

# Comparative brain morphology of specimens with different adaptative behaviors the bongo, the Java deer mouse, the maki catta and the sea lion

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## Comparative brain morphology of specimens with different adaptative behaviors the bongo, the Java deer mouse, the maki catta and the sea lion.

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#### Abstract

One aim of comparative neuroanatomy is to better understand brain function among species. It is tempting to try and explain brain differences throughout the animal kingdom by differences in adaptive behaviors as well as ecological factors.

Based on this idea, we explored, with MRI, the brain morphology of three species with different sociality and predator avoidance (Bongo, Java deer mouse and Maki Catta). Brains were collected after death of natural causes and MR-imaged. Brain and body weights were collected, and volumes of brain were estimated after MRI segmentation.

The brain-to-body weight ratio was close to 1 for the Java deer mouse (1.04%) and the maki catta (1.05%) but only 0.26% for the bongo. Encephalization guotients (EQ) were calculated using formulas defined for human (hEQ, constants 0.12 and 2/3; Cairó 2011,

doi:10.3389/fnhum.2011.00108) and for dog (dEQ, constants 0.14 and 0.528; Saganuwan 2021, doi:10.1186/s13104-021-05638-0). Whatever the method, the Java deer mouse EQs were the smallest (hEQ=0.98; dEQ=0.88). The maki catta had a higher hEQ (1.23) than the bongo (1.14) whereas the order was reversed for the dEQ (maki catta dEQ=1.21; bongo dEQ=1.96). These values are coherent with the idea that EQ is higher in prey species using active predator avoidance (bongo) and in social species (bongo and maki catta).



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not, Cynr Poupon, Frederic Andersson											
Adaptative beha	aviors of speci		Enceph	alization qu	iotient						
BONGO Tragelaphus eurycerus Herbivore					Declaration of death	$hEQ = \frac{1}{(0)}$	$hEQ = \frac{Brain weight}{(0.12 \times Body weight^{\binom{2}{3}})} \times 10$		$dEQ = \frac{Brain weight}{(0.14 \times Body weight^{0.528})} \times 10$		
Gregarious Prey (vigilance in group, esca	ape)	1					SPECIMEN ly weight (kg)	BONGO	JAVA DEER MOUSE	MAKI CATTA SEA L	
JAVA DEER MOUS Tragulus Javanicus	E				Brain sample Brain weight	Bra	in weight (kg) Body weight rat		0.015 1.04	0.029 0.4 1.05 0.1	9
Herbivore Solitary Prey (hiding, fight)		Re l		23-	Brain Fixation		hEQ dEQ	1.14 1.96	0.98 0.88	1.23 0.9   1.21 1.6	
MAKI CATTA	Stellar Control	de thatiou -			Brain volume			ROIs volume			
Omnivore Gregarious Hierarchy		2	SOR	A CA	T <sup>2</sup> w	*		P P			
Prey (vigilance in group)					Images conversion DICOM to NIFTI		12		David 6	er	BONGO
SEA LION Zalophus californianus Piscivore					AC-PC reorientation	Top	Back	Left	- Ariter and a second s	- ((***))3	- A
Gregarious Hierarchy Predator (hunts alone, i	in etcoParc de Beauvel			B) -	Segmentation	R (1)		s s			JAVA DEER MOUSE
group or in cooperation)								ten	(and the second se	fil at most	
SPECIMEN	BONGO	JAVA DEER MOUSE	MAKI CATTA	SEA LION	If the proportion of the brain occupied by a structure has a					015	M
Brain	353600 1988	12080 63	25590 398	377800 4315	functional significance, is the						snc
Caudate nucleus	0.56% to the brain	0.52% to the brain	1.56% to the brain	1.14% to the brain	place occupied by the PAG related to the strategy of a prey	Top A	Back	Left		e v mentet	
Caudate nucleus	704 0.20% to the brain	58 0.48% to the brain	43 0.16% to the brain	214 0.06% to the brain	against a predator (Bongo and		-				_
S Hippocampus	6320 1.79% to the brain	639 5.29% to the brain	624 2.44% to the brain	N.D.	Maki catta: vigilance in group; Java deer mouse: hiding and fight; sea lion: predator)?	(See	60	Les Les	A Constant	100 - 100 -	MAKI CATTA
10000				ngnt, sea non. preuatory:		EB.			2.	<b>C</b>	ATTA
(b) sst 100-					The hQE values found in the four specimens are coherent with the relationships already			Left	anten Daris and Add prices	C & C AND	199.4 68
-000 Brain mass (g)	primates rodents marsupials carnivorans	The ratio of bra weight of the st		proposed in behaviour ar	· 200			Ex-S		<u>s</u>	
1	artiodactyls afrotherians eulipotyphlans	specimens is co	ecimens is consistent with e data previously described		ith social and gregarious species o and Maki catta.	ter -		3	(and the second se	The second secon	SEA LION
Body mass (g)						AL ALS		- Steep		·	ž

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