

Anticipated Niche Expansion of *Erythrura gouldiae* Based on Climate Projections

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Introduction

The species focused on this study is the *Erythrura Gouldiae*, also known as the Gouldian Finch. It is an endangered species endemic to the Northern and Western parts of Australia. In recent years the population has been in decline, researchers believe this could be due to a low clutch size, fires, and the degradation of their habitat for livestock (Tidemann 1996).



Fig. 1. *Erythrura gouldiae*

Looking at the current distribution records as well as the current climate in the environment we can make predictions about the niche for *Erythrura Gouldiae* (Fig. 2). This project will explore these predictions in niche modeling to allow us to compare the shift in the range in this species and see if they are projected to continue to decline in nature.

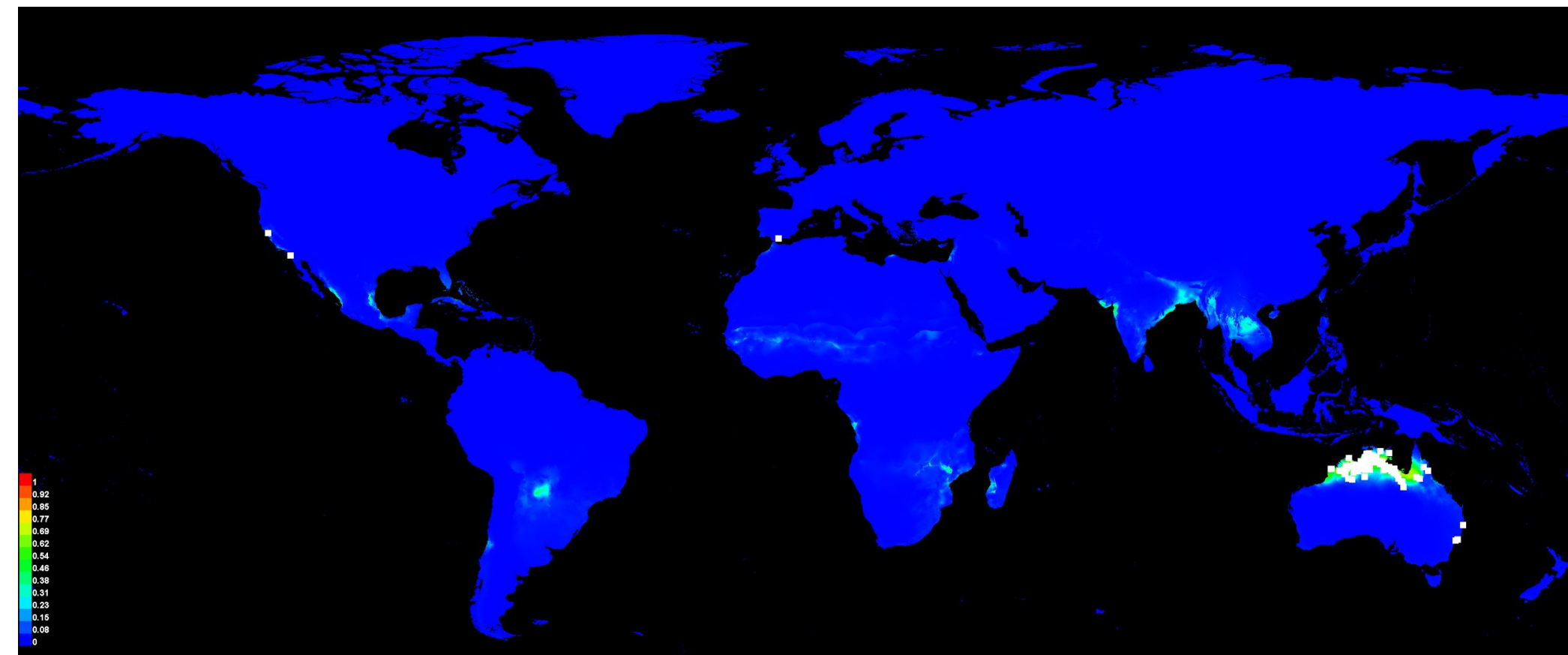


Fig. 2. Current *Erythrura gouldiae* Positive Outcome Locations.

