

AGE AND GROWTH

Background Information

Why determine the age and growth of a fish?

Knowledge of age and length in fish allows biologists to understand fish stock size and changes in fish populations. It allows for the calculation of growth, mortality, and reproduction rates that aid in managing and sustaining our fisheries resources.

What is used to determine the age and growth of a fish?

Otoliths, or fish earstones, are used to age fish. They increase in size incrementally over time and develop rings, similar to those of a tree, that are counted to determine age.

Otoliths are bone-like structures located on both sides of the brain in most fish. They help fish to remain upright in the water and to hear through detection of sound vibrations. They rest on a bed of sensory hairs that signal the brain when vibrations from sound move the otolith. Otolith size and shape varies for each fish species. Otolith rings are deposits of calcium carbonate crystals that form each year – one ring represents one year of a fish's life.

- A. Black drum
- B. Red drum
- C. Spotted seatrout
- D. Gray snapper
- E. Sheepshead
- F. Southern flounder
- G. Striped mullet

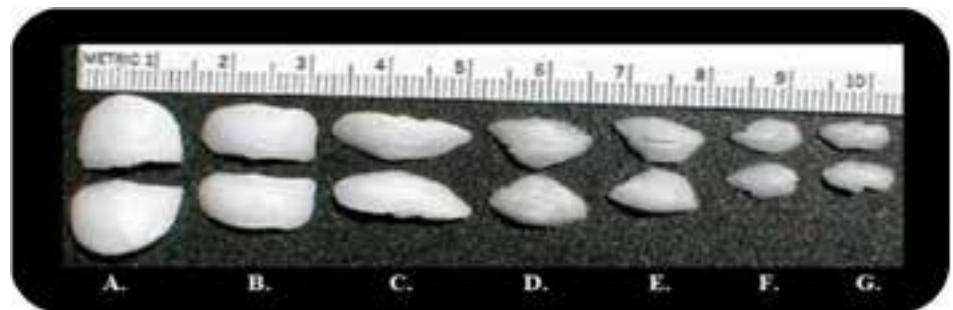


Figure 1: Whole otoliths from multiple fish species

How is age and growth of a fish determined?

Otoliths are located inside a fish's head and have to be removed before they can be examined.

- A saw cuts a vertical (in front of the gills) and horizontal (above the eyes) incision into the fish's skull.
- Otoliths, located in hollow openings on either side of the brain, are removed and cleaned.
- A specialized saw is used to slice the otolith into small, thin 1/2mm cross sections.
- Each section is mounted on a slide for microscopic viewing.



Figure 2: Fish with a portion of the head removed to show otoliths.

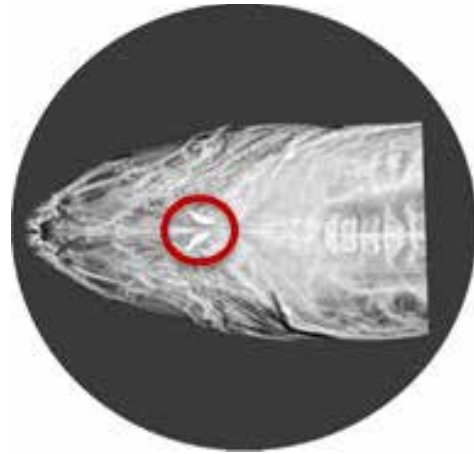
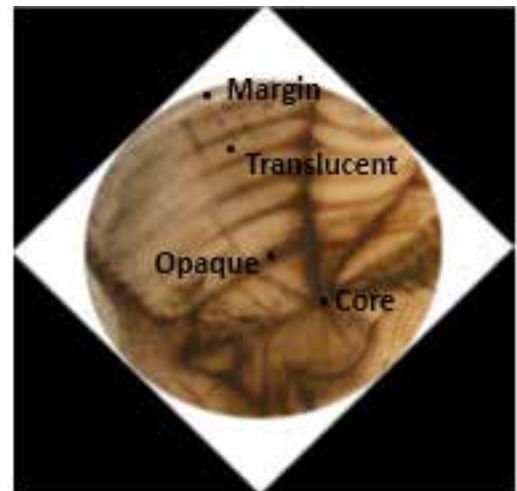
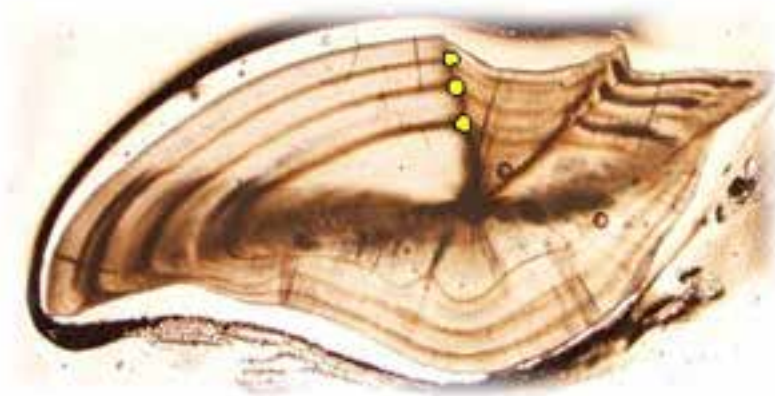


