*Marine and Freshwater Research* **66**, 654–664
10.1071/MF14042_AC 

**Supplementary material**

# Does the telemetry technology matter? Comparing estimates of aquatic animal space-use generated from GPS-based and passive acoustic tracking

*Ross G. Dwyer*[A,D], *Hamish A. Campbell*[A,B], *Terri R. Irwin*[C] *and Craig E. Franklin*[A]

[A]School of Biological Sciences, The University of Queensland,
Brisbane, Qld 4072, Australia.

[B]School of Environment and Rural Science, The University of New England,
Armidale, NSW 2350, Australia.

[C]Australia Zoo, Steve Irwin Way, Beerwah, Sunshine Coast Qld 4519, Australia.

[D]Corresponding author. Email: ross.dwyer@uq.edu.au

```
## Author: Ross Dwyer
## Manuscript: Comparison of travel distance and home range estimates from GPS-based and
   passive acoustic telemetry
## Date: 2012-12-12

## Suppl R script to
## Generate random points based on duration in receiver detection fields (PA presence events)
## Generate random points based on duration between receiver detection fields (PA movement
   events)


################################
## Function to simulate PA-based presence locations for 1 individual in the correct timeframe
   (x = individual id)

fResXY <- function(x,table=FALSE)
{
  require(sp)
  require(rgeos)

  nameID <- unique(VCRresid$NAME)[x]
  R_croc <- subset(VCRresid,VCRresid$NAME==nameID)
  # Calculate total residence duration making sure all receivers are present in output table
  R_croc_emptyR <- data.frame(RECEIVERID="",
                              ANIMALID="",
                              NAME="",
                              STARTTIME="2000-01-01",ENDTIME=("2000-01-01"),
                              DURATION=0,NUMRECS=0)
  R_croc_res <- rbind(R_croc_d,R_croc_emptyR)

  # Extract the number of hours (rounded) spent at each receiver
  nHours <- as.vector(round(tapply(R_croc_res$DURATION,R_croc_res$RECEIVERID,sum)/(60*60)))
  RECEIVERID <- names(round(tapply(R_croc_res$DURATION,R_croc_res$RECEIVERID,sum)/(60*60)))

  # Attach this to the spatial polygons data frame
  # We need to be VERY careful here to attach the correct values to their respective polygons
  myRes <- data.frame(RECEIVERID,nHours=as.numeric(nHours))
  VR2resonly.df <- as(VR2resonly, "data.frame")
  VR2resonly.df1 <- merge(VR2resonly.df, myRes, sort=FALSE, by.x="RECEIVERID",
                          by.y="RECEIVERID", all.x=TRUE, all.y=TRUE)
  VR2resonly1 <- SpatialPolygonsDataFrame(as(VR2resonly, "SpatialPolygons"),
                                          data=VR2resonly.df1)

  # Function to generate random points within detection field polygons
  fRanXY <- function(y)
  {
    ##select polygon only from 1 VR2 and randomly sample n times
    VR21P <- slot(VR2resonly1, "polygons")[[y]]
    VR21P_Ran <- spsample(VR21P,n=VR2resonly.df1$nHours[y],type="random")
    return(VR21P_Ran)
  }

  #Generate random points for all receivers
  VR2P_Ran <- lapply(1:length(VR2resonly1),fRanXY)

  if(table==FALSE)
    return(VR2P_Ran)
  if(table==TRUE)
    return(R_croc_d)
}

################################
## Function to simulate PA-based movement locations for 1 individual in the correct timeframe

fNonResXY <- function(x,table=FALSE)
{
  require(sp)
  require(rgeos)

  nameID <- unique(new.MOV$NAME)[x]
  s_dates <- s_IDDate[x,]
  M_croc <- subset(new.MOV,new.MOV$NAME==nameID)
  M_croc_d <- M_croc[as.POSIXct(M_croc$STARTTIME) %in% s_dates[1,2]:s_dates[1,3],]

  if(nrow(M_croc_d) > 0){
    # For non-reseidences, make movement non-directional
    new.table <- M_croc_d[,c("RECEIVERID1","RECEIVERID2","DURATION")]
```

