International Council for the Exploration of the Sea

C.M.1968/J:4
Pelagic Fish (Southern) Committee

# A note on age determination in the horse-mackerel (Trachurus trachurus L.)

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## Introduction

An investigation into the biology of the horse-mackerel has been started at the Lowestoft Laboratory, and regular samples from the western English Channel have been obtained in 1967 and 1968.

It was thought that age determination would present no great problems. Letaconnoux (1951) was unable to obtain satisfactory results using scales or otoliths and resorted to a Petersen analysis of length-frequency distributions; using this method he found the maximum age to be nine years. However, recent authors (Baidalinov & Starosel'skaya 1964, Polonsky 1967) have reported no difficulties in using the otoliths and have found the maximum age in their western Channel samples to be 8 and 11 years respectively. Their method has been to soak the otoliths in a clearing agent such as glycerine or xylene for 3 to 5 days and then to view the unbroken otoliths, immersed in the same liquid, using reflected light. The present author has found this method to be satisfactory only for fish up to about age 3 or 4 years; with older fish, otolith interpretation has been found to be extremely difficult or impossible. The burning technique of Møller Christensen (1964) was then tried and has proved to be very successful in clarifying the ring structure; the technique adopted was asfollows.

## Method

The dried otolith is broken transversely across the short axis, either with the fingers or by using forceps. If the break is very uneven, the fractured surface is ground smooth using the apparatus described by Bedford (1964). At this stage, clear rings can be seen on the fractured surfaces by viewing the shaded surface illuminated from the side, as in Bedford's (1964) technique for gadoid otoliths. The fractured surface is then slowly charred by holding it (with the aid of forceps) at the periphery of a very low micro-bunsen flame until it is dark brown. The burnt surface is then brushed with cedar-wood oil

and viewed, mounted on plasticine, under a binocular microscope using reflected light. Very clear rings can then be seen, especially if the otolith is rotated so that the light strikes it at different angles. Examples are shown in Plates 1 & 2, which are photographs (taken by electronic flash) of otoliths from a sample of horse-mackerel caught in January 1968 off Plymouth by R.V. Ernest Holt.

Otolith structure

Plate 1 a, b & c shows otoliths with 3, 4 and 5 growth zones respectively. Plate 2 shows otoliths in which the zones are much more numerous; in (a) there are 13 zones, in (b) 24 with a possible 25th on the edge, and in (c) 34 or 35. This large number of rings is clearly much greater than the maximum age (11 years) previously reported for this species, and the question immediately arises as to whether each ring is annual or whether more than one is laid down each year. This question cannot, at present, be answered but some general observations can be made.

Firstly, there seems to be no obvious grouping of the rings and they all appear to be equally prominent. Secondly, it is apparent that when the first few rings are laid down the otolith increases mainly in width (and length), but that subsequent growth results primarily in a thickening rather than an increase in width or length. This means that, in older fish, the ring structure is not apparent when the whole otolith is viewed from above and that a section must be used. Unlike mackerel otoliths, the rings are not very clear on the rostrum.

The burning technique itself has been shown to be valuable not only for temperate-water species such as sole (Møller Christensen 1964) but also for tropical species such as some members of the Sciaenidae (Poinsard & Troadec 1966, Bayagbona 1967), in which age determination was previously very difficult.

Further details of the sample from which the otoliths in Plates 1 & 2 were taken are shown in Figure 1. The length distribution (A) shows three main groups which, on a Petersen analysis, would be expected to correspond to 1-group, 2-group, and 3-group +, with a January 1st 'birthday'. This is borne out by the composition of the sample with respect to the number of rings on the otoliths (Figure 1B), which is a conversion of the length distribution to otolith ring distribution, based on the analysis of 279 otoliths. The otoliths of the group with modal length 12 cm (Figure 1A) have a single growth zone and those with a mode of 20 cm have 2 growth zones. The fish in the largest length group, however, have otoliths with between 3 and 35 growth zones. Figure 1C is a plot of mean length against number of otolith rings; the initial portion of the curve is similar to that given by Baidalinov & Starosel'skaya (1964) for horse mackerel

of stated ages up to 5 years but, as previously mentioned, no fish more than 8 years of age are reported by these authors.

Discussion

If the otolith rings are truly annual, it is clear that the present data indicate that the horse mackerel is a long-lived fish with a low natural mortality rate; in these respects it would be similar to Sebastes spp. (eg. Sandeman 1968). If they are not annual, then the problem is to decide how many rings are formed each year.

Summary

The ring structure of horse-mackerel otoliths has been examined using the burning technique of Møller Christensen (1964). At present it cannot be stated whether the rings so produced are annual, but if so, it indicates that this species is long-lived (otoliths with 35 rings have been found); this conflicts with the work of previous authors.

