

## Figures

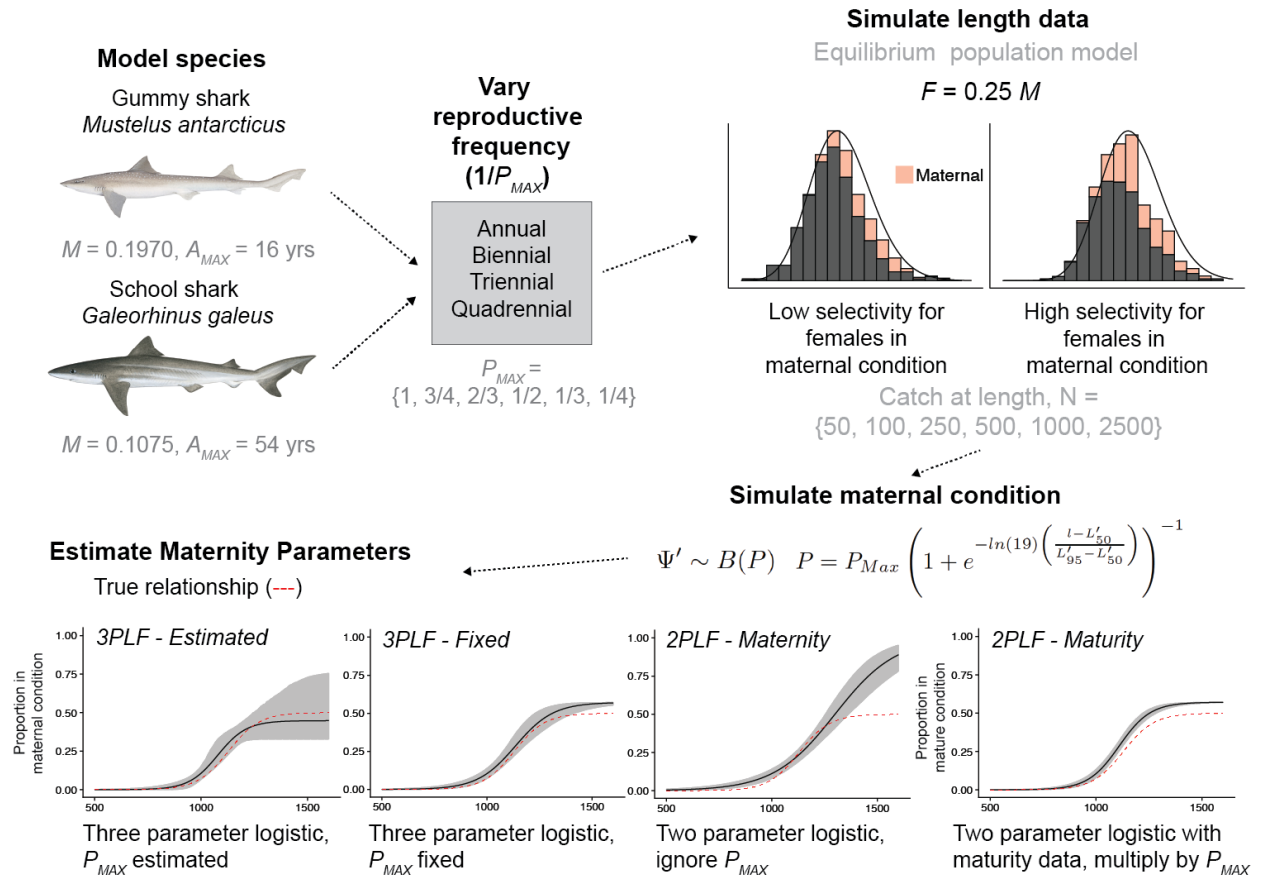


Figure 1. Approach used to generate simulated data and test the performance of four methods for calculating maternity parameters. Illustrations © R.Swainston/www.anima.net.au

