4.7 Characteristic Hull Polygons (CHP)

Manual of Applied Spatial Ecology

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Now we are going to get into another class of home range estimators that use polygons created by Delaunay triangulation of a set of relocations and then removing a subset of the resulting triangles. These polygons can have concave edges, be composed of disjoint regions, and contain empty portions of unused space within hull interiors. This estimator has been described in the adehabitatHR package and evaluated on black-footed albatross (Phoebastria nigripes; Downs and Horner 2009). Polygon-based estimators may be a useful method for a variety of species but research has been limited.

1. Exercise 4.7 - Download and extract zip folder into your preferred location

2. Set working directory to the extracted folder in R under Session - Set Working Directory...

3. Now open the script "CHPscript.Rmd" and run code directly from the script

4. First we need to load the packages needed for the exercise

```
library(adehabitatHR)
library(maptools)
```

5. Now let's have a separate section of code to include projection information we will use throughout the exercise. In previous versions, these lines of code were within each block of code

```
utm17.crs <- CRS("+proj=utm +zone=17N +ellps=WGS84")
```

```
## Warning in showSRID(uprojargs, format = "PROJ", multiline = "NO", prefer_proj
## = prefer_proj): Discarded datum Unknown based on WGS84 ellipsoid in Proj4
## definition
```

6. Load panther dataset

```
#Creates a Spatial Points Data Frame for 2 animals by ID
twocats <-read.csv("pantherjitter.csv", header=T)
data.xy = twocats[c("X","Y")]

#Creates class Spatial Points for all locations
xysp <- SpatialPoints(data.xy)
proj4string(xysp) <- CRS("+proj=utm +zone=17N +ellps=WGS84")

#Creates a Spatial Data Frame from
sppt<-data.frame(xysp)

#Creates a spatial data frame of ID
idsp<-data.frame(twocats[1])

#Merges ID data frame with GPS locations data frame
#Data frame is called "idsp" comparable to the "relocs" from puechabon dataset
coordinates(idsp)<-sppt
```

```
head(as.data.frame(idsp))
```

```
##   CatID          X        Y
## 1   121 494155.6 2904240
## 2   121 498182.3 2905598
## 3   121 498476.2 2905114
## 4   121 499210.5 2905661
## 5   121 499467.3 2905533
## 6   121 502960.9 2904391
```
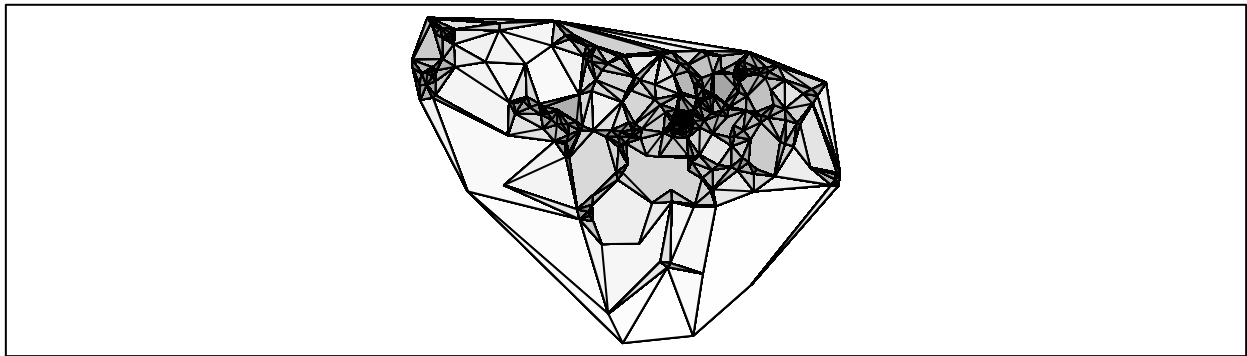```
#Results for above code

