

ORJIP project: Modelling framework for the joint analysis of survey and telemetry data in seabirds

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Abstract

BLA.

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1 Simulation scenario

A realistic scenario for developing the framework would include the following features

- A sufficiently large spatial extent, compared to the grid resolution used.
- A sufficiently complex coastline, to challenge the model with regard to land-shadowing effects.

- Multiple colonies of different sizes arranged along the coastline.
- Environmental covariates that may be continuous, or categorical.
- Individual-level movement rules, to enable the model to collect tracking data
- A tendency to return to the colony periodically
- A distinction in the strength of this homing tendency between provisioning adults and juveniles
- Flexible and realistic user-defined options for the distribution of tagging effort (by colony and by individual)
- Flexible and realistic user defined options for transect survey design

1.1 Environmental covariates

One continuous, one factor.

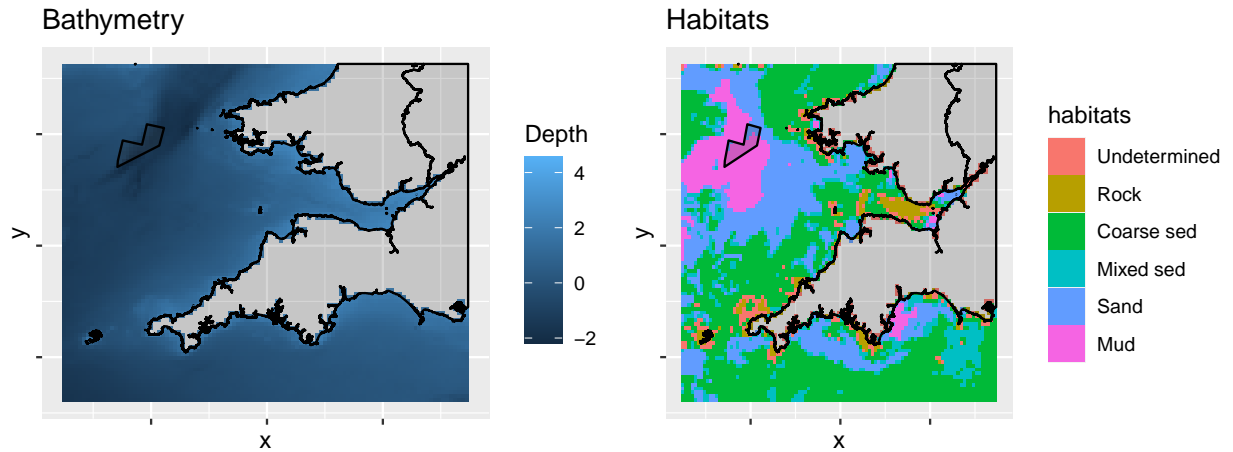
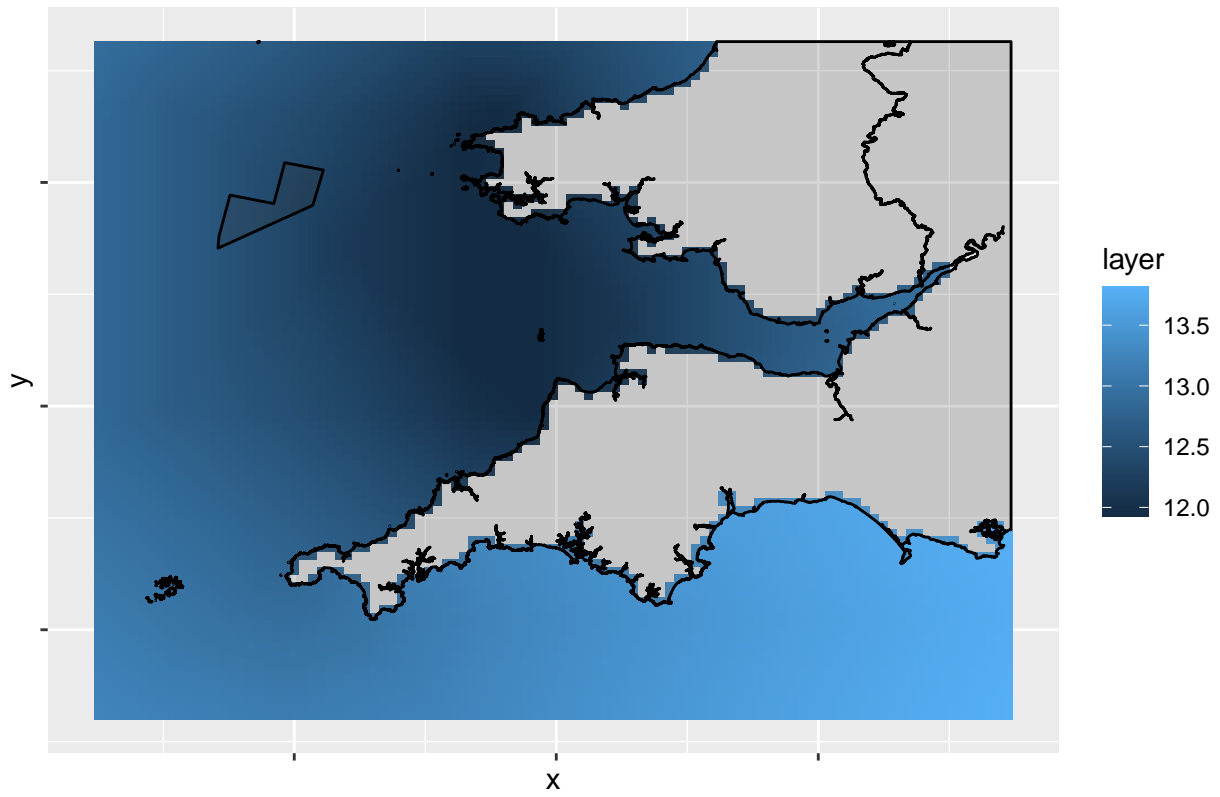