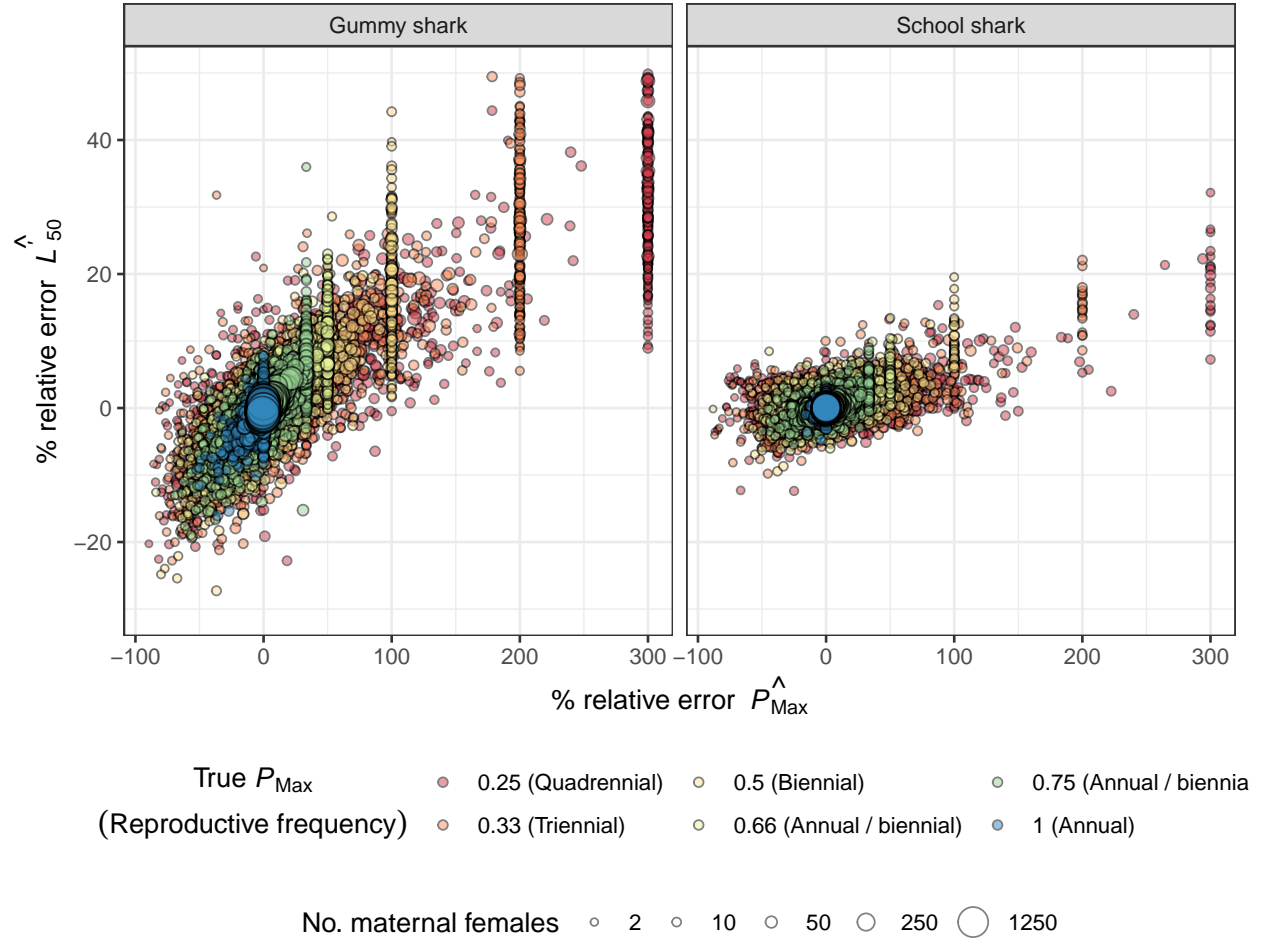


Figure 2. Bias (per cent relative error) in parameter estimates for  $L_{50}^{\hat{}}$  and  $P_{Max}^{\hat{}}$  for the 3PLF maternity function with  $P_{Max}$  estimated. Each point represents parameter estimates from one iteration of simulated data ( $n = 43,129$ ), including all combinations of variables. Simulations with longer reproductive cycles and fewer maternal females were associated with higher bias in both parameters  $L_{50}^{\hat{}}$  and  $P_{Max}^{\hat{}}$ . Note: 42 data points were cropped to aid with data visualization (see Figure S12 for uncropped figure).