#Home Range estimation
res <- CharHull(idsp[,1])
class("res")
```
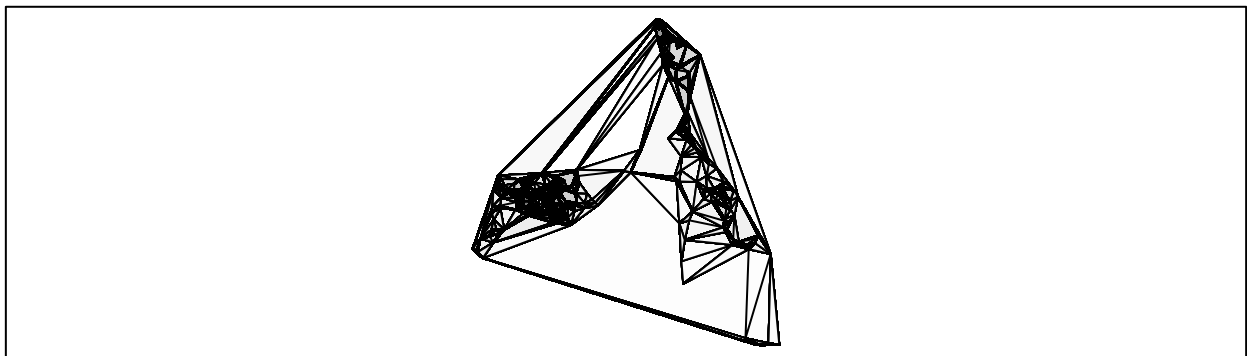
```
[1] "character"
```
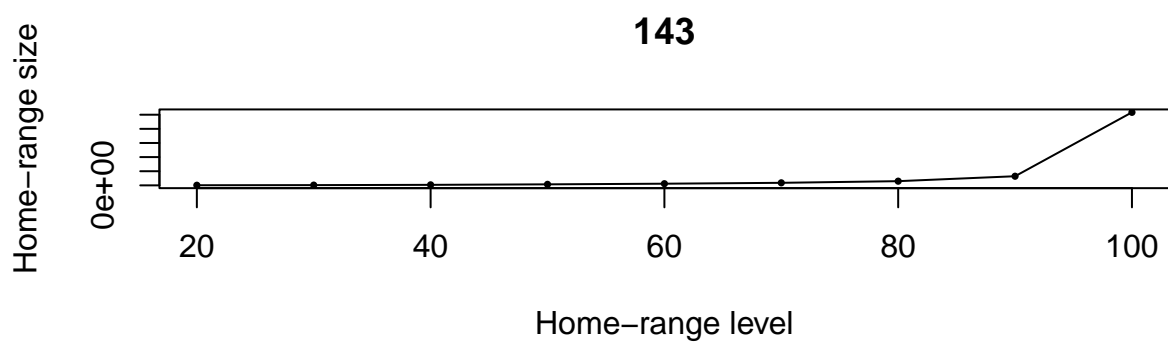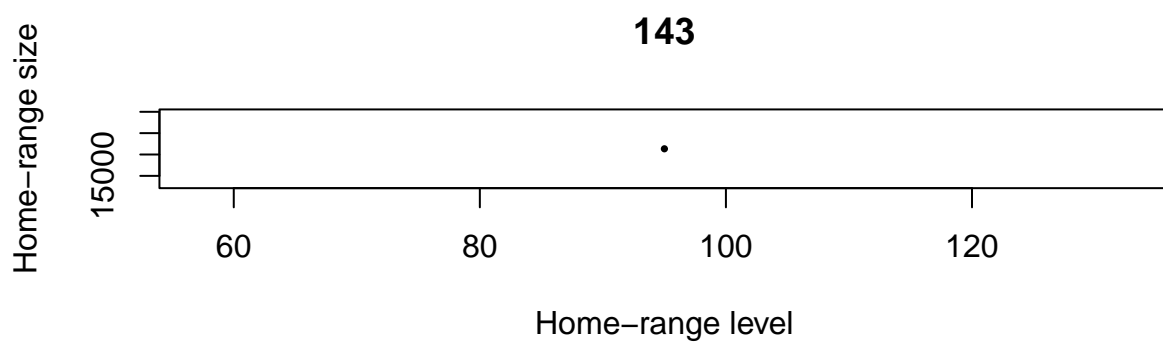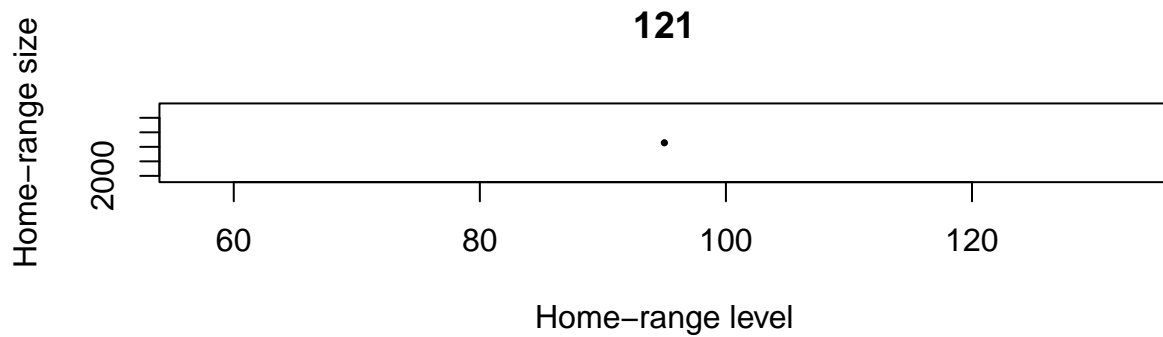```
#Displays the home range
plot(res)
```