**Fig. S1.** R code for extracting pseudo-positional data derived from passive acoustic detections.

```
    for(i in 1:nrow(M_croc_d))
    {
      if(M_croc_d[i,1] < M_croc_d[i,2])
      {
        new.table[i,1] <- M_croc_d[i,1]
        new.table[i,2] <- M_croc_d[i,2]
      }else{
        new.table[i,1] <- M_croc_d[i,2]
        new.table[i,2] <- M_croc_d[i,1]
      }
    }

    # Combine single croc movement event data with all movement event combinations
    new.table1 <- rbind(new.table,ntable)

    # Calculate total movement duration making sure all receivers are present in output table
    M_croc_new <- aggregate(new.table1$DURATION,list(RECEIVERID1=new.table1$RECEIVERID1,
                                                     RECEIVERID2=new.table1$RECEIVERID2),sum)

    # Extract number of hours spent at each receiver and sort by receiverid1 then receiverid2
    M_croc_new$nHours <- as.vector(round(M_croc_new$x/(60*60)))
    M_croc_all <- M_croc_new[order(M_croc_new$RECEIVERID1,M_croc_new$RECEIVERID2),]


    # Load individual/combination of movement polygon(s)
    source('R code/Nonresidence polygons for crocs_vtrack.R')
    # Function to generate random points between detection field polygons
    fRanXY_mov <- function(y)
    {
      if(M_croc_all$nHours[y] > 0){
        if(length(nonresP[[y]])>0)
        {
          MovementOnlySPDF <- MovementOnly[nonresP[[y]],]#]+1,]
          Movexy <- spsample(MovementOnlySPDF,n=M_croc_all$nHours[y],type="random")
          return(Movexy)
        }
      }
    }

    #Generate random points for multiple movement polygons
    moveP_Ran <- lapply(1:63,fRanXY_mov)

  }
  if(table==FALSE)
    return(moveP_Ran)
  if(table==TRUE)
    return(M_croc_d)
}

##############################

## Now the code...

# Specify projections used
WGSproj <- "+init=epsg:4326"
GDAproj <- "+init=epsg:28354"

## Presence data
# Load shapefile of receiver detection fields clipped from Wenlock River
receiverSHP <- readOGR("E:/GIS/Shapefiles/",
                       p4s=CRSargs(CRS(WGSproj)))
# Transform to a projected CS
VR2inter <- spTransform(receiverSHP,CRS(GDAproj))


###
## PA movement data
# Load shapefile of areas between receiver detection fields clipped from wenlock
moveSHP <- readOGR("E:/GIS/Shapefiles/movementpolys",
                   p4s=CRSargs(CRS(WGSproj)))
##Transform to a projected CS
MovementOnly <- spTransform(moveSHP,CRS(GDAproj))

## Construct empty table containing all undertaken movements
# Make movements non-directional
nrtable <- unique(VCRnonresid[c("RECEIVER1","RECEIVER2")])
```