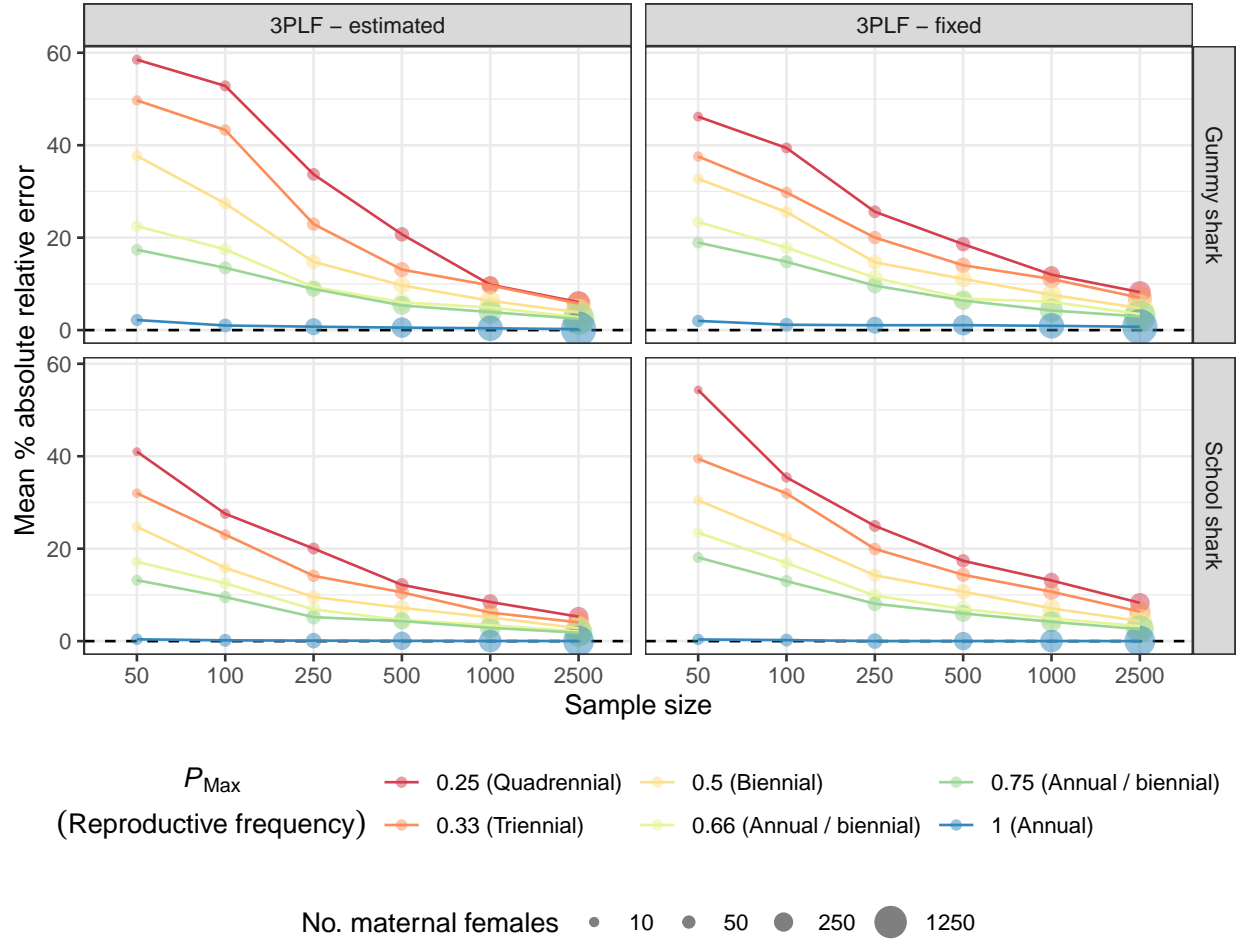


Figure 3. Accuracy (per cent absolute error) in parameter estimates of  $P_{Max}$  for 3PLF methods. Large sample sizes were needed to accurately estimate  $P_{Max}$  and accuracy decreased as the duration of the reproductive cycle increased. Each point reflects a mean value from 300 simulated data sets.

