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Pollock
Pollachius virens

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Pollock is an amphiboreal gadoid found on both sides of the North Atlantic. In the western North Atlantic it ranges from Labrador to Cape Hatteras, but is most abundant on the southwestern Scotian Shelf and in the Gulf of Maine. Pollock are highly migratory and extensive movements have been documented (Steele 1963). Stock structure has not been elucidated in the Northwest Atlantic.

Pollock spawn in winter; most individuals attain sexual maturity in 3 or 4 years, although some pollock may not mature before age 6 or so. Pollock are comparatively long-lived, attaining a maximum age of 23 years. They may reach lengths of 110 cm (43 inches) and weights of 16 kg (35 pounds). No significant differences have been observed in growth rates between sexes (Bigelow and Schroeder 1953, Hoberman and Jensen 1962, Steele 1963, Clark et al. 1978).

Scales and otoliths have been used for age determinations of pollock, but otoliths are preferred for older individuals because of the difficulty in distinguishing outer annuli on scales. Otoliths are stored dry.

Otolith processing involves making transverse thin-sections of from 0.17 mm to 0.28 mm in thickness cut exactly at the nucleus along the dorsoventral axis. For large otoliths (taken from individuals greater than 75 cm in length), it is preferable to produce a 0.17-mm thick section. Section thickness from otoliths of smaller fish is not as crucial.

Age determinations are made by placing the section on a square of black paper and applying Kodak Photo-Flo 200 solution to the surface, allowing for some spillage onto the paper. It is then viewed under a binocular microscope at 20 to 30× magnification using reflected light.

Annual zones on a pollock section are composed of a white opaque zone representing fast summer growth and a dark hyaline zone representing slow winter growth. The annulus is defined as the hyaline zone marking the end of a year of growth, i.e., the winter growth zone. These zones are easily distinguished in fish up to 6-8 years of age. Deposition of hyaline material begins as early as October in some fish and is clearly evident in almost all specimens collected by December and January (Fig. 1). Opaque material may be deposited as early as December, but is typically found May-September (Steele 1963) (Fig. 2).

By convention, a 1 January birthdate is used; therefore, a hyaline zone forming on the edge of the otolith is counted as an annulus on 1 January, even though the zone is not complete.

Age determinations are usually made by counting hyaline rings from the center to the edge. The first annulus is rarely located close to the nucleus. Spacing between the opaque and hyaline rings is important in locating a settling check. This settling check consists of a series of light hyaline lines more widely spaced than the hyaline lines comprising a true first annulus. The overall shape of the settling check is more elliptical and has fewer, if any, undulations than the true first annulus. The settling check in some otoliths encircles a dark area, but for others, it is barely visible. An opaque space usually marks its location (Figs. 2 and 3).

Age determinations may be made on several areas of the otolith. The proximal side near the nucleus is optimal for an initial reading and the side closer to the dorsal end sometimes is easier to read because the annuli tend to be more spread out in this region. Rings are also well defined on the dorsal end, but an age reader should carefully follow the rings around to the distal and proximal sides to insure that no splitting has occurred. For older fish, the dorsal end can be very helpful, particularly when searching for the most recently formed annulus. Older specimens taken in summer (July-

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September) can be particularly difficult, because for most fish little opaque summer growth is visible. The dorsal end generally magnifies the size of the annuli, a condition that clarifies differentiation. Another consideration when viewing the edge is the angle or bevel of the otolith surface. Occasionally, the section may have been cut through an area of the otolith which had a particularly rough surface. The result can be an optical illusion of a hyaline edge when in reality the age reader is looking at an opaque edge. It appears hyaline because it is thinner at the bevelled plane (Fig. 4). Therefore, it is important to examine the side of the otolith section to be sure a bevelled edge is not present.

The second, third, and fourth annuli are usually broad and frequently paired or split. The fifth and sixth annuli may also be split. Split rings must be carefully followed around the otolith. Split hyaline rings commonly occur for one or two successive years and may continue for up to four years (Figs. 5 and 6).

Several criteria must be considered when evaluating split hyaline rings. Spacing is most important. Usually, the opaque increment between the split rings is narrower than the opaque increment between the outside split ring and the next hyaline ring towards the edge. This next annulus, if not split, is usually darker with more clearly defined boundaries than the split ring. If two closely spaced hyaline rings, which appear suspect, merge as the reader follows them around to the ventral/proximal side, and/or if they merge at the sulcus, they should be recognized as a split ring and should be counted as a single annulus (Fig. 7).

