

ANNUAL MEETING - JUNE 1964Report on the otolith photograph exchange scheme

by R. W. Blacker

After several unforeseeable delays the first set of photographs was sent out in December, 1963. This was a selection of fifteen otoliths chosen by Dr. Kohler and Dr. Messtorff as being representative of the Gulf of St. Lawrence cod (Subarea 4). All of these have now been returned. In March the second set illustrating West Greenland cod otoliths was sent out (twenty-nine pictures, Subarea 1), and many of these have already been returned.

First series: Gulf of St. Lawrence cod (Subarea 4T-4V)

The returns are detailed in Table 1. The problem of these otoliths is the interpretation of the central conglomeration of hyaline and opaque rings, of which there may be up to six or seven pairs. There is general agreement about the growth zones outside this mass, allowing for the doubts caused by the absence of the date of capture from the distributed forms. Table 1 apparently shows that there are two main groups of answers, which differ by only one year. The difference, unfortunately, is not caused by the consistent omission or addition of a single zone. The annotated photographs show that the same ages have been reached by counting different hyaline zones. For example, there are eight different interpretations of P15; three of these, used by seven readers, give the age as 5, while another three versions, used by six readers, give the age as 6. The number of different interpretations of each otolith is given in the right-hand column of Table 1, which may well be the most significant column in the Table.

Figures 1 to 15 show the otoliths with markings on all the hyaline zones which were counted as annual rings. The solid black bars indicate zones, the validity of which cannot be reasonably doubted. Only in one or two instances were any of these omitted. The hyaline zones marked '0' were interpreted as true annual zones by some readers and as checks by others. One of the main causes of disagreement is the placing of the first winter zone. Accepting the majority view of what constitutes the first true hyaline zone, the writer's assessment of the otoliths is given in the Figure captions, with the reasons for this assessment. In each case, unless otherwise stated only the marked hyaline zones (numbered from the centre) are considered. The date of capture is taken as winter, after January 1st. It must be stressed that these are assessments only and that other interpretations may be equally valid.

The variation in opinions on these otoliths underlines the importance of Recommendation No. 21 of the 1963 Annual Meeting: "that the validation of cod otolith age-reading methods be vigorously pursued . . .". The need for Subarea 4 seems to be large-scale sampling of small fish through as much of the year as

ice conditions permit. This could give sufficient information to assist in the interpretation of the central complex rings. The problem of the validity of the wide second hyaline zone as a winter ring or a check should easily be solved in this way.

Second series: West Greenland Cod (Subarea 1D and E (ICES XV))

The otoliths for this series were selected as examples of the clearest cod otoliths found in the ICNAF area, representing 20-30% of the West Greenland stock. Apart from one or two of the photographs in which the edge is not too clear, no difficulty was anticipated in the interpretation of this set. The results so far, with one notable exception, support this contention. A few minor errors have been made by counting the current year's growth in autumn-caught fish. The exception mentioned (U. S. A.) has in almost all cases counted an imaginary ring in the nucleus, yet in only one photograph is there a suggestion of a check in the nucleus. While it is not claimed that the photography is perfect, the writer has found very few instances where even the smallest check rings visible on otoliths through the microscope have not appeared on the photographs. It is hoped that one day there will be an opportunity to demonstrate the comparability of readings from photographs and otoliths.

