Brazil data

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2025-11-13

1. are all males represented in all clutches?

```
clean_data %>%
  group_by(Season, Female) %>%
  filter(length(unique(Nest)) > 1)
```

```
## # A tibble: 0 x 9
## # Groups:   Season, Female [0]
## # i 9 variables: mom_nest_combo <chr>, dad <chr>, hatchling_count <dbl>,
## #   NestTotalHatchCount <dbl>, propdadcontribute <dbl>,
## #   LowNestSampleSize <chr>, Season <chr>, Female <chr>, Nest <chr>
```

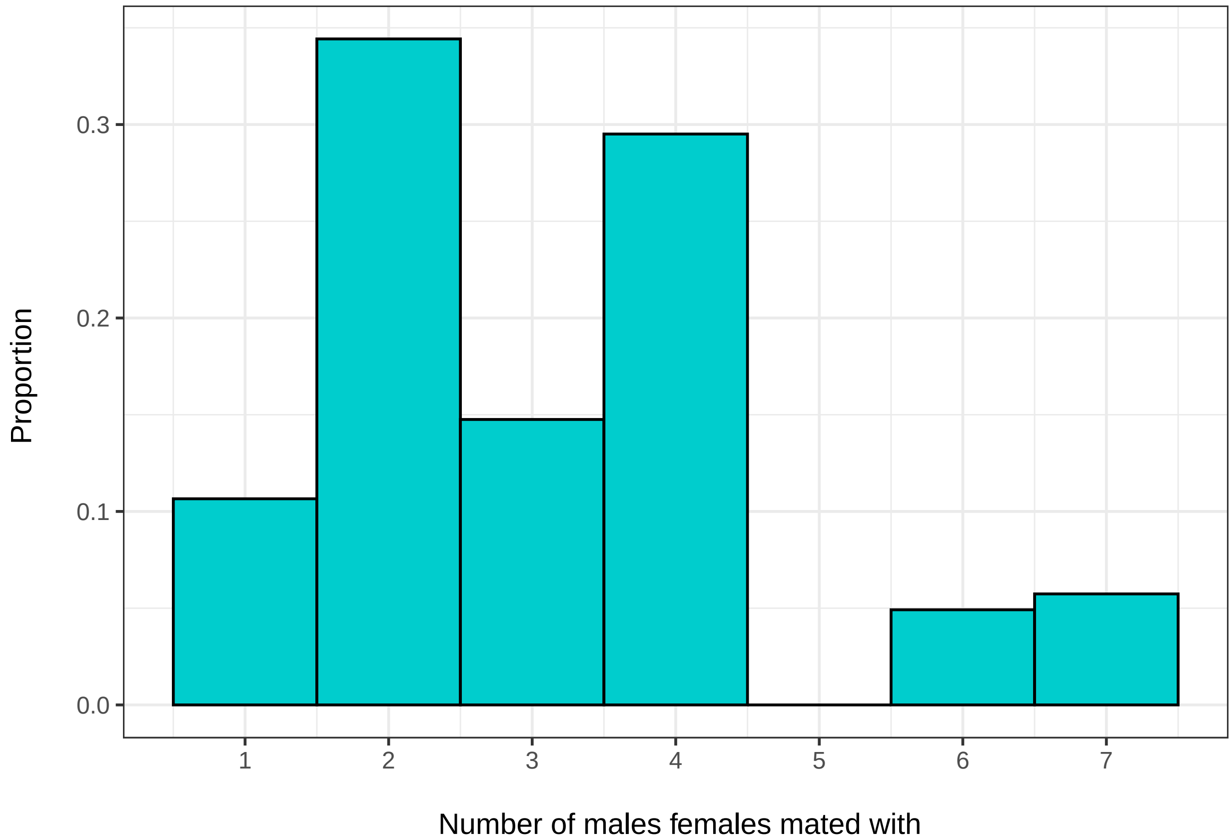
Not applicable, no more than one clutch is represented per female per season

