Introduction to Distance Sampling

Line transect analysis with Distance

1a) Results of estimating density from simulated data in which true density was 79.8 per km^2. Findings from some candidate models:

Key function	**Adjustments**	**w (m)**	$\hat{D}$	$\hat{D}$ **CV**	$\hat{D}$ **LCL**	$\hat{D}$ **UCL**
Half normal	0	35.8	87.49	0.16	63	122
Half normal	0	20	84.12	0.17	59	120
Uniform	1	20	86.43	0.17	61	123
Hazard rate	0	20	85.66	0.20	57	129
Neg. exponential	0	20	105.04	0.21	69	159

Not surprisingly for these data (simulated from a half normal detection function with a broad shoulder), the negative exponential model gives a higher estimate than the others, although the confidence interval still includes the true density. The other models provide very similar estimates, though precision is slightly worse for the hazard-rate model (because more parameters fitted). Agreement between the estimate and the known true density is less good if you do not truncate the data, or do not truncate them sufficiently. Take home message: With care, we can get reliable estimates using the wrong model (the data were simulated using a half-normal detection function).

Additional question

2) These capercaillie data are reasonably well-behaved and different models that fit the data well should give similar results. Note the rounding in the distance data. This means that interval cutpoints for histograms and goodness-of-fit testing, and for the analysis of grouped data if this is required, should be chosen with care (i.e., distance bands ought to be sufficiently broad such that the ‘correct’ perpendicular distance is in the bands containing the rounded recorded value. e.g. 0, 7.5, 17.5, 27.5, …

Fitted model	$\hat{D}$	$\hat{D}$ **LCL**	$\hat{D}$ **UCL**	$\hat{D}$ **CV**
Half normal	4.76	4.01	5.65	0.09
Uniform cosine	4.28	3.22	5.68	0.14
Hazard rate	4.2	3.6	4.9	0.08
Half normal with grouped data	4.06	3.75	4.4	0.09