121

143


```
#Computes the home range size for 20-100 percent
MCHu2hrsize(res)
```

121

Home-range size

Home-range level

143

Home-range size

Home-range level
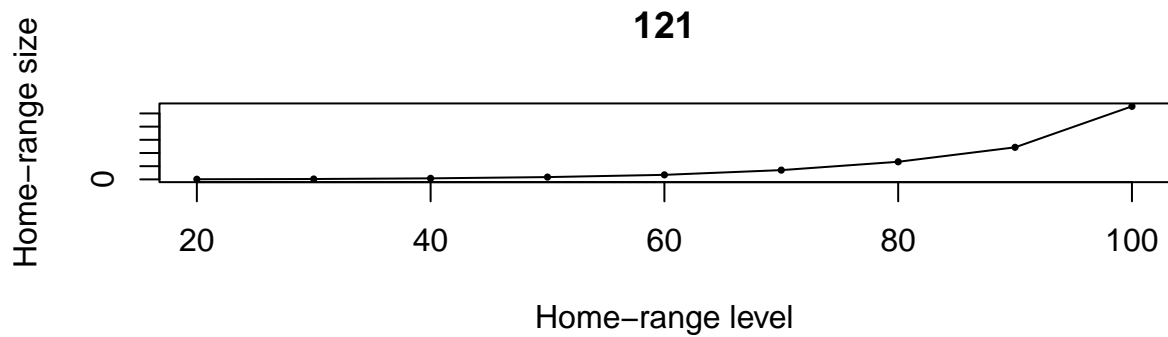
```
##             121          143
## 20     10.70262     150.2998
## 30     28.73158     342.9798
## 40     79.15079     688.7553
## 50    172.95317    1418.7588
## 60    343.12024    2319.1578
## 70    700.94072    3574.5525
## 80   1333.94110    5910.8221
## 90   2431.27046   12912.0320
## 100  5538.22402  103361.1336
```

```
#OR

#Computes the home range size for 95 percent
MCHu2hrsize(res, percent=95)
```

