S2 Appendix. R Code to run negative binomial model with first order auto-regressive random effects in INLA. Example R code to fit negative binomial model with an independent and identically distributed (IID) random effect for year, and a first order auto-regressive random effect (AR1) for day nested within year. Year and day effects were centered prior to analysis (cyear, cday)

```r
require(INLA)

# Set up model (can include or not include effect of phi). Alternative parameterization using -1

formula1 <- count ~ cyear - 1 + doy1 + doy2 + phi + f(fdoy, model = "ar1", replicate = year) + f(fyear, model = "iid")

# Run model

inla.out <- inla(formula1, family = "nbinomial", data = in.data, control.predictor = list(compute = TRUE), control.inla = list(int.strategy = "grid"), control.compute = list(config = TRUE))

# Extract fitted values

in.data$pred1 <- inla.out$summary.fitted.values[, "mean"]

# Fixed effects

summary(inla.out)$fixed

# Random effects

summary(inla.out)$hyperpar
```