**Supplementary Material**

**Using camera traps to enhance community-based management of subsistence hunting in the Amazon**

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**S1 - Description of the four models used in the MSOMs as described in the paper:**

**Model #1 –** Community distance, Hunting strategy and their interaction affecting relative abundance; individual detection constant.

**Model #2 –** Community distance, Hunting strategy and their interaction affecting individual detection probability; relative abundance constant.

**R-code of generic MSOM used in our analyses:**

##----- Specify model in JAGS language ----- adaptaded from Sampaio et al., 2023

sink(file = here("data","model#x.txt"))

cat("model {

# prior distributions on community level estimates - hyperparameters

psi ~ dunif(0,1) # inclusion rate that generates psi

# mean value (mu)

# parameter related to occupancy

mu.a0 ~ dnorm(0,0.5) # intercept on lambda

mu.a1 ~ dnorm(0,0.5) # slope on lambda for predictor

mu.a2 ~ dnorm(0,0.5) # slope on lambda for predictor

mu.a3 ~ dnorm(0,0.5) # slope on lambda for predictor

# parameter related to detectability

mu.r0 ~ dnorm(0,0.5) # intercept on lambda

mu.r1 ~ dnorm(0,0.5) # slope on detection for predictor

mu.r2 ~ dnorm(0,0.5) # slope on detection for predictor

mu.r3 ~ dnorm(0,0.5) # slope on detection for predictor

# standard deviation

# parameter related to abundance

sigma.a0 ~ dunif(0,10) # intercept

sigma.a1 ~ dunif(0,10) # Com.dist

sigma.a2 ~ dunif(0,10) # Hunt.est

sigma.a3 ~ dunif(0,10) # Com.dist\* Hunt.est

# parameter related to detectability

sigma.r0 ~ dunif(0,10) # intercept

sigma.r1 ~ dunif(0,10) # Com.dist

sigma.r2 ~ dunif(0,10) # Hunt.est

sigma.r3 ~ dunif(0,10) # Com.dist\* Hunt.est

# create precision

# parameter related to abundance

tau.a0 <- pow(sigma.a0,-2)

tau.a1 <- pow(sigma.a1,-2)

tau.a2 <- pow(sigma.a2,-2)

tau.a3 <- pow(sigma.a3,-2)

# parameter related to detectability

tau.r0 <- pow(sigma.r0,-2)

tau.r1 <- pow(sigma.r1,-2)

tau.r2 <- pow(sigma.r2,-2)

tau.r3 <- pow(sigma.r3,-2)

for(i in 1:(nspecies+nzeros)) {

# Create priors for species i from the community level prior distributions w[i] ~ dbern(psi) # inclusion indicators

a0[i] ~ dnorm(mu.a0, tau.a0) # intercept

a1[i] ~ dnorm(mu.a1, tau.a1) # Com.dist

a2[i] ~ dnorm(mu.a2, tau.a1) # Hunt.est

a3[i] ~ dnorm(mu.a3, tau.a1) # Com.dist\* Hunt.est

r0[i] ~ dnorm(mu.r0, tau.r0) # intercept

r1[i] ~ dnorm(mu.r1, tau.r1) # Com.dist

r2[i] ~ dnorm(mu.r2, tau.r1) # Hunt.est

r3[i] ~ dnorm(mu.r3, tau.r1) # Com.dist\* Hunt.est

## Likelihood

#likelihood - Ecological model for latent abundance of species i in sites j

for (j in 1:nSites){

# population abundances.

log(lambda[j,i]) <- a0[i] + a1[i]\* Com.dist [j] + a2[i]\* Hunt.est [j] + a3[i]\* Com.dist\* Hunt.est [j]

Z[j,i] ~ dpois(lambda[j,i]) # latent abundance of each species in each site

A[j,i] <- Z[j,i] \* w[i] # latent abundance only for extant species

o[j,i] <- step(A[j,i]-1) # occupancy of each species in each site

# detection process model

r[j,i] <- 1/(1+exp(-(r0[i])))

r[j,i] <- 1/(1+exp(-(r0[i] + r1[i]\* predictor[j] + r2[i]\* Hunt.est [j] + r3[i]\* Com.dist\* Hunt.est [j])))

p[j,i] <- 1-pow(1-r[j,i],A[j,i])

y[j,i] ~ dbin(p[j,i], k[j]) # model observation data as binomial outcome with prob p and k trials

}#j

}#i

## counting species richness at site

for(j in 1:nSites){

SR[j] <- sum(o[j,]) # whole species

## counting abundance at site

AB[j] <- sum(A[j,]) # whole species

## couting biomass at site

BI[j] <- sum(A[j,1:nspecies]\*biomass) # whole species

}}", fill=TRUE)

sink()

