Supplementary Document: MCMC Diagnostics

A Bayesian Capture-Recapture model of vector-reservoir interaction in an ecological setting: a reservoir-targeted vaccine field study against Borrelia burgdorferi

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MCMC Diagnostics. We computed the Monte-Carlo Standard Error (MCSE), which is a measure of the precision of the posterior distribution obtained from a MCMC algorithm. The purpose of MCSE is to provide a measure of the accuracy of the estimate of the posterior distribution, which is the distribution of the parameters of interest after taking into account the data and prior information. MCSE is calculated by estimating the standard deviation of the MCMC samples of the posterior distribution, which provides a measure of the variability in the posterior estimates due to the Monte Carlo sampling process. This value is then divided by the square root of the effective sample size (ESS), which is the number of independent samples that the MCMC algorithm generates.

Year 2020.

Parameter	MCSE
alpha.adult	0.0057
alpha.behavior	0.0346
alpha.male	0.0033
alpha.site[1]	0.0055
alpha.site[2]	0.0063
alpha.site[3]	0.0059
alpha.site[4]	0.0058
alpha.site[5]	0.0068
alpha.site[6]	0.0068
alpha.subadult	0.0223
beta.site[1]	0.0247
beta.site[2]	0.0245
beta.site[3]	0.0247
beta.site[4]	0.0237
beta.site[5]	0.0249
beta.site[6]	0.0240
lambda[1]	0.0315
lambda[2]	0.0184
lambda[3]	0.0374
lambda[4]	0.0285
lambda[5]	0.0260
lambda[6]	0.0141
p.adult	0.0012
p.male	0.0012
p.subadult	0.0055
psi	0.0141

sigma2.site.encounter	0.0124
sigma2.site.member	0.0169
siteprob[1]	0.0013
siteprob[2]	0.0010
siteprob[3]	0.0012
siteprob[4]	0.0010
siteprob[5]	0.0011
siteprob[6]	0.0011
delta[1]	0.0041
delta[2]	0.0048
delta[3]	0.0037
delta.site[1]	0.0396
delta.site[2]	0.0368
delta.site[3]	0.0500
delta.site[4]	0.0266
delta.site[5]	0.0400
delta.site[6]	0.0362
lambda.site[1]	0.0280
lambda.site[2]	0.0228
lambda.site[3]	0.0444
lambda.site[4]	0.0306
lambda.site[5]	0.0367
lambda.site[6]	0.0235
omega[1]	0.0012
omega[2]	0.0012
omega.site[1]	0.0110
omega.site[2]	0.0078
omega.site[3]	0.0084
omega.site[4]	0.0088
omega.site[5]	0.0088
omega.site[6]	0.0081
rho.dragged	0.0090
rho.ticks	0.0018
sigma2.ExpDraggedTicks	0.0140
sigma2.ExpTicks	0.0005
sigma2.site.dragged.ticks	0.0450
sigma2.site.infected.dragged.ticks	0.0129
sigma2.site.infected.mice	0.0155
sigma2.site.protectiveOspA	0.0441
sigma2.subj.infected.mice	0.0202
sigma2.subj.infticks.drag	0.0492
sigma2.subj.infticks.mice	0.0298
sigma2.subj.protected.mice	0.0186
theta.site[1]	0.0047
theta.site[2]	0.0311
theta.site[3]	0.0112
theta.site[4]	0.0232
theta.site[5]	0.0120
theta.site[6]	0.0080

Year 2021.

Parameter	MCSE
alpha.adult	0.0034
alpha.behavior	0.0183
alpha.male	0.0031
alpha.site[1]	0.0041
alpha.site[2]	0.0041
alpha.site[3]	0.0034
alpha.site[4]	0.0039
alpha.site[5]	0.0040
alpha.site[6]	0.0039
alpha.subadult	0.0158
beta.site[1]	0.0245
beta.site[2]	0.0251
beta.site[3]	0.0245
beta.site[4]	0.0256
beta.site[5]	0.0251
beta.site[6]	0.0255
lambda[1]	0.0238
lambda[2]	0.0258
lambda[3]	0.0161
lambda[4]	0.0657
lambda[5]	0.0165
lambda[6]	0.0390
p.adult	0.0008
p.male	0.0007
p.subadult	0.0046
psi	0.0061
sigma2.site.encounter	0.0077
sigma2.site.member	0.0109
siteprob[1]	0.0006
siteprob[2]	0.0006
siteprob[3]	0.0005
siteprob[4]	0.0012
siteprob[5]	0.0006
siteprob[6]	0.0010
delta[1]	0.0052
delta[2]	0.0045
delta[3]	0.0027
delta.site[1]	0.0378
delta.site[2]	0.0356
delta.site[3]	0.0385
delta.site[4]	0.0281
delta.site[5]	0.0341
delta.site[6]	0.0349
lambda.site[1]	0.0292
lambda.site[2]	0.0275
lambda.site[3]	0.0295
lambda.site[4]	0.0251