Annuli become thinner and more crowded towards the edge of the otolith and are occasionally difficult to read. In such cases, an age reader should count back toward the center to locate a strong hyaline ring. It may be followed down toward the dorsal end until an area is located that has more distinct hyaline rings. Repeated counts on each otolith are necessary, especially for older fish. Otoliths from specimens >12 years of age should be examined several times until a consistent determination is reached (Fig. 8).

Although pollock otoliths cause the age reader many problems because of settling checks and split annuli, there is a close correspondence between age and length, especially in small and medium-sized fish.

Citations

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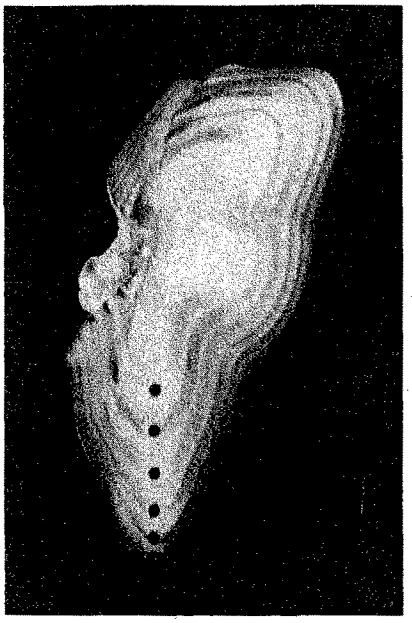

Figure 1
Otolith section from a 69-cm age-6 pollock collected in January showing clearly defined annuli with hyaline edge (sixth annulus) forming.

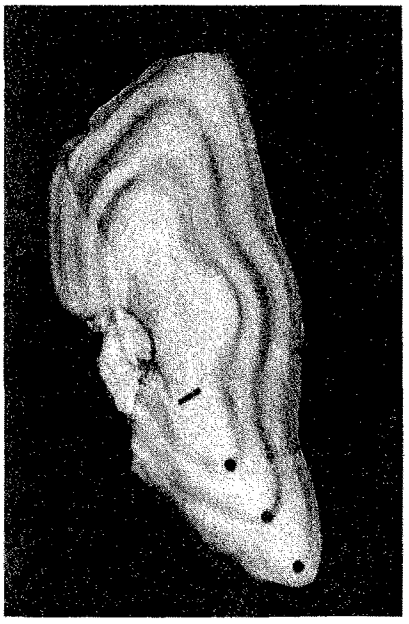

Figure 2
Otolith section from a 50-cm age-3 pollock collected in July with opaque edge forming. A fairly strong settling check is evident.

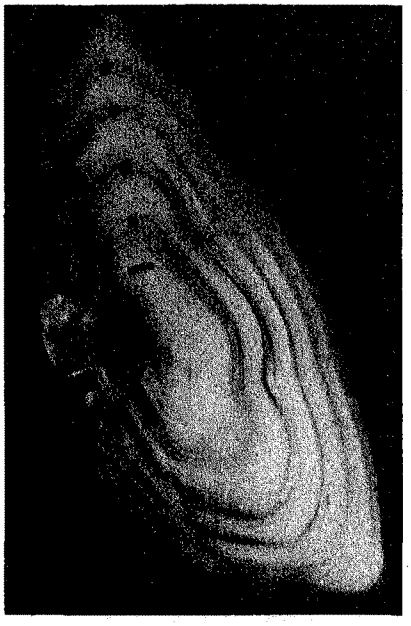

Figure 3
Otolith section from a 59-cm age-5 pollock collected in March showing a strong settling check.

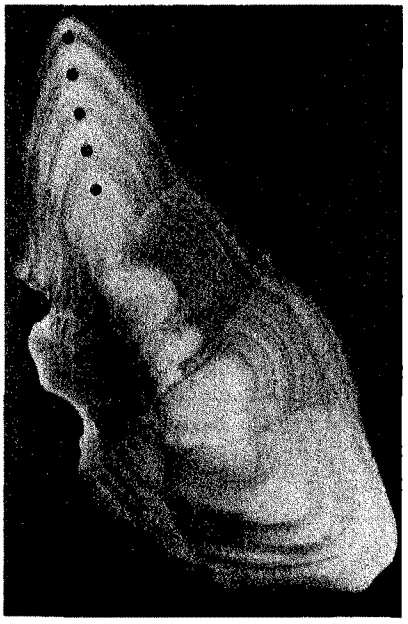

Figure 4
Otolith section from a 54-cm age-5? pollock collected in July with opaque edge forming. This otolith has not been sectioned exactly at the nucleus.

