

Tale of a Scale

Background information: Review Chapter 6: *Fish Anatomy* and 9: *Fisheries Management* in [Going Fishing](#)

Standards:

Duration: 45 minutes

Materials: Copies of Crappie Scale Impression Worksheet (pg. 3); markers, colored pencils or crayons; transparency of fish scale to lead class

Objectives: Students will correlate different seasons with a fish's growth.

Notes: In this activity, we will examine a crappie's scale. Crappie are native to Nebraska and are found throughout the state in rivers and lakes.

There are four types of fish scales - placoid, cycloid, ctenoid (pronounced 'ten-oid'), and ganoid. Most bony fish have cycloid scales. Fish with cycloid scales have the same number of scales their entire lives - the scales enlarge to accommodate a fish's growth (scales that are lost to injury will be regrown). This results in a pattern of concentric growth rings on the scale, which look similar to the growth rings in the trunk of a tree. The growth rings on a scale are known by scientists as circuli (singular circulus).

Just like counting the rings of a tree, biologists can determine the age of a fish by reading its scales with a microscope. How do biologists do this? Actually, aging fish is fairly easy. The development of circuli is similar to that of tree rings. During periods of rapid growth, the rings are

widely spaced and when growth slows, the rings are constricted together. Rings are formed on a cycloid scale constantly, so biologists can read seasons of growth. In the Great Plains, fish will grow rapidly in the summer months when water temperatures and food availability are highest; they experience slower growth during the colder winter months. Therefore, the scales typically exhibit bands of widely spaced growth rings (summer) separated by constrictions (winter). By counting the number of winters on a scale, a biologist can determine how long that fish has been alive.

In addition to viewing scales to age a fish, biologists can also collect and examine otoliths. The otolith (which literally translates to "ear stone") is a small bone that floats in a fluid-filled capsule located near the base of a fish's skull. They function in equilibrium maintenance, but can be used to age fish and are generally considered more accurate than scales (particularly for older specimens) and can even determine daily growth. However, the fish must be dead before an otolith is removed. Scale removal is relatively harmless to the fish, therefore scale reading is generally preferred.

Biologists commonly collect age data for fish species in a water body to determine the relative health of the population. Age is compared to other information such as the length and weight of the fish, and will indicate whether a population is growing slowly in relation to other populations. For example if the average age-3 crappie in Lake A is 6 inches, and the average age-3 crappie in Lake B is 8 inches, biologists may be concerned about the population in Lake A. This information is very useful for making decisions on how to manage a fishery to produce healthy, quality fish.

The scale image is obtained by removing a scale from the fish and then making an impression of the scale in a piece of acetate. The impression is then viewed under magnification.

Activity:

1. Pass out copies of the scale drawing and coloring utensils. Have students observe the scale. Does this remind them of anything else found in nature? A tree's rings. If you have a picture or tree cookie, use it to compare with the scale. Note that some of the irregularities on the image are a result of making an imperfect impression of the scale into a piece of plastic.
2. Discuss tree rings and how they are formed. Each tree ring is a layer of wood cells produced in one year. Does a tree grow the same amount every year? Are the rings all the same size? Why not? Each year brings different weather and a different growing season. A drought one year won't allow the tree to grow much while a wet and warm year will promote tremendous growth.
3. We can see the same is true with fish. The rings are not all the same size. Fish, however, grow rings constantly (not just once a year). Knowing what we do about trees, what do you think causes changes in the growth of fish? Summer brings warm weather and lots of food for growth. The opposite occurs in the winter.
4. Point out and label the core of the scale and explain that the first growth rings, or circuli, are formed from this point.
5. Ask students to identify the mark of the first winter on the fish scale. Have them color in the area of the first summer's growth with a crayon.
6. Continue to identify each mark of winter, and fill in each season of growth with a different color.
7. Ask how many summers this fish had been alive when it was collected?