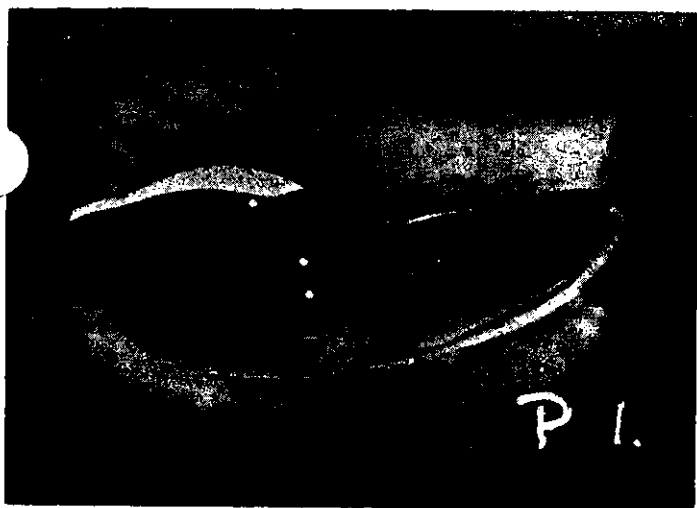
Future Exchanges

The new series will illustrate the more difficult otoliths which come from 70-80% of the West Greenland ~~cod stock~~. Material is at hand for series on the cod from all the other ICNAF subareas except Subarea 5. The aim is to send these out at about two-monthly intervals. Any suggestions or material for future exchanges will be welcomed. In due course Mr. Jensen or Dr. Kohler will be asked for examples from Subarea 5.

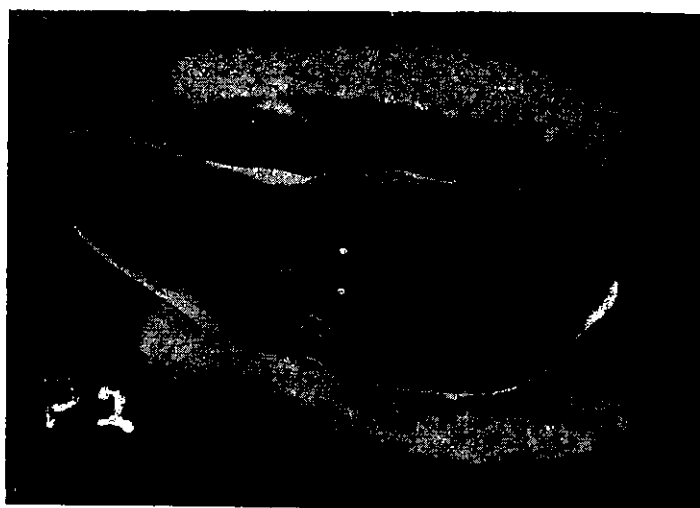
Conclusions

It is clear that, although most readers were not familiar with the problem of interpreting photographs of otoliths, sending out sets of photographs is a feasible method of rapidly obtaining opinions on age determinations. Experts from fourteen countries have given their interpretations of two sets of otoliths in four months. Not only is this probably much quicker than circulation of the otoliths themselves would have been, but the results are recorded and can easily be compared. Only comparisons like this will show the widespread differences of interpretation that exist amongst the otolith readers.

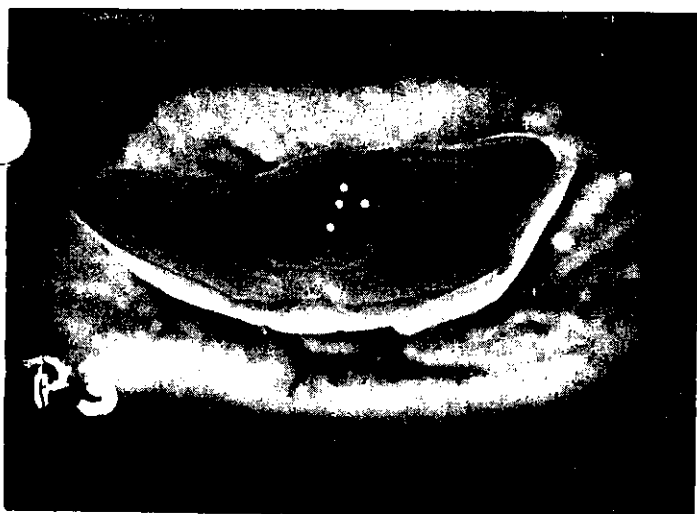
The results from these exchanges will form a valuable basis for future meetings of otolith readers. Such evidence has never been available at previous discussions, when the difficulty of deciding what zones each reader counted has seriously limited the progress made.



P1 (Figure 1). 6 yrs. The second zone is considered to be a broad hyaline one like that in P2, which was counted by everyone. This zone should therefore be counted too.