lambda.site[5]	0.0288
lambda.site[6]	0.0361
omega[1]	0.0012
omega[2]	0.0013
omega.site[1]	0.0112
omega.site[2]	0.0100
omega.site[3]	0.0088
omega.site[4]	0.0124
omega.site[5]	0.0085
omega.site[6]	0.0098
rho.dragged	0.0106
rho.ticks	0.0021
sigma2.ExpDraggedTicks	0.0055
sigma2.ExpTicks	0.0009
sigma2.site.dragged.ticks	0.0207
sigma2.site.infected.dragged.ticks	0.0112
sigma2.site.infected.mice	0.0159
sigma2.site.protectiveOspA	0.0312
sigma2.subj.infected.mice	0.0201
sigma2.subj.infticks.drag	0.0574
sigma2.subj.infticks.mice	0.0209
sigma2.subj.protected.mice	0.0238
theta.site[1]	0.0157
theta.site[2]	0.0070
theta.site[3]	0.0104
theta.site[4]	0.0054
theta.site[5]	0.0099
theta.site[6]	0.0063

Year 2022.

Parameter	MCSE
alpha.adult	0.0062
alpha.behavior	0.0076
alpha.male	0.0025
alpha.site[1]	0.0064
alpha.site[2]	0.0062
alpha.site[3]	0.0047
alpha.site[4]	0.0062
alpha.site[5]	0.0050
alpha.site[6]	0.0059
alpha.subadult	0.0096
beta.site[1]	0.0131
beta.site[2]	0.0127
beta.site[3]	0.0126
beta.site[4]	0.0131
beta.site[5]	0.0141
beta.site[6]	0.0126
lambda[1]	0.0123
lambda[2]	0.0097
lambda[3]	0.0146
lambda[4]	0.0120
lambda[5]	0.0087
lambda[6]	0.0127
p.adult	0.0003
p.male	0.0005
p.subadult	0.0004
psi	0.0004
sigma2.site.encounter	0.0089
sigma2.site.member	0.0129
siteprob[1]	0.0006
siteprob[2]	0.0004
siteprob[3]	0.0007
siteprob[4]	0.0005
siteprob[5]	0.0006
siteprob[6]	0.0005
delta[1]	0.0047
delta[2]	0.0055
delta[3]	0.0019
delta.site[1]	0.0390
delta.site[2]	0.0306
delta.site[3]	0.0448
delta.site[4]	0.0285
delta.site[5]	0.0341
delta.site[6]	0.0257
lambda.site[1]	0.0203
lambda.site[2]	0.0351
lambda.site[3]	0.0215
lambda.site[4]	0.0654

lambda.site[5]	0.0466
lambda.site[6]	0.0276
omega[1]	0.0012
omega[2]	0.0013
omega.site[1]	0.0058
omega.site[2]	0.0081
omega.site[3]	0.0082
omega.site[4]	0.0089
omega.site[5]	0.0079
omega.site[6]	0.0046
rho.dragged	0.0091
rho.ticks	0.0014
sigma2.ExpDraggedTicks	0.0093
sigma2.ExpTicks	0.0003
sigma2.site.dragged.ticks	0.0450
sigma2.site.infected.dragged.ticks	0.0091
sigma2.site.infected.mice	0.0142
sigma2.site.protectiveOspA	0.0352
sigma2.subj.infected.mice	0.0176
sigma2.subj.infticks.drag	0.0555
sigma2.subj.infticks.mice	0.0133
sigma2.subj.protected.mice	0.0073
theta.site[1]	0.0175
theta.site[2]	0.0066
theta.site[3]	0.0124
theta.site[4]	0.0049
theta.site[5]	0.0143
theta.site[6]	0.0087