

Stratigraphy of leaf structure and stable isotope ratios within a tropical rainforest canopy in West Africa: implications for primate feeding and isotope ecology

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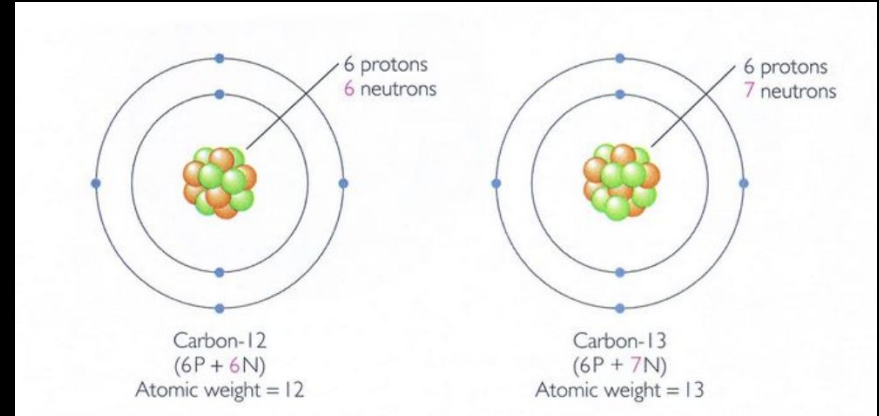
The Canopy Effect and Isotope Analysis

$$\delta X\text{‰} = [(R_{\text{sample}} / R_{\text{standard}}) - 1] \times 10^3$$

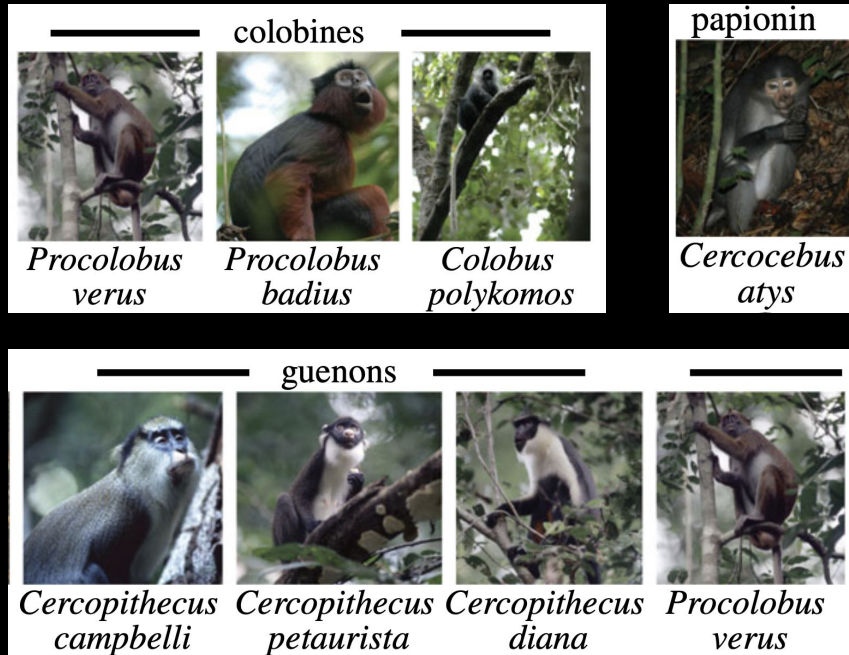
$$\delta^{13}\text{C} = {}^{13}\text{C} / {}^{12}\text{C}$$

$$\delta^{15}\text{N} = {}^{15}\text{N} / {}^{14}\text{N}$$

$$\delta^{18}\text{O} = {}^{18}\text{O} / {}^{16}\text{O}$$



Sympatric Primates



taxon	<i>n</i>	mean observed height (m) ^a
papionins		
<i>Cercocebus atys</i>	6	2.4 (1343)
cercopithecines		
<i>Cercopithecus diana</i>	6	19.7 (3539)
<i>Cercopithecus campbelli</i>	3	8.4 (1437)
<i>Cercopithecus petaurista</i>	1	13.3 (2042)
colobines		
<i>Colobus polykomos</i>	6	27.5 (3538)
<i>Procolobus verus</i>	4	13.87 (1595)
<i>Procolobus badius</i>	7	26.05 (4196)

Photos and Table pulled from Krigbaum et al. 2013

Measuring Leaf Mass Area (LMA)