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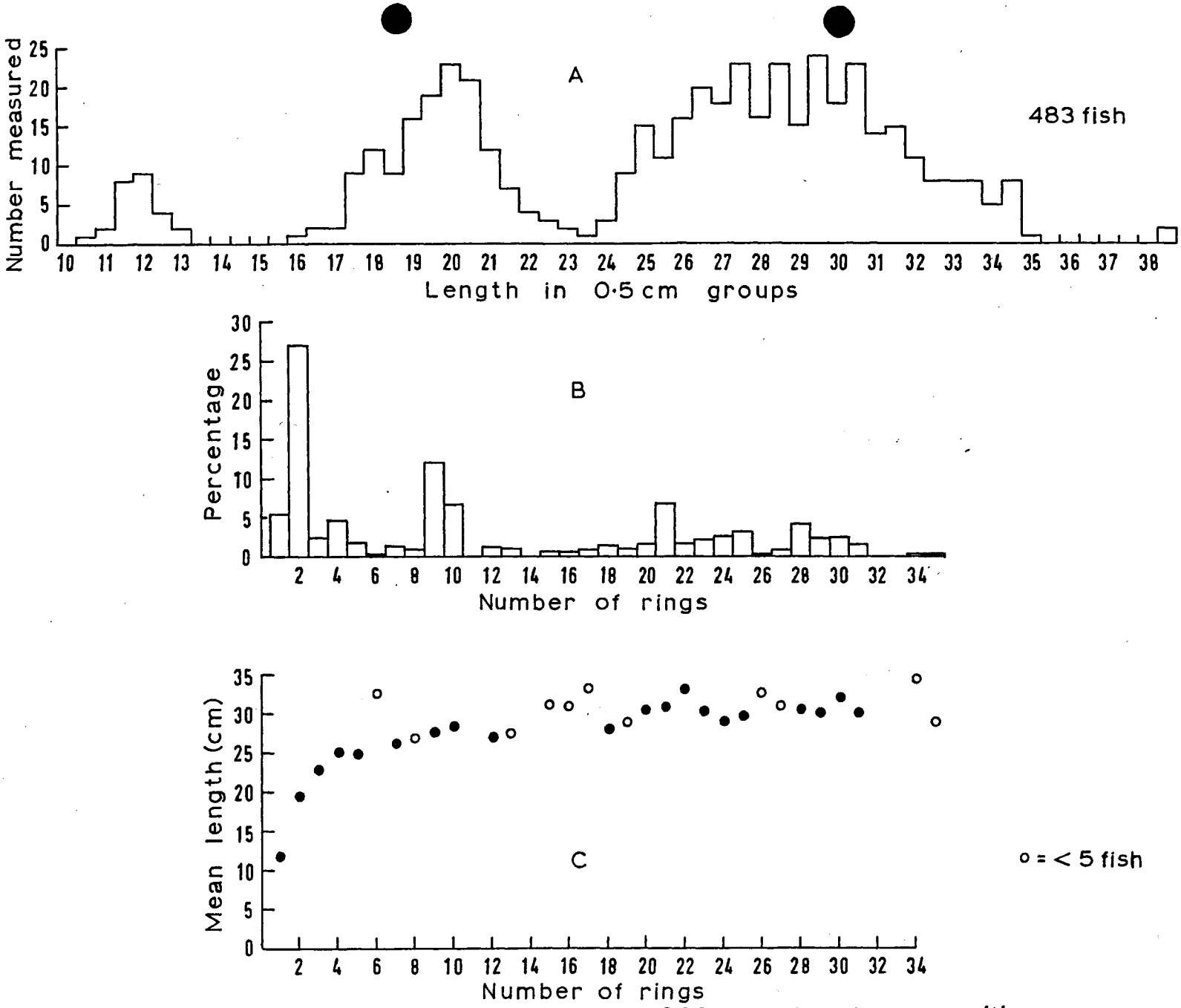
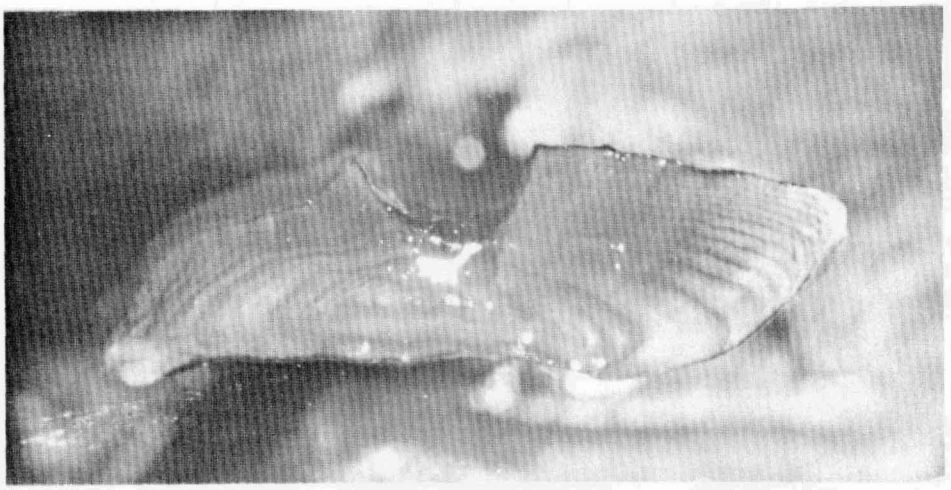



