

Comment on “Five centuries of cod catches in eastern Canada,” by Schijns *et al.*

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Schijns *et al.* use a historical time series to inform a stock assessment model for the northern Atlantic cod (*Gadus morhua*) fishery from 1508 to 2019. They find that catches from the sixteenth century to the 1950s did not exceed 200 000 t per annum and could have been sustained today “if fishing effort and mortality had been stabilized in the 1980s”. Had Schijns *et al.* used a more complete and representative time series (as identified below), they would have found that catches were substantially higher during much of the time period, possibly affecting their conclusions regarding the timing and onset of unsustainable exploitation. In an earlier paper, based on original archival documentation, we have argued that total landings in the Newfoundland fishery averaged 400 000 t in the eighteenth century and peaked at 600 000 t in 1788. We contend that pre-industrial technology was sufficient to have a significant impact on marine life.

The historical data

The main source for the historical data is Hutchings and Myers (1995), hereafter referred to as H&M. The supplementary material for Schijns *et al.* is taken almost verbatim from this book chapter. H&M—and therefore also Schijns *et al.*—use French data from de La Villemarqué (1991) for the period from 1508 to 1792. H&M explain that catches from other countries were estimated by approximating the French share of the total catch. For example, the 1551–1600 estimate is based on a single letter by Parkhurst (1578), who fished off Newfoundland between 1575 and 1578. He noted that the fisheries took place from Labrador to Arcadia and “therefore the certaintie [of how many vessels] is not known”. However, he guesses that the English fleet consisted of 50 vessels, the Spanish 100, the Portuguese 50, and the French 150. Based on these figures, H&M estimate the French catch made up 43% of the total every year from 1551 to 1600. For example, in 1597 de La Villemarqué (1991) estimated the French catch was 94 t, H&M added 125 t (57% more) for a total catch in that year of 219 t. There are several issues with this methodology.

First, H&M assume that de La Villemarqué’s (1991) data were complete. However, de La Villemarqué (1995) published an updated version of the French data that included significantly revised figures (sometimes by hundreds of %) from 1508 to 1792 and extended the series to 1950. For instance, de La Villemarqué adjusted her figure for 1564 from 4610 to 9126 t, and for 1597 from 94 to 940 t. Schijns *et al.* make no reference to the 1995 corrected data. Second, de La Villemarqué’s data are not restricted to Divisions 2J3KL but include landings from all around Newfoundland and the Grand Banks. Third, even if we trust Parkhurst, his estimates are not relevant to the years before and after 1578. In a letter of 1577, he estimated the English fleet had grown from 4 to 40 vessels in the past 5 years (Parkhurst, 1577, p. 5). Schijns *et al.* might have used the excellent work undertaken by

Pope (1995, 2003) in identifying and numerating the Newfoundland English port landings from 1675 to 1790. His work stands the test of time, although many port landing records are either not available, missing, or may not have been recorded at all. Additionally, S.H. Barkham (1977, 1987) and M. Barkham (1990) argued that Parkhurst’s Spanish figures are hugely exaggerated, and Barros (2015) proposes the same of the Portuguese figure. The figures were probably in the dozens rather than the hundreds. We also know that Spanish vessels were largely eliminated from the fishery after the demise of the Spanish armada in 1588. The French were clearly the dominant force in the fishery. The precise percentage share assumed by H&M and, in turn, by Schijns *et al.* is therefore misleading.

The geographical delimitation of the fishery

Schijns *et al.* define the northern cod fishery as catches made in Northwest Atlantic Fisheries Organization (NAFO)-delineated Divisions 2J3KL. Unfortunately, de La Villemarqué’s (1991) data from 1991 do not provide enough spatial detail to distinguish catches between divisions. Ultimately, the precise locations of all historical catches in Newfoundland are uncertain, and likely impossible to determine with such accuracy. Schijns *et al.* recognize the geographical imprecision of the historical data but claim that “most of the cod harvested in Newfoundland waters since the early 1500s” occurred in Divisions 2J3KL (Schijns *et al.*, 2021, supplementary material, p. 1). There is no evidence for this claim. De La Villemarqué (1995)—which is not used by Schijns *et al.*—provided more geographical information, and showed that many landings were made in areas far from 2J3KL, such as St Pierre et Miquelon in Division 3Ps on the south coast of Newfoundland.

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From 1804 to 1850, Schijns *et al.* employ what they state are “unpublished data” from Henry Lear. However, Lear did publish his data on the Newfoundland fisheries (Lear, 1998, p. 56), and stated that his data relate to “inshore catches” only in the NAFO Divisions 2GH3KL, i.e. the full stretch from Labrador to Cape Pine (Lear does not refer to 2J which may just be an omission). It is unclear if H&M hypothesized a percentage share of the records to represent the Divisions 2J3KL. Schijns *et al.* acknowledge in their supplementary material that Lear’s data may “underestimate actual catches” because they are based on export records alone, but they do not report that his figures are related only to inshore catches.

