



ANNUAL MEETING - JUNE 1964

Use of Jensen's Standard Terminology and Notation for Redfish and Halibut
Otolith Age Readers

1. Because important disagreements in cod age determination occurred between different laboratories in ICNAF countries, an ICNAF Workshop on Ageing Techniques was held in Bergen, November 1962, to draw up a set of terms and symbols for use in reporting cod otolith age readings. A paper by A. C. Jensen "A Standard Terminology and Notation for Otolith Age Readers" represents the consensus of the meeting (Redbook 1963, Pt. III, p. 127-134).

2. At the 1963 Meeting of Research and Statistics it was agreed that Jensen's standard terminology "be referred to redfish (and halibut) experts to see if the terminology would be suitable for redfish and halibut otoliths as well as for gadoids" (Recommendation (19) from Redbook 1963, Pt. I, p. 47).

3. The following comments on the suitability of Jensen's standard terminology and notations for redfish and halibut otolith readers were received in response to the Secretariat's circular letter of 7 November, 1963:

- (a) "The original manuscript was circulated to otolith experts and reviewed (with comments) by 10 biologists in ICNAF in 1960. Thus the paper ... included evaluations by persons engaged in reading cod, haddock, redfish, herring and halibut otoliths."

A. C. Jensen
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- (b) "A. Otolith Marks

The terms 'zones' to 'hyaline edge' are definitions which can apply to redfish otoliths and one might as well use them as any other synonyms. I am not, however, so happy about 'spawning zones'.

1. This definition appears to put forward a usage of the word zone which conflicts with the previously defined usage.

i. e. for a 'spawner' fish - A spawning zone \equiv 1 hyaline zone + 1 opaque zone \equiv The growth of the otolith in a twelve month period.

2. The actual definition is contained in the first sentence of the paragraph. The latter part of the paragraph may be regarded as an amplification of the definition as it would apply to a gadoid species such as cod which has been shown to have an annual pattern of otolith growth different after maturity to that which was present before the annual spawning cycle started. For this reason I would like to see these latter qualifying sentences in brackets (as was done in the definition of 'nucleus') and the limitation of applying only to gadoids included. i. e. - line 2 --- from the onset of sexual maturity. (For gadoids, both hyaline and opaque zones of spawners are, in general, uniform ---)'.

If the above change is made the definition should be general enough to apply also to: (a) species of fish which have otoliths in which a different pattern of growth before and after maturity has not been demonstrated (no definite evidence for this has been documented for Sebastes sp.), as well as (b) species of fish in which the spawning or pre-spawning period

does not coincide with or follow closely the normal pre-maturity period of hyaline zone deposition. (Males of North American mentella-type redfish spawn - copulate - in the late summer period). In this latter case one would presumably expect the possibility of a 'spawning check' to be laid down within the 'opaque zone' of the 'spawning zone' - (This illustrates my point #1 above).

B. Type of edge growth

I would prefer to see line 4 - '--- broken for reading and often the beginning---' or delete '---and usually---axis of the otolith'. The statement as written would not often, in my opinion, apply to redfish older than about 12 years.

C. Age Notation

It might be sometimes convenient to use a + type of notation for redfish. e. g. 36(+3) for
(33) (34) (35) 36 (37) (38) (39)"

E. J. Sandeman
Fisheries Research Board
St. John's, Newfoundland

- (c) "I have reviewed Al Jensen's paper 'A standard terminology and notation for otolith age readers' and find that all of the material is in accord with what we have used in redfish age studies. I have no suggestions for change at this time. "

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- (d) "I have checked over Jensen's paper on otolith terminology and can find only two places where this would not apply for halibut:

- (1) Under the 'Otolith Marks' section, the definition of spawning zones may or may not be correct. We can't recognize spawning zones in halibut otoliths at present.
- (2) Under the 'Abbreviations and Symbols' section, first paragraph under 'Type of Edge Growth' heading, the second sentence here does not apply since we don't break halibut otoliths to read them. "

A. C. Kohler
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- (e) "I find that the terminology and notation proposed by Albert Jensen is concise and good, and I find it suitable for those fishes I have tried to read (cod, redfish, halibut, wolffish). There are only two things I like to comment on.

