

Determination of the best otolith preparation method for aging of dab (*Limanda limanda*)

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Age determination of fish is key in fisheries biology and the management of stocks. Indeed, one of the management tools for marine biological resources is the use of stock assessments, which utilize fish length-at-age data to estimate mortality, recruitment and recommended harvest levels. Age studies can also supply other important information such as stock age structure, age at first maturity, spawning frequency, individual and stock responses to changes in the habitat, recruitment success, etc. Obviously, it is imperative to develop accurate age determination methods to be able to perform correct stock assessments. Age can be determined by different methods of which counting the growth increments formed in hard calcified tissues (such as e.g. otoliths or scales) is most commonly used. We examined and compared two different otolith preparation techniques for age determination in dab with the aim of assessing the best method for the species. The included methods were based on reading of whole (WH) and stained sections (S&S) of otoliths.

Otoliths of 296 dab from the North Sea (ICES region IVb and IVc) were collected during 2015 and analysed by two experienced readers for each method which resulted in four readings for each otolith. Readers of the otoliths were provided with metadata such as the month of capture (to assist in edge interpretation) and individual fish length at time of capture. For both methods, otoliths were read from digital images, with annual growth increments being annotated on the image using in house developed software, i.e. OtolithManager. Comparisons of the methods were made for accuracy (the proximity of the determined age to the modal age) and precision (the reproducibility of results between readers). Accuracy was evaluated by means of bias by comparing reader derived ages against the modal age. In absence of calcified structures of known age, the age readings can be compared to modal age, which is here defined as the age agreed upon between both readers for an individual structure. Precision was determined using coefficients of variation (CVs) with data calculated for each reader for both whole and sectioned otoliths. Results were also calculated for the percentage agreement to modal age.

Fish were between 1 and 9 years old and individual length was between 15 and 30,5 cm. There was no significant difference between the results of both methods ($p=0,27$). Bias for both methods was small for both readers, however it was slightly higher for the sectioned otoliths (-0,08) than for whole otoliths (-0,06) read by analyst 1. The results for coefficients of variation and percentage agreement demonstrated better results for the sectioned otoliths for both readers. A source of age determination error was the disagreement in the identification of the first annual ring as a false ring when reading whole otoliths. Based on these results, it was agreed to continue age readings of dab using the stained sections as best preparation method.

Keywords: age reading; dab; preparations methods; otoliths

Reference

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