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Report of Herring Ageing Workshop<sup>4</sup>  
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by

J.J. Hunt<sup>1</sup>, L.S. Parsons<sup>2</sup>,  
J.E. Watson<sup>3</sup> and G.H. Winters<sup>2</sup>

Introduction

At the 1972 Annual Meeting of ICNAF, the St. John's Laboratory of the Fisheries Research Board of Canada reported on a program of herring otolith exchange between Member Countries involved in herring studies in the Convention Area (Parsons and Winters, MS 1972). This and previous exchanges have recorded considerable discrepancies in age- and year-class estimates among participating countries. These differences were attributed to a large degree to variation in criteria and conventions for age- and year-class designation and it was concluded that problems could not be resolved through further exchanges. The Herring Working Group then recommended that a special herring ageing workshop be held to standardize conventions and methods of reporting. A workshop was scheduled for Hamburg, Germany in early 1973 but was subsequently cancelled due to the inability of some Member Countries to participate. In lieu of this, the Chairman of the Herring Working Group rescheduled the meeting for 11-13 December at St. Andrews, N.B. where it was attended by representatives of Canada and the United States. This document reports the results of that meeting.

Results

Technique

Otoliths are used exclusively for routine age determination at the St. John's and St. Andrews Laboratories of the Fisheries Research Board of Canada and the Boothbay Harbor Laboratory of the National Marine Fisheries Service of the United States. Scales are considered inadequate for age determination because of dislodging by the fishing gear, mixing of scales from different fish, de-scaling of fish for commercial use and variability in age estimates from scales taken from different parts of the fish. No real attempts have been made to evaluate the use of other bony structures, e.g., opercula bones or fin rays, for routine ageing of herring. In view of the convenience of collection and storage of otoliths and their confirmed utility, we see no necessity of pursuing studies of alternative ageing structures further at this time.

At all three laboratories the technique of Watson (1965) for mounting and storing otoliths is used. Otoliths are moistened with 95% ethyl alcohol, and examined under a dissecting microscope in polarized reflected light at 10X to 15X. The antistrostrum-parastrostrum portion of the otolith is considered most useful for age determination. The length of the fish is generally used as a guide in estimating age and often ocular micrometers are helpful for assessing the comparative size of otoliths and their zones as an age check.

At the St. John's Biological Station otoliths are first read independently by two readers; discrepancies are re-checked by the original readers, and subsequent disagreements are resolved in consultation with a more senior reader. This method was considered most effective by all participants and an effort will be made to implement it at participating laboratories.

Separation of Spring and Autumn Spawners

The existence of separate spring- and autumn-spawning stocks within the same area poses problems for age determination and year-class assignment. Parsons and Hodder (1971) and Messieh and Tibbo (1971)

Participants are listed in alphabetical order.

<sup>1</sup> Fisheries Research Board of Canada, Biological Station, St. Andrews, N.B.

<sup>2</sup> Fisheries Research Board of Canada, Biological Station, St. John's, Nfld.

<sup>3</sup> National Marine Fisheries Service, Biological Station, Boothbay Harbor, Maine.

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have demonstrated that the vast majority of autumn spawners are the progeny of herring which spawn in the autumn, and spring spawners of herring which spawn in the spring. The available evidence indicates that the amount of interchange between the two spawning groups is probably slight.

Various methods including otolith nuclei, ratio of  $L_1/L_2$ , otolith morphometry and meristics have been proposed for classifying individual fish to their respective groups. Although most of these physical characteristics reveal group differences, the extent of overlap between spawning groups is such that none of these characters by themselves can be considered for classification of individual fish as spring- or autumn-spawned. For immature fish, however, discrimination is based mainly on the composite physical characteristics of the otolith combined with meristic data. For adult fish maturation stage in relation to season of capture provides the most practical means of classification.

#### Conventions

To resolve existing discrepancies among Member Countries the following conventions are recommended:

- (1) That the generally accepted 1 January birthday for fishes of the Northwest Atlantic be adopted for herring.
- (2) The term age-group should be used instead of age because it is inclusive of both spring and autumn spawners. A fish is placed in age-group 0 in the year of its birth; on 1 January of the year following its birth, it enters age-group 1 and progresses to subsequent age-groups in similar fashion. We also recommend that Arabic numerals be substituted for the conventional Roman numerals for ease of tabulation; thus, age-group eight would be designated as 8-group rather than VIII-group.
- (3) Year-class designation is of main importance for stock assessment purposes and age-composition data should be reported to ICNAF on this basis.
- (4) The year-class is determined by subtracting the age-group from the year of sampling.

If opaque zones are counted, an age-group is defined as:

- (a) For spring spawners - the number of completed opaque zones prior to 1 January of the sampling year;
- (b) For autumn spawners - the number of completed opaque zones prior to 1 January of the sampling year plus one (1).

If hyaline zones are counted, the age-group is defined as:

- (a) For spring spawners - the number of completed hyaline zones prior to 1 January of the sampling year plus one (1);
- (b) For autumn spawners - the number of completed hyaline zones prior to 1 January of the sampling year including the nucleus as the first zone.

#### Conclusions

Application of the foregoing procedures will result in uniform year-class designation regardless of whether hyaline or opaque zones are counted or fish are born in spring or autumn. Their adoption will eliminate many of the discrepancies in age and year-class reporting by Member Countries. We feel that further exchanges among member laboratories to resolve differences in estimation of zone counts might be fruitful but would prove so massive and time-consuming as to be impractical; however, consultation between investigators on specific problems should be encouraged.

#### References

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