	7.6	8.2	8.5	-	-	-	-	-	-
VIOLA, BURNETT	-	-	3.0	3.6	4.3	4.9	5.5	6.1	6.6	7.0	-	-	-	-
WINDFALL, SAWYER	-	3.7	5.3	5.9	7.8	7.8	-	9.5	-	-	-	-	-	-
MEAN	1.6	3.3	4.3	5.4	6.4	6.9	7.3	7.8	8.0	7.9	7.5	8.0	7.8	11.3

Table B.5. *Length-at-age by lake for largemouth bass.*

Lake Name, County	Length-at-age												
	1	2	3	4	5	6	7	8	9	10	11	12	13
ANDERSON, BARRON	4.6	7.7	9.7	11.5	12.1	13.9	-	16.9	-	18.9	-	-	-
BASHAW, BURNETT	4.5	6.8	10.0	-	15.9	-	-	18.7	-	-	-	20.5	-
BASS T31R8S2-4, CHIPPEWA	-	-	7.3	-	-	-	-	-	-	-	-	-	-
BASS T40R10S17, WASHBURN	4.6	7.3	10.5	-	-	-	-	-	-	-	-	-	-
BASS T40R13S29, WASHBURN	4.0	6.4	8.2	-	-	-	-	-	-	-	20.0	-	-
BEAR TRACK, WASHBURN	4.0	6.5	8.8	11.8	14.0	15.7	16.4	17.3	19.1	-	-	-	-
BIG BUTTERNUT, POLK	5.3	-	12.6	13.1	-	-	-	-	-	-	-	-	-
BIG, POLK	3.8	6.0	8.0	10.2	12.4	16.6	-	18.9	-	-	-	-	-
BLADDER, BAYFIELD	4.2	6.9	10.0	12.0	-	17.5	-	-	-	-	-	-	-
BUCKS, RUSK	4.5	-	-	15.0	-	-	-	-	-	-	-	-	-
CABLE, WASHBURN	4.5	8.6	9.5	13.4	-	-	-	18.9	-	-	-	-	-
CLEAR, SAWYER	-	5.8	8.6	9.7	12.6	-	-	-	-	-	-	-	-
CURRIER, SAWYER	-	-	-	-	-	-	-	15.9	-	-	-	-	-
DEEP T38R11S18, WASHBURN	4.4	9.8	12.3	14.8	17.2	17.8	15.5	-	20.2	-	-	-	-
DOWLING, DOUGLAS	-	6.6	-	-	-	-	-	-	-	-	-	-	-
FALK, BURNETT	3.5	5.8	-	12.0	13.3	15.1	19.6	19.9	-	-	-	-	-
GRANITE, BARRON	4.5	-	12.0	13.5	-	-	16.1	-	-	-	-	-	-
GREENQUIST, POLK	3.9	5.5	9.1	12.9	14.5	16.6	19.0	18.8	-	-	-	-	-
GULL, BURNETT	4.2	5.8	-	-	-	-	-	-	-	-	-	-	-
IRON, BAYFIELD	4.1	-	-	-	-	-	-	-	-	-	-	-	-
KEKEGAMA, WASHBURN	3.2	6.4	8.6	10.5	12.4	-	-	-	-	-	-	-	-
LINCOLN, WASHBURN	-	-	-	-	-	14.6	-	-	-	-	-	19.2	21.3
LITTLE LONG, BURNETT	3.4	6.7	9.4	11.1	12.7	-	14.2	-	19.0	-	-	-	-
