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A Method to Help Age American Plaice in Division 3M

by

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Introduction

Difficulties in ageing American plaice (*Hippoglossoides platessoides* Fab.) from NAFO area have been reported by some authors. Otolith readings of American plaice from Div. 3M (and 3L) are particularly difficult. This appears to be the first conclusion made from the 1990 otolith exchange conducted between Canada and EEC/Spain, with an inter-reader agreement of only 27% (NAFO Sci. Coun. Rep., 1990). Three main reasons have been considered responsible for such a high level of disagreement: difficulties in identifying the first annual ring, the presence of double or split rings and difficulties with interpretation of otolith edges.

In order to reduce this disagreement STACFIS recommended that in 1991 further exchange of American plaice otoliths from Div. 3M and 3L should be conducted accompanied with photographs showing the criteria used in interpretation of the nucleus and the duplicate rings. This paper describes the use of a different methodology for otolith preparation, that were carried out to improve ageing of American plaice in Div. 3M.

American plaice otoliths have been prepared for ageing in several ways. Powle (1965) and Lux (1970) examined the whole otolith stored in glycerine; Pitt (1967) broke the otoliths in half and examined the broken surfaces. Dery (1988) examined thin sections from fish greater than 35 cm. Recent otolith exchanges show that Canadian and Spanish readers prefer to use polished whole otoliths.

Material and Methods

The current method of polishing the whole otolith requires that the otoliths be held by hand and pressing them against the polishing plate of the machine with a finger. This method poses a hazard to the technicians on the one hand and causes unevenness and breakages in the otoliths on the other hand.

In this paper, the methodology used was to polish otoliths that were previously mounted on a micro slide by using a fast hardening resin "Lakside 70" (ref. No. 40-8100, supplied by BUEHLER). This resin is a kind of cement that requires the application of a moderate amount of heat to liquify and produces very good adhesion when it solidifies on cooling. This procedure prevents otolith from breaking and protects the fingers of the polishers during the polishing process.

Each pair of otoliths was mounted on one previously labelled microscope slide, the upper one (the more asymmetrical one) with the sulcus up and the lower one (less asymmetrical) with the sulcus down (Fig. 1). In order to mount the otoliths, each microscope slide with two small pieces of resin were lightly heated (using an alcohol lamp), till the resin liquefied. Immediately after, otoliths were carefully placed in such a way that after the resin hardened the otolith was completely surrounded and supported but not covered by it. After this, each otolith was polished with an ECOMET III polishing machine (Fig. 2) provided with different grinding paper discs. The grit used varied, according to otolith thickness.

Since otoliths become thicker with age, special care must be taken when polishing those from older individuals. An inappropriate time of polishing can destroy the first few rings. As a consequence, for American plaice greater than 30 cm, a two stage method of polishing was carried out. The first stage was to make the first 2 or 3 rings evident and the second was to make visible, where necessary, the more external or the less clear rings and also to show the type of otolith edge. In the first stage an ECOMET III machine, with controlled rotational speed, was used and the degree of otolith polishing was verified by regular observations using a stereo microscope. In the second stage a boring machine was used.

Polished otoliths were examined using a binocular stereomicroscope, with reflected light against a dark background. Growth rings were enhanced by clove oil or by immersing them in water. Each pair of otoliths was used for age determination and annual rings were identified according to the three directions represented in Fig. 3.

A TV camera monitor and a video printer connected to the binocular stereomicroscope were used for ageing and to take photographs.

Ages were assigned according to the birthdate of 1st January as adopted for species in northern hemisphere.

Conclusions and Recommendations

In the 1989 3L American plaice otolith exchange, there were three main reasons considered responsible for the age disagreements between readers. I believe another important reason for the high level of disagreement was due to a deficiency in the degree of polishing of the otoliths, and additionally many otolith broke during the exchange exercise. I also think that, although checks or split rings occurring in the otolith may create problems in age determination, a good polishing would help overcome those uncertainties. These were the main reasons a different method to handle and polish the American plaice otoliths was attempted.

Figures 3 to 7 show examples of the results obtained with the methodology described. Very often the area of the otolith corresponding to the axis C in Fig. 3 was preferred for assigning the age, because in this area annuli seemed to present fewer visible checks.

