**Purpose:** This function is used to estimate the mean CPUE and the variance around the CPUE. A jackknife estimator is calculated for each year’s CPUE data using the method of Smith (1980 – CJFAS). The ‘err’ option has been removed from this function and a real se with CI’s has been added.

**Version Control:** Surely multiple versions around but should be very similar.

**Librarys**:

**Function Arguments Summary**

1. **data**: CPUE to calculate, CPUE by month/bank/nafo, Default is "Month". Options are
   * “month": Calculate CPUE by month, area or nafo region
   * "obs": Caluculate CPUE for Observer trips only
   * "both": Calculate both the Observer trips and CPUE by month.

**Section 1**

This function is essentially a for loop which repeatedly recalculates the mean of our data with a new value excluded each time we move through the loop. There has been some confusion about the *err = ‘se’* vs *err= ‘sd’* options so we have removed them. For completeness here is how the se and sd options were related:

1. Both options actually calculate a variance not the standardized measure.
2. The ‘sd’ option calculates the raw variance of the jackknife estimator.
   1. We would rarely (if ever) really want use this or it’s standard deviation in a plot, the standard error is what we would plot
   2. To convert to the standard deviation
   3. To convert to the standard error
3. The ‘se’ option calculates the unbiased variance estimator from Smith 1980. In maths this is

but remember the raw variance of a data set is just the sum of squares divided by n-1

notice the only difference between (1) and (2) is the n in the denominator, so the Smith 1980 variance estimator in simple terms is just the variance (the exact same thing as is calculated in point 2 above)

if we take the square root of *var(SE)* we get….

So in short we can easily move between (1) and (3) the sd and se, it is rather important that you know which you are calculating and what you are using it for. Using the “se” option leads more naturally to finding the actual ‘se’ (just take square root) and this is generally what you would use in a graphic or model as it is our estimate of the precision of the mean.

**Function Index**

data.frame

for

function

if

mean

na.omit

print

rep

return

sum

tapply

with

**Reference:**

Smith, S.J. 1980 Comparison of Two Methods of Estimating the Variance of the Estimate of Catch Per Unit Effort. CJFAS 37: 2346:2351.