121

Home-range size

2000

Home-range level

60   80   100   120

143

Home-range size

15000

Home-range level

60   80   100   120

```
##          121      143
## 95 3139.295 21335.9
```

```
#OR use

ver <- getverticeshr(res, percent=90)
ver
```

```
## Object of class "SpatialPolygonsDataFrame" (package sp):
##
## Number of SpatialPolygons:  2
##
## Variables measured:
##    id       area
## 1 121  2413.518
## 2 143 12845.298
```
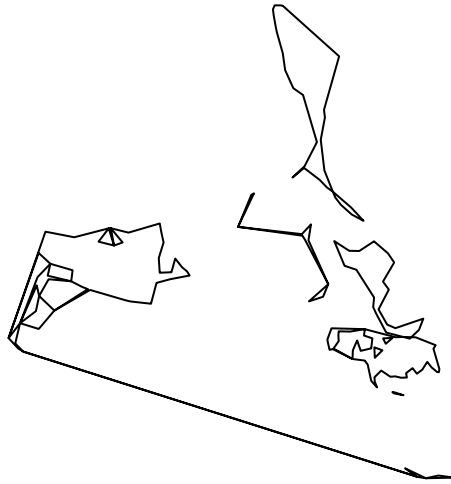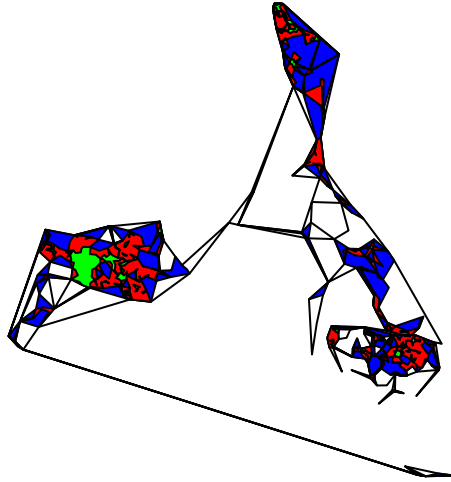
```
plot(ver)
```

```
ver50 <- getverticeshr(res, percent=50)
ver80 <- getverticeshr(res, percent=80)
ver90 <- getverticeshr(res, percent=90)
ver95 <- getverticeshr(res, percent=95)
plot(ver95)
plot(ver90, add=TRUE, col="blue")
plot(ver80, add=TRUE, col="red")
plot(ver50, add=T, col="green")
```

```
#The object uu below is the single-linkage cluster analysis that estimates
#home range returned as a list of SpatialPolygonDataFrame objects (one per animal)

uu <- clusthr(idsp)
class(uu)
```

```
## [1] "MCHu"
```
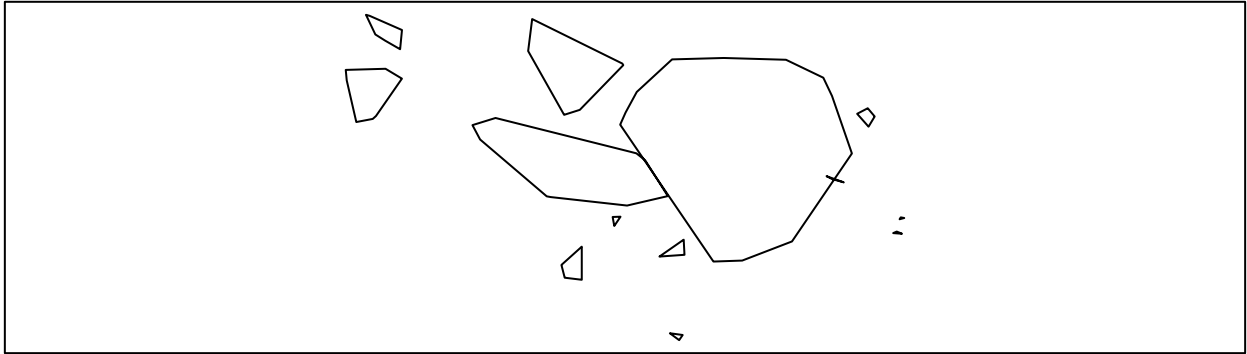
```
#[1] "MCHu"

plot(uu, percent=95)

#Returns home range of Cat143 and 95% HR
plot(uu[[1]][250,], add=T, col="green")
```

121

143