Final Report: Finfish Stock Assessment Team – Atlantic Mackerel, May 2018
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The Model Conference for the US Atlantic mackerel stock assessment (NAFO Subareas 3-6) was held in the Clark meeting room at the NEFSC during August 15 - 17, 2017 (https://www.nefsc.noaa.gov/saw/saw-wg/mackerel/). The assessment includes information from Canadian and US waters. The meeting was chaired by Gary Shepherd from the NEFSC. All members of the assessment WG (Kiersten Curti, Jason Didden, Thomas Doniol-Valcroze, Martin Castonguay, Elisabeth Van Beveren, Charles Adams, Dave Richardson, John Manderson, J. -J. Maguire and David Secor as lead for the MAFMC SSC) participated, Jason Didden and Thomas Doniol-Valcroze doing so remotely.

The previous mackerel assessment in Transboundary Resources Assessment Committee (TRAC 2010) was not accepted as a basis for management mostly because of severe retrospective pattern. As a result, the 2017 assessment is not a simple update of the previous assessment and new data and or modelling approaches have been considered.

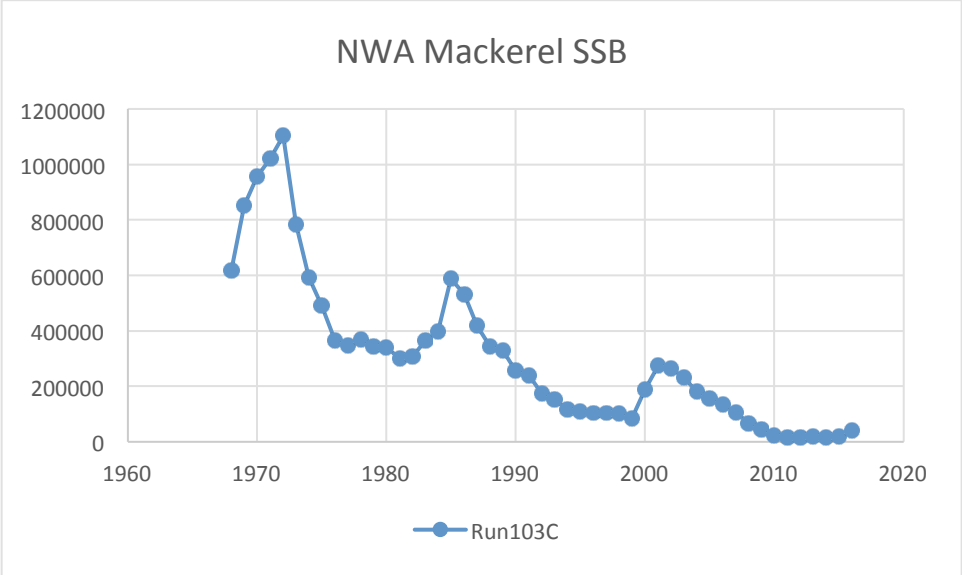
Three assessment approaches were used i) ASAP (http://nft.nefsc.noaa.gov/ASAP.html) an approach used in several of the NEFSC stock assessments, SAM (https://www.stockassessment.org/login.php) an approach used in several ICES (http://www.ices.dk/Pages/default.aspx) stock assessments, and a Censored Catch approach (Cadigan 2015 - http://www.nrcresearchpress.com/doi/abs/10.1139/cjfas-2015-0047), similar in many respect to SAM used in for the 2017 Canadian assessment of Atlantic mackerel in Canadian waters (NAFO Subareas 3+4). The 2017 Canadian assessment did not include information from US waters. Both SAM and the Censored Catch approach make it possible to estimate missing deaths, but in slightly different ways.

Mackerel in the Northwest Atlantic has two main spawning locations, one off the Mid Atlantic in late Spring and a second one in the Gulf of St. Lawrence in June-July. These two biological units are not considered two separate stocks as they overlap in overwintering concentrations off the Mid – Atlantic Bight and individuals seem to be able to move from one population to the other. The two biological units are called "contingents" to account for the greater fluidity in being in one or the other spawning location. Conventional knowledge is that individual born in the northern contingent overwinter on the Scotian Shelf in their first year, but may join the migration south to off the Mid-Atlantic Bight in various proportion at age 2 and the majority of individuals are expected to migrate south by age 3 onwards.

Consistent with the data model in May 2017, the three assessment approaches used similar data and assumptions: i) catch at age, weights at age and maturity at ages for 1968 – 2016 as the basic input data, ii) the Canadian and USA egg surveys translated into SSB estimates as an index of SSB, and iii) the NEFSC Spring bottom trawl survey numbers per tow. The SAM approach used ages 1-10, while the ASAP and Catch Censored approaches used ages 3-10. Ages 1 and 2 were not included because they are believed to