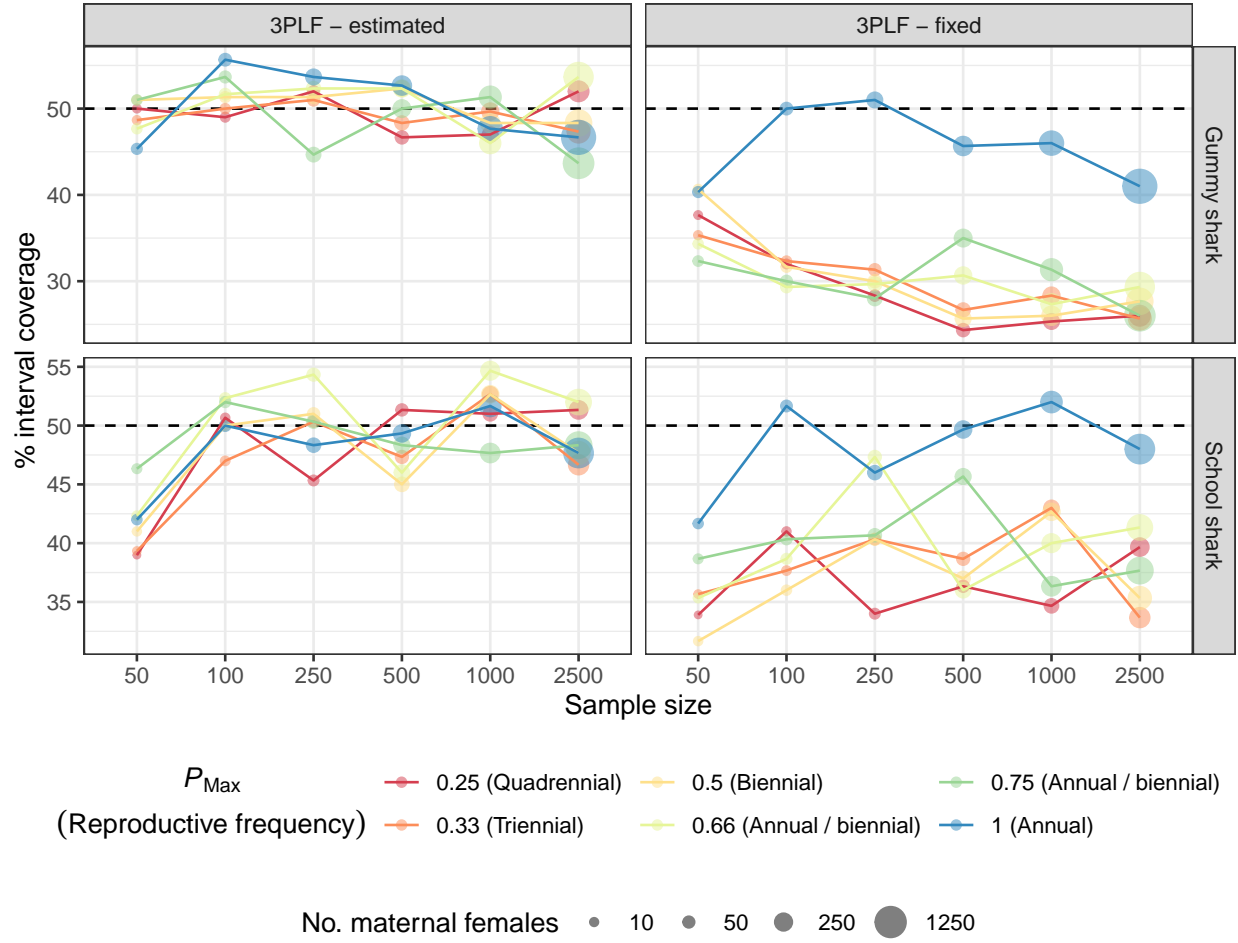


Figure 4. Confidence interval coverage for  $\hat{L}_{50}$  for 3PLF methods (high selectivity scenarios). Figure shows the percentage of simulations ( $n = 300$ ) where the true parameter value fell within the 50% bootstrap confidence interval.

