

Analysis of Jaguar Home Ranges Via a Novel Application of Spatially Explicit Capture-Recapture

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Introduction

- Jaguars are an apex predator that are near threatened and their populations are declining due to habitat loss and fragmentation.
- To effectively manage their populations, we need to know things like how large their home ranges are and if those home ranges overlap with other individuals.
- Telemetry can be an expensive and invasive method used to infer movement and space-use of wildlife species.
- Non-invasive trail cameras collect data on a much broader cross-section of the population and using models may offer unique insight into large carnivores' space-use at a population level.



Figure 1. (a) Our 4 study sites in the Orange Walk District in western Belize were La Milpa, Hill Bank, Gallon Jug, and Yalbac. (b) One of our camera trap stations

Methods (Camera Trapping)

- We deployed a grid of non-invasive, motion activated cameras across 4 study sites (Fig. 1) in northwestern Belize for 2–3-month survey periods between 2010–2018.
- We had a total of 39 cameras in 2010 and 126 in 2018 set up along trails and roads.
- Jaguar images were manually matched by eye, catalogued, and numbered, identifying 73 individual jaguars (27 females and 46 males).

Methods (SECR Model)

- SECR models are typically used for estimating density and abundance of an animal for a given area, but since it incorporates animal movements, we're able to use it for estimating home range and space-use.
- Each circle in the figure below is a different individual's home range using a 95 percent confidence interval to include their confidence levels (Fig. 2).



Home Range Map

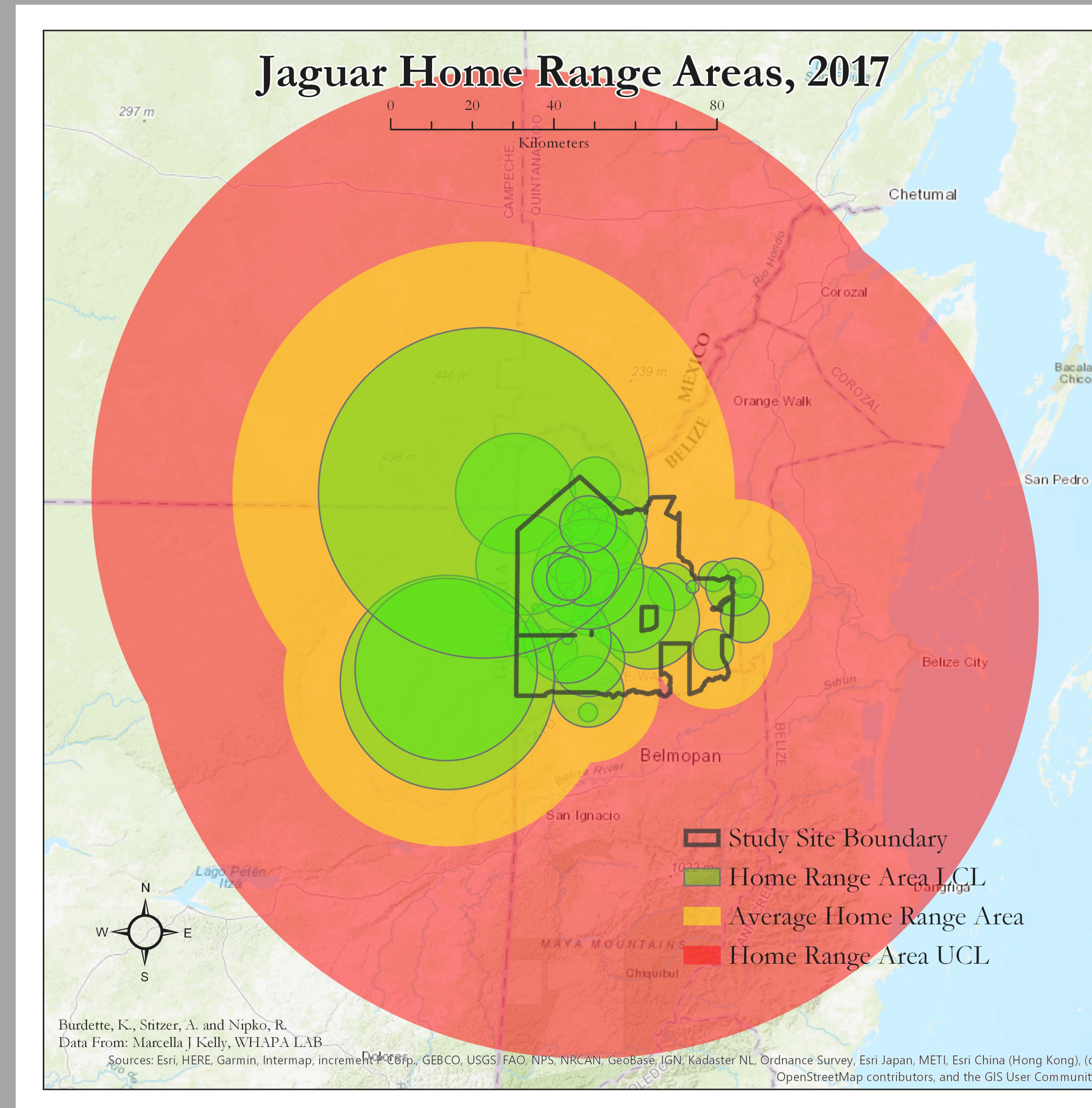


Figure 2. Jaguar Home Range Areas for the year 2017 created in ArcGIS Pro

Results

- We found the average home range area to be 287.9 km² for females and 937.4 km² for males (Fig. 3).
- Male home ranges are larger than those of females.
- The home ranges of certain jaguars crossed country borders multiple times.

