# Objectives

1. To estimate the length at maturity (L50) of Black and Yelloweye Rockfish in (list strata) such that our estimate is within 10% of the true value with .90 probability.
2. To estimate the age at maturity (A50) of Black and Yelloweye Rockfish in (list strata) such that our estimate is within 10% of the true value with .90 probability.

**Sample Size – Length and Age at Maturity (Objectives 1 and 2)**

To determine the sample sizes required to meet our objectives, we will conduct a series of simulations using the results obtained by Hannah et al. (2009). \* Citation format. The simulation consists of the following steps:

1. For a given sample size, simulate lengths (ages) from a uniform distribution.
2. Using parameter estimates from the logistic regression performed in Hannah et al., simulate maturity status.
3. Employing the same technique described the Data Analysis section, create a credible interval for L50 (A50).
4. Record the width of the interval in terms of percent of estimate.

The above procedure will be performed 1000 times, and the maximum percent width recorded will serve as a reasonable upper bound on the possible width of credible intervals obtained using that sample size.

After performing the above procedure for both lengths and ages, we can conclude that a sample size of 80 rockfish per species and area will satisfy our precision criteria.

**Data Analysis – Length and Age at Maturity (Objectives 1 and 2)**

The final maturity values from histological examination of Black and Yelloweye Rockfish will be used to estimate the probability of maturity as a function of length (age). We will perform a Bayesian analysis to obtain estimates and credible intervals for L50 and A50. Maturity status will be modeled as a Bernoulli(*p*) random variable where:

(6)

We will use weakly informative Normal(0, 100) priors for both . Draws from the posterior distribution of will be obtained using Program R (R Core Team 2017) and the rjags package (Martyn Plummer 2016). After obtaining draws for , draws from the posterior distribution of L50 (A50) will be calculated as:

(7)

A 90% central credible interval will be calculated from the posterior distribution. The median of the posterior distribution will be used as our estimate. The model will be fit once using length as the explanatory variable and once using age, resulting in unique estimates and credible intervals for L50 and A50.

Martyn Plummer (2016). rjags: Bayesian Graphical Models using MCMC. R package version 4-6. <https://CRAN.R-project.org/package=rjags>

R Core Team. 2017. R: A language and environment for statistical computing. R Foundation for

Statistical Computing, Vienna, Austria. URL https://www.R-project.org/.