LITTLE MIRROR, POLK	4.6	7.2	9.8	12.9	14.5	16.3	17.1	18.4	-	-	-	-	-
LITTLE SAND, WASHBURN	3.6	5.9	-	15.0	16.7	-	-	-	-	-	-	-	-
LONG T41R14S28, BURNETT	-	5.2	7.0	10.4	12.7	15.8	16.5	17.5	19.0	20.0	-	-	-
LOON, BARRON	3.8	7.6	11.7	14.1	16.1	18.0	-	-	-	-	-	-	-
LOVE, BURNETT	-	6.7	10.1	12.1	14.2	16.9	17.0	-	-	-	-	-	-
LOVELESS, POLK	4.0	6.8	9.1	11.7	13.6	14.9	16.2	18.2	-	20.1	-	-	-
LOWER TURTLE, BARRON	4.8	5.7	11.6	14.2	14.5	15.8	-	-	-	-	-	-	-
MAGNOR, POLK	-	9.2	13.3	14.6	16.8	17.0	17.7	19.3	20.3	-	-	-	-
MCGRAW, BURNETT	-	7.9	10.1	9.6	-	-	-	-	-	19.0	-	-	-
MINERVA, BURNETT	3.7	6.6	9.9	12.2	13.5	15.1	-	-	-	-	-	-	-
PEAR, WASHBURN	3.1	5.8	7.9	10.7	12.6	14.0	16.4	18.1	17.9	-	-	-	-
POKEGAMA, BURNETT	-	-	10.6	13.1	-	18.2	-	-	-	20.3	-	-	-
POSKIN, BARRON	-	-	-	-	12.7	-	-	-	-	-	-	-	-
RED, DOUGLAS	-	7.0	9.3	13.3	15.9	16.5	-	18.3	19.2	-	-	-	-
ROUND T37R18S27, BURNETT	-	7.9	9.6	12.6	13.0	-	17.6	-	-	-	-	-	-
SCOTT, BARRON	4.6	7.1	9.5	12.4	14.5	16.8	18.7	19.1	-	-	-	-	-
SILVER, WASHBURN	-	-	6.7	11.8	10.4	-	17.6	-	-	-	21.1	-	-
SISSABAGAMA, SAWYER	-	-	11.4	-	15.4	-	-	-	-	-	-	-	-
SMITH, SAWYER	5.0	-	13.5	-	16.6	18.4	-	-	-	-	-	-	-
SPRING T39R10S36, WASHBURN	4.9	9.6	13.6	-	-	17.2	18.5	19.5	20.0	-	-	-	-
SPRING T40R11S25, WASHBURN	-	5.4	8.1	11.1	13.4	15.2	16.4	-	18.6	19.7	-	21.2	-
SUNFISH, WASHBURN	-	5.5	7.8	8.7	13.2	-	-	-	-	-	-	-	-
TAYLOR, BURNETT	4.5	7.7	8.7	-	-	-	-	-	-	-	-	-	-
UPPER DEVILS, BARRON	4.8	9.5	13.2	-	-	-	-	-	-	-	-	-	-
UPPER TURTLE, BARRON	5.0	7.9	11.2	14.3	15.6	18.6	-	-	-	-	-	-	-
VIOLA, BURNETT	-	4.4	7.8	9.1	11.0	14.3	-	-	-	20.1	-	-	-
MEAN	4.2	6.9	9.9	12.2	14.0	16.3	17.1	18.4	19.3	19.7	20.5	20.3	21.3