**Fig. S1.** *(Cont.)*

```
empty.table <- data.frame(RECEIVER1=0,RECEIVER2=0)[NULL]
for(i in 1:nrow(table2010))
{
  if(nrtable[i,1] < nrtable[i,2])
  {
    empty.table[i,1] <- nrtable[i,1]
    empty.table[i,2] <- nrtable[i,2]
  }else{
    empty.table[i,1] <- nrtable[i,2]
    empty.table[i,2] <- nrtable[i,1]
  }
}
ntable <- unique(empty.table)
ntable <- ntable2010[order(ntable[,1],ntable[,2]),]
names(ntable) <- c("RECEIVERID1","RECEIVERID2")
ntable$DURATION <- 0

##################################################
## Generate the pseudo-location data from PA presence (RES) and presence + movements
(RES+NONRES) for each individual
#set.seed(1)

#Write the PA presence location data individually to file
RES_coord_1 <- coordinates(do.call(rbind,unlist(fResXY(1))))
write.table(RES_coord_1,"Data/tab delim/RES_coord_1", sep =
"\t",row.names=FALSE,col.names=FALSE)
RES_coord_2 <- coordinates(do.call(rbind,unlist(fResXY(2))))
write.table(RES_coord_2,"Data/tab delim/RES_coord_2", sep =
"\t",row.names=FALSE,col.names=FALSE)
RES_coord_3 <- coordinates(do.call(rbind,unlist(fResXY(3))))
write.table(RES_coord_3,"Data/tab delim/RES_coord_3", sep =
"\t",row.names=FALSE,col.names=FALSE)
RES_coord_4 <- coordinates(do.call(rbind,unlist(fResXY(4))))
write.table(RES_coord_4,"Data/tab delim/RES_coord_4", sep =
"\t",row.names=FALSE,col.names=FALSE)
RES_coord_5 <- coordinates(do.call(rbind,unlist(fResXY(5))))
write.table(RES_coord_5,"Data/tab delim/RES_coord_5", sep =
"\t",row.names=FALSE,col.names=FALSE)
RES_coord_6 <- coordinates(do.call(rbind,unlist(fResXY(6))))
write.table(RES_coord_6,"Data/tab delim/RES_coord_6", sep =
"\t",row.names=FALSE,col.names=FALSE)
RES_coord_7 <- coordinates(do.call(rbind,unlist(fResXY(7))))
write.table(RES_coord_7,"Data/tab delim/RES_coord_7", sep =
"\t",row.names=FALSE,col.names=FALSE)
RES_coord_8 <- coordinates(do.call(rbind,unlist(fResXY(8))))
write.table(RES_coord_8,"Data/tab delim/RES_coord_8", sep =
"\t",row.names=FALSE,col.names=FALSE)
RES_coord_9 <- coordinates(do.call(rbind,unlist(fResXY(9))))
write.table(RES_coord_9,"Data/tab delim/RES_coord_9", sep =
"\t",row.names=FALSE,col.names=FALSE)
RES_coord_10 <- coordinates(do.call(rbind,unlist(fResXY(10))))
write.table(RES_coord_10,"Data/tab delim/RES_coord_10", sep =
"\t",row.names=FALSE,col.names=FALSE)
RES_coord_11 <- coordinates(do.call(rbind,unlist(fResXY(11))))
write.table(RES_coord_11,"Data/tab delim/RES_coord_11", sep =
"\t",row.names=FALSE,col.names=FALSE)
RES_coord_12 <- coordinates(do.call(rbind,unlist(fResXY(12))))
write.table(RES_coord_12,"Data/tab delim/RES_coord_12", sep =
"\t",row.names=FALSE,col.names=FALSE)
RES_coord_13 <- coordinates(do.call(rbind,unlist(fResXY(13))))
write.table(RES_coord_13,"Data/tab delim/RES_coord_13", sep =
"\t",row.names=FALSE,col.names=FALSE)
RES_coord_14 <- coordinates(do.call(rbind,unlist(fResXY(14))))
write.table(RES_coord_14,"Data/tab delim/RES_coord14", sep =
"\t",row.names=FALSE,col.names=FALSE)

RESxy_data <-rbind(data.frame(RES_coord_1,id=1),
                   data.frame(RES_coord_2,id=2),
                   data.frame(RES_coord_3,id=3),
                   data.frame(RES_coord_4,id=4),
                   data.frame(RES_coord_5,id=5),
                   data.frame(RES_coord_6,id=6),
                   data.frame(RES_coord_7,id=7),
                   data.frame(RES_coord_8,id=8),
                   data.frame(RES_coord_9,id=9),
                   data.frame(RES_coord_10,id=10),
                   data.frame(RES_coord_10,id=11),
```

