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## Comparative morphological study on the shape variance of the scapula in extant Cercopithecidae

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# Comparative morphological study on the shape variance of the scapula in extant Cercopithecoidea

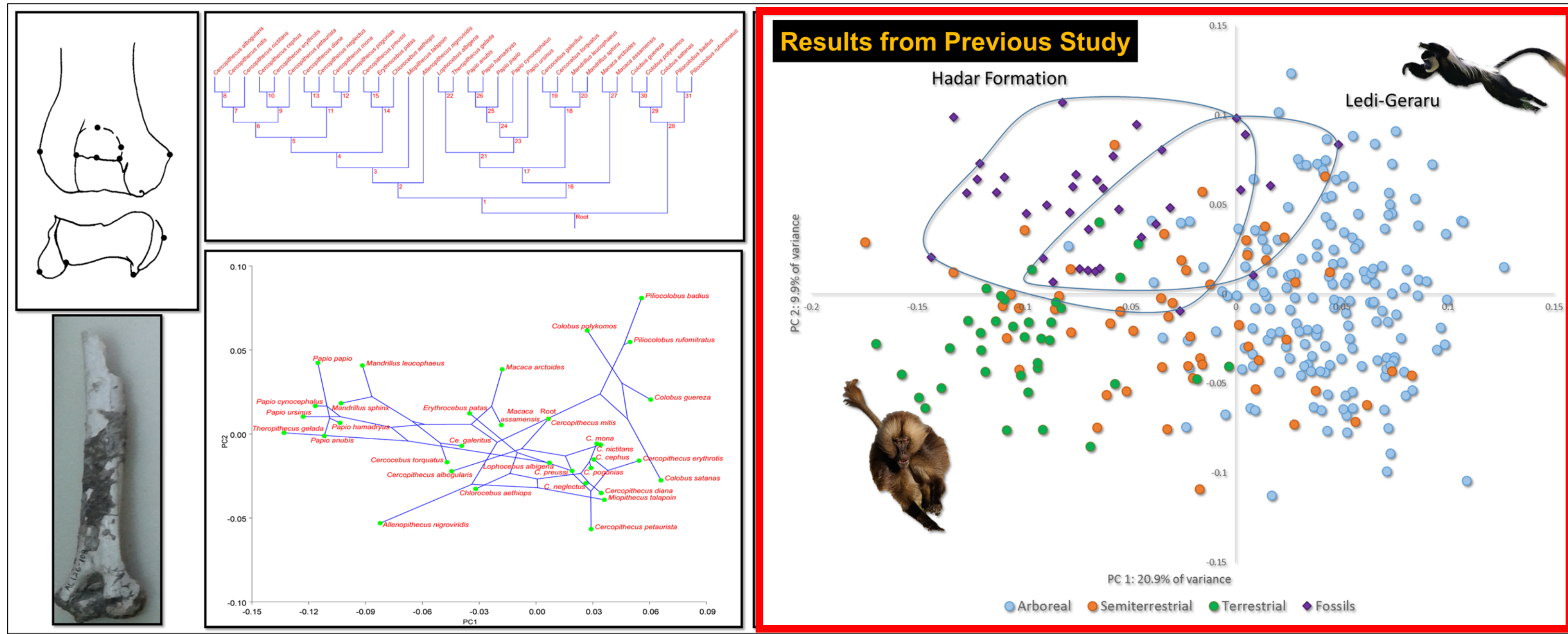
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## Background Information

Morphological variation in forelimb bones has been tied to substrate use in Cercopithecoidea. Studies of the distal humerus and proximal ulna (Rector et al., 2018) suggest that African and Asian monkeys' locomotor repertoires can be distinguished through analysis of variation of the elbow joint. Given that the scapula may be directly involved in weight-bearing during locomotion - similar to the elbow - the relationship between morphological variation and arboreality in the glenoid cavity, acromion, and coracoid process of the scapula may be analogous.



Vergamini et al., 2017; Rector & Vergamini, 2018

**QUESTION:** Can locomotion patterns in extant Cercopithecoidea be distinguished by 3D geometric morphometric analyses of the scapula?

