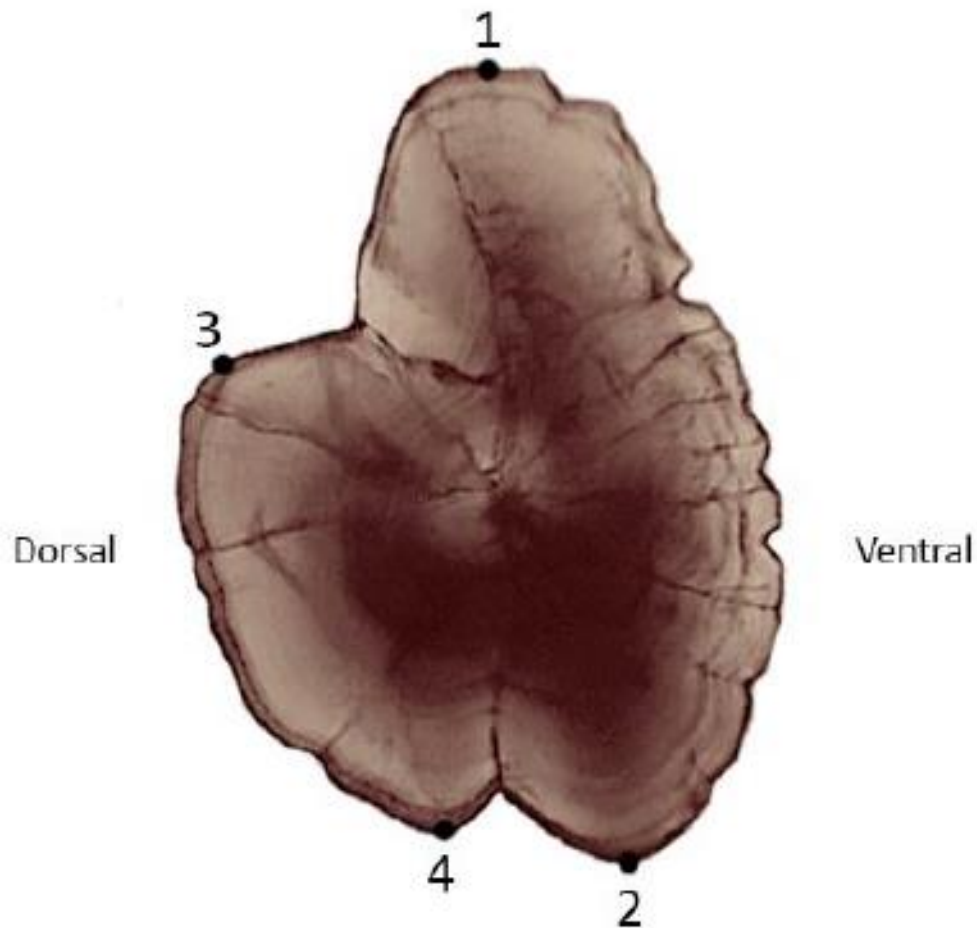


# **Baltic sprat age determination methodology**

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Translated by M. Plikšs

When carrying out biological analysis, two otoliths are removed from the fish with a scalpel and placed in a fish scale book, where they are kept until age determination. Otoliths can be taken from either fresh or frozen fish. To determine the age of a fish, the otolith is transferred from the scale book to a glass slide with a well and is filled with a few drops of 80% ethanol. The age is determined with the use of Leica DME microscope in transmitted light, primarily at 100x magnification. 200x magnification is sometimes used to determine the age of older fish. It is considered that magnification lower than 100x does not allow accurate determination of fish older than 3 years. Sprat age is usually determined in the dorsal part of the fish where the growth seasonality is most pronounced (Figure 1.)



1. Rostrum 2. Postrostrum 3. Antirostrum 4. Pararostrum

Figure 1. Structure of the sprat otolith

To determine the sprat age, the yearly growth zones must be identified and counted. These zones include a wider, lighter and non-transparent (opaque) summer zone as well as a more narrow, darker and more transparent winter zone (Figure 2.)

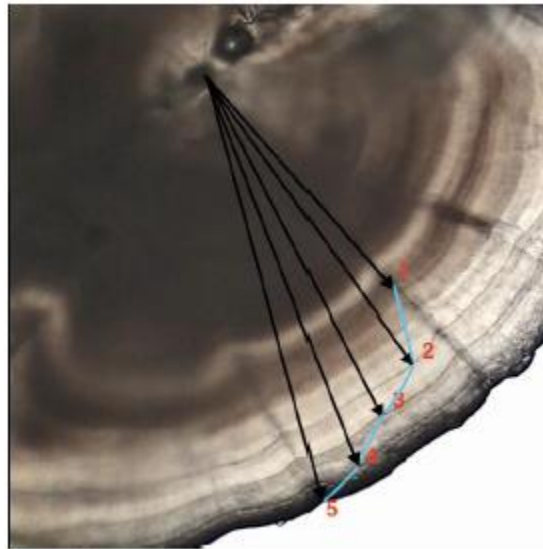


Figure 2. Otolith from a 5-year-old sprat with marked summer and winter zones (winter zones are marked with the red numbers and blue lines indicate the summer zones).

The non-transparent (opaque) zone is formed in the summer under good feeding conditions and the translucent (hyaline) zone is formed in late autumn and winter when the feeding intensity of the fish is low. Narrow hyaline rings are often formed inside the opaque zones during the annual growth zone formation in the summer (Figure 3).