Besides paying attention to the possible existence of double or split rings, special attention must be given to the interpretation of the edge. This is particularly important for samples collected during the second half of the year, when the nature of the edge varies from opaque to hyaline. In this season one problem that could arise is as a result of atypical edge growth which could happen during the summer time (Fig. 7). In this situation the readers must decide if summer growth is retarded (in which case the winter edge zone would be counted as an annulus), if winter growth is advanced (in which case the zone would not be counted), or if a check is being formed.

Finally, an otolith validation study which is not yet available for American plaice in NAFO Div. 3M, will improve American plaice age determinations.

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LUX, F. E. 1970. A note on the growth of American plaice (*Hippoglossoides platessoides* Fabr.) in ICNAF Subarea 5. Int. Comm. Northwest Atl. Fish. Res. Bull., 7: 5-7.

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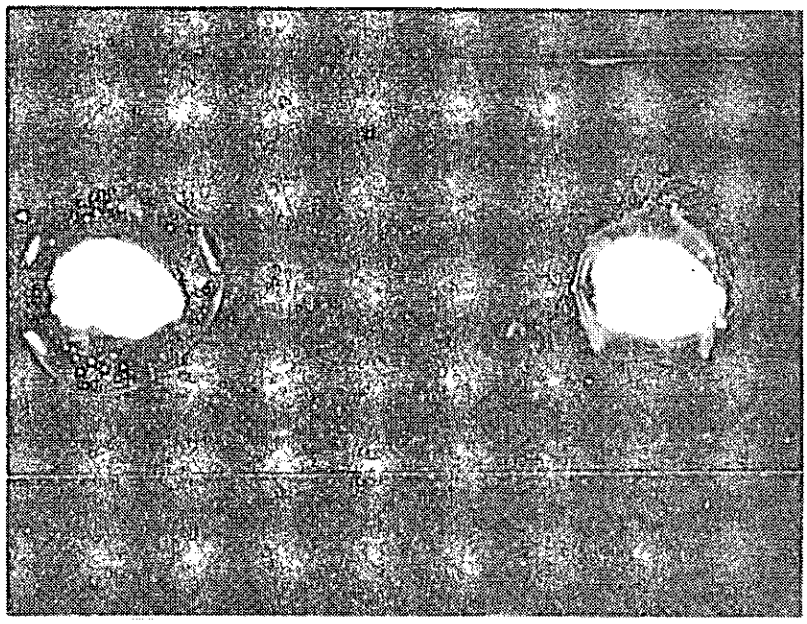


Fig. 1. A pair of otoliths mounted on a micro slide using "LAKSIDE 70" resin.

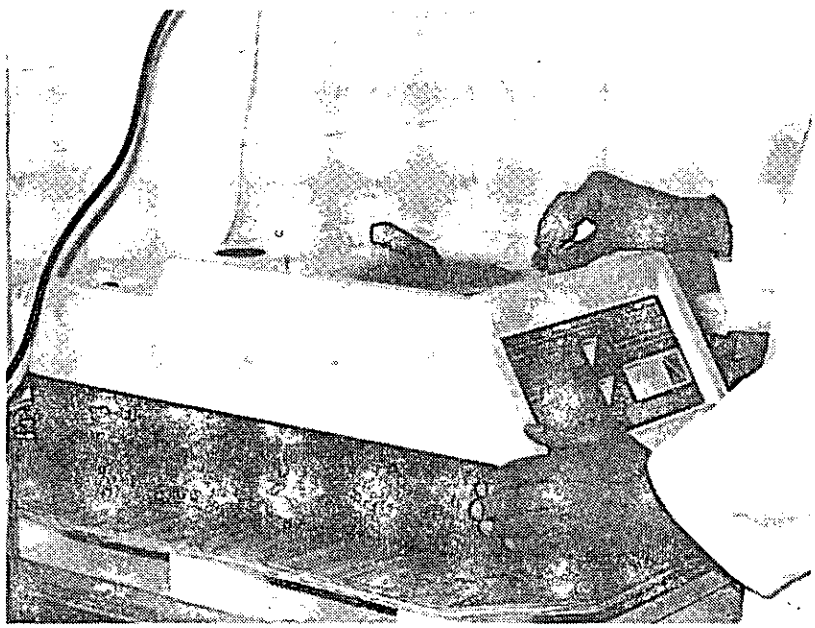


Fig. 2. Otolith being polished on "ECOMET III" polishing machine.