## Materials and Methods

- Scapular landmarks from 25 extant Cercopithecoidea were digitized using a 3D MicroScribe (170 specimens sampling 46 taxa were assigned to locomotor categories based on descriptions of behavior in the literature: **Arm-swing and Branch** quadrupedalism, **Branch** quadrupedalism, **Branch and Ground** quadrupedalism, and **Ground** quadrupedalism)
- Scapulae were analyzed in MorphoJ, and relative shape spaces were compared using PCA and phylogenetic trees downloaded from 10kTrees

Locomotion Pattern	N
Arm-swing and Branch quadrupedalism	62
Branch quadrupedalism	37
Ground and Branch quadrupedalism	45
Ground quadrupedalism	26



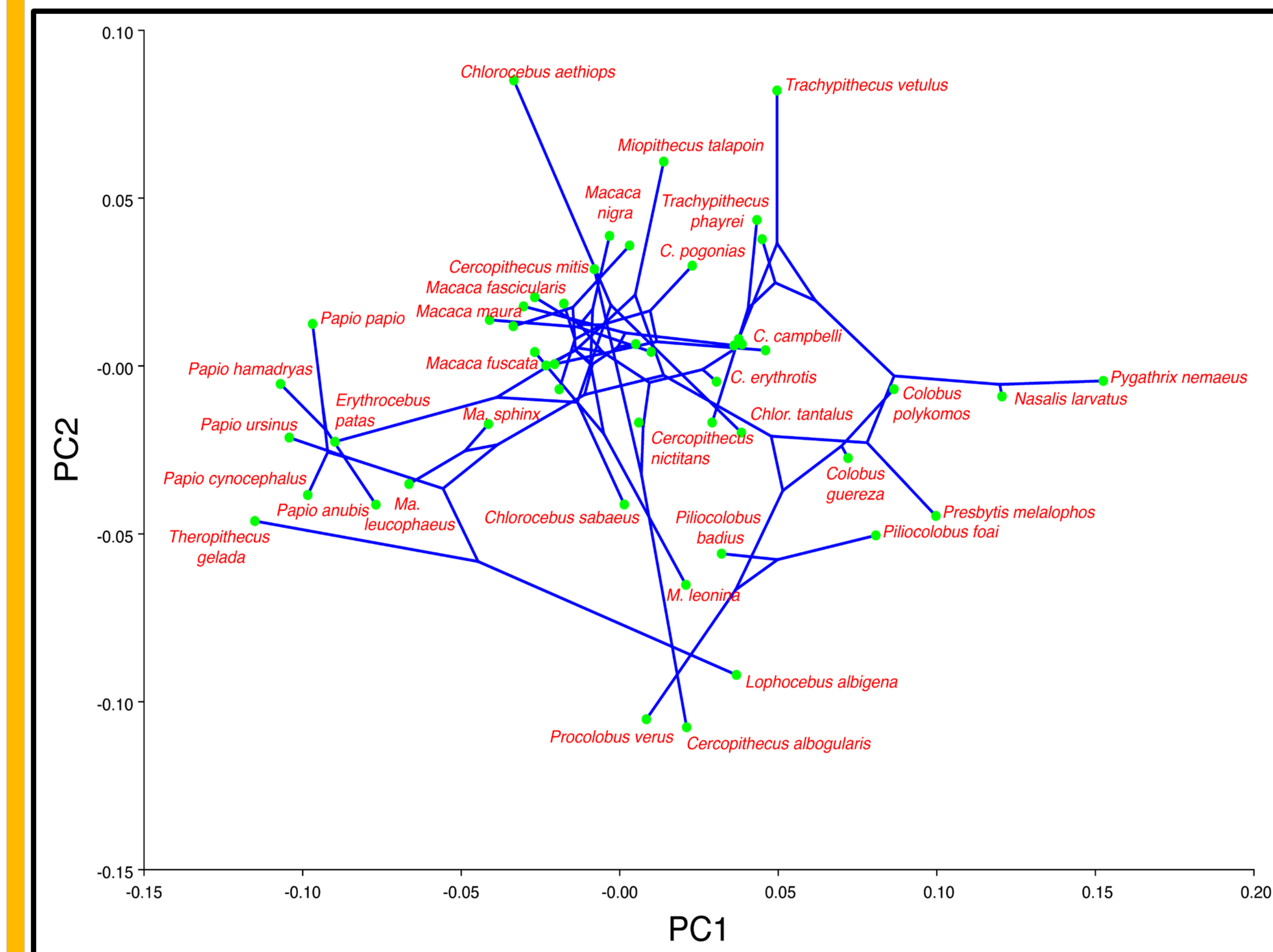
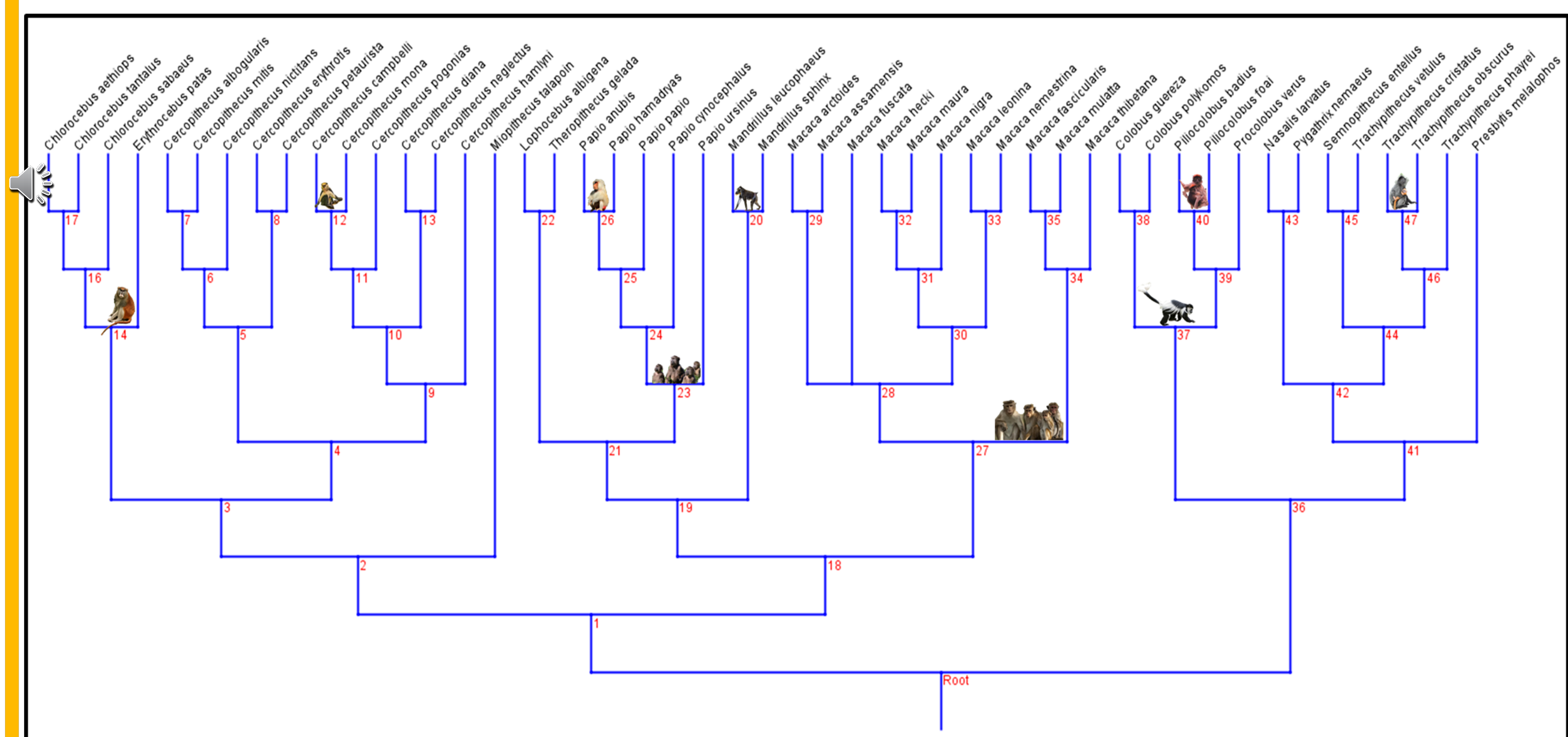
## Results and Discussion

