

# Global Analysis of Snake Ecomorphology: A Preliminary Study



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## Abstract

Ecomorphology is the study of the relationship between the ecological role of an individual and its morphological adaptations. Previously, there have been some attempts to quantify these snake ecomorphotypes depending on what type of predator they are, such as forage or ambush. There have also been other attempts to classify ecomorphotypes of snakes based on what habitat they are found in, such as in trees or aquatic environments. But what makes an arboreal snake arboreal or a terrestrial snake terrestrial? Our aim is to compare and quantify ecomorphotypes around the globe starting with species from 3 regional assemblages compared over 150 specimens.

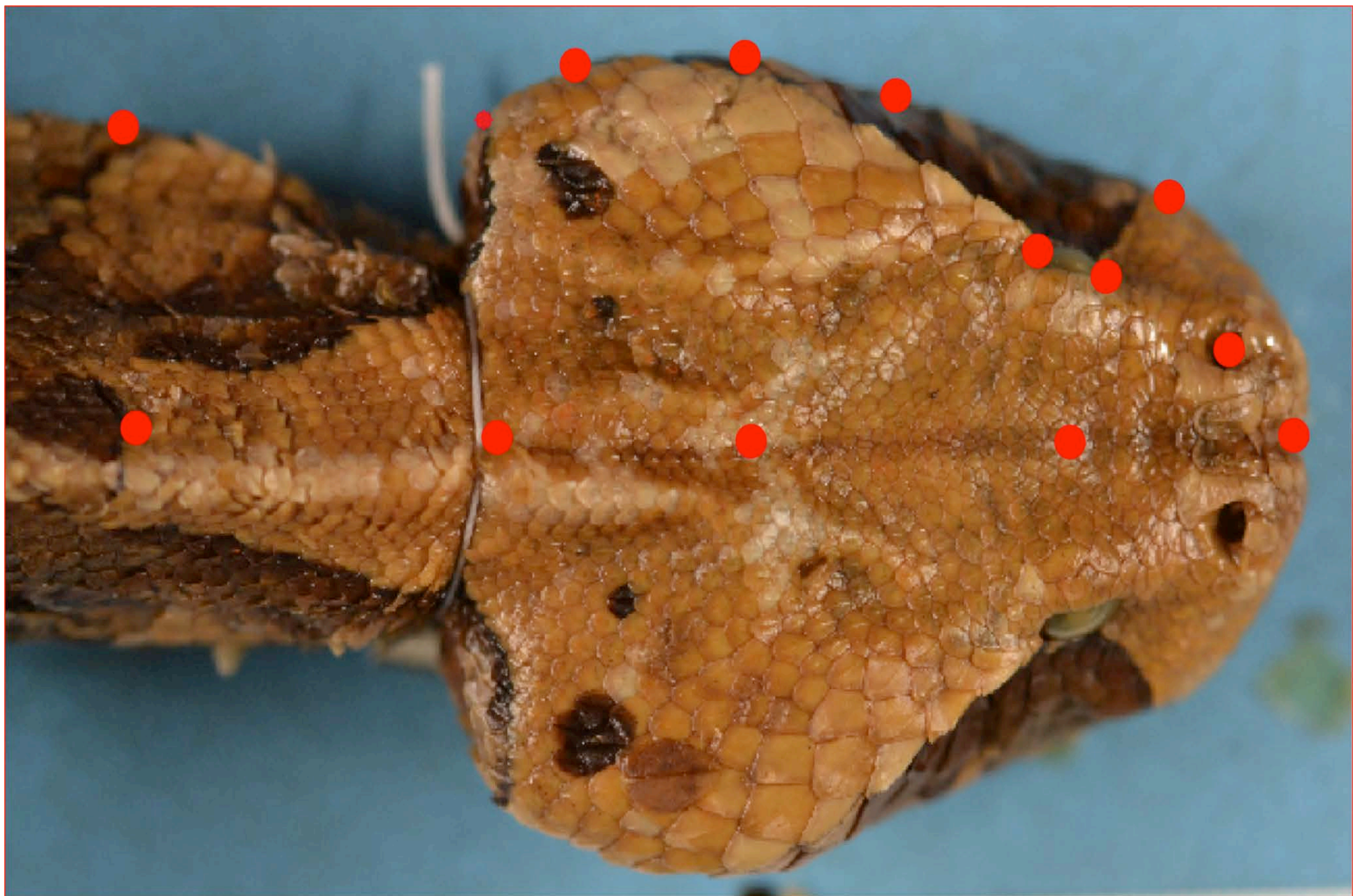


Figure 1 – *Bitis gabonica* with the 14 landmarks used for this analysis.

