Expressing Scientific Uncertainty in PFMC Groundfish Stock Assessments

Two Key Assertions

• Data-poor assessments cannot be more certain than data-rich assessments

• Variation “among” stock assessments captures a wide variety of sources of uncertainty, including:
  – Data used (e.g., NWFSC combined trawl survey)
  – Model software (e.g., SS1 vs. SS3)
  – Model specification (dome-shaped or asymptotic)
  – Parameter priors (e.g., Dorn prior on $h$)
  – STAT team composition
  – STAR panel composition
Repeats of the bocaccio stock assessment

thanks to John Field
Repeats of the widow rockfish assessment

thanks to Xi He
Sometimes biomass metrics change from one assessment to the next.
Standardize using ratio estimator

- SO1997_hat

- SO2000Model

- Ratio estimated line of equality
Form ratios of all possible permutations of biomass estimates in a year.

\[ R_{3,1} = \frac{B_3}{B_1} \]

\[ R_{2,1} = \frac{B_2}{B_1} \]

Assume green is accurate and reds are biased low.
Form ratios of all possible permutations of biomass estimates in a year

Biomass

Year

B1

R1,2 = B1/B2

B2

R3,2 = B3/B2

B3

assume green is accurate and reds are biased low & high
There are six different permutations of ratios for three observations of biomass in a year.

\[ R_{1,3} = \frac{B_1}{B_3} \]

\[ R_{2,3} = \frac{B_2}{B_3} \]

- Assume green is accurate and reds are biased high.

\[ B_1, B_2, B_3 \]
In general the number of permutations of \( n \) objects taken \( r \) at a time is:

\[
\text{Permutations} = \frac{n!}{(n-r)!} = \frac{n!}{(n-2)!}
\]
Widow Rockfish

$n = 1,092$
Widow rockfish – normal fit to log-transformed data

\[ m = 0.000 \]

\[ s = 0.311 \]

\[ \mu = 0.00 \]

\[ \sigma = 0.31 \]
Bocaccio

Ratio of Biomass Values

Frequency

$n = 1,168$
Bocaccio – normal fit to log-transformed data

\[ \mu = 0.00 \]

\[ \sigma = 0.49 \]
Combine stocks – normal fit to log-transformed data

$\mu = 0.00$

$\sigma = 0.38$
Create a Lookup Table

$$\mu = 0.00$$
$$\sigma = 0.38$$