Table B.6. *Length-at-age by lake for black crappie.*

Lake Name, County	Length-at-age										
	1	2	3	4	5	6	7	8	9	10	11
BASHAW, BURNETT	-	5.8	7.9	9.0	10.1	9.6	10.8	11.3	-	-	-
BIG BUTTERNUT, POLK	3.4	-	-	9.0	-	-	-	-	-	-	-
BIG, POLK	4.4	5.5	8.0	9.8	11.2	12.1	13.0	-	-	-	-
BUCKS, RUSK	3.4	-	9.7	12.0	-	-	-	-	-	-	-
CABLE, WASHBURN	-	-	5.9	8.7	10.4	11.3	-	-	-	-	-
CLEAR, SAWYER	-	4.2	6.4	8.1	9.1	10.2	-	-	-	-	-
DOWLING, DOUGLAS	-	5.1	7.9	10.2	10.8	11.6	12.2	-	13.0	13.9	-
FALK, BURNETT	-	-	6.5	7.7	9.1	10.2	-	-	-	-	-
GIBSON, POLK	-	5.1	8.5	9.9	11.4	11.9	-	-	-	-	-
GRANITE, BARRON	-	-	6.2	7.9	-	-	-	-	-	-	-
GREENQUIST, POLK	3.6	4.7	6.5	8.0	9.2	10.4	12.0	-	-	-	-
LINCOLN, WASHBURN	-	-	5.1	6.0	6.3	6.7	7.2	7.4	8.0	8.4	-
LITTLE LONG, BURNETT	-	4.4	6.7	9.7	10.1	-	-	-	-	-	-
LITTLE MIRROR, POLK	-	5.2	6.1	7.6	8.8	11.0	12.1	12.9	13.4	-	-
LITTLE SAND, WASHBURN	4.9	6.0	-	-	-	-	-	-	-	-	-
LONG T41R14S28, BURNETT	-	4.5	8.3	10.2	10.5	12.0	12.6	-	-	-	-
LOON, BARRON	3.0	4.9	7.3	8.7	10.4	11.0	-	-	-	-	-
LOVE, BURNETT	-	-	6.9	7.9	9.2	-	11.3	-	-	-	-
LOVELESS, POLK	-	4.4	7.5	7.2	8.2	-	14.5	14.0	14.0	-	-
LOWER TURTLE, BARRON	3.1	5.6	8.2	9.9	10.8	11.5	12.1	-	-	-	-
MAGNOR, POLK	3.1	4.8	8.1	9.7	10.7	-	-	-	-	-	-
MCGRAW, BURNETT	-	-	-	6.0	6.4	6.5	7.8	9.0	-	-	-
MINERVA, BURNETT	-	-	-	8.5	9.3	-	-	-	-	-	-
MINNESUING, DOUGLAS	-	5.2	6.5	8.5	10.1	11.0	-	-	-	-	-
PEAR, WASHBURN	3.5	4.4	6.2	7.1	7.9	9.8	10.4	13.3	12.5	-	-
POKEGAMA, BURNETT	-	-	6.0	-	7.9	-	9.0	9.5	-	-	-
POSKIN, BARRON	-	4.7	6.9	8.4	9.9	10.6	12.8	-	-	-	-
RED, DOUGLAS	-	-	-	-	-	-	-	8.9	10.5	-	-
ROUND T37R18S27, BURNETT	-	-	8.0	7.5	8.1	9.5	-	-	-	-	-
SCOTT, BARRON	2.8	5.1	9.9	11.7	12.9	-	14.0	-	-	-	-
SISSABAGAMA, SAWYER	-	5.7	8.2	10.0	11.4	12.9	12.7	-	-	-	13.9
SMITH, SAWYER	3.2	3.5	8.1	10.1	-	-	-	-	-	-	-
SPRING, BARRON	-	7.5	9.4	-	-	11.3	-	-	-	-	-
TAYLOR, BURNETT	-	4.7	-	6.8	8.4	9.6	9.7	12.6	-	-	-
UPPER TURTLE, BARRON	-	-	7.6	9.5	10.0	10.4	10.7	10.8	-	-	-
VIOLA, BURNETT	-	-	-	9.2	-	12.1	-	-	-	-	-
WINDFALL, SAWYER	-	6.9	8.3	-	11.9	-	-	-	-	-	-
MEAN	3.5	5.1	7.4	8.8	9.7	10.6	11.4	11.0	11.9	11.1	13.9

