Previous investigation of combining estimators

- It is theoretically straightforward to combine two estimators of the same parameter, to produce a better one
- Let $\hat{t}_1$ and $\hat{t}_2$ denote two estimators of same parameter (e.g., Red Snapper catch from MRIP and State program). Then theory shows that

$$\hat{t} = \mathrm{w}\hat{t}_1 + (1 - w)\hat{t}_2$$

where $w = \frac{V(\hat{t}_2)}{V(\hat{t}_1)+V(\hat{t}_2)}$ is the "best" (minimum variance) estimator of the common parameter when:

(a) $\hat{t}_1$ and $\hat{t}_2$ are unbiased and (b) $\hat{t}_1$ and $\hat{t}_2$ are independent

But…

- Neither of these are true
  - A variety of biases affect both estimators
    - we have pretty good evidence since confidence intervals for the estimators don’t overlap in many cases
    - we don’t know their relative magnitude
  - The estimators are not independent because (for most states) MRIP intercept data will be used
- Also, the variances aren’t known, but estimated