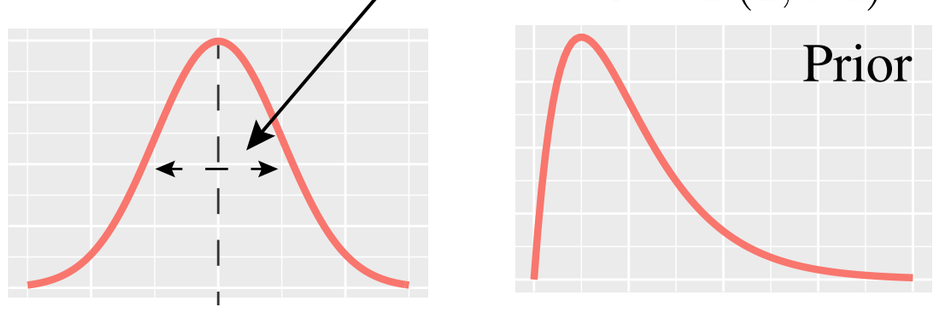
Likelihood

$$\chi_i \sim \mathcal{N}(\underbrace{\mu_i(t_i, m_i, j_i)}, \underbrace{\sigma})$$



$$\mu_i(t_i, m_i, j_i) = \frac{\phi_{[m_i,j_i]}\kappa_{e[m_i,j_i]}\kappa_{a[m_i,j_i]}\left(e^{-\kappa_{e[m_i,j_i]}t_i} - e^{\kappa_{a[m_i,j_i]}t_i}\right)}{\kappa_{a[m_i,j_i]} - \kappa_{e[m_i,j_i]}}$$

χ_i [Data, observation]

t_i [Data, time (days)]

m_i [Data, treatment (1 = ambient, 2 = warmed)]

j_i [Data, pond (1:8)]

μ_i [Deterministic process]

σ [Model standard deviation]

Transformed parameters

$$\kappa_{a[m,j]} = \exp(\overline{\ln\kappa_{a[m]}} + \ln\Delta\kappa_{a[m,j]})$$

$$\kappa_{e[m,j]} = 1/(1 + \exp(-(\overline{\kappa'_{e[m]}} + \Delta\kappa'_{e[m,j]})))$$

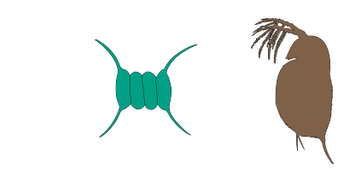
$$\overline{\kappa_{e[m]}} = 1/(1 + \exp(-(\overline{\kappa'_{e[m]}})))$$

$$\overline{\ln\phi_{[m]}} = \ln((1/\overline{\kappa_{e[m]}})/(1 + \exp(-\overline{\phi'_{[m]}})))$$

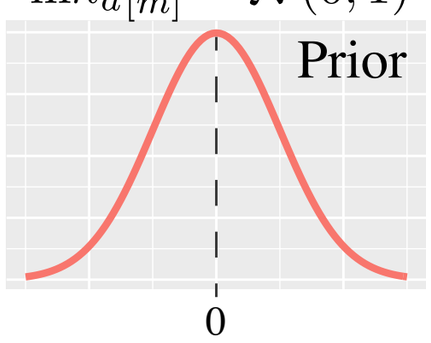
$$\phi_{[m,j]} = \exp(\overline{\ln\phi_{[m]}} + \Delta\ln\phi_{[m,j]})$$

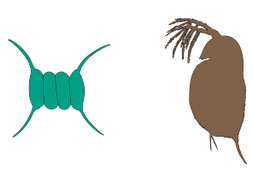
$$\phi_{[m,j]} = (1/\kappa_{e[m,j]})/(1 + \exp(-(\overline{\phi'_{[m]}} + \Delta\phi'_{[m,j]})))$$

Parameter priors

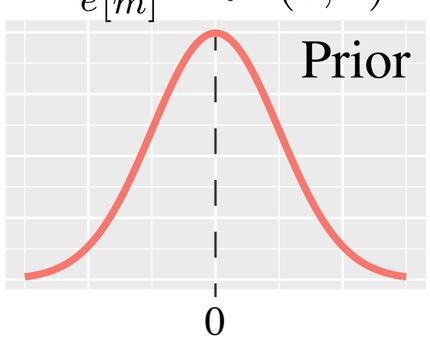


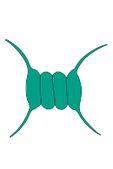
$\overline{\ln\kappa_{a[m]}} \sim \mathcal{N}(0, 1)$



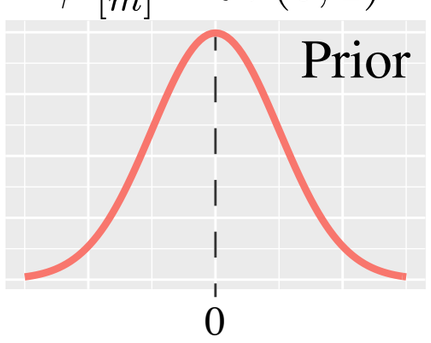


$\overline{\kappa'_{e[m]}} \sim \mathcal{N}(0, 1)$

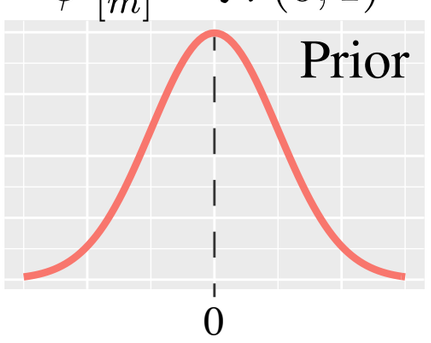




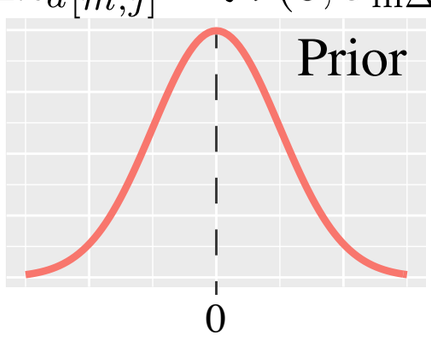
$\overline{\phi'_{[m]}} \sim \mathcal{N}(0, 1)$