Methods

The species occurrence data on *Erythrura gouldiae* was collected from the Global Biodiversity Information Facility (GBIF.org). From GBIF, we were able to collect the latitude and longitude data points for 743 occurrences. Initially 1578 occurrences were collected, but we deleted large stretches of occurrences with identical latitude and longitude. After these cuts, there were 743 occurrences left, albeit many identical entries still remained. Also, entries with very similar longitude and latitude were not removed. Despite the aforementioned points, we counted over 50 occurrences that were neither identical nor similar to any data point. From DIVA-GIS (Hijmans et al., 2012) we used the global political boundaries map and collected current climate data. We also collected projected climate data from the WorldClim database (Hijmans et al. 2005). Using Maxent (Phillips et al., 2006), we constructed maps of the current and projected niche models for *Erythrura gouldiae*. Lastly, we ran a one-sample t test using PAST (Hammer et al., 2001) between the current and projected niche to assess the statistical likelihood that the current niche and the projected niche were equal to each other.

Results

Maxent created a map indicating locations where *Erythrura gouldiae* were more likely to prosper. Warm colorations indicate areas where predictions are expected to have a more positive outcome for the species. Here maxent separated *Erythrura gouldiae* from *Chloebia gouldiae*, *Chloebia gouldiae* was the old scientific name while *Erythrura gouldiae* is the new scientific name. DIVA-GIS maps displayed that the birds were likely to be inhabiting the same locations in the future with a variation displaying that the populations have the potential to move closer to the equator.