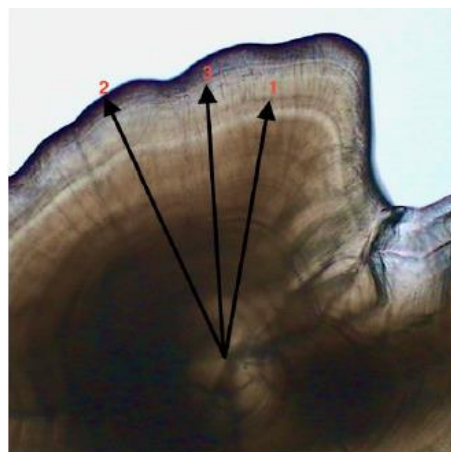


Figure 3. Age - 2 years ("3" – represents an additional ring).

This is particularly characteristic of the second annual growth zone, which is possibly related to certain deteriorations in the feeding conditions. These hyaline rings are considered as false or as additional rings and are not taken into account when calculating the age of the fish. Unlike true winter rings, they are usually intermittent. In order to distinguish additional rings from true ones, it is often necessary to measure the width of the first and second growth zones.

Certain difficulties in determining the age of fish can be caused by samples collected in the second half of the year. For example, in the summer period, one-year-old fish begin to form an opaque zone in June. The age is defined as "1+", the "+" indicates new growth visible on the edge of the otolith (Figure 4).

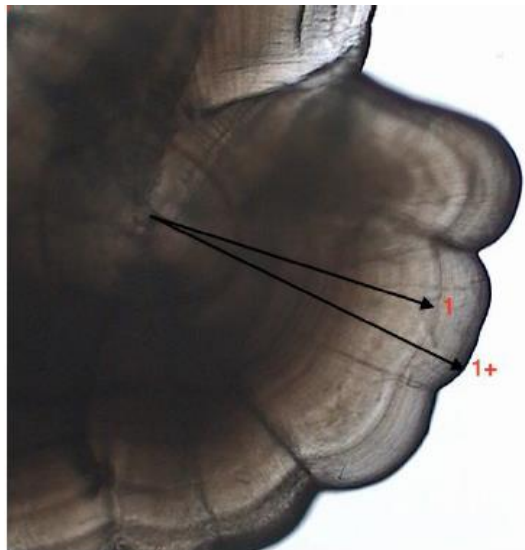


Figure 4. Age 1+(August)

The fish of this age, as a rule, do not participate in reproduction, and their energy resources are directed towards growth.

The oldest fish in the spring-summer period allocate their energy resources towards reproduction, and the opaque growth zone in their otoliths appears in late summer to mid-autumn after the completion of spawning. During this period, the age of the fish is defined as the current year plus a specific number, for example, 3+. When determining the age, this growth increment, such as the annual ring, is not taken into account in the current year. (Figures 5; 6).

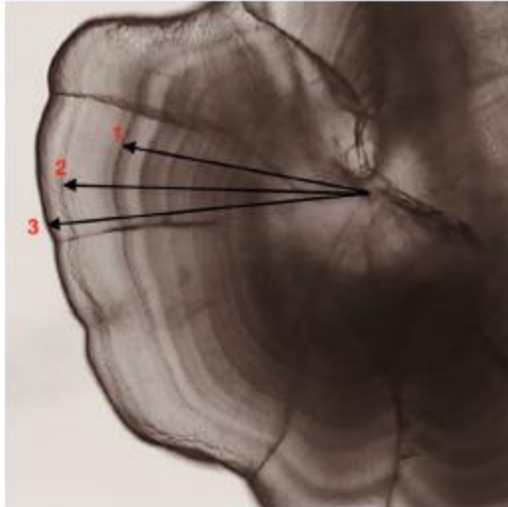


Figure 5. Age 3 years (February)

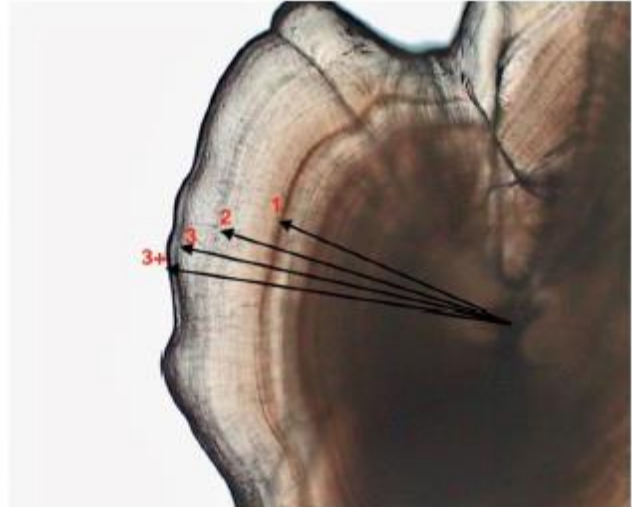


Figure 6. Age 3+ years (August)

From the next year's January, the edge of the otolith is already considered a yearly ring, even though the winter zone has not fully formed yet.

Sometimes, in fish, one or both otoliths undergo complete or partial crystallization. Such otoliths are not suitable for age determination. (Figure 7.)



Figure 7. Otolith crystallisation

## References

Р. Апс. 1982. Определение возраста балтийского шпрота по отолитам. Fisch.-Forsch. 20, 1: 55-58

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