2. how many males do females mate with in one season?

```
# TO DO make pretty table of stats

males_per_female <- clean_data %>%
  dplyr::select(Season, Female) %>%
  filter(Season != 'S1') %>%
  group_by(Season, Female) %>%
  mutate(nMales = n())

round(prop.table(table(males_per_female$nMales)), 2)
```

```
##
##    1    2    3    4    6    7
## 0.11 0.34 0.15 0.30 0.05 0.06
```

```
ggplot(data = males_per_female,
       aes(x = nMales)) +
  geom_histogram(aes(y = after_stat(count)/sum(after_stat(count))),
                 bins = 7, col = 'black', fill = 'cyan3') +
  theme_bw() +
  xlab('\n Number of males females mated with') +
  ylab('Proportion \n') +
  scale_x_continuous(breaks = c(1:7))
```




```r
summary(males_per_female$nMales)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   1.000   2.000   3.000   3.115   4.000   7.000
```

```r
# variance
var(males_per_female$nMales)
```

```
## [1] 2.433004
```

```r
# standard deviation
sd(males_per_female$nMales)
```

```
## [1] 1.559809
```

```r
# skew
skewness(males_per_female$nMales)
```

```
## [1] 0.8606339
```

```r
# kurtosis ('fatness' of tails)
kurtosis(males_per_female$nMales)
```

```
## [1] 0.2648594
```

why fit a model

we can't just use the proportions of females that mated with 1 - 7 males since sample sizes are small, and no recorded female mated with 5 males

discrete gamma distribution had best fit

```
# TO DO make pretty table
```

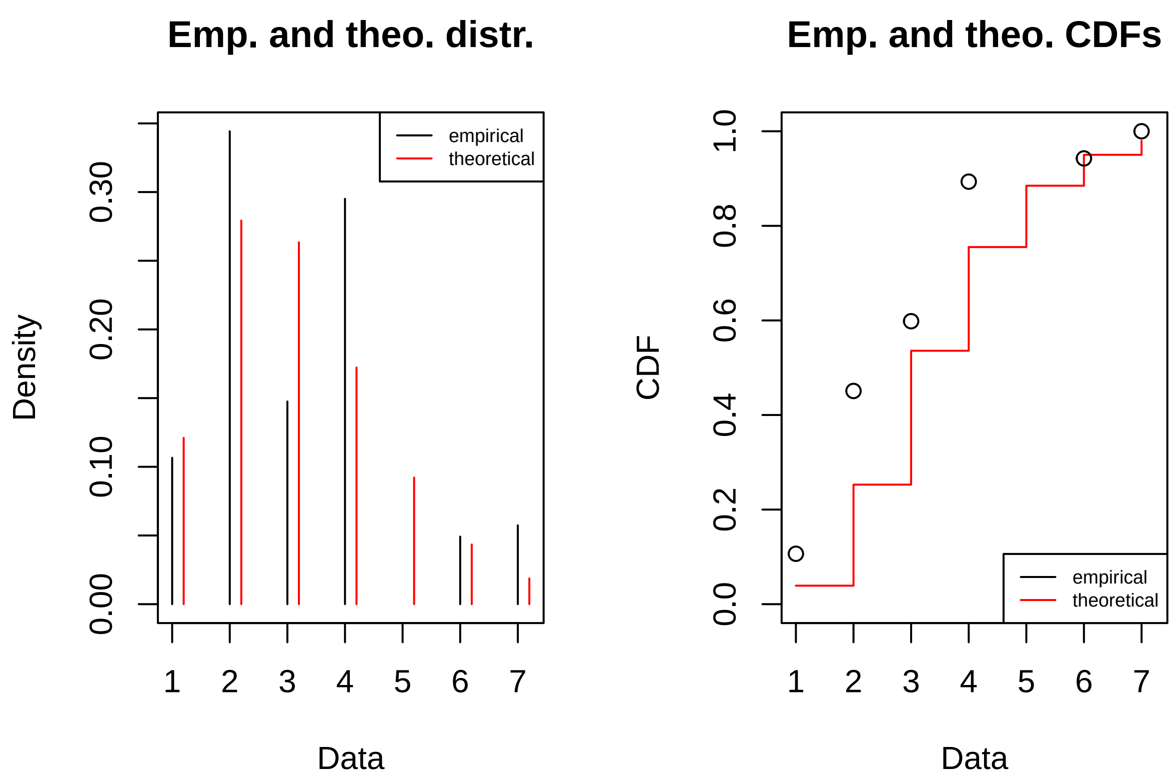
discrete gamma ______ Loglikelihood: -215.0036 | AIC: 434.0071 | BIC: 439.6152

