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A TECHNIQUE FOR SECTIONING BLUE WHITING OTOLITHS FOR AGE DETERMINATION

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ABSTRACT

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The basic principle of the method is to embedd the otoliths in a two component glue whereafter it is sectioned with a jewelers saw. When using this method a trained technician can section and make age determinations of approximately 50 otoliths per day.

INTRODUCTION

Age determination on blue whiting, *Micromesistius poutassou* (Risso, 1810), is most successfully performed by counting alternating hyaline and opaque zones in the otoliths (RAITT 1968).

The method commonly used in examining blue whiting otoliths is that discribed by GAMBELL and MESSTORFF (1964) for whiting otoliths. The otolith is broken transversely, and a beam of light striking the side of it is transmitted upwards through it, illuminating the hyaline and opaque zones on the broken surface. When working on blue whiting from the Norwegian Sea and adjacent areas this method was found to be difficult in obtaining reliable age determination of fish older than 5—7 years. The reason for this is that the outer opaque zones in old fish are very thin, and a great proportion of the fish form secondary rings in the otoliths. When sending the light in from the side the illumination of the surface is in many instances insufficient to distinguish primary rings from secondary rings, and the contrast is too weak to permit a sufficient discrimination of the zones.

In order to obtain better contrast in the otoliths, burning (CHRISTENSEN 1964) and dying (ALBRECHTSEN 1968) the otoliths has been tried without success. Sections are the only means by which the internal structure of some otoliths can be seen (JOHNSTON 1938). The main objec tions against sectioning otoliths is the time used for preparation of sections. In the search for an efficient method a modification of that described by

TÅNING (1938) for cutting cod otoliths has been adopted. This is a fairly rapid method and a trained technician can prepare and determine age of about 50 otoliths per day.

THE METHOD

The basic principle of this method is to embedd the otolith in a plastic glue whereafter it can be cut into sections with a saw. The embedding medium used is a two component glue (Araldit, manufactured by A/S Sigurd Hesselberg, Oslo). This gives a firm grip on the otolith and prevents breaking of the sections when sawed.

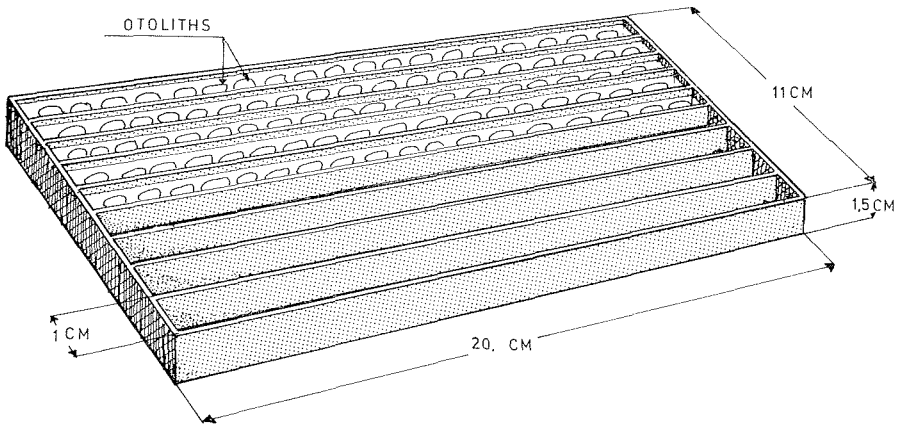

Fig. 1. Sketch of the tray-mould used for embedding the otoliths.

For practical reasons a special tray-mould has been made for the embedding (Fig. 1). This is made of metal and divided into 9 compartments, each giving room for 12—15 embedded otoliths. Before embedding the inside of the mould is covered with a thin layer of paraffin wax in order to prevent the glue from sticking to it. After this a ground layer (1—2 mm thick) of Araldit is placed in the form and allowed to dry for 1—2 hours at room temperature. The glue is then stiff enough to prevent the otolith from sinking, and at the same time it holds the otoliths when they are finally covered with glue.

A 1—3 mm thick cover of glue is sufficient to hold the otoliths during sawing, and when using this thickness the otoliths are fully visible, making it possible to section any desirable place of the otolith.

When the glue is dry (24—48 hours at room temperature, earlier if heated), the mould is heated to above the melting point of the paraffin.

The blocks of Araldit with the embedded otoliths can then easily be taken out, and in this form they can be kept indefinately.

The sectioning is done with a jewelers saw. The best results have been obtained with steel blades 0.2 mm thick and with 20.3 teeth per cm. Good results have also been obtained with thicker blades, but the disadvantage with these are that a greater part of the otolith is lost during sectioning.