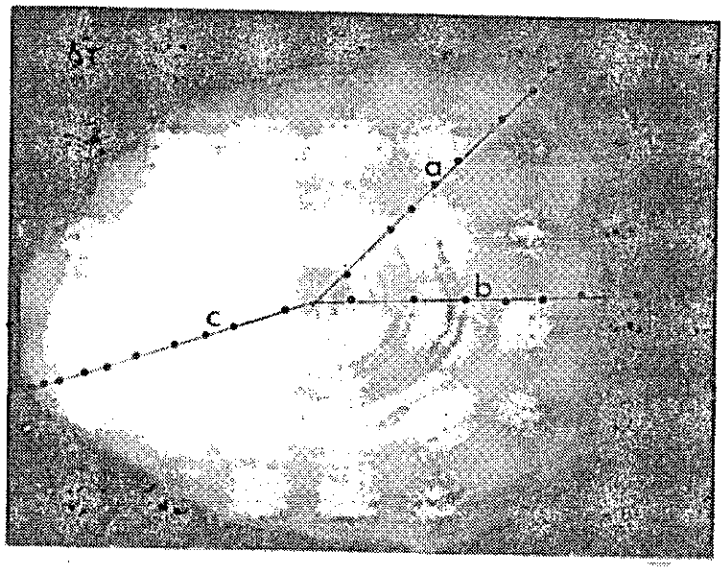


Fig. 3. A polished otolith showing the three axis used for ageing of an American plaice, 41 cm - age 10, collected in August 1990 in NAFO Div. 3M (Magnification 8x).

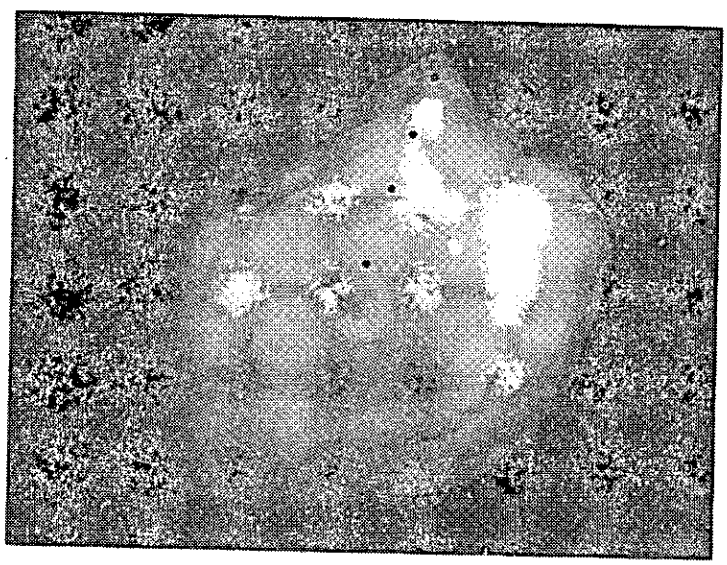
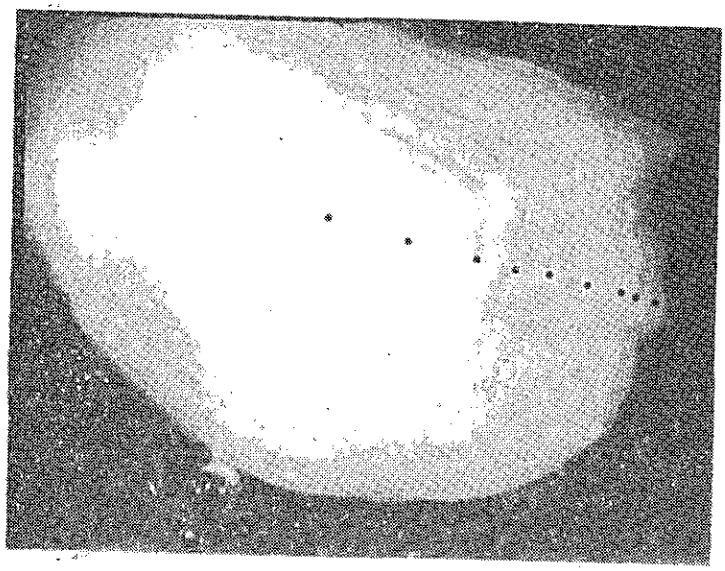


Fig. 4. A polished otolith showing a strong first annulus of an American plaice, 31 cm - age 4, collected in August 1990 in NAFO Div. 3M (Magnification 8x).