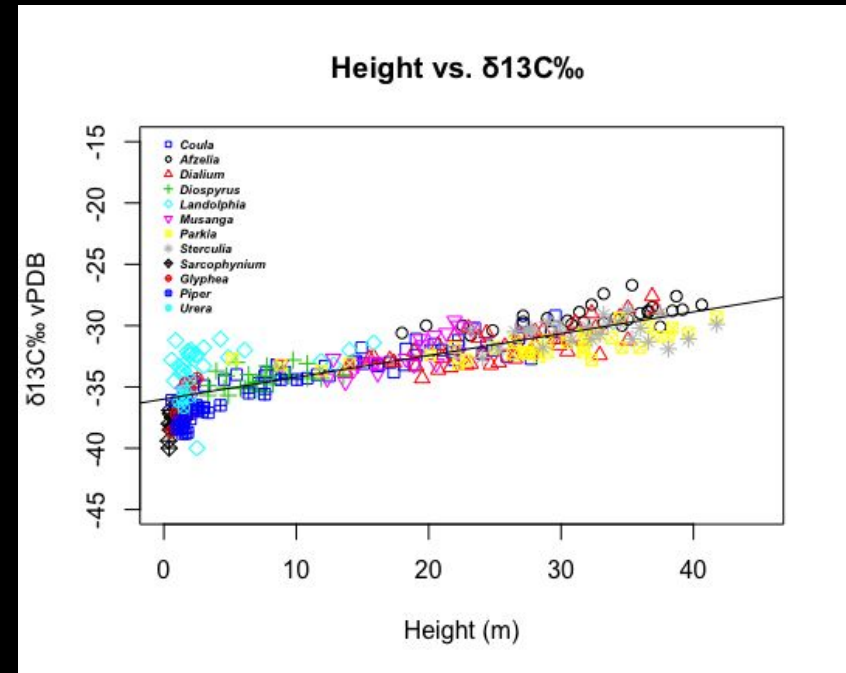
g/m^2



Results

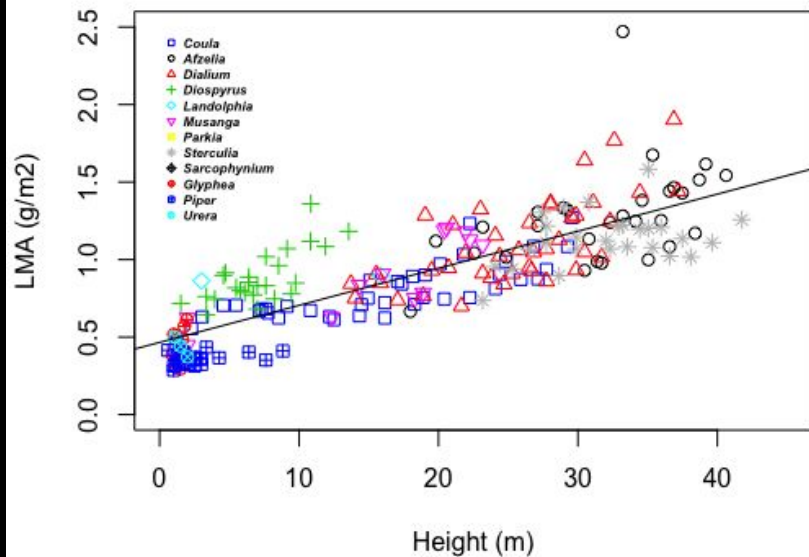
$\delta^{13}\text{C}$ values become less negative with increasing height

Regression	Adjusted R ²	p-value
Height vs. log10 Light	0.4552	<.0001*
Height vs. LMA	0.6725	<.0001*
Height vs. $\delta^{13}\text{C}\text{‰}$	0.7135	<.0001*
Height vs. $\delta^{15}\text{N}\text{‰}$	0.1214	<.0001*
Height vs. %N	0.09147	<.0001*
Height vs. C:N ratio	0.1539	<.0001*

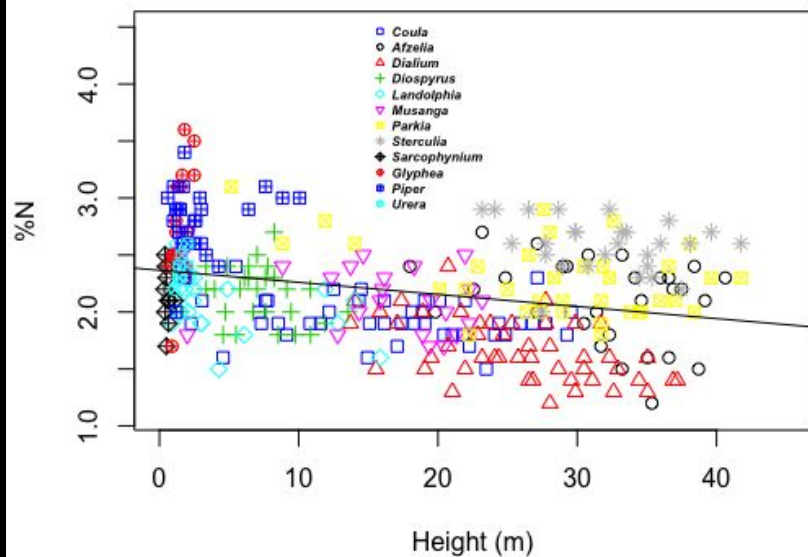


Leaf Structure and Nitrogen Content

Height vs. LMA



Height vs. %N



Implications for Primatology

- $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ values for plants of this forest can be matched with the values of primates to describe feeding height in the canopy.
- Leaf mass area (LMA) and nitrogen content heterogeneity in leaves could affect primate food selection and feeding height preference.



Conclusion

- Multidisciplinary studies let us monitor this forest as a dynamic system.
- Environmental fluctuations lead to changes in leaf nutrient content and structure, which affects animal feeding behavior.
- Long term isotopic values of leaves can reflect how plants are responding to fluctuations in humidity and temperature with time.

