Distance sampling-lab

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```
require(Distance)
require(readr)
require(gridExtra)

#data
data<-read.csv("/Users/nickg/OneDrive/Desktop/R projects/Population-dynamics-FANR/data/gazelle_data.csv")
```

Data manipulation

```
#Data manipulation
data2 <- data[,c("Transect", "GroupSize")]
colnames(data2) <- c("Sample.Label", "size") ## Rename
data2$distance <- data$Distance / 1000 ## Convert to km
data2$Region.Label <- 1 ## Just one region
data2$Effort <- data$TransectLength / 1000 ## Convert to km
data2$Area <- data$RegionArea ## Square km
```

Half-normal model

```
model.hn <- ds(data=data2, key="hn",
               transect="line", truncation=250/1000,
               adjustment=NULL, quiet=TRUE)
summary(model.hn)
```

```
##
## Summary for distance analysis
## Number of observations :  118
## Distance range         :  0  -  0.25
##
## Model : Half-normal key function
## AIC   : -430.3899
##
## Detection function parameters
## Scale coefficient(s):
##              estimate         se
## (Intercept) -2.548889 0.07142174
##
##                  Estimate        SE         CV
## Average p       0.3913367 0.0275207 0.07032488
## N in covered region 301.5306612 30.3090846 0.10051742
##
## Summary for clusters
##
## Summary statistics:
##   Region Area CoveredArea Effort  n   k  ER     se.ER    cv.ER
## 1      1    5           5    0.5  1 118 10 118 8.919392 0.07558807
##
## Abundance:
##   Label Estimate      se       cv      lcl      ucl      df
## 1 Total 3015.307 311.3097 0.1032431 2443.168 3721.429 29.61684
##
## Density:
##   Label Estimate      se       cv      lcl      ucl      df
## 1 Total 603.0613 62.26194 0.1032431 488.6335 744.2857 29.61684
##
## Summary for individuals
##
## Summary statistics:
##   Region Area CoveredArea Effort      n   ER      se.ER     cv.ER mean.size
## 1      1    5           5    0.5      1 354825 354825 27204.24 0.07666945  3006.992
##     se.mean
## 1 5.061028
##
## Abundance:
##   Label Estimate       se       cv      lcl      ucl      df
## 1 Total 9067001 943307.8 0.1040375 7333216 11210704 28.93915
##
## Density:
##   Label Estimate       se       cv      lcl      ucl      df
## 1 Total  1813400 188661.6 0.1040375 1466643 2242141 28.93915
##
## Expected cluster size
##   Region Expected.S se.Expected.S cv.Expected.S
## 1 1  Total   3006.992      5.079631   0.001689274
## 2 2  Total   3006.992      5.079631   0.001689274
```

Half-hazard model

```
model.hr <- ds(data=data2, key="hr",
               transect="line", truncation=250/1000,
               adjustment=NULL, quiet=TRUE)
summary(model.hr)
```