**Fig. S1.** *(Cont.)*

```
                  data.frame(RES_coord_10,id=12),
                  data.frame(RES_coord_10,id=13),
                  data.frame(RES_coord_10,id=14))

#Write the PA presence plus movement location data individually to file
NONRES_coord_1 <- rbind(coordinates(do.call(rbind,unlist(fNonResXY(1)))),RES_coord_1)
write.table(NONRES_coord_1,"Data/tab delim/NONRES_coord_1", sep =
"\t",row.names=FALSE,col.names=FALSE)
NONRES_coord_2 <- rbind(coordinates(do.call(rbind,unlist(fNonResXY(2)))),RES_coord_2)
write.table(NONRES_coord_2,"Data/tab delim/NONRES_coord_2", sep =
"\t",row.names=FALSE,col.names=FALSE)
NONRES_coord_3 <- rbind(coordinates(do.call(rbind,unlist(fNonResXY(3)))),RES_coord_3)
write.table(NONRES_coord_3,"Data/tab delim/NONRES_coord_3", sep =
"\t",row.names=FALSE,col.names=FALSE)
NONRES_coord_4 <- rbind(coordinates(do.call(rbind,unlist(fNonResXY(4)))),RES_coord_4)
write.table(NONRES_coord_4,"Data/tab delim/NONRES_coord_4", sep =
"\t",row.names=FALSE,col.names=FALSE)
NONRES_coord_5 <- rbind(coordinates(do.call(rbind,unlist(fNonResXY(5)))),RES_coord_5)
write.table(NONRES_coord_5,"Data/tab delim/NONRES_coord_5", sep =
"\t",row.names=FALSE,col.names=FALSE)
#No non residence events for this croc
NONRES_coord_6 <- RES_coord_6
write.table(NONRES_coord_6,"Data/tab delim/NONRES_coord_6", sep =
"\t",row.names=FALSE,col.names=FALSE)
NONRES_coord_7 <- rbind(coordinates(do.call(rbind,unlist(fNonResXY(7)))),RES_coord_7)
write.table(NONRES_coord_7,"Data/tab delim/NONRES_coord_7", sep =
"\t",row.names=FALSE,col.names=FALSE)
NONRES_coord_8 <- rbind(coordinates(do.call(rbind,unlist(fNonResXY(8)))),RES_coord_8)
write.table(NONRES_coord_8,"Data/tab delim/NONRES_coord_8", sep =
"\t",row.names=FALSE,col.names=FALSE)
NONRES_coord_9 <- rbind(coordinates(do.call(rbind,unlist(fNonResXY(9)))),RES_coord_9)
write.table(NONRES_coord_9,"Data/tab delim/NONRES_coord_9", sep =
"\t",row.names=FALSE,col.names=FALSE)
NONRES_coord_10 <- rbind(coordinates(do.call(rbind,unlist(fNonResXY(10)))),RES_coord_10)
write.table(NONRES_coord_10,"Data/tab delim/NONRES_coord_10", sep =
"\t",row.names=FALSE,col.names=FALSE)
NONRES_coord_11 <- rbind(coordinates(do.call(rbind,unlist(fNonResXY(11)))),RES_coord_11)
write.table(NONRES_coord_11,"Data/tab delim/NONRES_coord_11", sep =
"\t",row.names=FALSE,col.names=FALSE)
NONRES_coord_12 <- rbind(coordinates(do.call(rbind,unlist(fNonResXY(12)))),RES_coord_12)
write.table(NONRES_coord_12,"Data/tab delim/NONRES_coord_12", sep =
"\t",row.names=FALSE,col.names=FALSE)
NONRES_coord_13 <- rbind(coordinates(do.call(rbind,unlist(fNonResXY(13)))),RES_coord_13)
write.table(NONRES_coord_13,"Data/tab delim/NONRES_coord_13", sep =
"\t",row.names=FALSE,col.names=FALSE)
NONRES_coord_14 <- rbind(coordinates(do.call(rbind,unlist(fNonResXY(14)))),RES_coord_14)
write.table(NONRES_coord_14,"Data/tab delim/NONRES_coord_14", sep =
"\t",row.names=FALSE,col.names=FALSE)

# Combine the individual data into a single dataframe
RESNONRESxy_data <-rbind(data.frame(NONRES_coord_1,id=1),
                    data.frame(NONRES_coord_2,id=2),
                    data.frame(NONRES_coord_3,id=3),
                    data.frame(NONRES_coord_4,id=4),
                    data.frame(NONRES_coord_5,id=5),
                    data.frame(NONRES_coord_6,id=6),
                    data.frame(NONRES_coord_7,id=7),
                    data.frame(NONRES_coord_8,id=8),
                    data.frame(NONRES_coord_9,id=9),
                    data.frame(NONRES_coord_10,id=10),
                    data.frame(NONRES_coord_11,id=11),
                    data.frame(NONRES_coord_12,id=12),
                    data.frame(NONRES_coord_13,id=13),
                    data.frame(NONRES_coord_14,id=14))


##############################################
```