Figure 3: X-ray image of fish head. Otoliths are located in the red circle.

An otolith cross section must be examined on a microscope to see the rings. The dark rings are counted from the middle (core) to the outside (margin). One dark ring represents one year of age in most fishes. The darker zone forms during slow growth in the winter and the whiter zone forms during fast growth in the summer. The rate that rings form is proportional to the fish's growth.



***For most fishes in the Gulf of Mexico
1 dark ring = 1 year***

In addition to showing the effects of seasonal changes, otoliths also reveal periods of slow growth that may be caused by a lack of available food, increased fish competition, or environmental pollutants. These factors may produce false rings in otoliths that biologists must separate from the growth rings when counting.

Fish age can be correlated to fish length to develop growth curves, such as the Von Bertalanffy Growth Function (VBGF), that show how a fish's growth changes over time. As seen in Figure 5, fish length and age are plotted on a graph to create a growth curve. The steepness of the curve in the early years of a fish's life represents rapid growth. As a fish ages, growth slows, the curve stabilizes, and energy is used for reproduction rather than growth. The point where the curve stabilizes is the size at which a fish will start to reproduce. Biologists set this length as the minimum size an angler can harvest a fish. This ensures that a fish will reproduce at least once and add to the fish population before possibly being harvested by anglers. These regulations sustain healthy fish populations and ensure successful fisheries for future generations of Louisiana anglers.

Female Speckled Trout:

AGE (YEARS)	APPROX. AVERAGE LENGTH	APPROX. LENGTH RANGE
1	11"	9" - 13"
2	16"	13" - 19"
3	18"	14" - 24"
4	19"	15" - 23"
5	19"	15" - 23"
6+	19"	16" - 23"

Male Speckled Trout:

AGE (YEARS)	APPROX. AVERAGE LENGTH	APPROX. LENGTH RANGE
1	9"	7" - 11"
2	13"	11" - 16"
3	15"	12" - 18"
4	16"	13" - 19"
5	16.5"	13" - 20"
6+	17"	12" - 20"

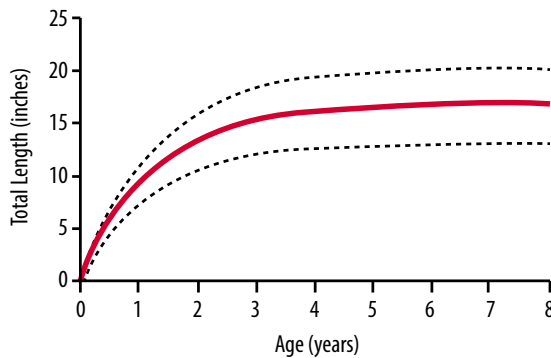
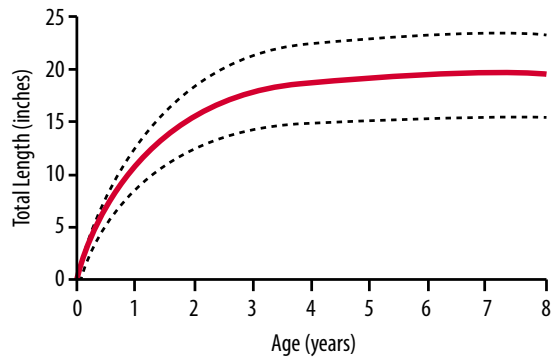


Figure 5: The solid line represents a predicted length for a given age, and variation is represented by the dashed lines. For example, the average length of a four year old female is 19 inches, but can vary from 15-23 inches and the average length of a seven year old female is 19.5 inches, but can vary from 16-23 inches. After sexual maturity is reached by about age 2, energy is invested in reproduction rather than growth.