## Materials and Methods

We did a global comparison of communities of snakes to determine what defines these ecomorphotypes. Character information were extracted from photographs (dorsal and lateral view) and based on 15 type 2 semilandmarks morphological characters around the head. Preserved museum specimens were borrowed from the USNM and AMNH. Canonical Variates Analysis (CVA) was then used to determine where species fell out in morphospace. Representatives from all clades and habitats were included from each region.

## Aims

1. Are the characters the same in North America and other regions, such as, Southeast Asia?
2. How do these characters differ from what defines arboreal or tree-living snakes etc?
3. Is there an evolutionary correlation for these ecomorphotypes?

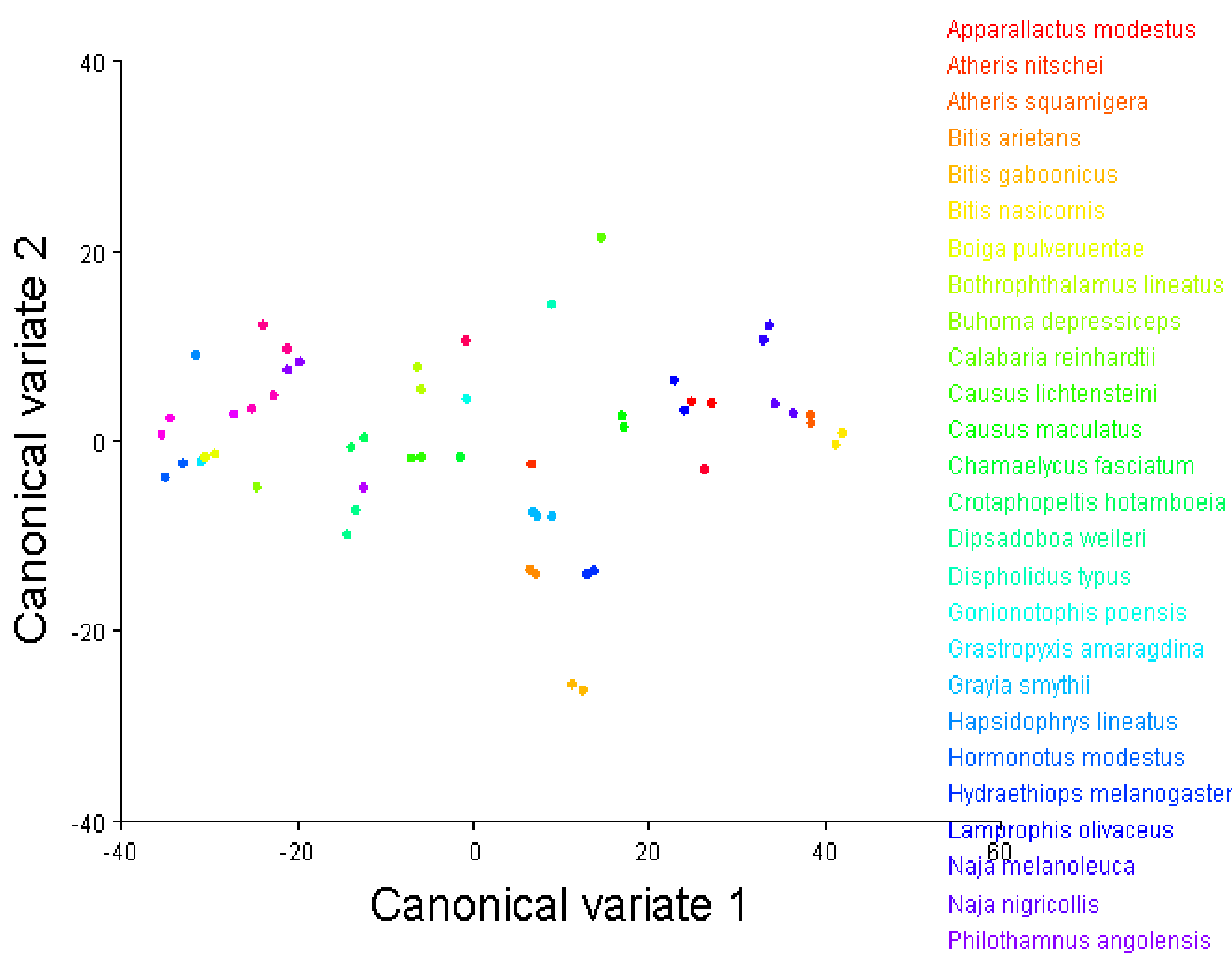


Figure 2 – CVA results for Congo region.