Table B.7. *Length-at-age by lake for yellow perch.*

Lake Name, County	Length-at-age											
	1	2	3	4	5	6	7	8	9	10	11	12
ANDERSON, BARRON	-	3.5	4.5	5.2	5.7	6.7	7.2	8.4	9.8	-	-	8.5
BASHAW, BURNETT	-	5.2	6.1	7.1	7.7	8.4	-	9.4	-	-	-	-
BASS T31R8S2-4, CHIPPEWA	3.6	5.4	6.7	-	8.0	8.6	9.3	10.2	-	-	-	-
BASS T40R10S17, WASHBURN	-	5.8	6.7	8.1	-	-	-	-	-	-	-	-
BASS T40R13S29, WASHBURN	-	5.2	7.0	8.0	9.6	10.5	9.5	11.9	-	-	-	-
BEAR TRACK, WASHBURN	-	5.2	7.5	9.1	10.6	10.9	12.0	12.8	12.4	-	-	-
BIG BUTTERNUT, POLK	-	5.5	7.4	9.0	10.3	-	-	-	-	-	-	-
BIG, POLK	-	4.6	6.8	-	-	-	-	-	-	-	-	-
BLADDER, BAYFIELD	-	4.5	5.5	-	6.5	8.5	-	-	-	-	-	-
BUCKS, RUSK	-	4.4	5.6	6.4	8.2	9.3	10.8	-	-	-	-	-
CABLE, WASHBURN	-	4.4	5.3	7.4	8.6	9.4	-	-	-	-	-	-
CLEAR, SAWYER	-	-	4.9	6.1	7.1	7.9	8.5	-	7.6	7.5	-	-
CURRIER, SAWYER	-	5.1	5.9	7.2	7.5	8.0	9.2	-	-	-	-	-
DOWLING, DOUGLAS	-	-	6.5	7.7	8.0	8.8	-	-	-	-	-	-
GREENQUIST, POLK	-	4.3	5.0	5.9	6.8	7.9	-	-	-	-	-	-
IRON, BAYFIELD	2.2	4.3	5.8	-	-	12.3	-	-	-	-	-	-
LINCOLN, WASHBURN	-	-	4.3	-	-	-	-	-	-	-	-	-
LITTLE MIRROR, POLK	-	4.6	5.0	6.4	7.1	8.2	9.7	10.3	10.9	12.0	-	-
LITTLE SAND, WASHBURN	-	5.0	5.9	7.8	10.3	-	-	-	-	-	-	-
LONG T41R14S28, BURNETT	-	4.6	5.8	6.5	-	-	-	-	-	-	-	-
LOVE, BURNETT	-	-	-	6.8	8.9	-	-	-	-	-	-	-
LOWER TURTLE, BARRON	4.4	5.3	7.7	8.9	10.2	11.3	-	-	-	-	-	-
MAGNOR, POLK	-	4.4	7.0	8.0	-	-	11.3	-	-	-	-	-
MINERVA, BURNETT	-	-	-	6.7	7.0	-	8.4	-	-	-	-	-
MINNESUING, DOUGLAS	4.4	4.7	5.7	6.7	8.5	10.3	11.0	-	-	-	-	-
RED, DOUGLAS	-	-	4.6	5.7	6.7	8.7	-	8.2	-	-	-	-
ROUND T37R18S27, BURNETT	-	5.7	7.1	8.4	8.6	7.9	-	-	-	-	-	-
SCOTT, BARRON	-	3.9	-	7.1	6.9	-	-	-	-	-	-	-
SISSABAGAMA, SAWYER	-	4.8	6.5	8.3	8.6	9.0	-	-	-	-	-	-
SMITH, SAWYER	-	4.9	5.5	-	-	-	-	-	-	-	-	-
SPRING T39R10S36, WASHBURN	-	4.1	5.0	6.9	9.3	9.9	10.6	11.0	12.0	10.7	12.5	12.1
SUNFISH, WASHBURN	-	-	5.3	5.6	6.6	-	-	-	-	-	-	-
TAYLOR, BURNETT	-	-	4.9	5.4	6.6	-	-	-	-	-	-	-
UPPER DEVILS, BARRON	-	6.0	7.3	8.7	-	-	-	-	-	-	-	-
UPPER TURTLE, BARRON	-	-	6.5	7.7	8.4	9.3	9.7	-	-	-	-	-
VIOLA, BURNETT	-	4.0	5.0	-	-	-	-	-	-	-	-	-
WINDFALL, SAWYER	-	4.9	6.7	7.7	-	-	-	-	-	-	-	-
MEAN	3.6	4.8	6.0	7.2	8.1	9.1	9.8	10.3	10.5	10.1	12.5	10.3