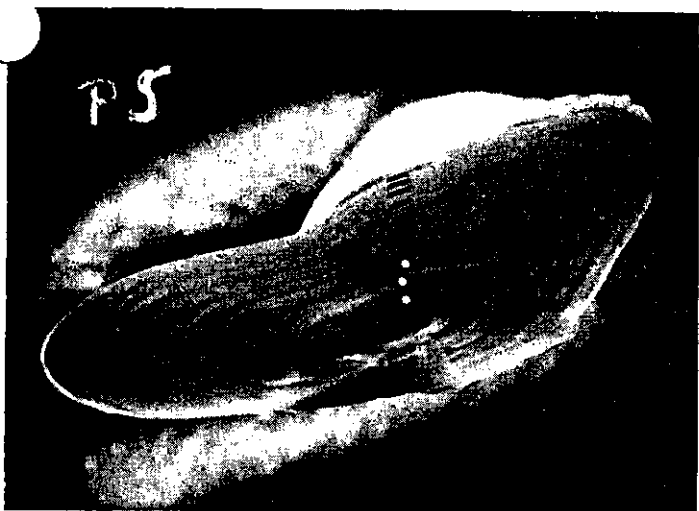
P2 (Figure 2). 8 yrs. The third hyaline is somewhat split but it is as clearly marked as the fourth zone on the long axes of the otolith. The strong double check in the fourth opaque zone was counted by no one. Similar, but weaker, checks appear in most of the outer opaque zones.



P3 (Figure 3). 6 yrs (possibly 5). The second and fourth zones are similar in structure and are considered to be separate years. The third zone (marked to the right of the others) is undoubtedly a check ring. Second, third and fourth zones could perhaps be grouped to give a broad second hyaline zone, making the age 5 years. There was little dispute that the first marked zone indicates the first winter.



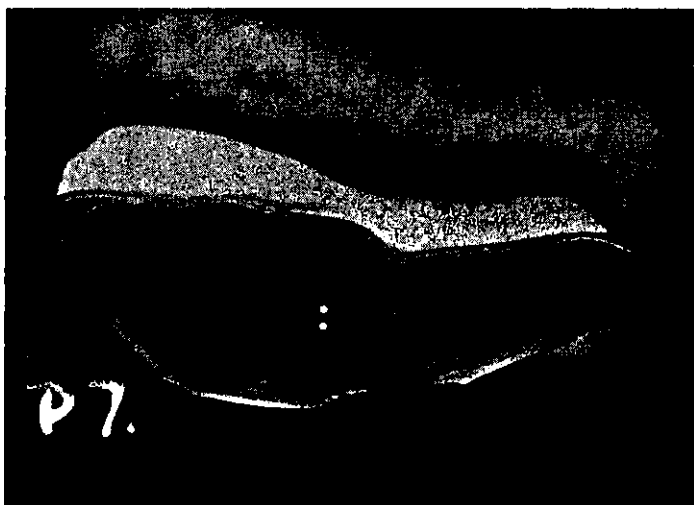
P4 (Figure 4). 7 or 5 yrs. It is impossible to sort out the central complex. The otolith itself is no clearer than the photograph. The second and third rings could constitute the edge of the nucleus. There is no reason to suppose that there is a hyaline zone under the first mark. Fourth and sixth rings are almost certainly checks.



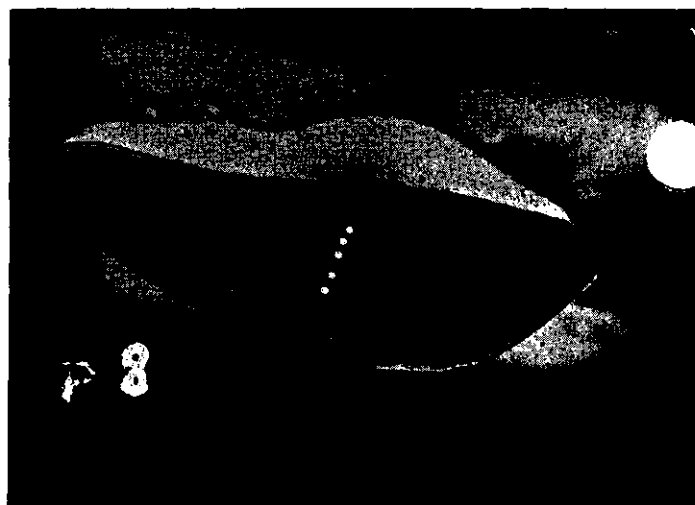
P5 (Figure 5). 9 yrs. A broad hyaline zone seems to be characteristic of some fish in this stock and there seems to be no reason why this zone should not be counted. The third zone marked is considered to be a check. Although weakly marked it bears some resemblance to the fourth zone and should perhaps be considered a true winter zone.