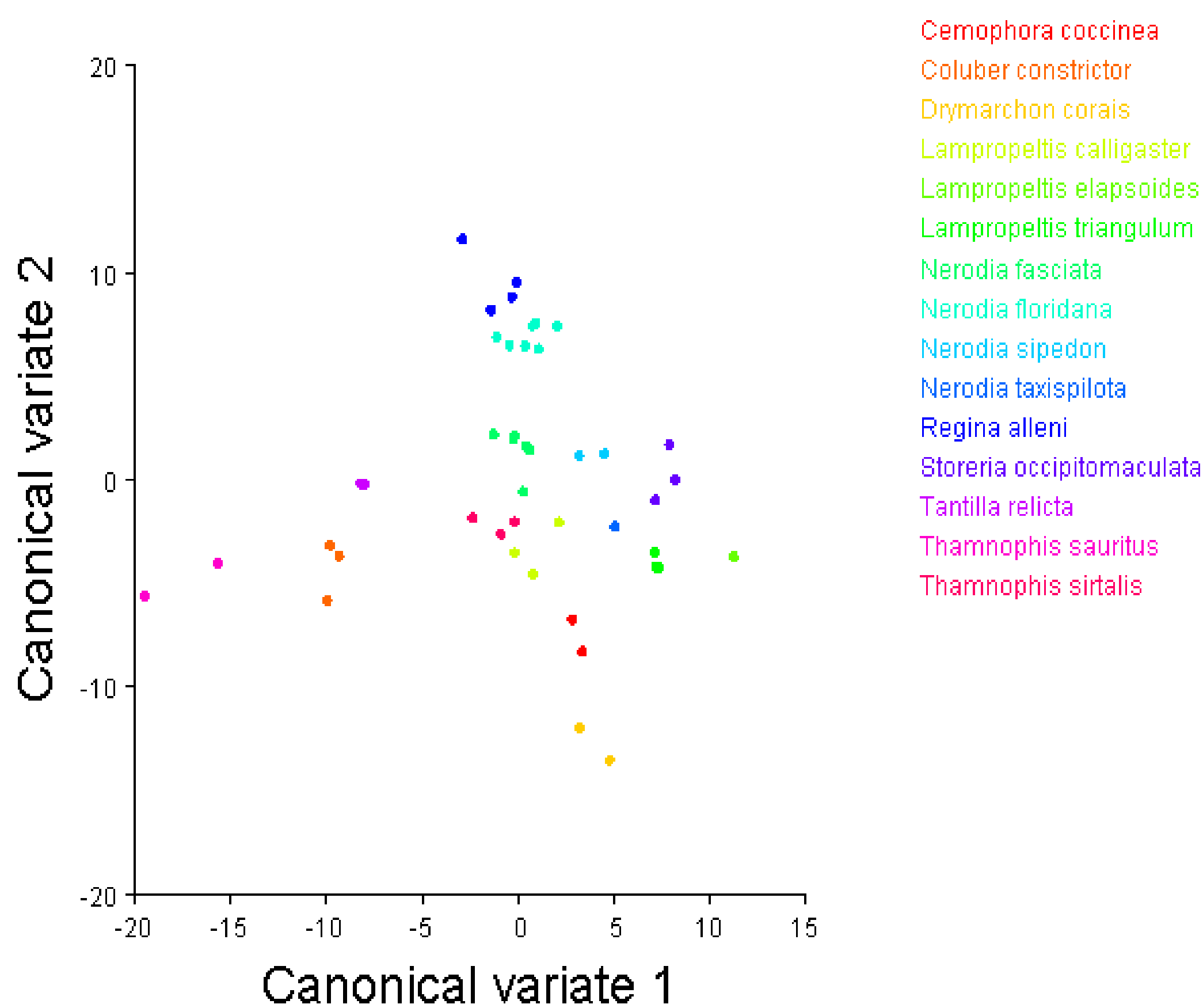


Figure 3 – CVA results for Southeast USA region.

## Results

As CVA maximizes between species' group variations, there isn't a strong correlation in arboreal separation. Removing size, there are differences between terrestrial, arboreal, and aquatic species. The overlap in variation captured shows that there is not enough statistical information in our preliminary analysis to separate the analysis out. However, we are able to see that ecomorphotypes are convergently replicated in different habitats across multiple lineages, as there are different lineages in each community.