```
##
## Summary for distance analysis
## Number of observations :  118
## Distance range         :  0  -  0.25
##
## Model : Hazard-rate key function
## AIC   : -426.2041
##
## Detection function parameters
## Scale coefficient(s):
##              estimate         se
## (Intercept) -2.158617 0.06742034
##
## Shape coefficient(s):
##             estimate        se
## (Intercept) 1.816185 0.2166982
##
##                  Estimate         SE         CV
## Average p       0.5178954  0.02737977 0.05286737
## N in covered region 227.8452434 18.89961069 0.08294933
##
## Summary for clusters
##
## Summary statistics:
##   Region Area CoveredArea Effort  n   k  ER     se.ER    cv.ER
## 1      1    5           5    0.5  1 118 10 118 8.919392 0.07558807
##
## Abundance:
##   Label Estimate      se       cv      lcl      ucl      df
## 1 Total 2278.452 210.1681 0.09224161 1879.934 2761.451 19.59512
##
## Density:
##   Label Estimate      se       cv      lcl      ucl      df
## 1 Total 455.6905 42.03363 0.09224161 375.9868 552.2902 19.59512
##
## Summary for individuals
##
## Summary statistics:
##   Region Area CoveredArea Effort      n   ER      se.ER     cv.ER mean.size
## 1      1    5           5    0.5      1 354825 354825 27204.24 0.07666945  3006.992
##     se.mean
## 1 5.061028
##
## Abundance:
##   Label Estimate       se       cv      lcl      ucl      df
## 1 Total  6851287 638059.2 0.09312982 5641268 8320849 19.25557
##
## Density:
##   Label Estimate       se       cv      lcl      ucl      df
## 1 Total  1370257 127611.8 0.09312982 1128254 1664170 19.25557
##
## Expected cluster size
##   Region Expected.S se.Expected.S cv.Expected.S
## 1 1  Total   3006.992      5.079631   0.001689274
## 2 2  Total   3006.992      5.079631   0.001689274
```

Plot
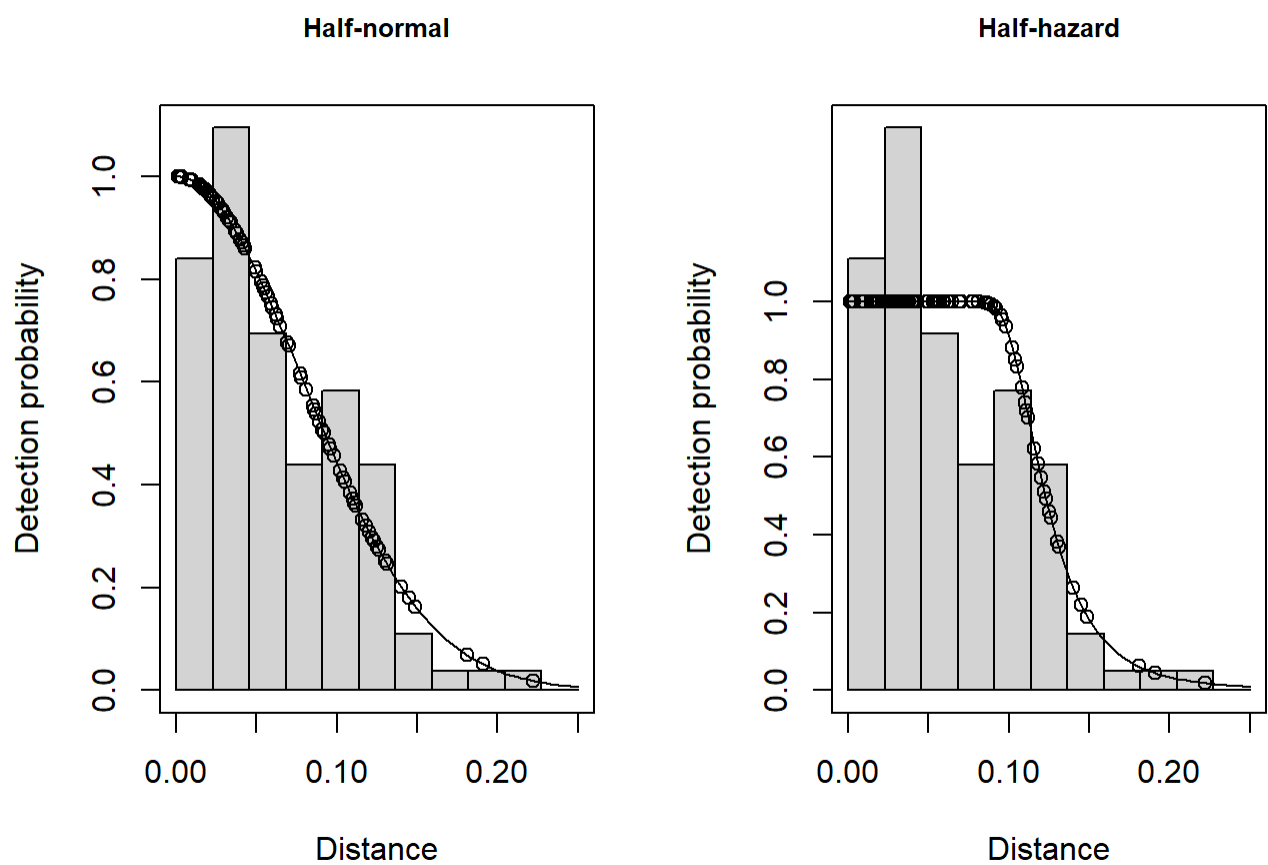
Table

Table 1. Results for distance sampling of gazelle for half-normal and half-hazard models.

Model	pbar	Abundance	SE(N)	Density	SE(D)	AIC
Half-normal	0.39	9067001	943307.8	1813400	188661.6	-430.39
Half-hazard	0.52	6851287	638059.2	1370257	127611.8	-426.20