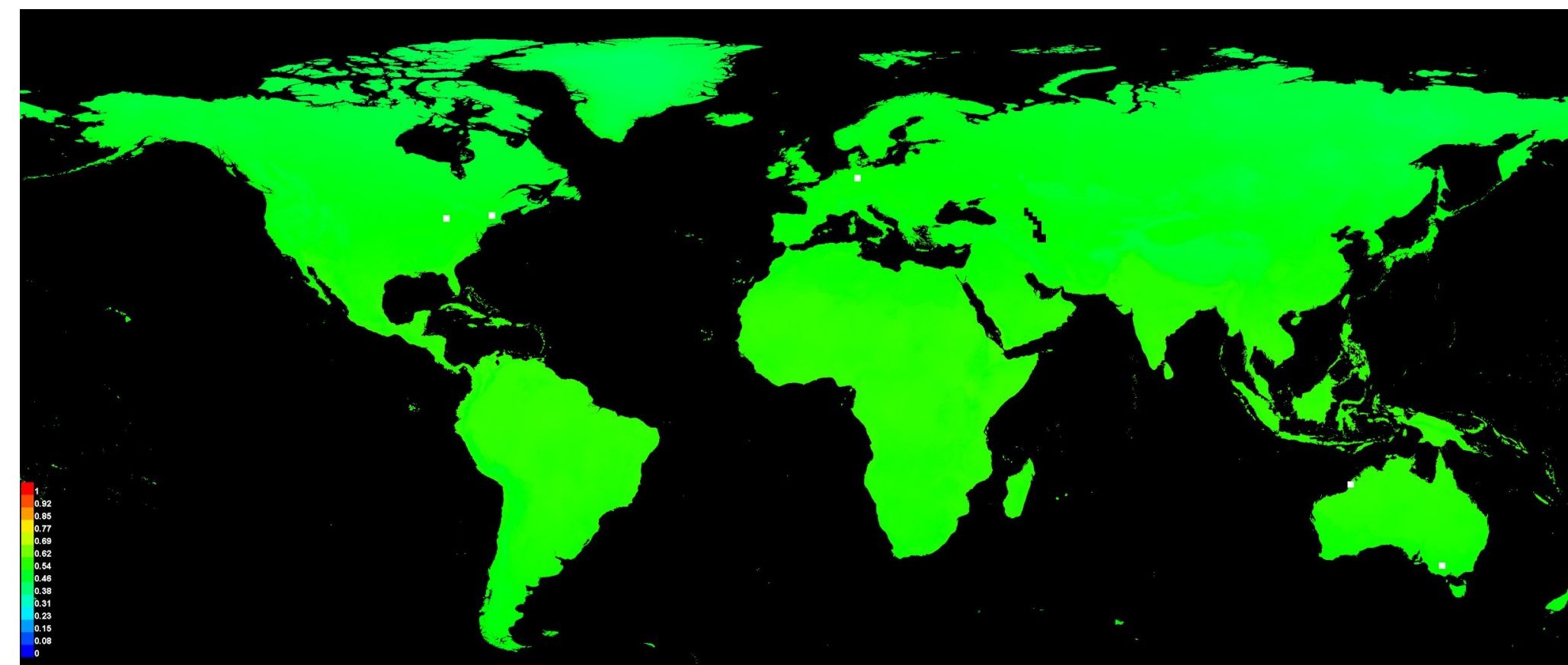


Fig. 3. Current *Chloebia gouldiae* Positive Outcome Locations

Running a one-sample t test, the p-value for this data was .00001 meaning that the results were significant. (See figure 2 and 3 for current niches) (See figure 4 and 5 for potential future niche locations by examining the warm colorations.)

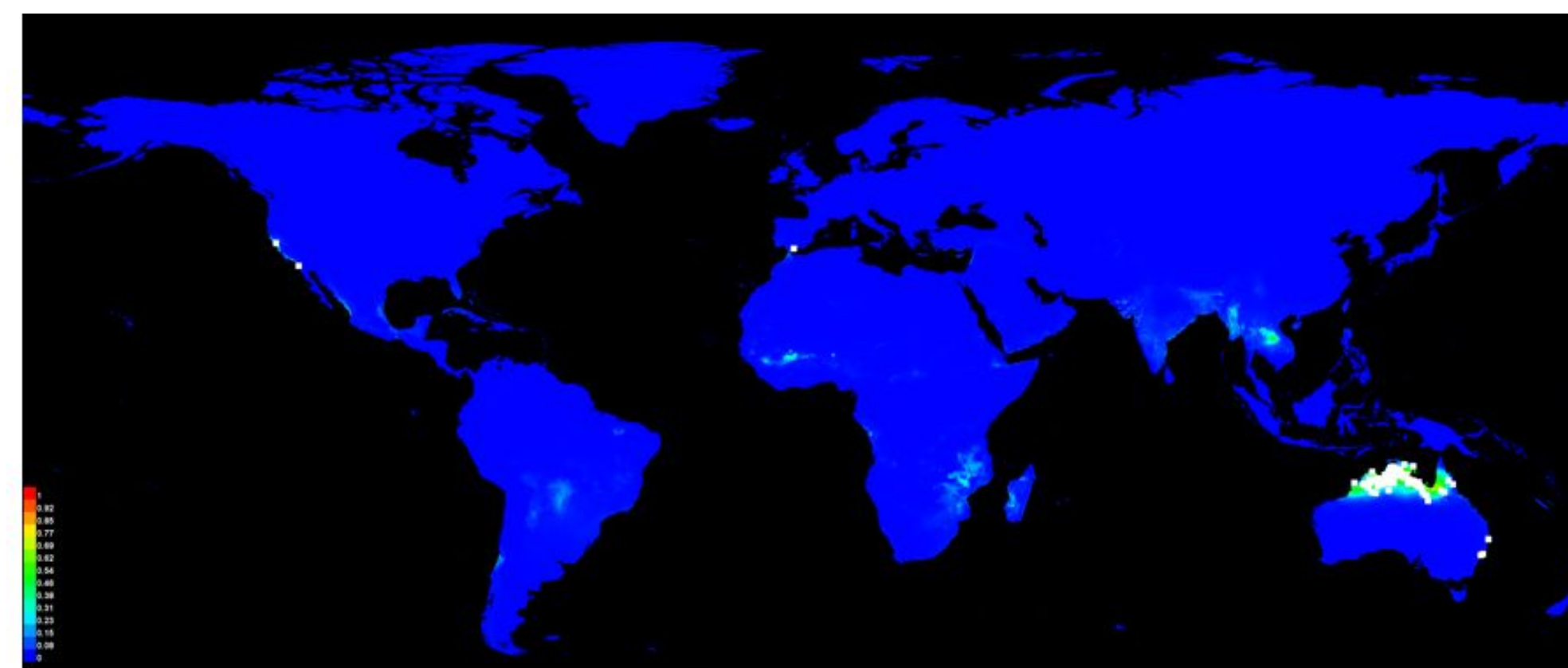


Fig. 4. *Erythrura gouldiae* Positive Outcome Locations.