**Fig. S1.** *(Cont.)*

**Table S1. Summary table showing home-range (HR) estimates and corresponding smoothing parameter value (*h*) for each crocodile ID**

| Crocodile ID | HR measure | Location data | *h* (m) | HR size (km ha$^{-1}$) | HR overlap | River overlap |
|---|---|---|---|---|---|---|
| 1 | linear distance | GPS | | 12.83 | 1.00 | |
| | | Presence | | 9.66 | 0.88 | |
| | | Presence + movement | | | | |
| | MCP | GPS | | 2641.42 | 1.00 | 0.24 |
| | | Presence | | 498.06 | 0.59 | 0.28 |
| | | Presence + movement | | 557.01 | 0.60 | 0.29 |
| | href | GPS | 989.00 | 5755.69 | 0.95 | 0.17 |
| | | Presence | 759.00 | 2645.18 | 0.45 | 0.19 |
| | | Presence + movement | 385.00 | 840.48 | 0.21 | 0.31 |
| | hlscv | GPS | 14.00 | 14.56 | 0.95 | 0.99 |
| | | Presence | 72.00 | 64.55 | 0.03 | 0.75 |
| | | Presence + movement | 36.00 | 75.10 | 0.05 | 0.88 |
| | hadhoc | GPS | 396.00 | 2191.40 | 0.95 | 0.23 |
| | | Presence | 607.00 | 1843.52 | 0.37 | 0.23 |
| | | Presence + movement | 270.00 | 554.90 | 0.22 | 0.35 |
| 2 | linear distance | GPS | | 16.49 | 1.00 | |
| | | Presence | | 9.54 | 0.68 | |
| | | Presence + movement | | | | |
| | MCP | GPS | | 1948.57 | 1.00 | 0.16 |
| | | Presence | | 496.33 | 0.55 | 0.25 |
| | | Presence + movement | | 509.10 | 0.51 | 0.31 |
| | href | GPS | 416.00 | 1036.78 | 0.95 | 0.40 |
| | | Presence | 608.00 | 1400.42 | 0.15 | 0.43 |
| | | Presence + movement | 464.00 | 1360.77 | 0.55 | 0.39 |
| | hadhoc | GPS | 208.00 | 460.62 | 0.95 | 0.44 |
| | | Presence | 487.00 | 956.29 | 0.08 | 0.44 |
| | | Presence + movement | 93.00 | 280.70 | 0.36 | 0.66 |
| 3 | linear distance | GPS | | 30.55 | 1.00 | |
| | | Presence | | 20.35 | 0.80 | |
| | | Presence + movement | | | | |
| | MCP | GPS | | 4373.06 | 1.00 | 0.31 |
| | | Presence | | 467.77 | 0.55 | 0.29 |
| | | Presence + movement | | 2355.66 | 0.77 | 0.30 |
| | href | GPS | 1753.00 | 14270.13 | 0.95 | 0.11 |