P6 (Figure 6). 7 yrs. Zones 2 and 3 again make up a broad second hyaline zone (this is a little clearer in the otolith itself). Fifth ring seems to be a check, although there is space between zones 4 and 6 for another winter zone. (This ring is no clearer in the otolith than in the photograph.)



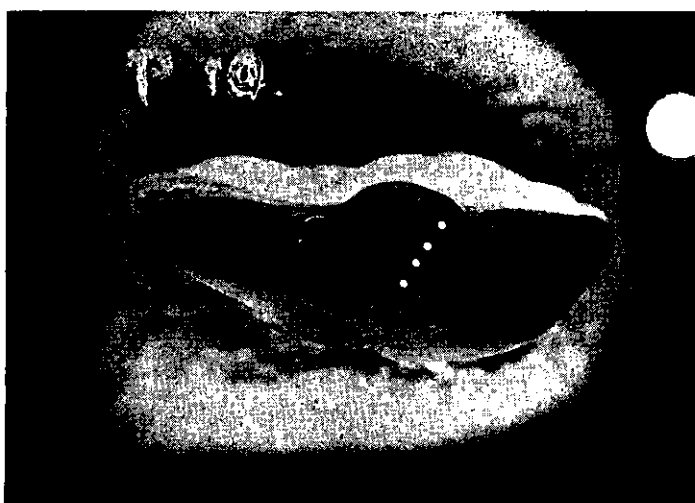
P7 (Figure 7). 4 or 6 years. The two central rings, the structure of which is so completely different from that of the outer four, may either be considered as checks in a very large nucleus, or should both be counted as year zones. There seems to be no difference between them which would indicate that one is a check and the other a true winter zone.



P8 (Figure 8). 8 yr. There is no reason why any of the marked zones, except the innermost one which was 'seen' by only one reader, should be considered to be a check. The weakening of the third zone on the right-hand side seems to be an effect of the cutting of the otolith. A good otolith.



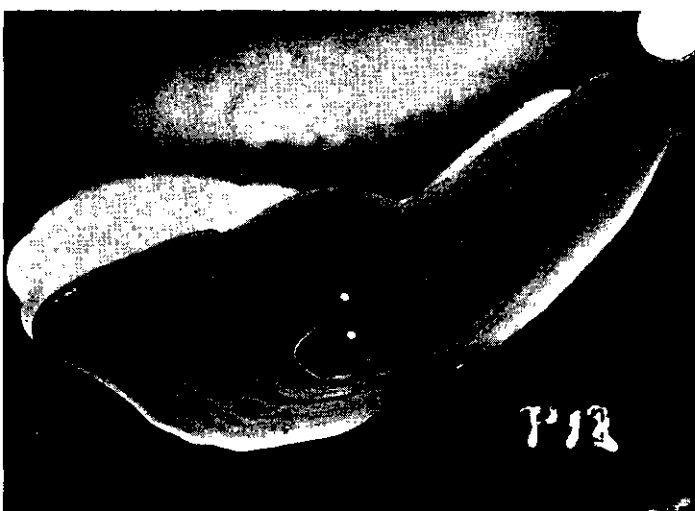
P9 (Figure 9). 4 yrs. There is no sign in the otolith itself of a nucleus inside the four rings which everyone counted.