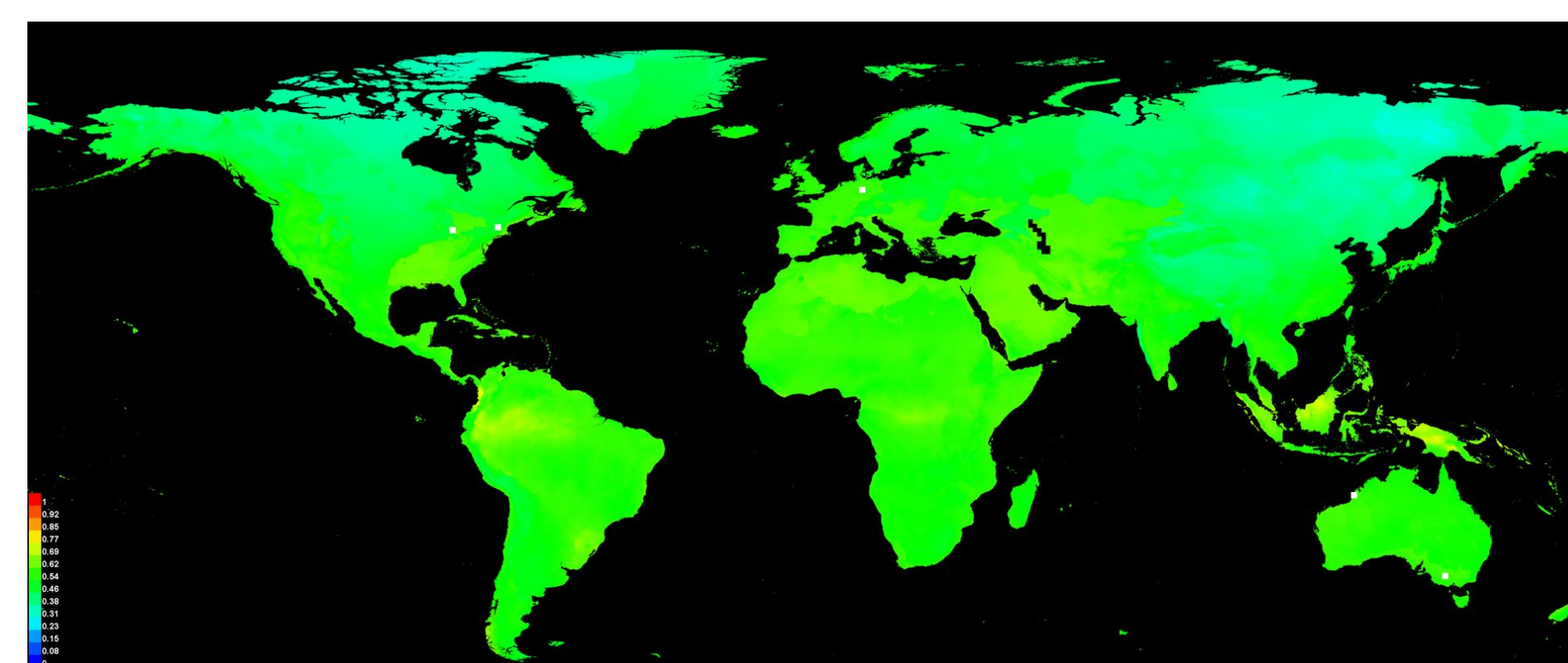


Fig. 5. Future *Chloebia gouldiae* Positive Outcome Locations.