poisson _______________ Loglikelihood: -223.1883 | AIC: 448.3767 | BIC: 451.1807

negative binomial _____ Loglikelihood: -223.1884 | AIC: 450.3767 | BIC: 455.9848

geometric _____________ Loglikelihood: -278.3816 | AIC: 558.7632 | BIC: 561.5673

```
# plot data (black) vs. fitted discrete gamma distribution (red)
plot(fit_dgamma)
```

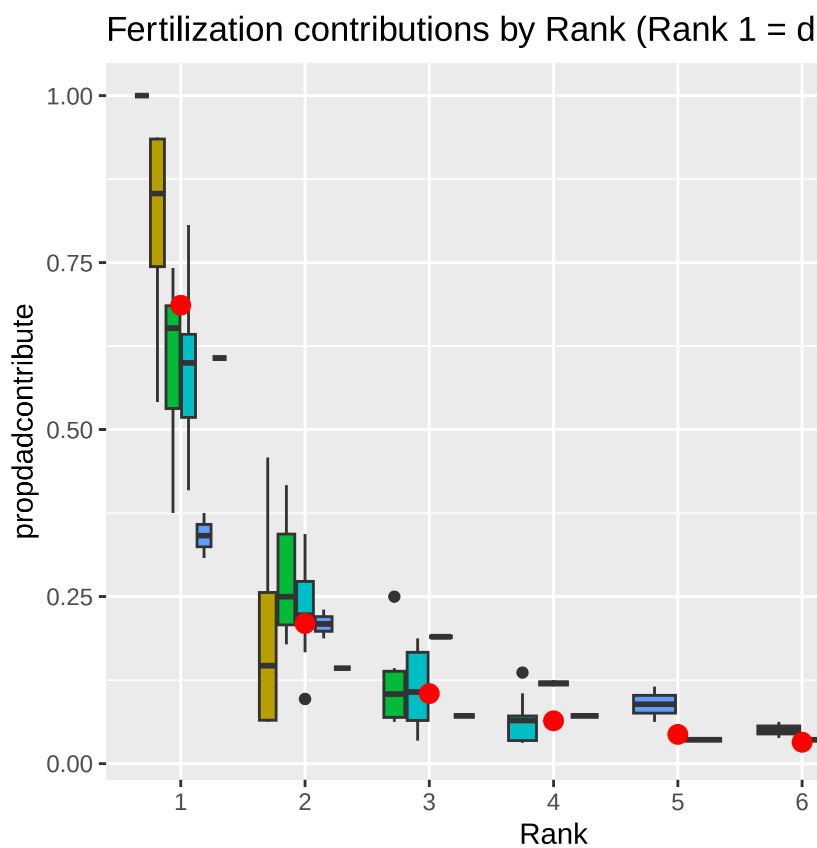



```
# max number of males females can mate with (7 in data)
max_males <- 7

# weighted probabilities for females mating with 1 - 7 males
weightedP <- ddgamma(1:max_males,
                     shape = fit_dgamma$estimate['shape'],
                     rate = fit_dgamma$estimate['rate'])

raw_weights <- round(weightedP, 3)
# 0.214 0.283 0.219 0.130 0.065 0.030 0.012

total_sum <- sum(raw_weights)
# 0.9531114
```

```r
# normalize weights so that they add up to 1
# this assumes we can't have females mating with more than 7 males)
# to adjust this assumption, adjust max_males values
weights_to_use <- round(weightedP / sum(weightedP), 3)
probability_of_mating_with_n_Males <- data.frame(number_of_males = 1:7,
                                                 probability = weights_to_use)
probability_of_mating_with_n_Males
```

```
##   number_of_males probability
## 1               1       0.224
## 2               2       0.297
## 3               3       0.230
## 4               4       0.136
## 5               5       0.069
## 6               6       0.031
## 7               7       0.013
```

3. how do males contribute to nests?



decaying power law fits very well: $y(x) = a{\cdot}p^{-x}$

4. how often do males remigrate