Table B.8. *Length-at-age by lake for walleye.*

Lake Name, County	Length-at-age													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
BASS T40R10S17, WASHBURN	-	9.2	12.0	13.7	14.3	16.3	17.4	21.6	19.6	26.0	-	-	-	-
BASS T40R13S29, WASHBURN	8.2	10.8	15.0	-	18.5	18.7	-	20.2	-	23.1	-	25.5	-	-
BEAR TRACK, WASHBURN	7.5	10.8	13.1	14.5	16.5	16.9	19.9	20.2	23.8	27.5	-	-	-	-
BIG BUTTERNUT, POLK	6.1	10.6	13.2	15.5	16.8	19.3	20.8	22.6	25.1	-	-	-	-	-
BIG, POLK	-	-	11.9	13.5	19.3	19.3	-	24.2	-	-	-	-	-	-
BLADDER, BAYFIELD	5.9	9.6	11.9	15.6	15.9	19.1	20.2	-	-	-	-	-	-	-
CABLE, WASHBURN	7.7	-	12.4	13.9	15.9	18.9	21.6	25.7	-	-	-	-	-	-
CLEAR, SAWYER	-	-	-	-	-	18.9	19.8	19.9	19.6	18.5	-	-	22.9	24.7
CURRIER, SAWYER	-	-	-	-	-	22.0	-	22.9	-	-	27.3	-	-	-
DEEP T38R11S18, WASHBURN	8.1	12.0	14.2	14.9	16.1	17.6	19.3	22.7	26.2	26.1	-	-	-	-
DOWLING, DOUGLAS	4.4	8.1	10.9	13.4	15.5	16.9	19.2	-	-	-	-	-	-	-
GRANITE, BARRON	7.2	8.8	12.0	16.3	17.7	20.2	21.2	-	-	-	-	-	-	-
GREENQUIST, POLK	-	-	-	-	-	-	-	-	-	25.4	26.5	-	-	-
IRON, BAYFIELD	5.9	11.4	15.2	-	-	23.7	23.0	22.3	23.3	27.5	26.0	28.2	-	-
LITTLE SAND, WASHBURN	7.1	9.0	13.6	16.8	18.3	21.1	22.1	-	-	-	-	-	-	-
LONG T41R14S28, BURNETT	7.5	-	-	-	-	-	20.4	25.2	26.1	-	-	-	-	-
LOON, BARRON	-	12.0	13.8	15.0	16.2	18.5	21.9	-	24.2	-	-	-	-	-
LOWER TURTLE, BARRON	6.8	11.4	14.1	16										-
MAGNOR, POLK	-	12.4	13.2	15.0	17.2	19.4	23.0	22.2	25.0	24.5	-	-	-	-
MINNESUING, DOUGLAS	5.5	9.3	12.8	13.8	15.5	17.9	20.6	23.2	24.8	-	27.2	-	-	-
PEAR, WASHBURN	-	-	-	-	-	-	-	19.2	20.7	21.8	25.4	-	-	-
POSKIN, BARRON	-	-	-	18.5	-	20.6	20.6	-	26.2	-	-	-	-	-
RED, DOUGLAS	-	10.4	-	-	-	-	20.6	23.4	22.3	26.6	-	25.2	-	-
ROUND T37R18S27, BURNETT	6.0	9.7	10.9	12.4	-	18.4	20.4	-	27.3	-	-	-	-	-
SCOTT, BARRON	-	12.2	14.3	17.3	18.0	20.8	22.9	25.2	26.5	28.0	-	-	-	-
SILVER, WASHBURN	-	-	-	-	-	20.3	20.1	21.6	23.1	22.0	-	-	-	-
SISSABAGAMA, SAWYER	6.1	8.3	11.1	12.5	14.3	16.6	19.2	21.9	22.8	26.2	27.2	28.8	-	-
SMITH, SAWYER	6.3	10.0	13.3	15.0	15.9	17.4	18.8	20.0	21.2	23.9	26.0	27.3	-	-
SPRING T39R10S36, WASHBURN	8.2	14.2	17.4	18.2	21.5	18.2	19.1	19.6	20.9	-	-	-	-	-
SPRING T40R11S25, WASHBURN	7.3	11.8	16.6	19.5	20.9	-	24.0	-	-	-	-	-	-	-
SPRING, BARRON	6.7	10.8	13.8	15.1	16.7	18.3	24.0	25.0	-	-	-	-	-	-
SUNFISH, WASHBURN	-	-	-	-	-	-	-	-	-	26.0	-	-	-	-
UPPER DEVILS, BARRON	-	-	-	-	18.1	19.0	-	-	-	26.9	-	-	-	-
UPPER TURTLE, BARRON	6.4	11.9	13.0	16.0	18.3	19.9	21.2	20.7	24.7	-	-	28.8	-	-
VIOLA, BURNETT	-	-	-	-	-	20.2	-	26.6	-	-	-	-	-	-
WINDFALL, SAWYER	7.9	10.0	11.6	13.4	14.3	19.1	22.8	27.0	-	-	-	-	-	-
MEAN	6.8	10.6	13.3	15.2	17.1	19.1	20.9	22.6	23.7	25.0	26.5	27.3	22.9	24.7

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