

Reintroducing species when threats still exist: assessing the suitability of contemporary landscapes for island endemics

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SUPPLEMENTARY MATERIAL 1 Methodological details.

Land cover

We delineated land cover types for the island of St Croix in 1750 by overlaying the borders of the island and its waterways onto a current map using the *DigitizingTools* plugin for *QGIS 2.14.0* (Open Source Geospatial Foundation, Beaverton, USA). We then used *GeoprocessingTools* in *QGIS* to quantify land cover in 1750 into urban, woodland, forest, edge forest, shrubland, water, pasture, grassland, salt ponds (Fig. 1). We categorized modern land cover into 76 types Gould et al., (2007) and we combined these into the same categories that we used on the 1750 map. We combined woodland and shrubland into one category, and edge forest and forest into a second category. We compared urban land cover and pastures including agriculture. We did not compare the land cover contributions from water or salt ponds because these do not directly affect the areas that ground lizards utilize.

Lizard abundance models

We used the *predict* function for the rasterized data from the top model to fit the model parameters to the island of St Croix. The model was fit in the *R 0.10.2* package *unmarked* with a negative binomial *N*-mixture occupancy model (Fiske & Chandler, 2011). We conducted visual counts of unmarked animals with multiple observers at 42 sites throughout Buck Island. We found that by 2015, St Croix ground lizards *Pholidoscelis polops* had dispersed from the translocation site to occupy 68.9–89.1% of Buck Island. For detailed results see Angeli et al. (2018) and Fitzgerald et al. (2015).

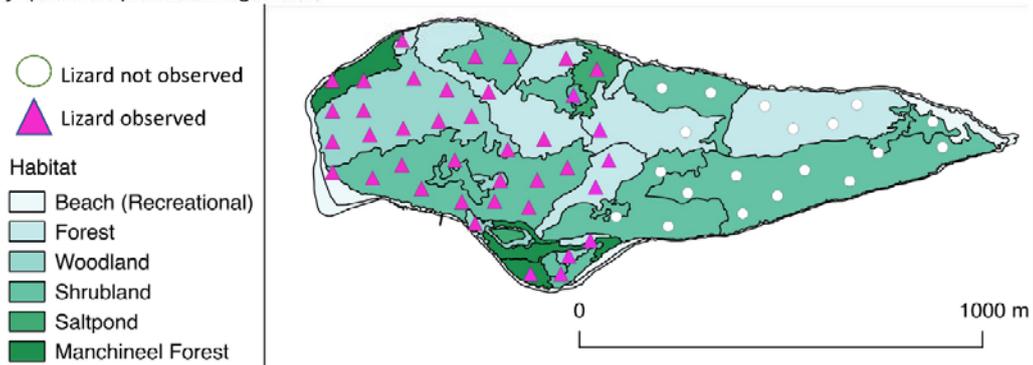
Binomial N -mixture models used to estimated abundance on the region based on 2013 surveys

Site (i) – 42 sites
 Survey (j) - 6 surveys
 $Y_{i,j}$ – counts – 12,900 observations

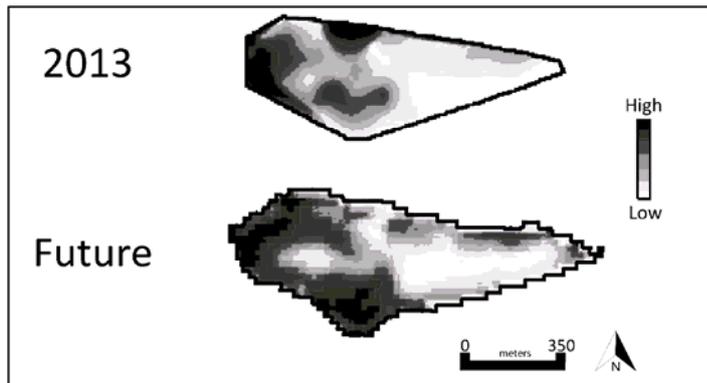
λ – density
 N_i – true abundance by site
 P_{ij} – probability of observing a lizard

$$N_i \sim \text{Poisson}(\lambda) \quad Y_{i,j} \sim \text{Binomial}(N_i, P_{ij})$$

$$\text{Log}(\lambda_i) = \alpha + \beta * x_i \quad \text{Logit}(P_{ij}) = \alpha + \beta * x_{ij}$$



SUPPLEMENTARY FIG. 1 The study design on Buck Island for detailed surveys including six observers making six repeated visits of 40 minutes to each site. We used habitat types important to the lizard's distribution from the best fit 2013 Binomial N -mixture models of Buck Island ($P = 0.636$) that used 2016 Landsat 8 satellite imagery. However, we converted the habitat types of woodland, shrubland, manchineel forest, beach, and forest from the Landsat 8 data using elevation, sand cover, water soil permeability, canopy cover (normalized difference vegetation index), and operative land surface temperature in a statistical treatment described in Angeli et al., 2018. The original model corrected for the ongoing dispersal (distance to dispersal ($Dist$)) of the lizards on Buck Island. We set a new data frame value for $Dist = 0$ because we were interested in where the lizards would go when they were finished dispersing (i.e., where they would live on St Croix if reintroduced).



SUPPLEMENTARY FIG. 2 The results of modeling by Angeli et al., 2018 to describe the 2013 abundance of the Buck Island population of St Croix ground lizards was used to determine the future habitat suitability across Buck Island. In this article, we used the same method to determine where the lizards would live on St Croix as described in this article.

References

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