From 1850 to 1950, H&M derive their data from Harris (1990, p. 26), who acknowledges that his data were based on a “superficial examination” and referred to total Newfoundland catches. Harris (and H&M) inferred a share for the 2J3KL divisions back to 1850, based on recorded catches between 1953 and 1961. The data only included Canadian (other than Newfoundland) fishery data from 1873, French data from 1874, Portuguese data from 1896, and Spanish data from 1951. Before these years, H&M did not attempt to fill in the gaps.

Omissions

H&M did not consider alternative evidence, such as the figures for Newfoundland salt cod exports reported by the Government of Newfoundland, covering years 1815–1934 (Hist-Stats, 1970, Table K-7; Alexander, 1976; Morse 2001). These data represent traded goods, and consequently will have been liable to customs inspection. When converted to live weight using the standard conversion factor of 4.7 (Pope, 1995; Nicholls *et al.*, 2021), we find that export figures exceed the catches reported by Harris (1990) and thus by H&M. Total landings would be higher if we allowed for domestic consumption and the French exports from 3K.

Schijns *et al.* (2021) do not consider the improvements in data for the Newfoundland and Grand Banks fisheries, which have been made since H&M published their compilation. The History of Marine Animal Populations (HMAP) project provided extensive data on the English fishery. HMAP dataset 6, compiled by Peter Pope, covers 1675–1698 (Pope, 2003), while dataset 5, composed by Michael Haines (2004), covers 1698–1833. These datasets were widely reported and made available online, free-to-use, and downloadable from different repositories including HYDRA (<https://hydra.hull.ac.uk/>) and the Oceans Past Initiative (https://oceanspast.org/hmap_d_b.php) as well as the Ocean Biodiversity Information System (<https://obis.org>). Schijns *et al.* did not use or refer to these datasets in their work, nor did they provide justification for their exclusion. Pope and Hutchings published papers on the Newfoundland fishery in the same conference proceedings in 1995 (Hutchings, 1995; Pope, 1995). At that time, Pope questioned the H&M data, writing that their findings “seriously unreported” catches and asserted that real catches were far higher (Pope, 1995, pp. 25–26). In his chapter, Hutchings conceded that his own estimates “may have been considerably under-estimated” and referenced Pope’s work (Hutchings, 1995, p. 46).

Recently, we improved estimates of extractions in the North Atlantic fisheries from 1500 to 1790. In January 2021, we published an improved data series of historical English and French catches of Atlantic cod 1675–1790 around the coast

of Newfoundland (Nicholls *et al.*, 2021). We addressed many of the issues raised by Pope in 1995 and later. We significantly corrected de La Villemarqué’s data by research in French notarial archives that provide evidence of individual annual voyages rather than piecemeal qualitative estimates in contemporary correspondence. Raw information from the archives was further combined with gap-filling methods to produce a more realistic picture of the English and French fisheries. Finally, in August 2021, we published datasets for the Spanish/Basque, Portuguese, French, and English northwest Atlantic fisheries of Atlantic cod from 1520 to 1790 (Holm *et al.*, 2021a). The full details on the sources can be found in our supplementary material (Holm *et al.*, 2021b). While this last paper came too late to be used by Schijns *et al.* (as their paper was submitted on 19 May 2021), they could have found the previous open-access publications, certainly the works by Pope (2003) and Haines (2004).

Conclusion

Based on the H&M data, Schijns *et al.* (2021) present a trajectory of the fishery in Divisions 2J3KL characterized by low intensity, extreme variability, and sustainability until the early twentieth century. In contrast, data published since H&M document that the fishery around all of Newfoundland had already built up rapidly by the mid-sixteenth century, and stabilized at around 150000 t through the next 200 years. After 1740, landings increased again to 400000 t, reaching 600000 t in the 1780s. The implication is that the scientific community’s perception of what is or was sustainable for this fishery, as a minimum, needs to be reassessed, given the actual historical data. The premodern fisheries technology of the Newfoundland fishery was highly effective and fishing effort was intensive.

The paper by Schijns *et al.* (2021) is a reminder of the need for closer work between marine scientists and historians. Did extractions significantly impact the marine ecosystems around Newfoundland? Perhaps. Were these levels of extraction sustainable? Perhaps. We suggest that revised modelling based on more complete and accurate data is needed to investigate what the consequences of these new catch levels were for stock and fisheries sustainability. No model is better than the data informing it.

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