Walleye for the Ages

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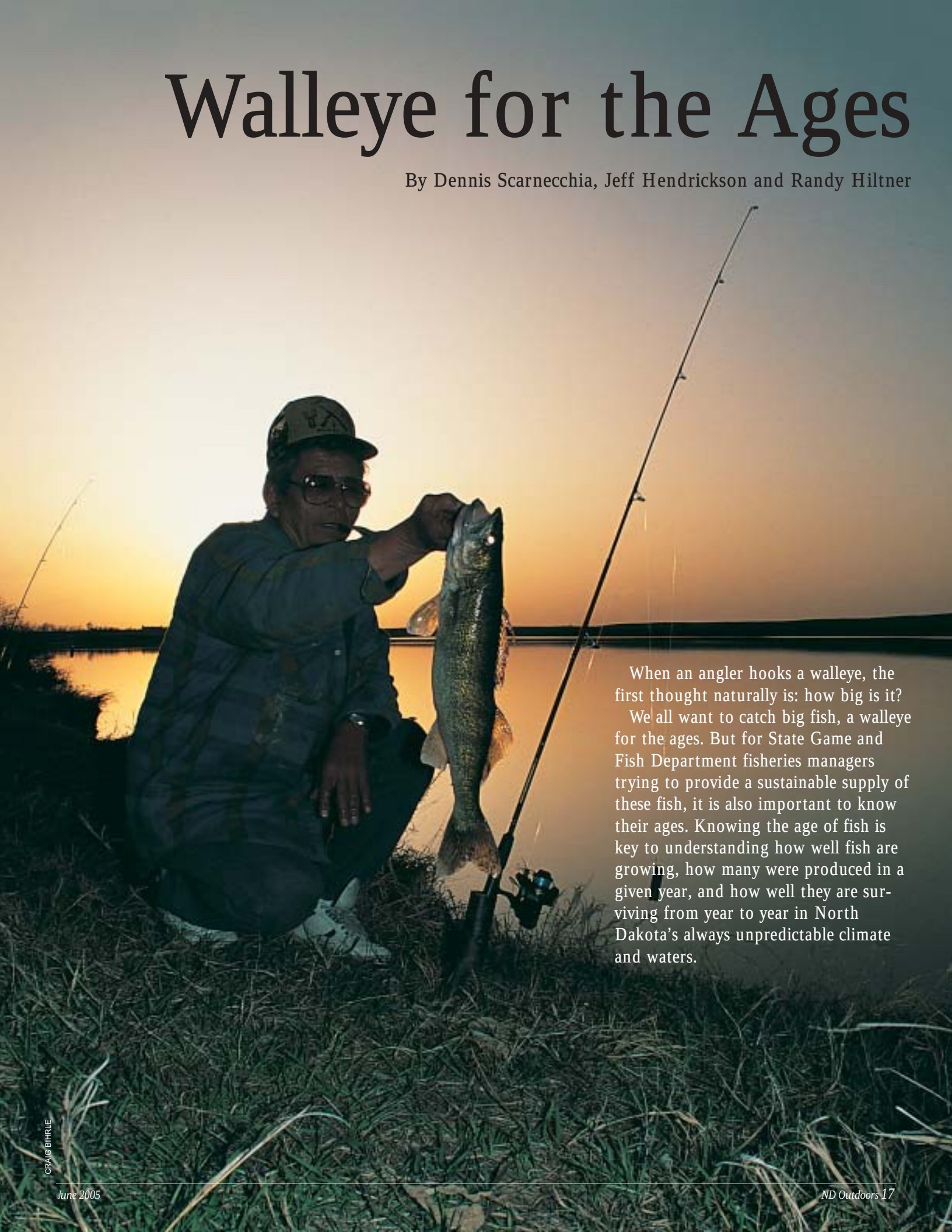

When an angler hooks a walleye, the first thought naturally is: how big is it?