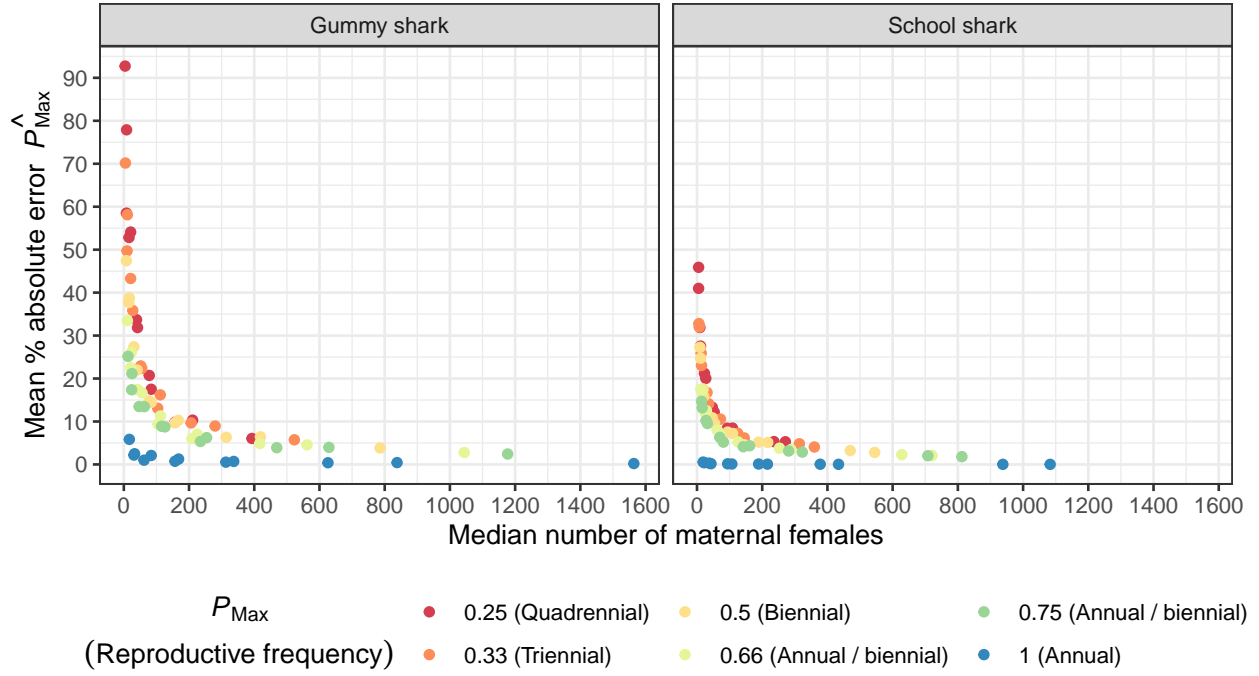


Figure 5. Accuracy (per cent absolute error) in parameter estimates of  $\hat{P}_{Max}$  for the 3PLF - estimated method as a function of number of maternal females. Each point reflects a value from 300 simulated data sets.