Spawning zones: In Jensen's example 12(4S) you know, that you find 4 spawning zones out of a total of 12 zones, but you do not know the location of these spawning zones. For cod they are most surely the last 4 zones (9-12), but this may not always be the case, especially for other fishes. I therefore propose a numbering of the spawning zones too. In the above mentioned example it would then be 12(s 9-12), but it might also have been 12 (s 8, 10-12) indicating that the fish spawned in its 8, 10, 11 and 12th year, but not in its 9th year.

Readability: My comment here is only of minor interest and could almost be deleted.

Trying to read the otoliths of redfish I find some otoliths absolutely impossible to read. I would like to call their readability 3-impossible. I am aware that Jensen places such otoliths in the category 2-poor, but in redfish I think that you get too wide a range of readability in Jensen's category 2 if you operate only with the three categories proposed by him."

Sv. Aa. Horsted
P. M. Hansen
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Charlottenslund, Denmark

(e) "As regards terminology, we find the proposed uniform set of terms and symbols quite adjusted to the specific structure of redfish and halibut otoliths - though our experience and achievements concerning ageing of these species appear to be rather small. In our opinion, the adaptation of this terminology and notation for redfish and halibut as regards the otolith exchange programme is to be defined as very useful, eliminating differences in ageing techniques.

(f) "As regards terminology, we find the proposed uniform set of terms and symbols quite adjusted to the specific structure of redfish and halibut otoliths - though our experience and achievements concerning ageing of these species appear to be rather small. In our opinion, the adaptation of this terminology and notation for redfish and halibut as regards the otolith exchange programme is to be defined as very useful, eliminating differences in ageing techniques.

I should like to add, that our research works on redfish age is based on otoliths and scales."

F. Chrzan
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(g) "Soviet specialists studied the proposals concerning the problem of unification of terms and symbols used for otolith age reading. From our point of view, the proposed system on the whole doesn't give rise to any objection and we consider it quite suitable for general application while studying the otoliths of gadoids, flounders (including halibut) and redfishes.

At the same time it seems reasonable to take as standard applied in the USSR method of fish age reading with additional sign +, if there is observed a narrow growth ring of opaque material around the edge of otolith. If hyaline annual zone is formed during the spring period, the age of fishes caught in the spring time is marked according to the number of annual hyaline zones (in case if hyaline zone on the edge of otolith is visible), or one more than number of observed hyaline annual zones (in case if large opaque zone on the edge of otolith is visible, but the formation of hyaline zone has not yet begun). Age of fish is registered as 2; 3; 5; etc.

In summer and in autumn when there is seen a narrow opaque growth ring of the last year, the age is registered as 2+, 3+, 5+; etc.

Such a manner of registration allows to determine easily the year-class to which certain specimens may be related and simultaneously to characterize the condition of otolith at the capture.

It should be noted that in order to avoid misreading at the age determination it is necessary to fix the period of conspicuous formation both of hyaline and opaque zones for each investigated population."

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- (h) "I feel that the terminology and notation suggested can be used quite effectively for reading of otoliths of Pacific halibut. However, we do not find the detail in the halibut otolith suggested for cod, especially in regard to spawning zones, and neither do we find it necessary to record the location of checks, etc.

We do not record width of edge growth, though this could easily be done. We accept a birthdate of January 1, and assess age accordingly, thus associating the individual with its particular year class. We find much variation from year to year in the timing of deposition of edge growth however.

I have two women readers, between whom and with myself and others on the staff there has been good agreement in readings. We process great volumes of otoliths annually (about 30,000 read) from samples taken from all the major halibut fishing grounds off this coast. We therefore tend to eliminate illegible otoliths from our samples unless there is some specific reason for wishing to know the precise age of an individual, such as a tag recovery, etc.

We normally make two independent readings, accepting the age of the agreements. Disagreements are read again, and if agreement is gained, that age is also accepted. More difficult otoliths are decided on the basis of a fourth examination or are marked illegible. Nevertheless, the notation suggested by Mr. Jensen is similar to our own and could be used completely."

William H. Hardman
Biologist
International Pacific Halibut
Commission