Discussion

As shown, environmental factors present significant concerns for *E. gouldiae*. The p-value is significant, indicating that the bird's niche will not stay the same and will likely decrease. It is likely *E. gouldiae* remains endangered. The best location for the species overall survival is in the northern territory of Australia currently, but with future climate issues such as global warming, there is an indication that the niche may move slightly closer to the equator in all of the finch colonies, while still maintaining their current niche location. The species remains in decline because of small clutch sizes, fires, habitat degradation, and over collection of species for pets.

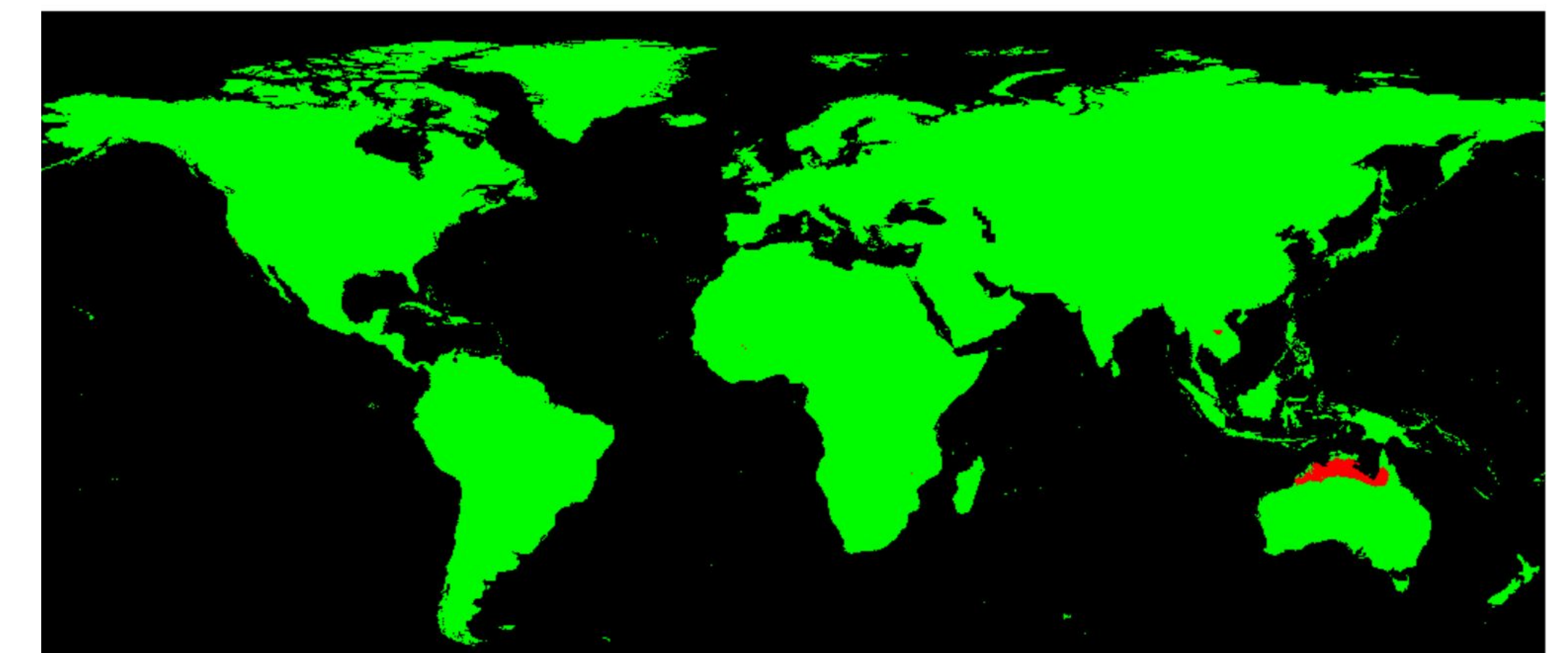


Fig. 6. DIVA-GIS niche modeling tool view.

Conclusions

- *E. gouldiae* lives primarily in Northern Australia.
- Their habitat has a possibility of shifting closer to the equator in the future.
- *E. gouldiae* will remain endangered for the foreseeable future, due to survivability factors (habitat destruction, small clutch size, presence of fires, etc.)

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