**S2 – Table informing the Gelman-Rubin convergence diagnostic mean value for each parameter of interest in the two MSOMs.**

|  |  |  |
| --- | --- | --- |
| Parameter of interest | Relative abundance | Individual detection |
| Community distance | 1,003 | 1,002 |
| Hunting strategy | 1,003 | 1,003 |
| Community distance\*Hunting strategy | 1,002 | 1,002 |
| Hyperparameter for community distance | 1,005 | 1,001 |
| Hyperparameter for hunting strategy | 1,009 | 1,001 |
| Hyperparameter for Community distance\*Hunting strategy | 1,002 | 1,000 |
| Species richness | 1,003 | 1,002 |
| Total abundance | 1,002 | 1,001 |

A piece of paper with text

Description automatically generated

**S3 – Photograph of the letter containing the official minutes of the meeting in the community of Periquito, in Riozinho da Liberdade Extractive Reserve.**

**S4 – English translation with few modifications of the letter containing the official minutes of a meeting in the community of Periquito, in Riozinho da Liberdade Extractive Reserve.**

MINUTES OF THE MEETING OF THE HUNTING AGREEMENT IN THE PERIQUITO COMMUNITY RIOZINHO DA LIBERDADE EXTRACTIVE RESERVE TO RE-EVALUATE THE AGREEMENT

SAID AGREEMENT

On April 19, 2019, the residents of the Periquito community met to re-evaluate and re-discuss the hunting agreement that was made on March 25, 2016 and evaluated periodically each year. Mr. Erivaldo opened the meeting, greeting and thanking everyone for their presence, then Albecir read a reflective text and several comments were made about the meaning of the text for our community life, then Mr. Erivaldo asked those present to make an assessment of how the hunting situation was, whether it was easier or more difficult to capture the animals? Mr. Carlinho gave a very positive assessment, saying that it was much better than before and this improvement was recognized by almost everyone. Only two residents did not recognize this improvement. Mr. Erivaldo then recapped the points discussed and agreed upon at the previous meetings, and it was noted that "the agreement is not being complied with in its entirety", but the majority emphasized the importance of complying with what was decided by the collegiate body, and that the vast majority believes that it is best to stop the dog hunt once and for all. They also pointed out the results shown by the cameras displayed in the forest in a monitoring survey to check the number of animals in the reserve and compare it with other forest areas that are not reserves.

It was found that on the side that doesn't hunt with dogs there are many more animals than on the side that is hunting. According to the meeting participants, the following points were unanimously decided: Don't breed new hunting dogs; don't take the dogs into the fields; if you shoot game and it gets shot, don't use the hunting dog; if an animal catches livestock, don't use the hunting dog.

Therefore, it was agreed that they would continue hunting with assistance of domestic dogs on one side of the river for another year and preserve the other side´s river, until there was a significant improvement in the increase in game stock, "and then definitively stop the hunting assisted by dogs on both sides”.

I, Francisco Albecir Brito da Silva, drew up these minutes, which will be signed by me and by all those present, with a list of signatures attached.

**S5 - Description of the site-level variables used to investigate possible differences in both banks of the Liberdade river.**

We derived all spatial variables using QGIS (2021).

(1) Hydrography: the stream length around CT around 500 meters of each camera trap (CT), which corresponds to the total length of all perennial streams (Venticinque et al. 2016).

(2) Deforestation: the proportion of habitat loss extension around 500 meters of each CT, expressed by the deforested area (km2), using the accumulated deforestation up to the year (“Projeto de Monitoramento do Desmatamento na Amazônia Legal”; INPE, 2019)

(3) Flooded area: proportion of seasonally floodplain area around 500 meters of each CT, which corresponds to the sum of total area of seasonally floodplain area from the raster file presented in (Hess et al., 2015);

(4) Vertical distance of the nearest drainage as the value presented in the raster file presented in (Rennó et al., 2008), at the geographic location of each CT;

(5) Human density: the number of active households within 1 km of each CT. We digitized every household within 10-km of our CTs, through visual inspection of 2019 aerial photographs (Bing Maps of the Open-layers plugin [1:2000]).

**Diagrama

Descrição gerada automaticamente**

**S6 –** The violin plots show the variation in the estimated Hydrography, Deforestation, Flooded area, Vertical distance of the nearest drainage (VDND) and Human density for each Camera trap according to hunting strategy (Dogs – right river bank, where hunting assisted by domestic dogs are allowed; No dogs – left river bank, where only hunting without dogs is allowed), in each plot is described the Wil Cox statistic (W) and the level of significance (p).

**Distance Icons - Download Free Vector Icons | Noun Project**Canis familiaris familiaris

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