

**Estimating detection function from line-transect distance-sampling data for Gopher
Tortoise burrows at Avon Park Air Force Range, Florida**

SUMMARY

- *Methods:* Distance sampling analysis on line-transect data
- *Response variable:* Gopher tortoise burrow detection probability
- *Explanatory/independent variables considered:* Habitat type (scrub and flatwoods)
- *Selected model(s):* intercept-only model; hazard-rate for full data
- *Results:* No difference in detection probability between habitats; detection probability of 0.24 at 5 m; effective strip width (ESW) of 4.38 m

METHODS

We applied a distance-sampling analysis to line-transect data to assess the effect of distance on detection probability for gopher tortoise burrows (Buckland et al., 2001). We tested five separate models (uniform, half-normal with intercept only, half-normal with stratum effect, hazard-rate with intercept only, hazard-rate with stratum effect) for the full dataset after finding no significant effect of habitat type. Model selection was performed using Akaike's Information Criterion with a correction for small sample sizes (AICc, Burnham and Anderson, 2002). Analyses were performed using R package *Rdistance* (v. 2.1.3, McDonald et al., 2019) in R (v. 3.6.0; R Core Team, 2019).

RESULTS

Data consisted of 286 observed burrows, distributed over 69 transects surveyed in 2009 (Castellón et al., 2012), covering 2 habitat types (with 44 and 25 transects located in scrub and flatwoods habitats, respectively). In scrub habitat, 202 burrows were recorded (average: 4.59 detected burrows/transect), while 84 were observed in flatwoods (average: 3.36 detected burrows/transect). Recorded detection distances ranged from 0 m (i.e. on transect) to 24.27 m, with an average of 2.84 m (SD: ± 2.90).

Using AICc for model selection, the best model describing the detection function for the full dataset was the hazard-rate model with intercept only (Table 1). Although the hazard-rate model including habitat type as a covariate was the second best-supported model, addition of the covariate did not improve the intercept-only model, and the SD for the coefficient associated with the covariate overlapped zero (0.09 ± 0.12), indicating lack of a significant effect of habitat type on detection probability. Results from the top-ranked model (hazard-rate model with intercept only) indicated an estimated detection probability of 0.24 at 5 m (Fig. 1), and an effective strip width of 4.38 m, suggesting perfect detection to a distance of 4.38 m from the transect.

Table 1. Model selection for full dataset. *AICc*: Akaike's Information Criterion corrected for small sample sizes. Selected model is indicated in bold.

Model	AICc
Hazard-rate model with intercept only	1163.311
Hazard-rate model with habitat type as covariate	1164.813
Uniform distribution	1170.716
Half-normal distribution with habitat type as covariate	1215.422
Half-normal distribution with intercept only	1218.017

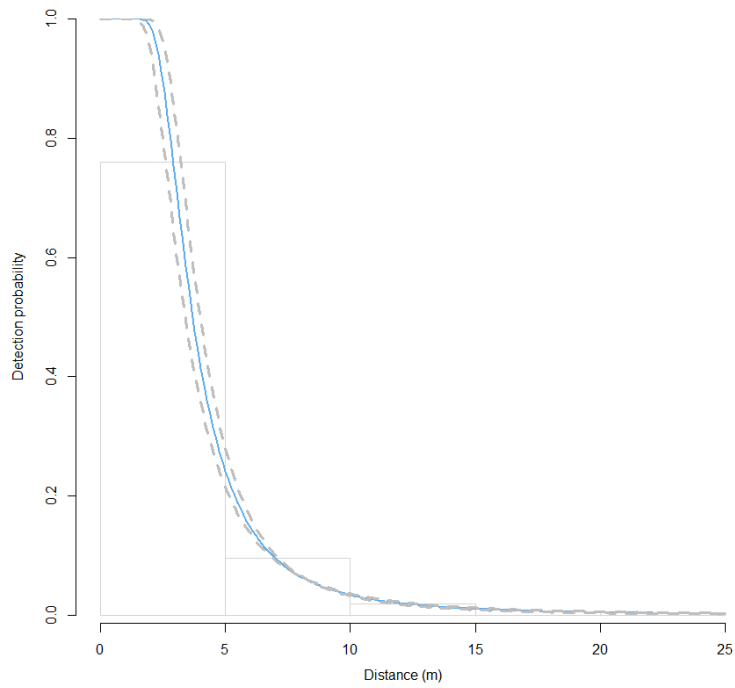


Fig. 1. Detection probability as a function of distance, and histogram of detections. Fitted detection function is represented by the solid blue line, with associated standard deviation in dashed gray lines.

LITERATURE CITED

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