

## Executive summary

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A Workshop on Age Reading of Atlantic mackerel (*Scomber scombrus*) otoliths were recommended by WGBIOP 2015 to be carried out in 2016-2017. Due to the difficulty of finding a chair time passed and the workshop was recommended again by WGBIOP 2017 to be carried out in 2018. This workshop (chaired by Jens Ulleweit, Germany, and Rosario Navarro, Spain), was held in San Sebastian (Spain) on 22–26 October 2018. 12 European countries took part in this workshop (Portugal, Spain, The Netherlands, Germany, Denmark, Norway, UK, Ireland, Faroe Islands, Iceland, Greenland and Greece), with a total of 23 participants from 14 laboratories. Most ICES Divisions of Northeast Atlantic mackerel distribution were analysed, as well as a bit of the Mediterranean Sea.

The workshop achieved quite a lot in terms of ironing out, through on-screen discussion of difficult and/or old otoliths and calibration, some of the differences in age interpretation between readers. Last workshop (WKARMAC 2010) ageing guidelines were revised and the modifications agreed between the participants. The participants agreed to employ the revised ageing guidelines in their age estimations.

The overall result of the workshop exercise shows an improvement in the agreement between readers (66.8% agreement, 31.4% CV), and especially Expert readers (73.2% agreement, 16.4% CV), regarding the exercise carried out before the workshop, which shows the usefulness of the on-screen discussion of difficult otoliths previous to the workshop exercise. However, the agreement between readers for otoliths with older ages (from age 6) continues to be very low (40-58% all readers; 53-71% Experts).

Both exchanges, the one previous to the workshop and the one carried out during the workshop, were performed via SmartDots, the web application developed by ICES to facilitate the setup of Exchanges, Workshops and Training. As this is a new application, for most readers this was the first time using the program but once all readers became familiar with the use of the tool it proved to be very useful. The exclusive use of images has the disadvantage that the readers find more difficult to identify the nature of the otolith edge, which in some cases, can make the age interpretation more difficult. In addition, the use of a standardized reading line for all readers in each otolith image, even though it makes the comparison between readings easier, sometimes this complicate marking the annuli on the otolith when there are better growth rings observed in another area of the otolith. However, the use of images allows a better comparison between the readers' estimations and a better identification of the problems in locating false rings, as well as to speed up the process. The use of SmartDots was especially useful for a posterior discussion on screen of the most significant otoliths during the workshop.

In addition, a Small exchange with Norwegian otoliths from tag-recaptured experiments was carried out during the workshop with the results being discussed after completion. Images of these otoliths were also discussed during the workshop, which proved to be very interesting due to the importance of these otoliths of known age.

An update of the known changes of mackerel biology was presented during the workshop, as well as a study of the seasonal formation of growth rings in mackerel otoliths from ICES Div. 8c and 9a, which showed a temporal delay in opaque-zone formation with age.

An image collection of agreed age otoliths will be found in the workshop ICES SharePoint and the Age Forum site. Such otolith collection includes the otoliths with > 80% agreement between Expert readers from the WKARMAC2 calibration exercise. In addition, the images of the otoliths from the Small exchange with Norwegian otoliths from the tag-recapture experiments will also be included in the reference otolith collection.