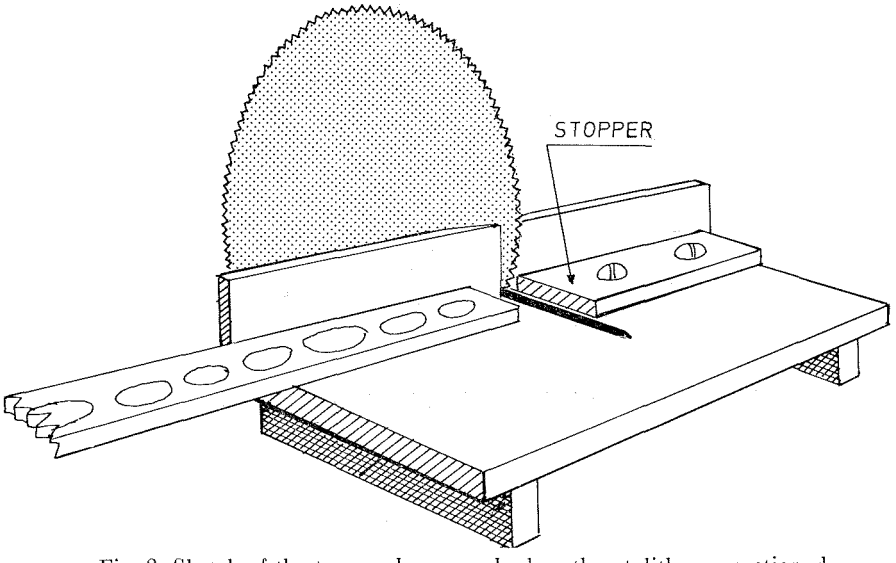

Fig. 2. Sketch of the tray and saw used when the otoliths are sectioned.

The embedded otoliths are placed on a tray with an adjustable stopper (Fig. 2) and held firmly by hand. By moving the tray against the rotating blade sections down to 0.3 mm can be made. The preferred thickness is form 0.4—0.6 mm.

Blue whiting has large otoliths with a wide first zone, and 2—3 sections can usually be made from the centre area without losing any zones. The sections are then washed in alcohol, which also acts as a clearing agent, and mounted in Eucit on glass slides.

The reading can be done immediately by binocular microscope with transmitted light from below, using a grey filter. A better result is obtained with a polarisation filter which makes it possible to change the angles of the light waves against the zone walls.

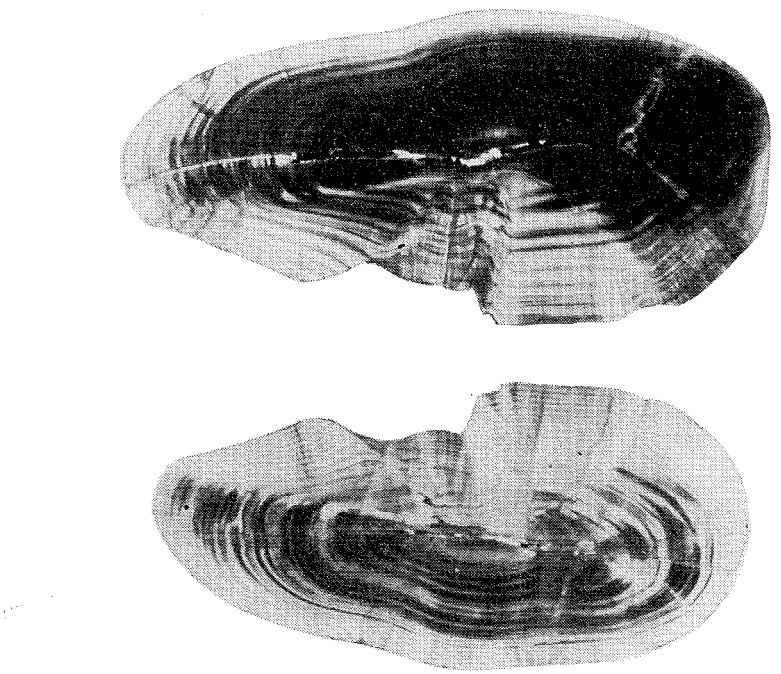

Fig. 3. Sections from blue whiting otoliths. Top) Female 32,5 cm. Bottom) Female 33,5 cm.

RESULTS

So far, the results of the sectioning seem very promising. Sections have been made from several hundred otoliths, and age determinations have been possible for otoliths formerly assigned as unreadable or uncertain. Fig. 3 illustrate sections from two otoliths.

The method has also been tried on otoliths of polar cod with good results.

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