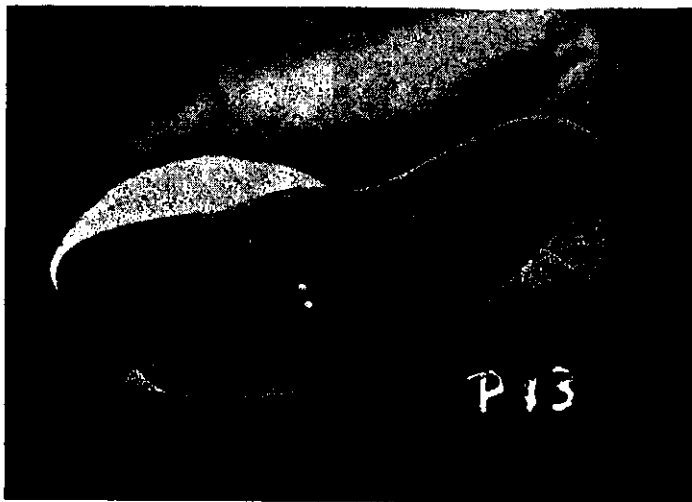
P10 (Figure 10). 5 yrs. Checks in the second, third and fourth opaque zones. The check in the fourth is well separated from the winter hyaline, whereas in the other two the check and winter rings are close together.



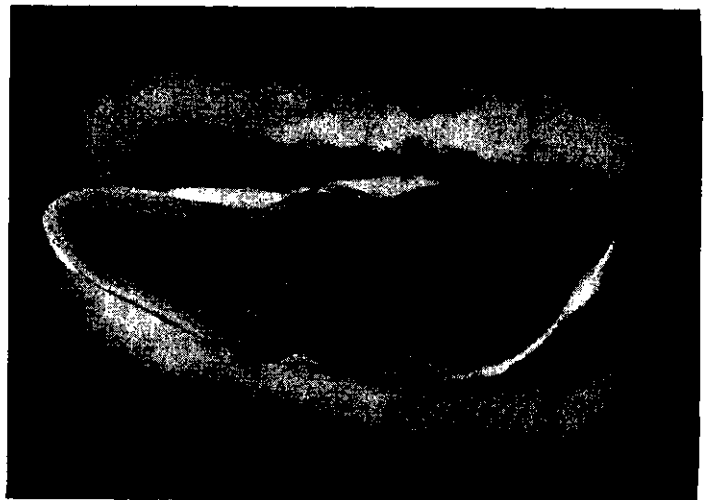
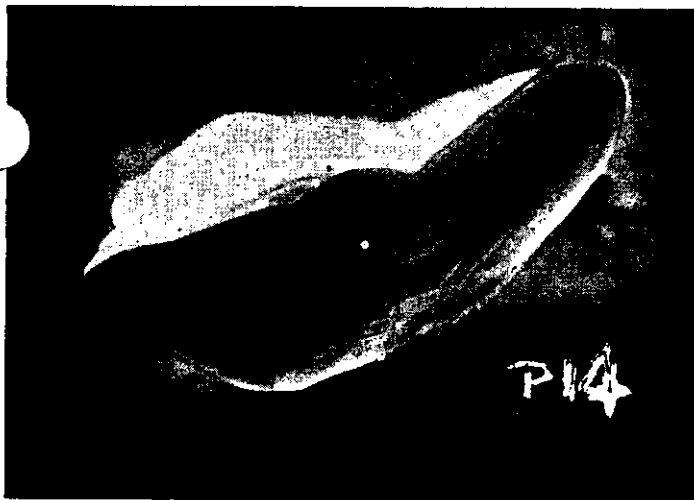
P11 (Figure 11). 8 yrs. Checks in the first two opaque zones. There seems to be no reason for counting the innermost marked ring as the first winter and not counting the second marked ring. Curiously enough, the two checks in this central complex were counted by no one.