Figure 1: The coastline definition and the associated marine covariate

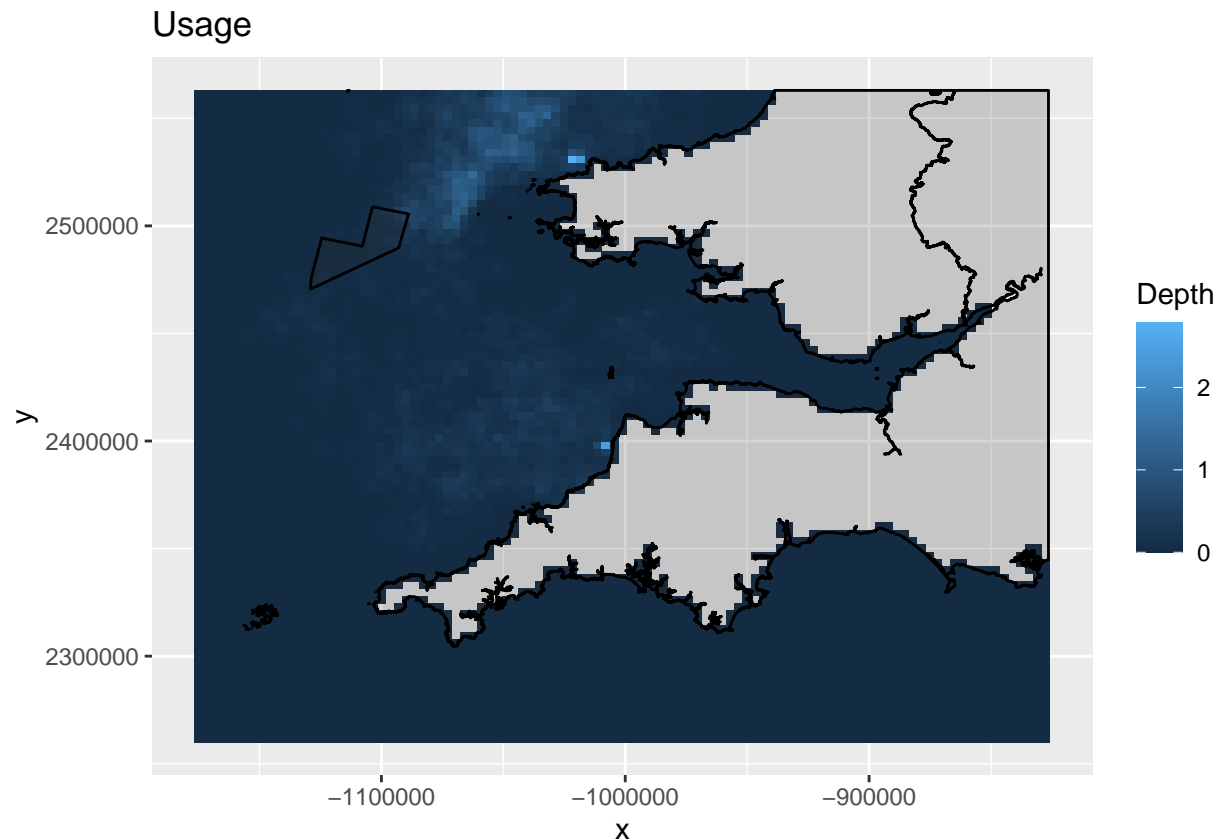
1.2 Derived covariates

Distance-to-colony calculation

Proximity to colonies



1.3 Individual-based simulation



Survey transects Import real transects and decide on different thinning regimes (i.e. truncate at ends, or introduce breaks between lines, how much to truncate, how long the breaks?) Perform data collection

```
##### TRANSECTS #####

ESAS2016<-read.csv("ESAS 2016_MG.csv")

thin<-1
survey<-data.frame("Date"=ESAS2016$Date, "Lat"=ESAS2016$Latitude, "Lon"=ESAS2016$Longitude)

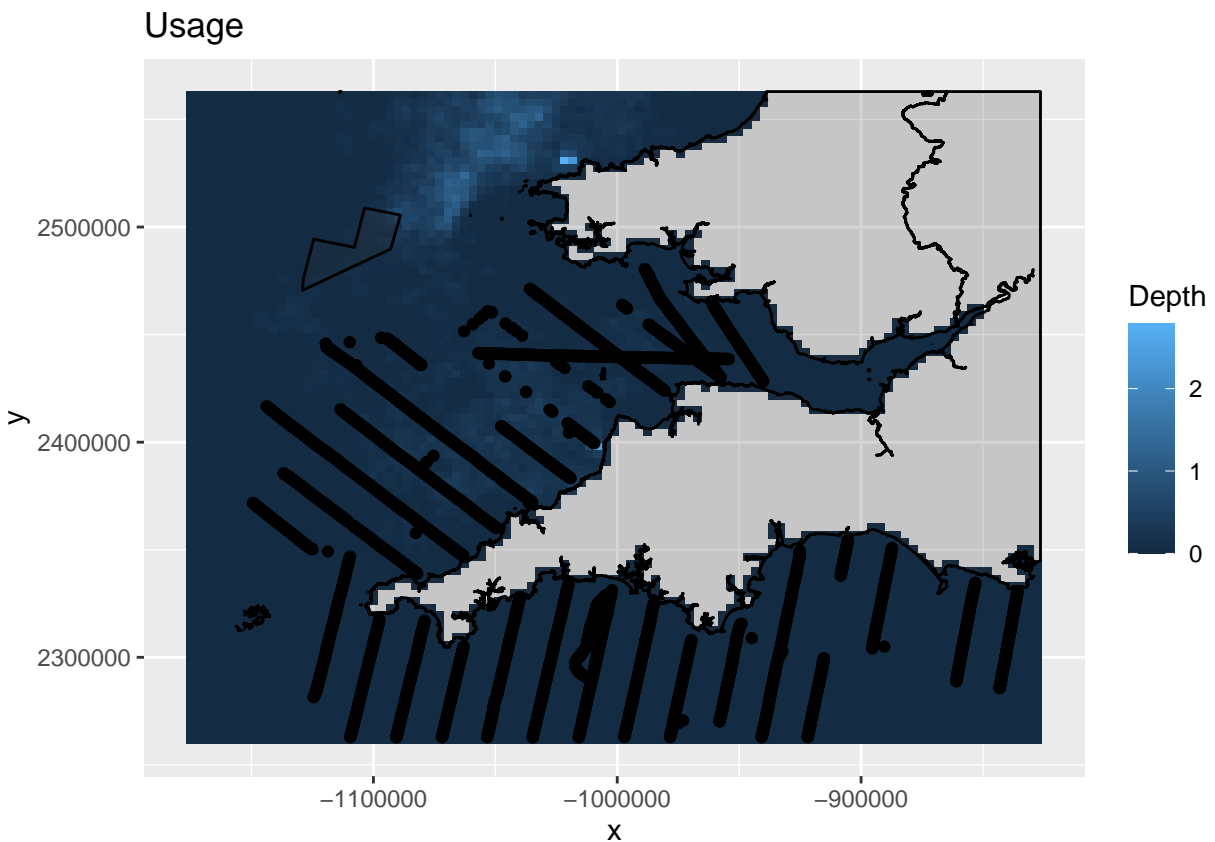
xy <- cbind(x=survey$Lon, y = survey$Lat)
xy<-cbind(as.numeric(xy[,1]),as.numeric(xy[,2]))
xyprojTR<-project(xy, as.character(crsDef))
kp<-((xyprojTR[,1]<xmax)*(xyprojTR[,1]>xmin)*(xyprojTR[,2]<ymin)*(xyprojTR[,2]>ymin))==1
xyprojTR<-xyprojTR[kp,]
covsTR<-data.frame("Date"=survey$Date[kp])
```

```

transects <- SpatialPointsDataFrame(coords = xyprojTR, data=covsTR,
                                   proj4string = crsDef)

ggplot()+
  gg(usagespdf)+
  gg(coast)+
  ggtitle("Usage")+
  gg(studyA1)+
  gg(transects)

```



1.4 Tagging effort

How many individuals, for how much time, what is the split in effort between the two colonies? Perform data collection

2 Inference

2.1 Inference on telemetry data (SSF)

2.2 Inference on survey data (HSF)

2.3 Joint inference

3 Appendix