

## Reply to Holm *et al.* 2022, “Comment on ‘Five centuries of cod catches in eastern Canada,’ by Schijns *et al.*”

In our original contribution, we used a new simple method (CMSY, Froese *et al.*, 2017) and the time series of catches of Hutchings and Myers (1995) to analyse five centuries of cod catches in eastern Canada (Schijns *et al.*, 2021). Holm *et al.* (2022) point out that there was actually an improved historical time series that we had overlooked. As we note in our paper, it is important to use the best available data, including all withdrawals in the case of catches, in order to realize the full potential of an exploited resource.

Thus, we are in agreement with the points raised by Holm *et al.* (2022), and acknowledge that the more complete and accurate data they point out will improve the reliability of the assessment results. We welcome this opportunity to bring together interdisciplinary thinkers, such as fisheries scientists and historians. Therefore, we have agreed to collaborate on a joint paper where we will perform CMSY modelling on revised historical catch estimates to investigate what the consequences of these new catch levels are for stock and fisheries sustainability. In this effort, catches will be updated from 1500 to 1790 based on Holm *et al.* (2021), from 1815 to 1934 based on the Government of Newfoundland data (HistStats, 1970, Table K-7; Alexander, 1976), and will include new reconstructed estimates based on domestic consumption and the French exports from part of the area.

We predict that the biological parameters ( $r$  and  $k$ ) will be similar as well as the biomass trajectory, since there is no doubt that the stock was large in the past and collapsed in the present. However, Holm *et al.* (2022) raise valid concerns that the stock may have been subject to unsustainable fishing earlier than the current model suggests. The intent of our new analyses, to be conducted coincidentally on the 30th anniversary of the moratorium, is to improve the documentation of this iconic stock's history and population trajectory.

We take this opportunity to also point out that, very unfortunately, the lesson to be learned from the collapse of the Newfoundland cod stock 30 years ago was lost on other fisheries managers, as documented by the subsequent collapse of many other cod stocks, with the western Baltic cod being the most recent example (Froese *et al.*, 2022).

### Data availability statement

The full CMSY package developed by Froese *et al.* (2017) is available from: <https://oceanrep.geomar.de/33076/>.

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<sup>3</sup>Jeffrey A. Hutchings, co-author of Schijns *et al.* (2021), regrettably passed away in late January 2022 at 63 years of age. Jeff made major contributions to the understanding of northern cod biology and history through assembling the original catch reconstruction upon which our study was based, pioneering work that led to the integration of depensation into stock assessment models, and being one of the scientists who voiced early concerns pertaining to the mismanagement of the collapsing cod stock in the early 1990s.

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### References

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