Source: https://unsplash.com/@satyadeep_d

In this exercise you will analyse point transect survey data: camera trap data are a special case of point transect sampling. This practical acquaints you with fitting detection functions to point transect data. In the first problem, the data are simulated and so the true density is known. In the second problem, two different data collection methods were used to survey song birds.

1 Simulated data

Simulated point transect data from 30 points are given in the data set PTExercise. These data were generated from a half-normal detection function and the true density was 79.8 animals/hectare. The radial distances were recorded in metres. Although the data were simulated with exact distances to each detection, we are going to analyze the data as if it were collected in equally-spaced 2.5m distance bins, because binned (also called "interval") data are the norm in camera trap surveys.

1.1 Fit a half normal detection function

1.1.1 Examine the fit of the model to the data

Through both formal goodness-of-fit test and visually via plotting

1.2 Experiment with other models

- Experiment with keys other than the half normal (i.e. hazard rate and uniform) to assess whether these data can be satisfactorily analysed using the wrong model:
  - determine a suitable truncation distance, and
  - for each key function decide whether any adjustments are needed.
- How do the bias and precision compare between models?

Note, to define a different truncation distance, you can change the upper limit of the cutpoints sequence – for example, to define a truncation distance of 30m.

2 Songbird point transect data

A point transect survey of songbirds was conducted at Montrave, Fife, Scotland, in 2004 (Buckland, 2006) and for this exercise, the data gathered from winter wrens is used. Several different methods of data collection were used and for this exercise, two point transect methods are used:

- standard five-minute counts and

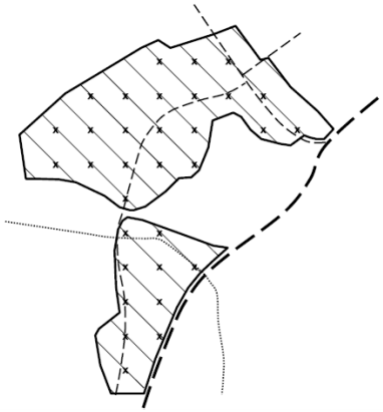
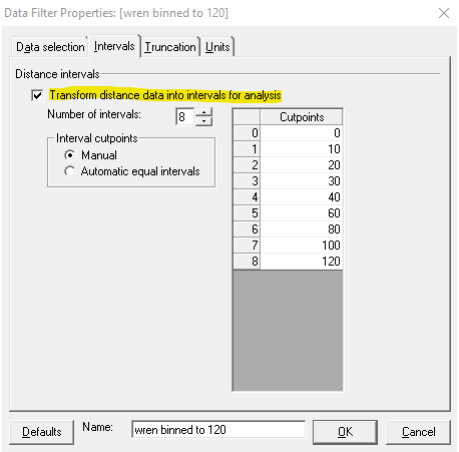


Figure 1: The study site at Montrave in Fife, Scotland. The dotted line is a small stream, the thin dashed lines are tracks, and the thick dashed line a main road. The 32 points are shown by crosses, and are laid out on a systematic grid with 100m separation.



- the 'snapshot' method.

For each method the same 32 point transects were used in 33.2 ha of parkland (Figure 1) and each point transect was visited twice. Detection distances (recorded in metres) were measured with the aid of a rangefinder.

Note the Effort field is 2 meaning each point transect was visited twice.

Although the data were collected using exact distances, we will again assume they were collected in distance bins, to make things more comparable with our future camera trap analyses. We will assume 10m distance bins out to 40m and then 20m bins thereafter; in both datasets the maximum distance is 120m. Adjust the analysis such that bins are used, setting 8 cutpoints to create 7 distance bins as in the screen shot below:

2.1 Analyses to perform

- Start with a simple model for exploration.

  - Experiment with truncation distances w and choose a value of w for each data set
  - Are there any troubling issues in either data set?
- Try some other models (key functions and adjustement)
- From AIC scores, plots and goodness-of-fit statistics, choose an adequate model
- Record point and interval estimates for your chosen model of each data set.

Territory mapping of winter wrens in this study area suggested territory density of 1.30 $territories^{-1}$

References

Buckland, Stephen T. (Apr. 2006). "Point-transect surveys for songbirds: robust methodologies". In: *The Auk* 123.2, pp. 345–357. DOI: 10.1642/0004-8038(2006)123[345:PSFSRM]2.0.CO;2.