Fig.1. Ernest Holt horse mackerel sample January 1968. A- Length composition; B-Composition with regard to the number of rings on otoliths; C-Mean length of each ring-group.

A



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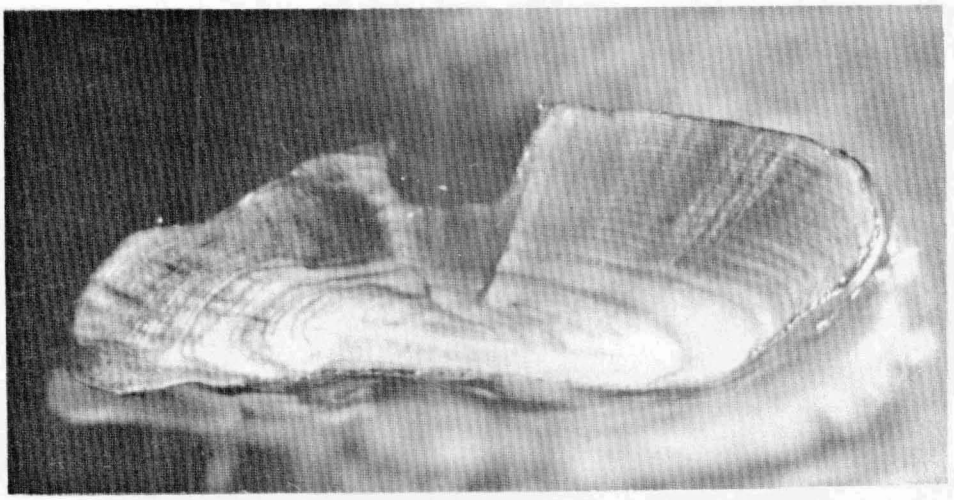

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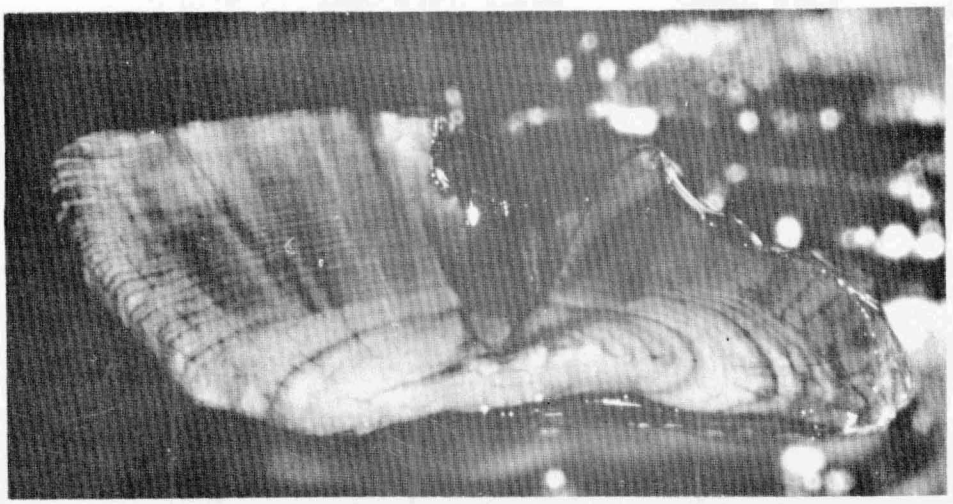
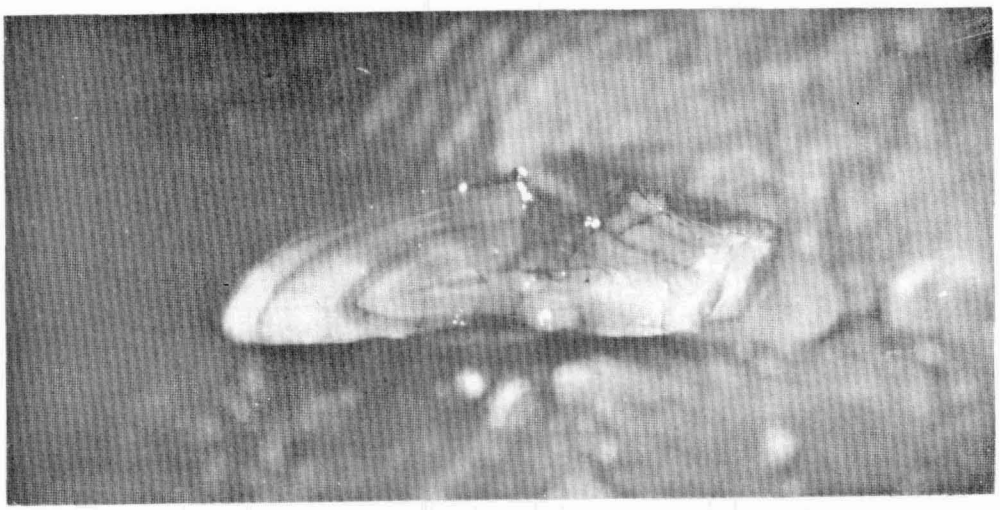


