Supporting Information for Sherley et al.
Defining ecologically-relevant scales for spatial protection using long-term data on an endangered seabird and local prey availability

Appendix S1 – JAGS code to fit the state-space model used to estimate the bank cormorant local population response from 1993 to 2015:

```
model {


##############################
# Priors and constraints
##############################

for(i in 1:nIs)
  {
      # Prior for initial population size (approx. log of 1987 pop^n at
      # Jutten Island)

      logN.est[1,i] ~ dnorm(3.6, 0.01)

      # Prior for sd of observation process
      sigma.obs[i] ~ dunif(0, 1)
      sigma2.obs[i] <- pow(sigma.obs[i], 2)
      tau.obs[i] <- pow(sigma.obs[i], -2)

      # Prior for colony specific mean growth rate
      mean.r[i] ~ dnorm(1, 0.001)
    } #i

    # Prior for sd of state process
    sigma.proc ~ dunif(0, 1)
    sigma2.proc <- pow(sigma.proc, 2)
    tau.proc <- pow(sigma.proc, -2)


##############################
# Likelihood
##############################

# State process
    for (t in 1:(T-1)){
    for (i in 1:nIs){
    r[t,i] ~ dnorm(mean.r[i], tau.proc)
    logN.est[t+1,i] <- logN.est[t,i] + r[t,i]
      }#i
      }#t

# Observation process
    for (t in 1:T) {
    for(i in 1:nIs){
    y[t,i] ~ dnorm(logN.est[t,i], tau.obs[i])
      }#i
      }#t
```

```
##############################
# Derived parameters
##############################

   lambda[1] <- 1

# Population sizes on real scale
    for (t in 1:T) {
    for(i in 1:nIs){
    N.est[t,i] <- exp(logN.est[t,i])
    } #i
    Ntot[t] <- sum(N.est[t,])
    logNtot[t] <- log(Ntot[t])
    } #t
    for(t in 2:T)
    {
    lambda[t] <- Ntot[t]/Ntot[t-1]
    } #t

} # model
```