Metamodeling for Bias Estimation of Biological Reference Points Under Two-Parameter SRRs

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Outline

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Many Thanks:

- Dr. Marc Mangel
- Collaborators at NOAA
- NMFS Sea Grant

Metamodel Details

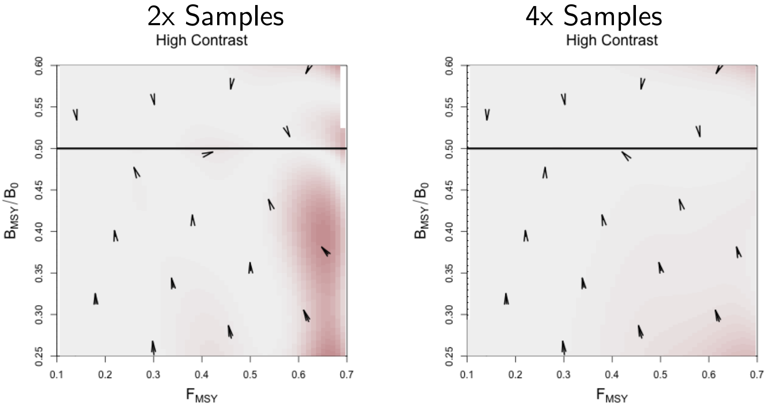
$$\hat{\mu} = \widehat{log(r)} \quad -or- \quad \hat{\mu} = \widehat{log(K)}$$

$$\boldsymbol{x} = \left(F_{MSY}, \frac{B_{MSY}}{\bar{B}(0)}\right)$$

$$\hat{\mu} = \beta_0 + \boldsymbol{\beta}'\boldsymbol{x} + f(\boldsymbol{x}) + \epsilon$$
$$f(\boldsymbol{x}) \sim \text{GP}(0, \tau^2 R(\boldsymbol{x}, \boldsymbol{x}'))$$
$$\epsilon_i \sim \text{N}(0, \hat{\omega}_i).$$

$$R(\boldsymbol{x}, \boldsymbol{x}') = \exp\left(\sum_{j=1}^{2} \frac{-(x_j - x_j')^2}{2\ell_j^2}\right)$$

High Contrast PT $\sigma = 0.12$ Data



Contrast	No Contrast

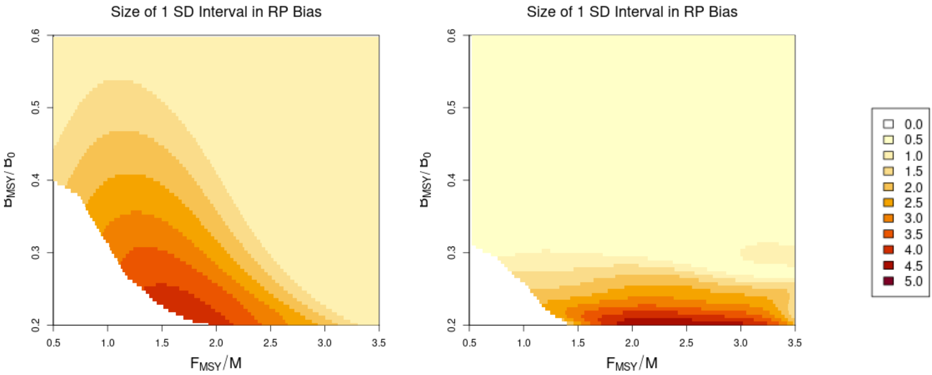
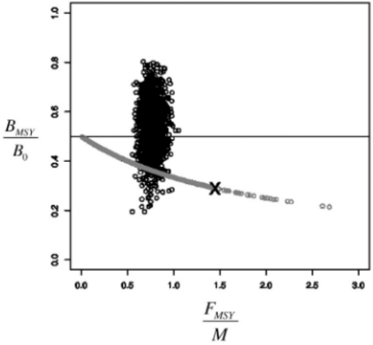
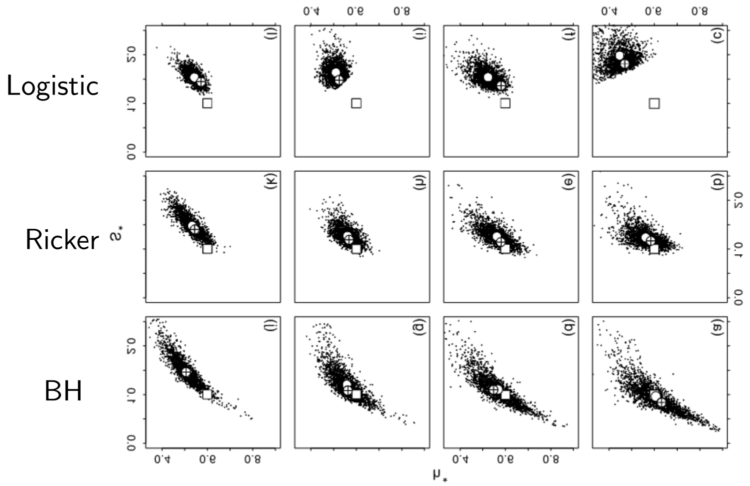


Fig. 4. DeYoreo et al. (2012) used both a BH-SRR and three-parameter SRR, similar to the S-SRR in a stock assessment of cowcod (*Sebastes levis*). We show samples from posterior distributions arising from different values of steepness. Unlike most stock assessments, we plot B_{MSY}/B_0 versus F_{MSY}/M. The grey circles show the results for the BH-SRR. This curve is another way of representing the constraint placed on a stock assessment by using a BH-SRR and specifying steepness — results must lie along this curve. The black circles represent the outcome of the three-parameter SRR. The black X represents the result when steepness is asserted to be 0.6.





Schnute, J. T., & Kronlund, A. R. (2002). Estimating salmon stock recruitment relationships from catch and escapement data. Canadian Journal of Fisheries and Aquatic Sciences, 59(3), 433–449.