### PCA:

- Results suggest that morphology of the scapula can be successfully used to distinguish substrate use in extant Cercopithecoidea
- Ground** quadrupedalism and **Arm-swing and Branch** quadrupedalism are most different in terms of shape variation
- Results also suggest that within **Branch** quadrupedalism, locality (African or Asian) can also be distinguished. This is the same for **Ground** and **Branch** quadrupedalism

### Conclusion:

- Morphology of Cercopithecoidea scapular elements can be used to identify locomotion categories in extant species
- Size and shape of the glenoid cavity, acromion, and coracoid process can be diagnostic
- It appears that Arm-swinging has shaped the scapula



### Phylogeny:

- The phylogenetic analysis suggests that while phylogeny strongly influences the morphology of the scapula ( $p < 0.001$ ), there is also a clear functional pattern
- There appears to be a distinguishable group of **Ground** quadrupedal primates and **Arm-swing and Branch** quadrupedal primates, with **Ground** and **Branch** quadrupedal primates often falling closer to species with shared behavior rather than with closer relatives
- This suggests that the functional requirements of **Ground** and **Branch** quadrupedalism are identifiable in these elements of the Cercopithecoidea scapula

## Acknowledgements

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## References

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Vergamini, M., Rector, A.L., Lewton, K.L., 2017. Ecomorphology of the fossil monkey community of the Hadar and Ledi-Geraru sites, Afar Region, Ethiopia. *American Journal of Physical Anthropology* 162, 395-395.