Wrap up:

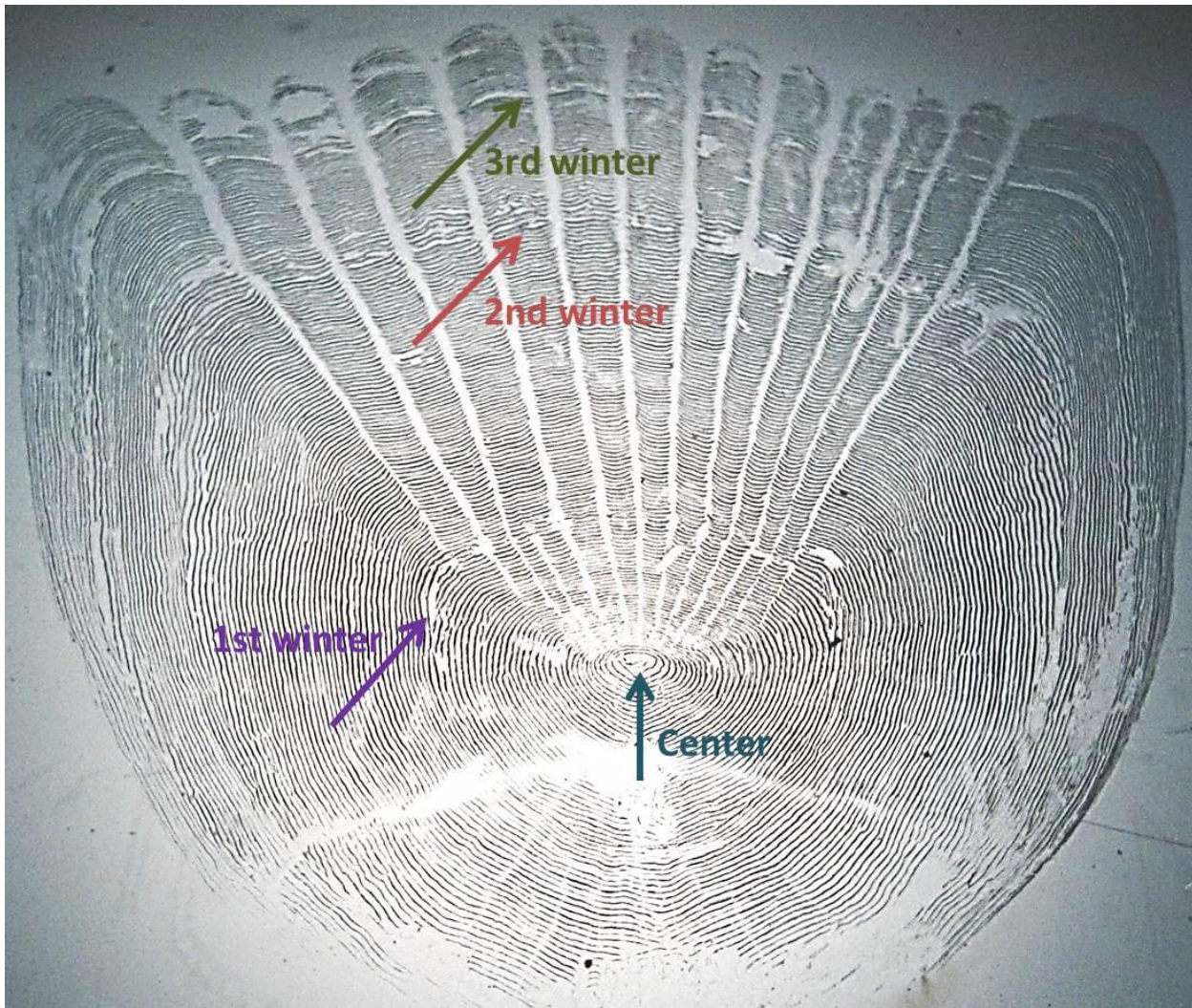
Ask students why it might interest biologists to learn the ages of fish.

CRAPPIE SCALE IMPRESSION WORKSHEET

Name _____



CRAPPIE SCALE IMPRESSION KEY



Note that the constrictions identifying the winter seasons circle the entire scale, but the base of the scale becomes very constricted and is difficult to get an impression of.