| Crocodile ID | HR measure | Location data | *h* (m) | HR size (km ha$^{-1}$) | HR overlap | River overlap |
|---|---|---|---|---|---|---|
| | | Presence | 189.00 | 84.14 | 0.04 | 0.46 |
| | | Presence + movement | 1551.00 | 10201.51 | 0.78 | 0.09 |
| | hadhoc | GPS | 1052.00 | 5240.60 | 0.95 | 0.13 |
| | | Presence | 189.00 | 84.14 | 0.10 | 0.46 |
| | | Presence + movement | 775.00 | 3394.72 | 0.66 | 0.16 |
| 4 | linear distance | GPS | | 0.46 | 1.00 | |
| | | Presence | | 15.18 | 0.52 | |
| | | Presence + movement | | | | |
| | MCP | GPS | | 7.33 | 1.00 | 1.00 |
| | | Presence | | 1468.12 | 0.50 | 0.06 |
| | | Presence + movement | | 1921.28 | 0.50 | 0.09 |
| | href | GPS | 93.00 | 44.30 | 0.95 | 0.51 |
| | | Presence | 1162.00 | 5792.43 | 0.02 | 0.09 |
| | | Presence + movement | 1092.00 | 5493.59 | 0.02 | 0.09 |
| | hlscv | GPS | 14.00 | 6.33 | 0.95 | 0.99 |
| | | Presence | 46.00 | 16.46 | 0.00 | 0.87 |
| | | Presence + movement | 55.00 | 92.99 | 0.06 | 0.78 |
| | hadhoc | GPS | 93.00 | 44.30 | 0.95 | 0.51 |
| | | Presence | 1046.00 | 4828.27 | 0.03 | 0.10 |
| | | Presence + movement | 328.00 | 1181.96 | 0.07 | 0.19 |
| 5 | linear distance | GPS | | 11.46 | 1.00 | |
| | | Presence | | 8.61 | 0.87 | |
| | | Presence + movement | | | | |
| | MCP | GPS | | 796.08 | 1.00 | 0.39 |
| | | Presence | | 118.31 | 0.16 | 0.35 |
| | | Presence + movement | | 587.29 | 0.38 | 0.36 |
| | href | GPS | 486.00 | 1044.77 | 0.95 | 0.45 |
| | | Presence | 1428.00 | 7471.52 | 0.15 | 0.18 |
| | | Presence + movement | 761.00 | 2991.13 | 0.31 | 0.27 |
| | hlscv | GPS | 16.00 | 19.68 | 0.95 | 1.00 |
| | | Presence | 203.00 | 284.61 | 0.00 | 0.51 |
| | | Presence + movement | 73.00 | 268.50 | 0.08 | 0.69 |
| | hadhoc | GPS | 486.00 | 1044.77 | 0.95 | 0.45 |
| | | Presence | 571.00 | 1806.53 | 0.11 | 0.31 |

| Crocodile ID | HR measure | Location data | *h* (m) | HR size (km ha$^{-1}$) | HR overlap | River overlap |
|---|---|---|---|---|---|---|
| | | Presence + movement | 228.00 | 863.92 | 0.31 | 0.41 |
| 6 | linear distance | GPS | | 2.01 | 1.00 | |
| | | Presence | | 0.40 | 0.37 | |
| | | Presence + movement | | | | |
| | MCP | GPS | | 79.52 | 1.00 | 0.90 |
| | | Presence | | 4.49 | 0.53 | 1.00 |
| | | Presence + movement | | 4.45 | 0.53 | 1.00 |
| | href | GPS | 76.00 | 38.85 | 0.95 | 0.97 |
| | | Presence | 35.00 | 8.65 | 0.07 | 1.00 |
| | | Presence + movement | 34.00 | 8.23 | 0.07 | 1.00 |
| | hadhoc | GPS | 61.00 | 31.34 | 0.95 | 0.98 |
| | | Presence | 35.00 | 8.65 | 0.06 | 1.00 |
| | | Presence + movement | 34.00 | 8.23 | 0.07 | 1.00 |
| 7 | linear distance | GPS | | 24.48 | 1.00 | |
| | | Presence | | 29.41 | 0.73 | |
| | | Presence + movement | | | | |
| | MCP | GPS | | 1890.03 | 1.00 | 0.36 |
| | | Presence | | 2943.82 | 0.26 | 0.09 |
| | | Presence + movement | | 7834.60 | 0.62 | 0.14 |
| | href | GPS | 1128.00 | 7318.82 | 0.95 | 0.16 |
| | | Presence | 1288.00 | 8284.73 | 0.33 | 0.12 |
| | | Presence + movement | 1653.00 | 16347.45 | 0.53 | 0.10 |
| | hlscv | GPS | 15.00 | 1.54 | 0.94 | 0.94 |
| | | Presence | 66.00 | 69.74 | 0.00 | 0.69 |
| | | Presence + movement | 97.00 | 482.43 | 0.00 | 0.71 |
| | hadhoc | GPS | 451.00 | 2330.28 | 0.95 | 0.35 |
| | | Presence | 1159.00 | 7080.14 | 0.26 | 0.13 |
| | | Presence + movement | 827.00 | 7891.12 | 0.41 | 0.16 |
| 8 | linear distance | GPS | | 9.88 | 1.00 | |
| | | Presence | | 10.05 | 0.88 | |
| | | Presence + movement | | | | |
| | MCP | GPS | | 919.88 | 1.00 | 0.49 |
| | | Presence | | 594.80 | 0.69 | 0.34 |
| | | Presence + movement | | 1579.27 | 0.73 | 0.32 |