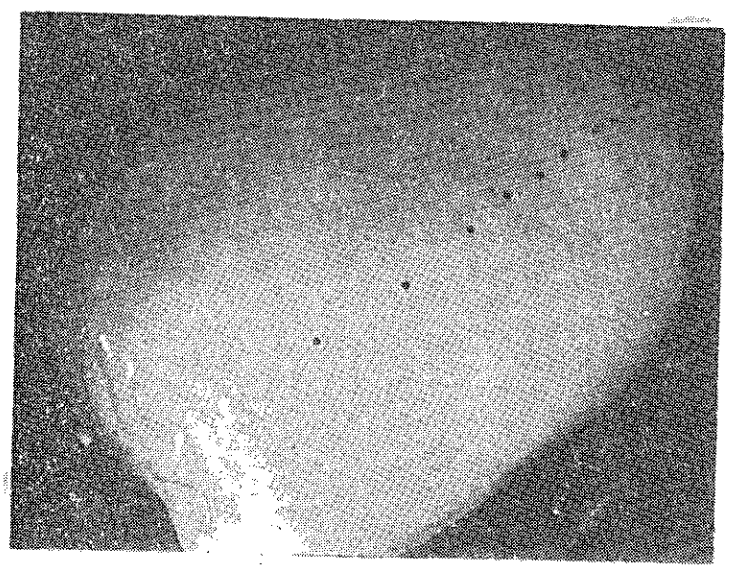


Fig. 5. A pair of polished otolith of an American plaice, 41 cm - age 9, collected in August 1990 in NAFO Div. 3M: a) lower otolith (left), and b) upper otolith (right) (Magnification 8x).

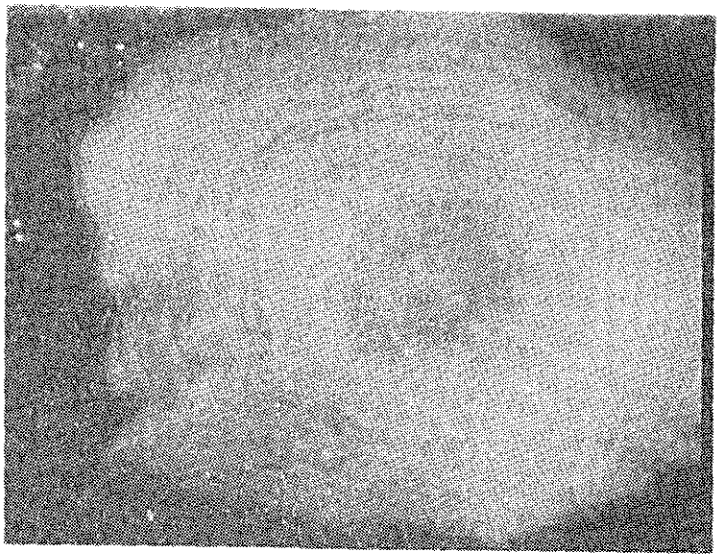


Fig. 6. A polished otolith showing near the central region an excessive polishing of an American plaice, 46 cm, collected in August 1990 in NAFO Div. 3M (Magnification 8x).

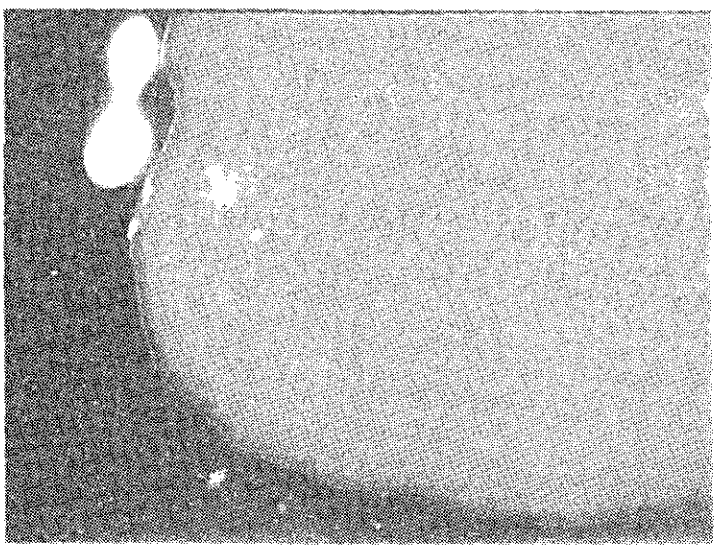


Fig. 7. A polished otolith showing an atypical edge for the summer time of an American plaice, 41 cm collected in August 1990 in NAFO Div. 3M (Magnification 16x).