


生物策略表

類別	生物策略 (Strategy)
生物策略 STRATEGY	可適應環境變遷的牙齒 (Teeth adapted to changing environments)
生物系統 LIVING SYSTEM	婆羅洲猩猩 <i>Pongo pygmaeus</i> (Bornean orangutan)
功能類別 FUNCTIONS	#適應基因型 #適應外表型 #分解活體物質 #應付機械性磨損 #改變材料特性 #Adapt genotype #Adapt phenotype #Break down living materials #Manage mechanical wear #Modify material characteristics
作用機制標題	大型人猿的牙齒因應類別和物質特性的不同可以幫助他們在食物短缺時生存，用以進食備用食物 (The teeth of great apes help them survive times of food scarcity because they are diverse in type and material characteristics, allowing consumption of fallback foods.)
生物系統/作用機制 示意圖	

作用機制摘要說明 (SUMMARY OF FUNCTIONING MECHANISMS)

「根據美國國家標準與技術研究院 (NIST) 進行的最新研究，某些猿類牙齒的產生主要是為了應對食物不足時的緊張時期。此研究結果意指如果人類認真保護其近親，那麼猿類在食物不足時期所食用的食物種類，以及發現食物的地方，都必須納入保護...」

「...在三種猿類中，某些猿類在牠們偏愛的食物短缺時，可以選擇食用「後備食物」(fallback food)，使牠們較容易在自然淘汰中存活。這些猿類—大猩猩、紅毛猩猩和黑猩猩，當情況許可時都偏好選擇食用水果。但是當常去的覓食地沒有水果時，每種物種都有不同的反應，而且牙齒的發育形成則可反映出這些差異的原因。」(EurekAlert! 2009)

“The teeth of some apes are formed primarily to handle the most stressful times when food is scarce, according to new research performed at the National Institute of Standards and Technology (NIST). The findings imply that if humanity is serious about protecting its close evolutionary cousins, the food apes eat during these tough periods—and where they find it — must be included in conservation efforts...”

“...[N]atural selection in three ape species has favored individuals whose teeth can most easily handle the 'fallback foods' they choose when their preferred fare is less available. All of these apes—gorillas, orangutans and chimpanzees—favor a diet of fruit whenever possible. But when fruit disappears from their usual foraging grounds, each species responds in a different way—and has developed teeth formed to reflect the differences.” (EurekAlert! 2009)

文獻引用 (REFERENCES)

「Lucas 及他的同事最近提出了一種根據骨折和變形概念的模型，以描述哺乳動物的琺瑯質如何適應飲食的力學需求 (Lucas et al.: Bioessays 30 2008 374-385)。我們透過檢查有關大猿類（猩猩、紅毛猩猩、大猩猩）的食物力學特性和琺瑯質形態的現有數據，回顧該模型的適用性。我們的結果確實顯示食用後備食品影響了大猿類琺瑯質的形態。我們也考量這項結論在已滅絕人族的牙齒演化之意涵。」 (Constantino et al. 2009: 653)

“Lucas and colleagues recently proposed a model based on fracture and deformation concepts to describe how mammalian tooth enamel may be adapted to the mechanical demands of diet (Lucas et al.: Bioessays 30 2008 374-385). Here we review the applicability of that model by examining existing data on the food mechanical properties and enamel morphology of great apes (Pan, Pongo, and Gorilla). Particular attention is paid to whether the consumption of fallback foods is likely to play a key role in influencing great ape enamel morphology. Our results suggest that this is indeed the case. We also consider the implications of this conclusion on the evolution of the dentition of extinct hominins.” (Constantino et al. 2009: 653)

參考文獻清單與連結 (REFERENCE LIST)

National Institute of Standards and Technology (NIST). (December 16, 2009). Among apes, teeth are made for the toughest time. *EurekAlert!* Retrieved from:

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Constantino, P. J., P. W. Lucas, J. J.W. Lee, and B. R. Lawn. (2009). The influence of fallback foods on great ape tooth enamel. *American Journal of Physical Anthropology: The Official Publication of the American Association of Physical Anthropologists*. 140(4): 653-660.

(<https://onlinelibrary.wiley.com/doi/abs/10.1002/ajpa.21096>)

延伸閱讀: Harvard 或 APA 格式

生物系統延伸資訊連結 (LEARN MORE ABOUT THE LIVING SYSTEM/S)

https://en.wikipedia.org/wiki/Bornean_orangutan

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<https://asknature.org/strategy/teeth-adapted-to-changing-environments/>