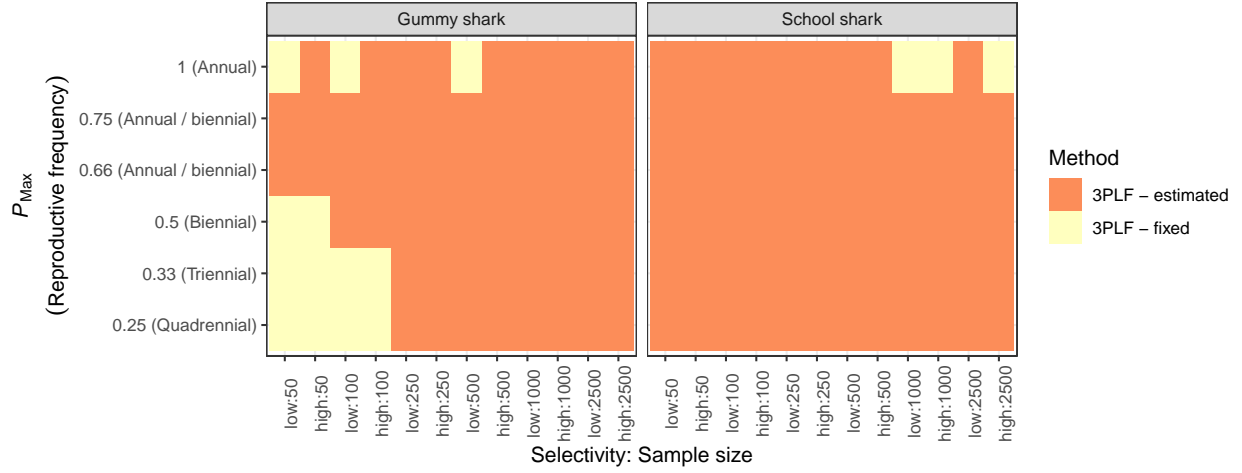


Figure 6. Performance of four alternative maternity functions in accurately calculating  $R_0$ . The best performing method was that which minimised mean absolute error across 300 simulated datasets. Note 2PLF-maternity (Annual) scenarios were excluded for this comparison.

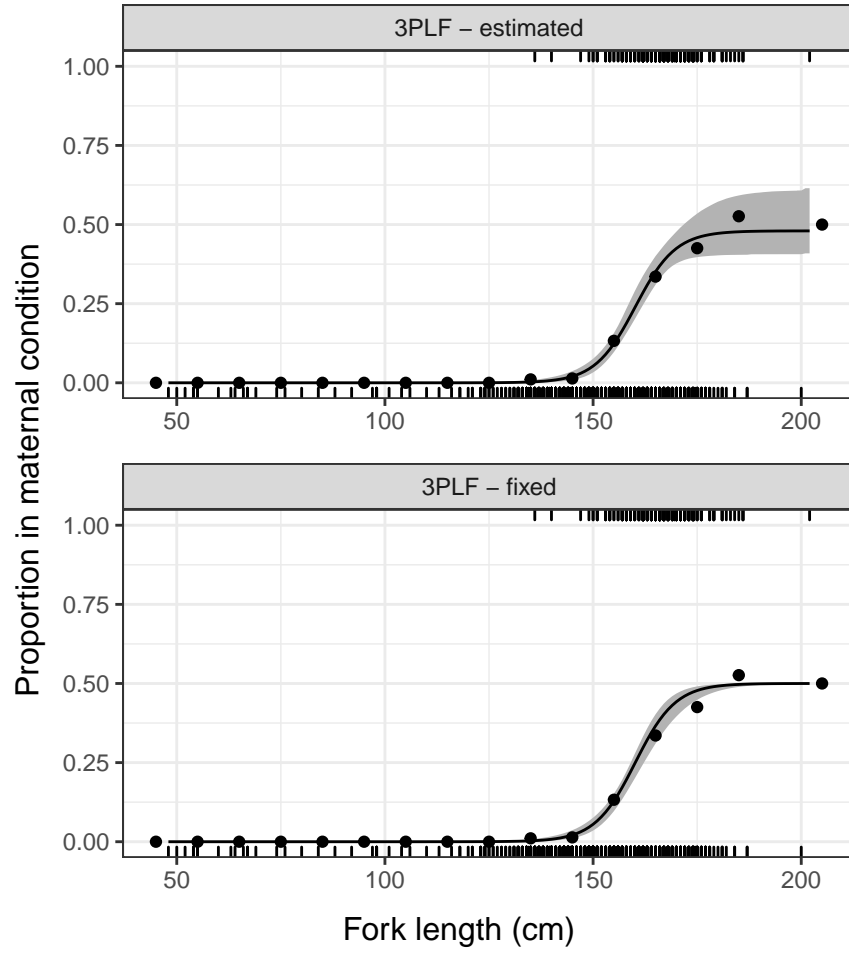


Figure 7. Comparison of 3PLF-estimated and 3PLF-fixed methods used to estimate maternal parameters for sandbar shark, *C. plumbeus*, in the Gulf of Mexico and Western North Atlantic. Solid line is the expected proportion in maternal condition at length,  $\Psi'(L)$ . The grey shaded region denotes 95% confidence intervals based on bootstrap resampling. Black points show proportion in maternal condition in 10cm length intervals. Marginal rug plots denote raw data that models were fit to.  $P_{Max}$  was fixed at 0.5 in the lower panel.