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]	0.0042
delta[2]	0.0046
delta[3]	0.0040
delta.site[1]	0.0392
delta.site[2]	0.0359
delta.site[3]	0.0490
delta.site[4]	0.0274
delta.site[5]	0.0397
delta.site[6]	0.0376
lambda.site[1]	0.0288
lambda.site[2]	0.0224
lambda.site[3]	0.0465
lambda.site[4]	0.0299
lambda.site[5]	0.0394
lambda.site[6]	0.0235
omega[1]	0.0012
omega[2]	0.0012
omega.site[1]	0.0116
omega.site[2]	0.0078
omega.site[3]	0.0084
omega.site[4]	0.0088
omega.site[5]	0.0088
omega.site[6]	0.0078
rho.dragged	0.0095
rho.ticks	0.0017
sigma2.ExpDraggedTicks	0.0133
sigma2.ExpTicks	0.0008
sigma2.site.dragged.ticks	0.0482
sigma2.site.infected.dragged.ticks	0.0126
sigma2.site.infected.mice	0.0159
sigma2.site.protectiveOspA	0.0412
sigma2.subj.infected.mice	0.0205
sigma2.subj.infticks.drag	0.0485
sigma2.subj.infticks.mice	0.0236
sigma2.subj.protected.mice	0.0178
theta.site[1]	0.0047
theta.site[2]	0.0290
theta.site[3]	0.0116
theta.site[4]	0.0228
theta.site[5]	0.0118
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]	0.0028
delta.site[1]	0.0383
delta.site[2]	0.0381
delta.site[3]	0.0387
delta.site[4]	0.0287
delta.site[5]	0.0374
delta.site[6]	0.0317
lambda.site[1]	0.0272
lambda.site[2]	0.0303
lambda.site[3]	0.0257
lambda.site[4]	0.0268

lambda.site[5]	0.0319
lambda.site[6]	0.0337
omega[1]	0.0013
omega[2]	0.0013
omega.site[1]	0.0114
omega.site[2]	0.0101
omega.site[3]	0.0090
omega.site[4]	0.0129
omega.site[5]	0.0089
omega.site[6]	0.0072
rho.dragged	0.0110
rho.ticks	0.0021
sigma2.ExpDraggedTicks	0.0056
sigma2.ExpTicks	0.0009
sigma2.site.dragged.ticks	0.0333
sigma2.site.infected.dragged.ticks	0.0115
sigma2.site.infected.mice	0.0156
sigma2.site.protectiveOspA	0.0350
sigma2.subj.infected.mice	0.0278
sigma2.subj.infticks.drag	0.0594
sigma2.subj.infticks.mice	0.0207
sigma2.subj.protected.mice	0.0183
theta.site[1]	0.0158
theta.site[2]	0.0070
theta.site[3]	0.0106
theta.site[4]	0.0055
theta.site[5]	0.0095
theta.site[6]	0.0060

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]	0.0017
delta.site[1]	0.0385
delta.site[2]	0.0305
delta.site[3]	0.0437
delta.site[4]	0.0305
delta.site[5]	0.0345
delta.site[6]	0.0243
lambda.site[1]	0.0195
lambda.site[2]	0.0387
lambda.site[3]	0.0207
lambda.site[4]	0.0697

lambda.site[5]	0.0468
lambda.site[6]	0.0293
omega[1]	0.0018
omega[2]	0.0021
omega.site[1]	0.0152
omega.site[2]	0.0117
omega.site[3]	0.0119
omega.site[4]	0.0173
omega.site[5]	0.0142
omega.site[6]	0.0147
rho.dragged	0.0091
rho.ticks	0.0016
sigma2.ExpDraggedTicks	0.0080
sigma2.ExpTicks	0.0003
sigma2.site.dragged.ticks	0.0657
sigma2.site.infected.dragged.ticks	0.0086
sigma2.site.infected.mice	0.0148
sigma2.site.protectiveOspA	0.0354
sigma2.subj.infected.mice	0.0514
sigma2.subj.infticks.drag	0.0594
sigma2.subj.infticks.mice	0.0139
sigma2.subj.protected.mice	0.0069
theta.site[1]	0.0184
theta.site[2]	0.0065
theta.site[3]	0.0122
theta.site[4]	0.0047
theta.site[5]	0.0138
theta.site[6]	0.0087