Supplementary Material S1**:** SECR models for estimating leopard population densities. Models 2-11 compare detection and encounter rates to the Null Model (Model 1). Models 13-18 compare detection and encounter rates for animals with masked covariates to the Null Model for masked covariates (Model 12). Model comparison uses Akaike Information Criterion (AIC). σ denotes the detection scale factor, λ_0 denotes basal encounter rate, and '~ 1' indicates constant detection parameters. All full maximum likelihood models utilised a negative exponential detection function and a Poissan observation process for camera trap detections.

Model no.	**Parameters**	**Model description**	**Explanation**
1	$\lambda_0 \sim 1$, $\sigma \sim 1$, $D \sim 1$	Null model	Neither the scale parameter, the basal detection rate, nor density is affected by any predictor variable, and they are constant across phases within each survey
2	$\lambda_0 \sim T$, $\sigma \sim T$, $D \sim 1$	Time effect	There is a variation in capture probability parameters between sampling periods (phases within survey)
3a	$\lambda_0 \sim Sex$	Sex response	Male and female leopards display different basal detection rates
3b	$\sigma \sim Sex$	Sex response	Male and female leopards display different scale parameters
4a	$\lambda_0 \sim b$	Behavioural response	The initial encounter with the trap leads to a step change in the basal detection rate
4b	$\sigma \sim b$	Behavioural response	The initial encounter with the trap leads to a step change in the scale parameter
Trap-specific covariates (*Cov*)			
5a	$\lambda_0 \sim Cov$	Response to Veld Type	Basal detection rate is influenced by Veld Type
5b	$\sigma \sim Cov$	Response to Veld Type	The scale parameter is affected by Veld Type
6a	$\lambda_0 \sim Cov$	Response to Land Use	Basal detection rate is influenced by Land Use
6b	$\sigma \sim Cov$	Response to Land Use	The scale parameter is affected by Land Use
7a	$\lambda_0 \sim Cov$	Response to RAI Livestock	Basal detection rate is influenced by RAI Livestock
7b	$\sigma \sim Cov$	Response to RAI Livestock	The scale parameter is affected by RAI Livestock
8a	$\lambda_0 \sim Cov$	Response to RAI Human Activity	Basal detection rate is influenced by RAI Human Activity
8b	$\sigma \sim Cov$	Response to RAI Human Activity	The scale parameter is affected by RAI Human Activity
9a	$\lambda_0 \sim Cov$	Response to Elevation	Basal detection rate is influenced by Elevation
9b	$\sigma \sim Cov$	Response to Elevation	The scale parameter is affected by Elevation
10a	$\lambda_0 \sim Cov$	Response to RAI Prey	Basal detection rate is influenced by RAI Prey
10b	$\sigma \sim Cov$	Response to RAI Prey	The scale parameter is affected by RAI Prey
11a	$\lambda_0 \sim Cov$	Response to Distance to Dwellings	Basal detection rate is influenced by Distance to Dwelling
11b	$\sigma \sim Cov$	Response to Distance to Dwellings	The scale parameter is affected by Distance to Dwelling

Mask covariates (*mCov*)			
12	$D \sim 1, \lambda_0 \sim 1, \sigma \sim 1$	Null model (mask)	Leopard density is unaffected by any predictor variable
13	$D \sim mCov, \lambda_0 \sim 1, \sigma \sim 1$	Response to Elevation	Leopard density responds to Elevation
14	$D \sim mCov, \lambda_0 \sim 1, \sigma \sim 1$	Response to Distance to Rivers (Euclidian)	Leopard density responds to Distance to Rivers
15	$D \sim mCov, \lambda_0 \sim 1, \sigma \sim 1$	Response to Slope	Leopard density responds to the landscape Slope
16	$D \sim mCov, \lambda_0 \sim 1, \sigma \sim 1$	Response to Prey	Leopard density responds to Prey availability
17	$D \sim mCov, \lambda_0 \sim 1, \sigma \sim 1$	Response to Land Cover	Leopard density responds to differences in Land Cover
18	$D \sim mCov, \lambda_0 \sim 1, \sigma \sim 1$	Response to Distance to Roads (Euclidian)	Leopard density responds to Distance to Roads