We all want to catch big fish, a walleye for the ages. But for State Game and Fish Department fisheries managers trying to provide a sustainable supply of these fish, it is also important to know their ages. Knowing the age of fish is key to understanding how well fish are growing, how many were produced in a given year, and how well they are surviving from year to year in North Dakota's always unpredictable climate and waters.

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Lake Sakakawea and Devils Lake are prime examples of lakes having wide fluctuations in water levels. Not surprisingly, the growth and survival of walleye often varies with these fluctuations. In a few southern North Dakota lakes, where the growing season is longer, walleye can reach 5 pounds in four years. Whereas in other lakes, and under different conditions, it may take two or three times that long. Lakes that produce many big walleye in just a few years can be managed differently than lakes where big fish are produced more slowly, or not at all.

Some lakes have good natural reproduction most years, while other lakes have only occasional reproduction, and some have no natural reproduction at all. If Department fisheries personnel stock these and other lakes, they want to know if planted fish have survived well enough to provide good fishing. They also want to know if survival is better in some years than others – and if so, why – so maybe something can be done to ensure reproduction and survival in the future.

Knowing the age of fish, scientists say, is important in understanding how well fish are growing, how many were produced in a given year and survival from year to year.

Life of North Dakota Walleye *Photos by Craig Bihrle*

May 1, 2005 –
Walleye spawn, either artificially or naturally
May 20, 2005 – Hatch
November 1, 2005 –
6 inches long at freeze up
November 1, 2006 –
10 inches after second year
November 1, 2007 –
14 inches after third year of growth; winter anglers begin to keep fish

May 1, 2008 –
Most male walleye become sexually mature at age 3 and 14 inches
November 1, 2008 –
Fully recruited into the recreational fishery during fourth year; length at the end of year four varies from 15-18 inches, with most around 16 inches depending on the lake and forage

May 1, 2010 or 2011 –
Females typically reach 20 inches and are sexually mature by ages 5-6
May 1, 2010 –
At age 5, a female will average 20 inches while a male will be 18 inches

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Walleye length at the end of year four varies from 15-18 inches.

Determining Fish Age

Large fish of a given species are usually older than smaller fish. But that relationship between length or weight and age is often unreliable for older fish, or for fish in waters where growth rates are different. Other than estimating a fish's age from its size, the first documented method developed for aging fish was in Europe in 1898 when ages of pond-reared carp were estimated from marks on their scales.

Two decades later, scales were being used to estimate ages of salmon and various other fishes in Europe and North America.

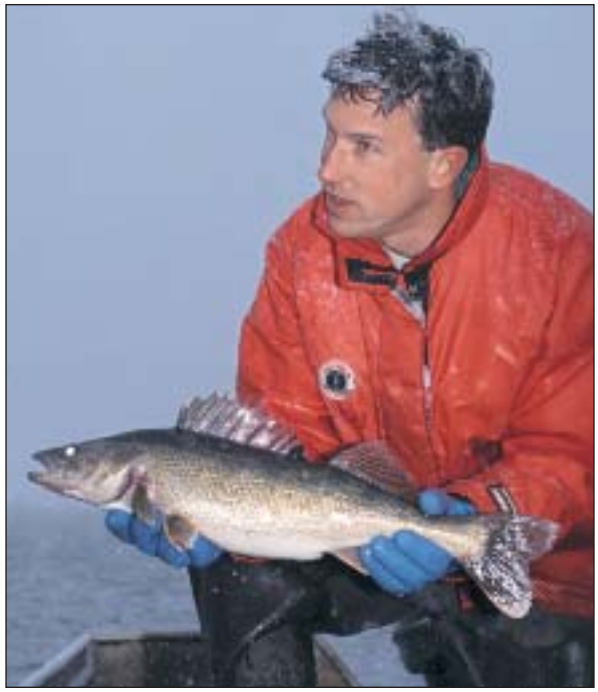
Fish develop rings called circuli on the scales. They develop numerous circuli each year, but when growth is fast, as in spring or summer, spacing of the circuli is wide. When growth is slow in winter, circuli are spaced more closely.