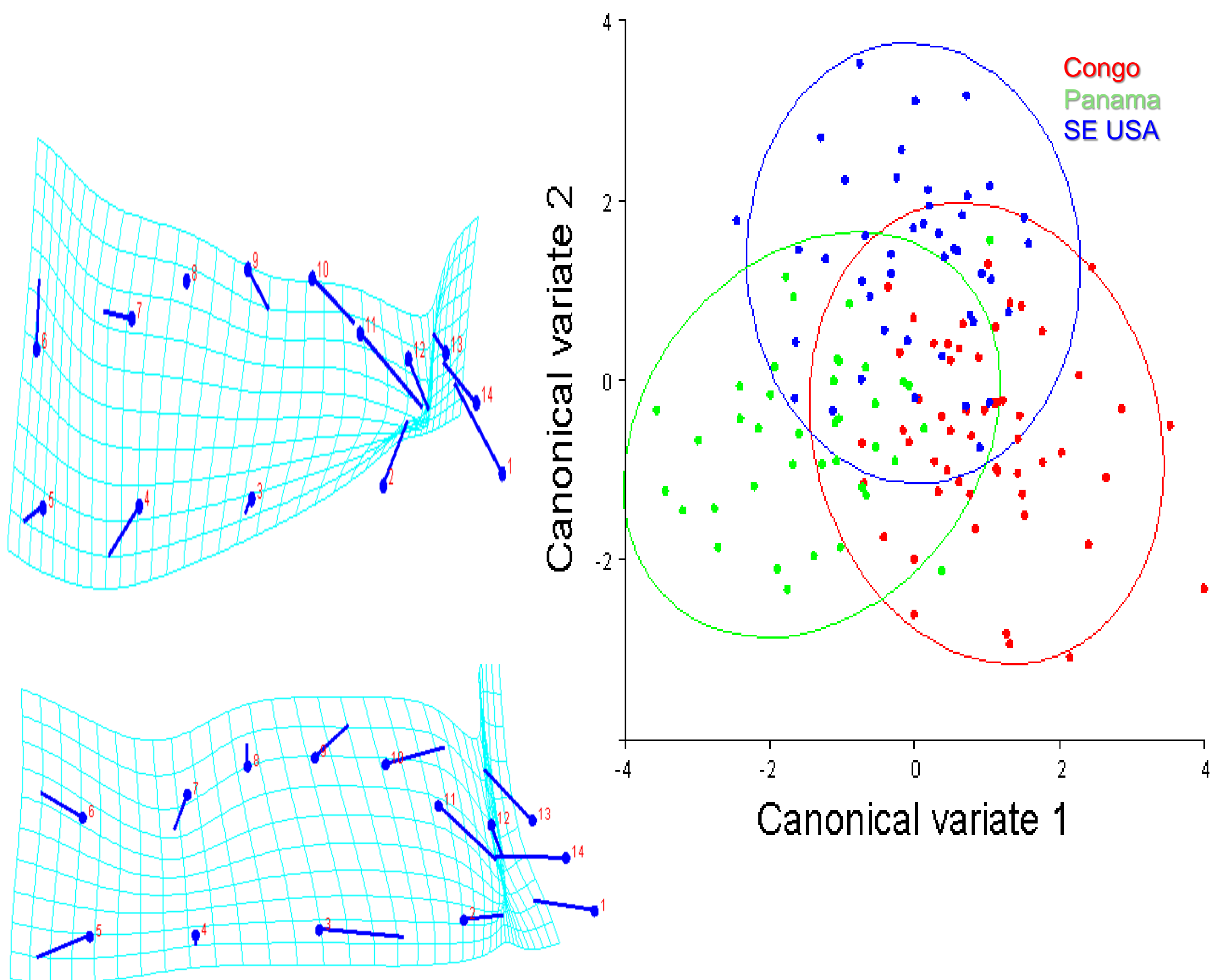


Figure 4 – CVA results for 3 regions: Panama, USA, and Congo with 95% confidence ellipses.

## Conclusions

We are currently analyzing species from Australia and Madagascar and will continue going to MSC to collect more data. We will explore landmark positions and the number of landmarks. We hope to have at least 15 regions in total for the analysis. Then, we will quantify the rate and strength of convergence using phylogenetic analysis.

## Acknowledgements

I would like to thank Sarah Green, Dr. Alex Pyron, Dr. Tara Scully and the Harlan Trust Summer Research Program. I would also like to thank Jeremy Jacobs and Ken Tighe from the USNM and everyone at the Herpetology department of the AMNH for use of specimens and facilities.

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