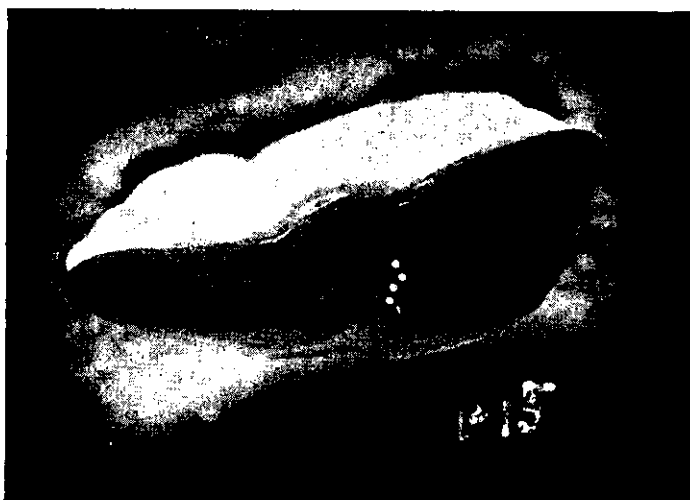
P12 (Figure 12). 7 yrs. The central ring is slightly clearer in the other half of the otolith, but the second hyaline is most probably the first winter zone. The third ring is taken as a check. The change in zone structure from the thin first zone to the wide outer zones resembles that of P7.



P13 (Figure 13). 7 yrs. Characteristic wide second winter hyaline zone again. Checks in most of the opaque zones, but a good otolith for this stock. No reason why the second zone should be considered a check.



P14 (Figures 14a and b). 7 yrs. Unfortunately, Figure 14a was sent out instead of Figure 14b in which the nucleus is clearly shown. The fourth and sixth zones from the edge are different in character from the other hyalines, but nevertheless look like good winter rings.



P15 (Figure 15). 5, 6 or 8 yrs. Four undisputed outer hyaline zones plus the two central zones: separate, giving an age of 6 yrs (most likely) or combined as a split nucleus (5 yrs). In either of these cases the next two double rings are taken as checks, but they both resemble the second and fifth zones and therefore may be valid winter zones, giving an age of 8 yrs.

Tab. 1. Summaries of Results. Series I. L...-area 4T-4V

No.	FORK LENGTH CM.	CANADA	NEWFD *	DENMARK *	FRANCE	GERMANY	ICELAND	ITALY	NORWAY *	POLAND	PORTUGAL	SPAIN	U.S.A.	U.S.-S.R. *	U.K.1	U.K.2	U.K.3	U.K.4	U.K.5	NUMBER OF INTERPRETATIONS
P 1	39	5	6	6(5)	6	5	6	6	5	6	6	6	7	6	5	5 (6)	6	5	6	4
P 2	54	7	8	8	7 OR 8	7	8	8	7 (6)	8	8	8	8	8	7	7 (8)	879	7	8	4
P 3	36	5	5	6(5)	5 OR 6	4	6	5	4	6	6	5	6	6	24	4 OR 5	6	5	6	5
P 4	34	4	5	5(6)	5 OR 6	3	4	5	24	4	435	4	72	6	3	5	25	5	677	10
P 5	53	9	9	9	9	8	9	9	7	8 (9)	9	8	9	9	8	8 (9)	1029	8	10	7
P 6	42	6	7	8(7)	7	6	7	7	5	7	7	6	7	7	6(25)	6 (9)	92	6	9	5
P 7	47	5	6(5)	6	5,6 OR 7	5	6	6	5+	6	625	6	6	5	4	5 (6)	6	5	6	4
P 8	47	6	8	8	8	8	8	8	6	8 (9)	8	8	9	8	7	7 (5)	8	8	8	7
P 9	36	4	4(5)	5	4 OR 5	4	4	5	4	4	4	4	5	4	4(23)	4 (5)	4	4	4	2
P 10	36	5	5	6(5)	5 OR 6	4(5)	5	5	4	6	524	5	6	5	4	4 (5)	625	4	877	4
P 11	55	6 OR 7	8	8	7 OR 8	7	7	8	6-7	7	8	7	8(9)	8	7	7	8	7	8	3
P 12	62	7	7	8	7 OR 9	7	7	7-8	7	8 (9)	7	7	8	7	7	7	9	7	728	3
P 13	40	6	7	7	7	6	7	7	5-6	7	7	7	7	7	6	6	7	6	7	4
P 14	46	5	5	6	5-6	5	6	5-6	5	6	625	6	6	5	5	5	6	5	625	2
P 15	41	5	5(6)	7(6)	5,7 OR 8	5	7	6-7	5	8	2627	6	7	6	5	5	8(7)	5	8	8

* READ BY MORE THAN ONE READER