Plate 2 Photographs of horse mackerel otoliths.
A - 13 growth zones; B - 24/25 growth zones;
C - 34/35 growth zones.

A



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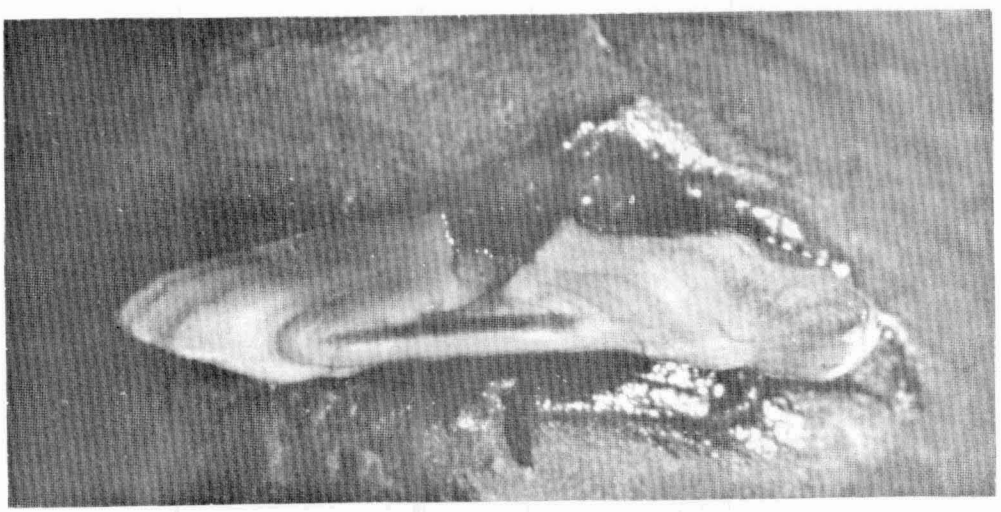

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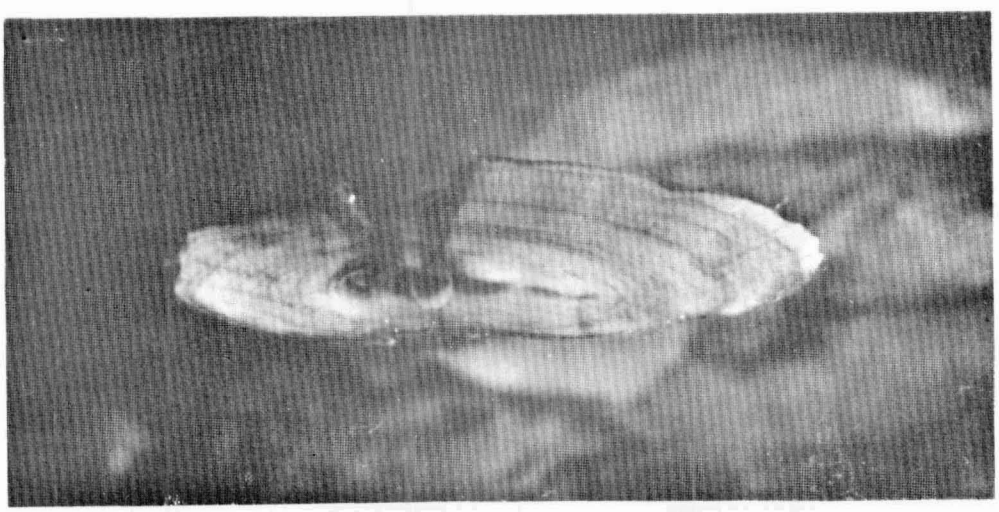

Plate 1 Photographs of horse mackerel otoliths.
A - 3 growth zones; B - 4 growth zones;
C - 5 growth zones.