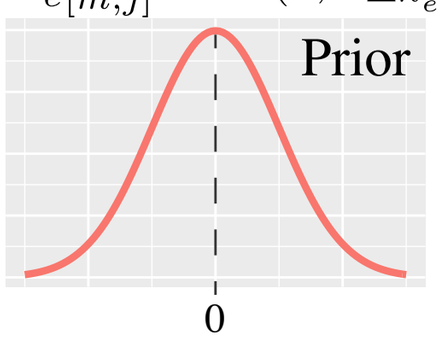
$\overline{\phi'_{[m]}} \sim \mathcal{N}(0, 1)$



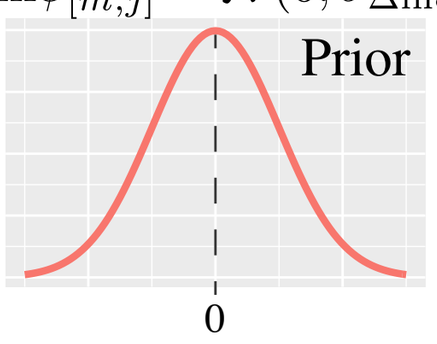
$\ln\Delta\kappa_{a[m,j]} \sim \mathcal{N}(0, \sigma_{\ln\Delta\kappa_a})$



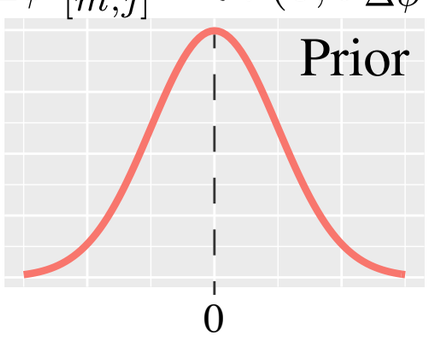
$\Delta\kappa'_{e[m,j]} \sim \mathcal{N}(0, \sigma_{\Delta\kappa'_e})$



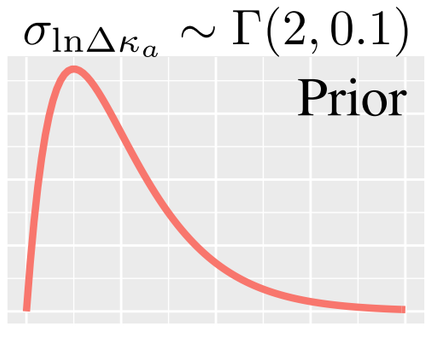
$\Delta\ln\phi_{[m,j]} \sim \mathcal{N}(0, \sigma_{\Delta\ln\phi})$



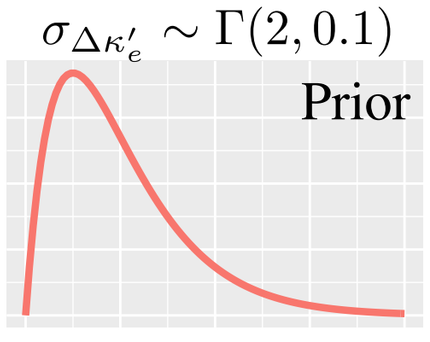
$\Delta\phi'_{[m,j]} \sim \mathcal{N}(0, \sigma_{\Delta\phi'})$



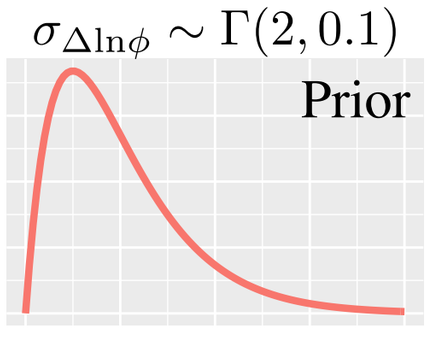
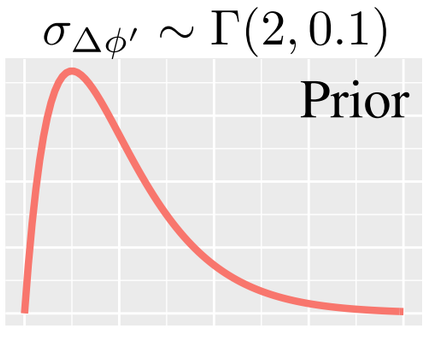
$\sigma_{\ln\Delta\kappa_a} \sim \Gamma(2, 0.1)$



$\sigma_{\Delta\kappa'_e} \sim \Gamma(2, 0.1)$



$\sigma_{\Delta\ln\phi} \sim \Gamma(2, 0.1)$



$\sigma_{\Delta\phi'} \sim \Gamma(2, 0.1)$