| Crocodile ID | HR measure | Location data | *h* (m) | HR size (km ha$^{-1}$) | HR overlap | River overlap |
|---|---|---|---|---|---|---|
| | href | GPS | 785.00 | 3185.96 | 0.95 | 0.23 |
| | | Presence | 653.00 | 2284.09 | 0.49 | 0.25 |
| | | Presence + movement | 747.00 | 3287.16 | 0.74 | 0.22 |
| | hlscv | GPS | 84.00 | 325.98 | 0.95 | 0.82 |
| | | Presence | 44.00 | 40.74 | 0.15 | 0.84 |
| | | Presence + movement | 41.00 | 121.41 | 0.26 | 0.90 |
| | hadhoc | GPS | 236.00 | 955.92 | 0.95 | 0.51 |
| | | Presence | 653.00 | 2284.09 | 0.37 | 0.25 |
| | | Presence + movement | 299.00 | 1269.57 | 0.60 | 0.38 |
| 9 | linear distance | GPS | | 35.01 | 1.00 | |
| | | Presence | | 33.38 | 0.97 | |
| | | Presence + movement | | | | |
| | MCP | GPS | | 10261.00 | 1.00 | 0.08 |
| | | Presence | | 7664.27 | 0.82 | 0.08 |
| | | Presence + movement | | 8060.58 | 0.87 | 0.09 |
| | href | GPS | 1529.00 | 15800.39 | 0.95 | 0.13 |
| | | Presence | 1146.00 | 8204.03 | 0.65 | 0.17 |
| | | Presence + movement | 1189.00 | 8835.04 | 0.68 | 0.17 |
| | hlscv | GPS | 32.00 | 200.83 | 0.95 | 0.85 |
| | | Presence | 25.00 | 33.88 | 0.07 | 0.92 |
| | | Presence + movement | 38.00 | 137.56 | 0.12 | 0.91 |
| | hadhoc | GPS | 1223.00 | 12347.14 | 0.95 | 0.15 |
| | | Presence | 1146.00 | 8204.03 | 0.69 | 0.17 |
| | | Presence + movement | 832.00 | 6040.22 | 0.61 | 0.21 |
| 10 | linear distance | GPS | | 10.10 | 1.00 | |
| | | Presence | | 4.38 | 0.72 | |
| | | Presence + movement | | | | |
| | MCP | GPS | | 688.01 | 1.00 | 0.37 |
| | | Presence | | 107.16 | 0.58 | 0.58 |
| | | Presence + movement | | 479.63 | 0.50 | 0.30 |
| | href | GPS | 580.00 | 1987.82 | 0.95 | 0.34 |
| | | Presence | 260.00 | 312.57 | 0.23 | 0.60 |
| | | Presence + movement | 274.00 | 396.09 | 0.28 | 0.63 |
| | hlscv | GPS | 17.00 | 43.15 | 0.95 | 0.97 |