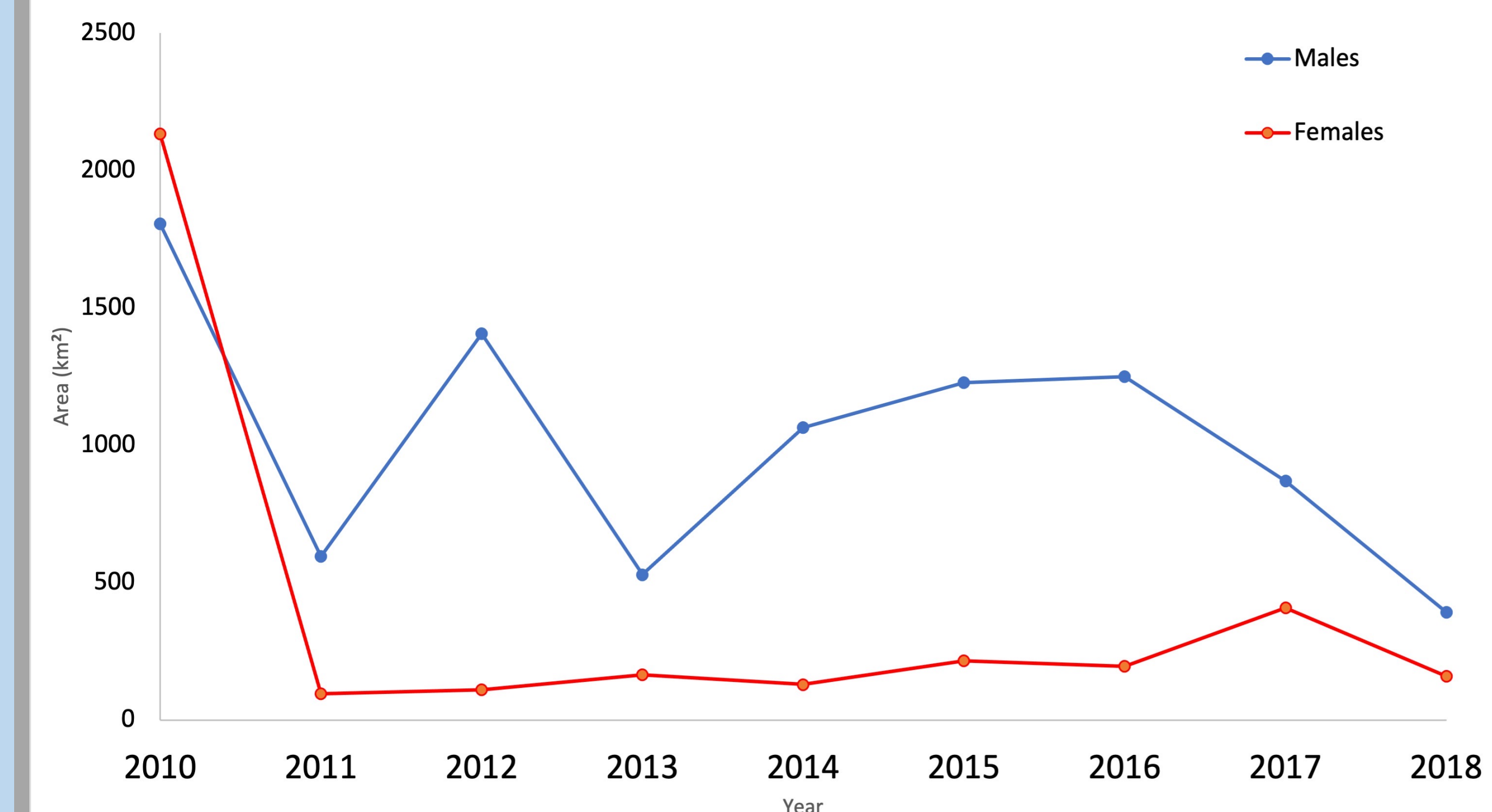


Figure 3. Home range areas (km²) between the years 2010–2018 for both females and males

Conclusions

- Male home ranges are larger than those of females due to behaviors of males that prompt them to move more widely across the landscape to find mates.
- Home range areas are much larger than expected.
- There is a lot more overlap between individuals' home ranges than we expected, especially pronounced between males.
- These results highlight a need for international conservation and cooperation between countries to allocate protected area that effectively provides habitat.