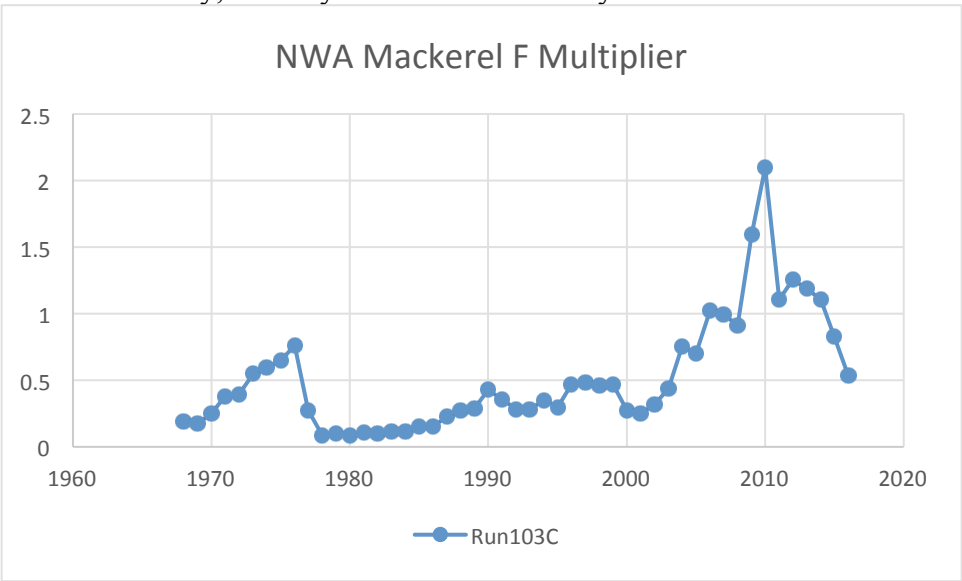
be mostly from the southern contingent with few or variable proportion of the northern contingent.

The three modelling approaches produced very similar results in SSB, recruitment and fishing mortality. ASAP was used as the base case with the other modelling approaches used as confirmatory evidence. The ASAP base case shows SSB peaking above 1 million tonnes in 1972, declining to 250 000t in 1981 and generally declining subsequently to less than 50 000t in 2016. There are two smaller intermediate peaks, the first one in 1985 (380 000t) as a result of the strong 1982 year-class and 2001 (260 000t) as a result of the strong 1999 year-class.

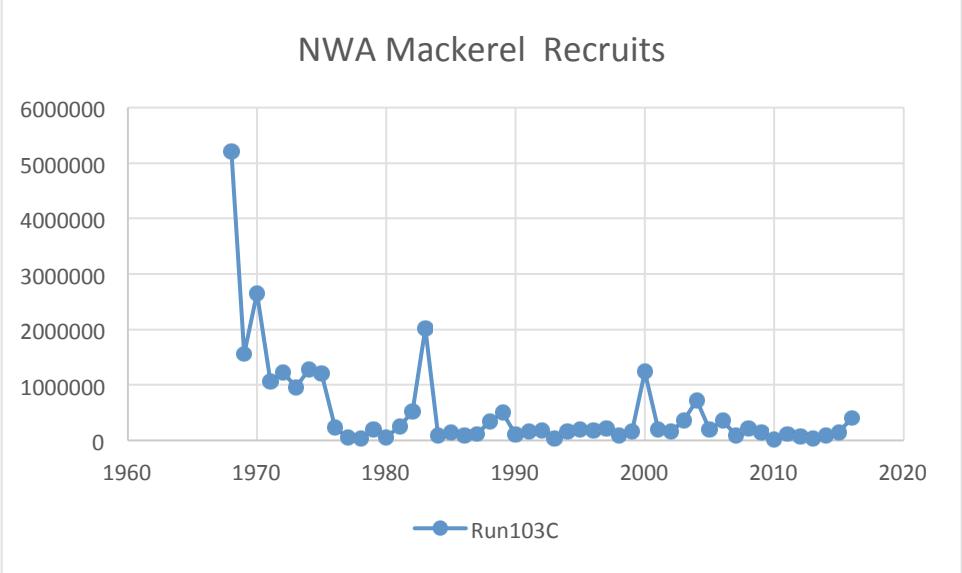


Fishing mortality was initially low at less than 0.20 in 1968, increased steadily to 0.76 in 1976 followed by a steep decrease with the implementation of 200 mi zones by Canada and the USA. Fishing mortality subsequently increased by steps to about 0.50 in the late 1990s. The subsequent very high values are difficult to explain, may reflect an increase in

natural mortality, but may also reflect relatively small catches on a small stock.



Recruitment was high in the late 1960s early 1970s. The 1982 year-class was of a similar strength, with the 1999 year-class being smaller. Other year-classes were very small.



Several sensitivity analyses were conducted excluding indices or including other ages. They differed in details, e.g. F in 2016 at 0.33 instead of 0.54 when excluding the egg stock size index, but the overall patterns of very low SSB, relatively high Fs and poor recruitment remain basically the same. All runs indicate that the stock is overfished and that overfishing is occurring.

The assessment summary report can be found at https://repository.library.noaa.gov/view/noaa/17247 , the full assessment report is not yet available (2018/11/20), but the web site says it is coming soon (https://www.nefsc.noaa.gov/publications/crd/crd1806/). The reports of the panelists can be found at https://www.nefsc.noaa.gov/saw/saw64/saw-64-panelist-reports.html