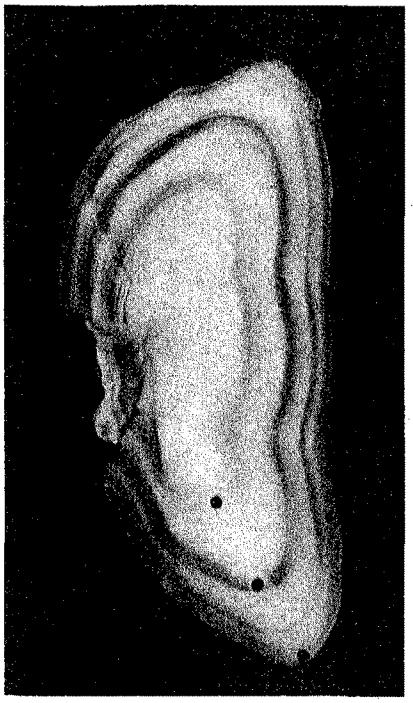

Figure 5
Otolith section from a 46-cm age-3 pollock collected in April showing a strongly split third annulus.

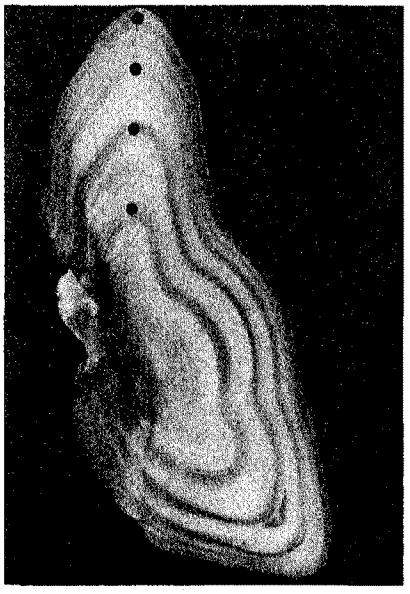

Figure 6
Otolith section from a 57-cm age-4 pollock collected in April showing a strongly split fourth annulus.

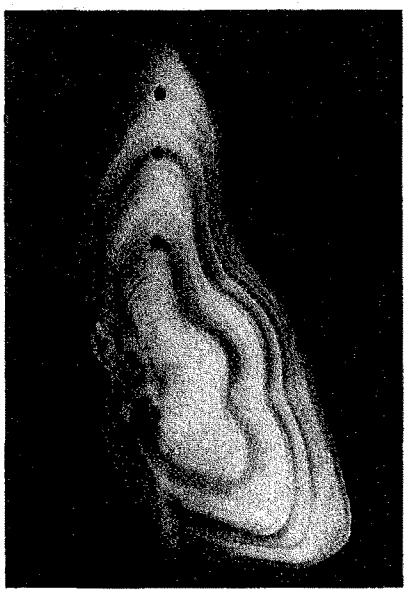

Figure 7
Otolith section from a 50-cm age-3? pollock collected in September showing close second and third annuli with hyaline edge forming.

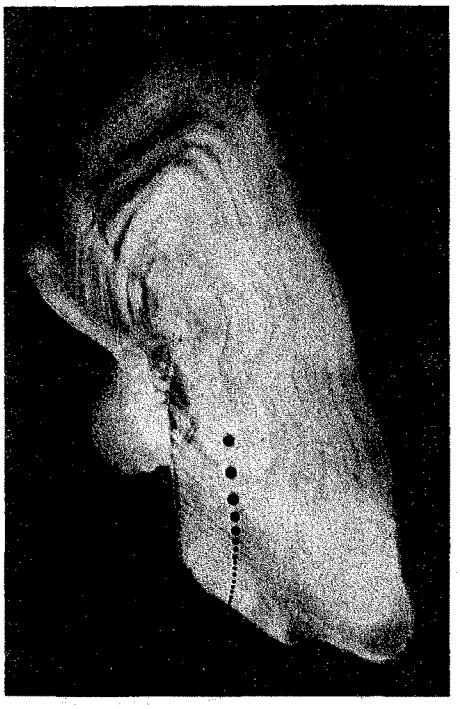

Figure 8
Otolith section from a 94-cm age-17? pollock collected in April. Clearest area on this otolith for ageing is on the dorsal/proximal side.