After each winter's slow growth period, a group of closely-spaced circuli usually appears as a dark band called annulus. One annulus, or annual mark, is formed each year, so that a 5-year-old fish would be expected to have five annuli. By counting these annual marks, biologists can estimate the age of fish.

2004 – Both male and female walleye collected for spawning from Lake Sakakawea averaged 7.4 years

2004 – There were more males 13 years and older in Sakakawea than females and the oldest male was 16 years and 22 inches; the oldest female was 15 years and 27 inches

14-20 inches – Most anglers harvest walleye between 14-20 inches; in Devils Lake and Sakakawea, these fish range between 3-7 years



12-15 years – While this walleye isn't an 8-pound whopper, a fish of that size could be as young as 9 years, but most range between 12-15 years

A microscopic image of a fish fin that enables biologists to count the rings to estimate the age of the fish.

Sometimes scales are useful for estimating ages, and sometimes not. For reasons not always well understood, some species or populations have clearly identifiable annuli, while other species or populations do not. Many fish may have clear annuli for the first few years, but as they age and growth slows, the annuli become packed so closely together on the edge of the scale that it is impossible to count them. Some scales also erode on their edges during spawning, obliterating one or more annuli. In addition, many species such as catfish, sturgeon, and paddlefish do not have scales. For these reasons, other aging methods have been developed in the past century.

These methods have included the use of ear bones called otoliths (used for many species), the gill cover bone (carp and suckers), the lower jaw bone (paddlefish), a bone on the cheek called cleithrum (northern pike), vertebrae, and several of the fins. In many of these methods, a thin cross-section of bone or fin is cut and annuli are counted like tree rings. It's basically the same approach used to assess deer or elk ages by sectioning their teeth.

For years, Department fisheries biologists have used fish length and scales with some success for estimating ages of younger walleye and other fish. However, there is always interest in getting better fish age estimates, especially for older fish that usually can't be aged accurately with length, weight, or scales. To do that, Game and Fish biologists have found that dorsal and pelvic fins work well for estimating age of North Dakota walleye. As with scales, this approach allows estimating ages without killing the fish.

The approach is to remove the front (leading) spine of the fin close to where it attaches to the body. The fin spine is placed in an envelope containing information such as length, weight, and sex of the fish, and allowed to dry. The fin sections are then mounted with epoxy on Popsicle sticks. Cross-sections as thin as 25/1000 of an inch, or sometimes thinner, are then cut with a low-speed saw equipped with diamond-edged blades. The sections are permanently mounted onto microscope slides by immersing in clear nail polish. When the polish hardens, the sections can be read under a microscope.

The image seen under the microscope is then photographed and projected onto a computer monitor, where a large image can be easily seen and age can be estimated by counting the rings. Estimates of age using fin sections can be verified for accuracy by using the method on marked or tagged fish of known age.

Once ages are estimated, fisheries biologists can calculate how old fish from a given lake or reservoir are at certain lengths. A range of information can then be used to estimate the age structure of the entire population without having to use fins to age all fish.

How Aging Helps Management

Some interesting and important results have come out of this work. For example, female walleye from Lake Sakakawea tend to mature a year or two later than males, and tend to be longer and heavier than males of the same age. Males mature a bit younger and direct more of their energy earlier in life to reproduction rather than body growth. The result is males remaining somewhat smaller than females at any age throughout life.

Walleye from Devils Lake and Lake Sakakawea have similar growth, reaching 15 inches during their third summer and 25 inches, on average, during their 12th summer. Other lakes show faster or slower growth. Fish from Dry Lake in McIntosh County, for example, averaged about 15 inches at the end of their second summer. Dry Lake has a longer growing season than Lake Sakakawea and Devils Lake and seems to provide exceptionally good growing conditions for walleye.

Reliable age and growth information for walleye is important for improving our understanding of why walleye survival is better in some years than others, and why growth and survival are better in some lakes than others. Knowing walleye ages makes it easier for the Game and Fish Department to manage North Dakota's lakes and reservoirs to produce more walleye for the ages.

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