| Crocodile ID | HR measure | Location data | *h* (m) | HR size (km ha$^{-1}$) | HR overlap | River overlap |
|---|---|---|---|---|---|---|
| | | Presence | 34.00 | 27.05 | 0.16 | 1.00 |
| | | Presence + movement | 37.00 | 50.12 | 0.18 | 0.99 |
| | hadhoc | GPS | 116.00 | 399.87 | 0.95 | 0.64 |
| | | Presence | 104.00 | 81.39 | 0.22 | 0.78 |
| | | Presence + movement | 109.00 | 146.52 | 0.32 | 0.74 |
| 11 | linear distance | GPS | | 76.29 | 1.00 | |
| | | Presence | | 58.17 | 0.88 | |
| | | Presence + movement | | | | |
| | MCP | GPS | | 28628.27 | 1.00 | 0.09 |
| | | Presence | | 17016.11 | 0.80 | 0.09 |
| | | Presence + movement | | 24569.60 | 0.75 | 0.09 |
| | href | GPS | 2090.00 | 27070.46 | 0.95 | 0.11 |
| | | Presence | 750.00 | 2743.28 | 0.35 | 0.21 |
| | | Presence + movement | 1820.00 | 22033.87 | 0.82 | 0.13 |
| | hlscv | GPS | 22.00 | 3.00 | 0.88 | 1.00 |
| | | Presence | 20.00 | 5.94 | 0.00 | 0.90 |
| | | Presence + movement | 26.00 | 50.62 | 0.11 | 0.85 |
| | hadhoc | GPS | 1463.00 | 17548.41 | 0.95 | 0.16 |
| | | Presence | 450.00 | 1424.31 | 0.32 | 0.26 |
| | | Presence + movement | 1274.00 | 13457.26 | 0.82 | 0.18 |
| 12 | linear distance | GPS | | 63.60 | 1.00 | |
| | | Presence | | 60.06 | 0.93 | |
| | | Presence + movement | | | | |
| | MCP | GPS | | 21795.25 | 1.00 | 0.10 |
| | | Presence | | 10111.98 | 0.69 | 0.09 |
| | | Presence + movement | | 20890.81 | 0.93 | 0.10 |
| | href | GPS | 2324.00 | 39056.95 | 0.95 | 0.09 |
| | | Presence | 1091.00 | 7218.01 | 0.45 | 0.19 |
| | | Presence + movement | 2074.00 | 31457.63 | 0.82 | 0.10 |
| | hlscv | GPS | 40.00 | 351.73 | 0.95 | 0.82 |
| | | Presence | 24.00 | 48.60 | 0.08 | 0.89 |
| | | Presence + movement | 42.00 | 410.96 | 0.24 | 0.85 |
| | hadhoc | GPS | 2091.00 | 34396.99 | 0.95 | 0.10 |
| | | Presence | 873.00 | 5460.97 | 0.40 | 0.23 |

| Crocodile ID | HR measure | Location data | *h* (m) | HR size (km ha$^{-1}$) | HR overlap | River overlap |
|---|---|---|---|---|---|---|
| | | Presence + movement | 1866.00 | 27746.03 | 0.80 | 0.11 |
| 13 | linear distance | GPS | | 17.41 | 1.00 | |
| | | Presence | | 12.66 | 0.86 | |
| | | Presence + movement | | | | |
| | MCP | GPS | | 2592.29 | 1.00 | 0.22 |
| | | Presence + movement | | 3006.98 | 0.76 | 0.15 |
| | href | GPS | 875.00 | 5550.91 | 0.95 | 0.14 |
| | | Presence | 966.00 | 5349.04 | 0.64 | 0.11 |
| | | Presence + movement | 799.00 | 4399.65 | 0.77 | 0.13 |
| | hlscv | GPS | 37.00 | 239.47 | 0.95 | 0.91 |
| | | Presence | 23.00 | 24.89 | 0.04 | 0.80 |
| | | Presence + movement | 61.00 | 331.66 | 0.38 | 0.79 |
| | hadhoc | GPS | 350.00 | 2292.44 | 0.95 | 0.28 |
| | | Presence | 869.00 | 4652.93 | 0.45 | 0.11 |
| | | Presence + movement | 320.00 | 1712.60 | 0.64 | 0.26 |
| 14 | linear distance | GPS | | 25.18 | 1.00 | |
| | | Presence | | 28.85 | 0.92 | |
| | | Presence + movement | | | | |
| | MCP | GPS | | 4899.26 | 1.00 | 0.12 |
| | | Presence | | 2914.29 | 0.76 | 0.13 |
| | | Presence + movement | | 3625.69 | 0.82 | 0.15 |
| | href | GPS | 1204.00 | 9561.27 | 0.95 | 0.13 |
| | | Presence | 1242.00 | 9234.92 | 0.70 | 0.13 |
| | | Presence + movement | 1347.00 | 11560.37 | 0.72 | 0.12 |
| | hlscv | GPS | 5.00 | 0.42 | 0.94 | 1.00 |
| | | Presence | 16.00 | 24.51 | 0.00 | 0.79 |
| | | Presence + movement | 32.00 | 287.27 | 0.01 | 0.92 |
| | hadhoc | GPS | 241.00 | 1901.00 | 0.95 | 0.34 |
| | | Presence | 994.00 | 6965.61 | 0.31 | 0.15 |
| | | Presence + movement | 269.00 | 2245.65 | 0.51 | 0.33 |