In 2017, an error in the catch numbers reported in Canadian sport fisheries was identified. There were periods where catch sampling did not occur, but the fishery was confirmed as open and voluntary CWT recoveries were returned. In the absence of sampling, DFO reported no catch in these periods. Using the new iREC system (<http://dfo-mpo.gc.ca/videos/survey-recreation-sondage-eng.html>), DFO has updated catch estimates for 2012 catch years onward, but years prior to 2012 had a recorded catch of zero. There was a need to develop catch estimates for these periods to use in FRAM to properly account for northern impacts.

Two methods to impute missing Canadian catches for FRAM post-season validation runs (unofficial catches for SUS domestic management) were proposed to Fisheries and Oceans Canada (DFO) by the SMAWG:

1. **Fill in missing catch periods according to monthly proportions of the annual catch (of the above Excel File/Tab; see cells B42:AW95).** The idea for the first method was simplistic – it was to use iREC data to get an estimate of how much catch each month contributed to the annual catch on average in 2013 through 2018.  Using the average percentage of annual catch in each month, when there were months of missing data, it was presumed that the amount missing relative to the total catch recorded was represented by the average percentage of annual catch in that month. For example, if March was the only month missing and March represents 3% of the annual catch on average, and if the total catch for the other 11 months of the year recorded was 97 fish, then we estimated that there were 3 fish that were unaccounted for in March. There are a few strengths with this method – it uses the iREC data directly, it accounts for differences in annual abundance (if annual catch is high or low relative to other years, so will the catch from missing months be high or low), and it is not dependent on mark rates. There are also a few weaknesses, with the main one being that it assumes the monthly catch proportions have not shifted and that those in 2013-2018 are representative of earlier years. There are many reasons why this may not be true, including shifts in stock distributions, stock-abundances across years, and regulation changes. With that said, looking at earlier years where complete annual data (1985-1989) were available versus the more recent iREC years (2013-2018), the averages in the October-April period did not differ substantially (summed = 5.6% annual catch versus 7.9%; see cells B189:R208 if interested).
2. **Use the rates of voluntary return from the iREC period to expand the voluntary returns during time periods of missing catch (see cells B98:AS151).** The second method was designed to use actual data (recoveries) from periods of missing catch in conjunction with catch:voluntary return ratios from the iREC period to estimate periods of missing catch.  For example, if the average (2013-18) number of Chinook caught per voluntary return was 100 in January and there were 2 voluntary returns in January 2005 (but a catch estimate of 0), then the estimated catch for January 2005 would be 200.

DFO recommended to use Method 1 due to a higher confidence in its major assumption, that the monthly pattern of catch for the 2013-18 period is similar to that for earlier years (and the comparison with the earliest years does seem to support this). According to DFO, for method 2 to work, the assumptions of similar submission rates and mark rates, seem difficult to support. Submission rates have been reduced by Mass Marking (MM) induced increases in mark rates (exhaustion, misunderstanding of the need for similar submission rates), and possibly by the cancellation of prizes for head submissions circa 2010.   
  
Files associated with imputing Canadian Catches:

Primary calculations file: 2020-06-19 BC\_Data\_Request\_With\_pre-2012.xlsx

Record of Recommendation by DFO, including additional calculation details and discussion: Re BC Data Request – Update.msg