

On reconstructing *Giraffa sivalensis*, an extinct giraffid from the Siwalik Hills, India

Introduction

- *Giraffa sivalensis* occurred during the Plio-Pleistocene and represents the terminal species of the genus in Southern Asia.
- The holotype is a cervical vertebra of disputed anatomical location.
- Although there is also uncertainty as to this animal's size, other specimens have been assigned to this species including fragments of two humeri, a radius, metacarpus and teeth.

Methods

- We estimated *G. sivalensis* neck length, leg length and body mass using interspecific and, unusually, ontogenetic allometry of extant giraffe skeletal parameters.
- The appropriateness of each equation to estimate body mass was evaluated through the prediction error incurred in both extant giraffes and okapis. It followed that the equations with the lowest prediction error in both species were considered robust enough to use in *G. sivalensis*.

Results

- The size of *G. sivalensis*, based on the holotype, is proposed as 400 kg (range 228 kg - 575 kg), with a neck length of about 147 cm and a height of 390 cm.
- The molar lengths of tooth specimens considered agree with this size estimate.
- The humerus was the most appropriate long bone to establish body mass which estimates a heavier animal of ca 790 kg. The discrepancy with the vertebral body weight estimate might indicate sexual dimorphism.
- Radial and metacarpal specimens estimate *G. sivalensis* to be as heavy as extant giraffes. This may indicate that the radius and metacarpus are unsuitable for body mass predictions in *Giraffa spp.*
- Alternatively, certain long bones may have belonged to another long legged giraffid that occurred during the same period and locality as *G. sivalensis*.

Conclusion

- If sexual dimorphism was present then males would have been about twice the size of females. If sexual dimorphism was not present and all bones were correctly attributed to this species, then *G. sivalensis* had a slender neck with a relatively stocky body.



Fig 1. The marker indicates the location of the Shivalik Fossil Park in the Siwalik Hills, a subHimalayan mountain range. This is most probably the area 'west to the river Jumna' (currently Yamuna River) to which Falconer and Cautley (1843) referred. Map data: AutoNavi, Google.

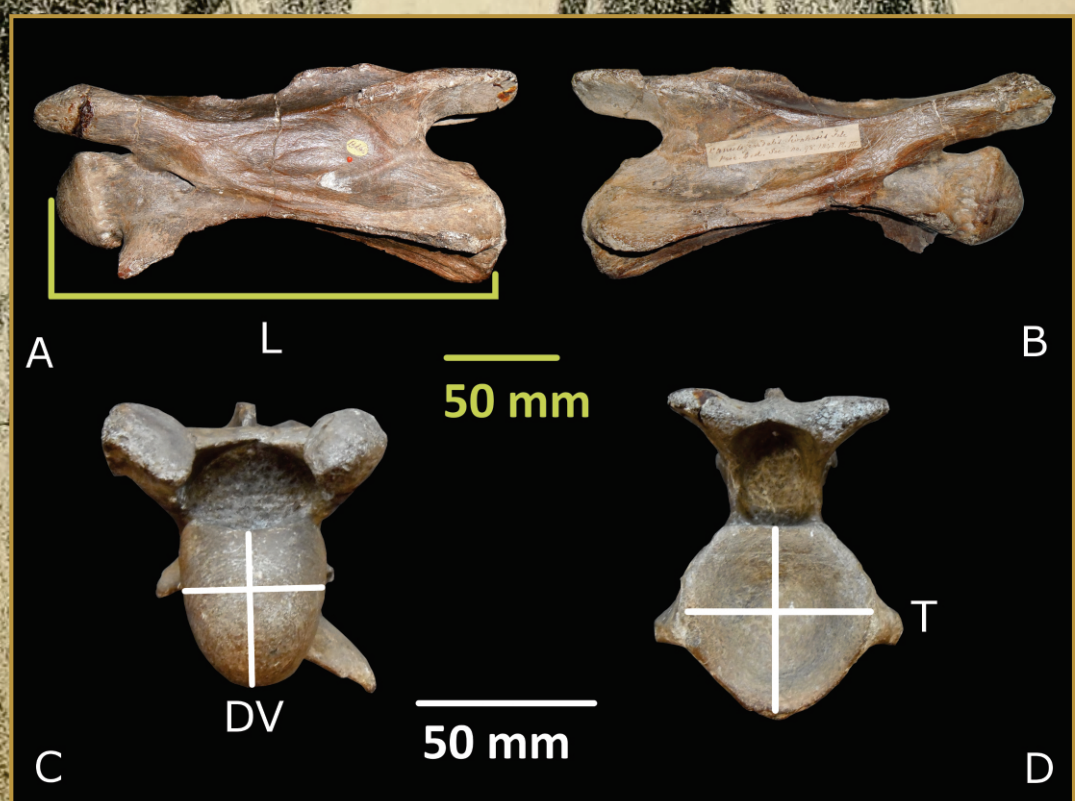


Fig 2 *Giraffa sivalensis* holotype, specimen OR39747.

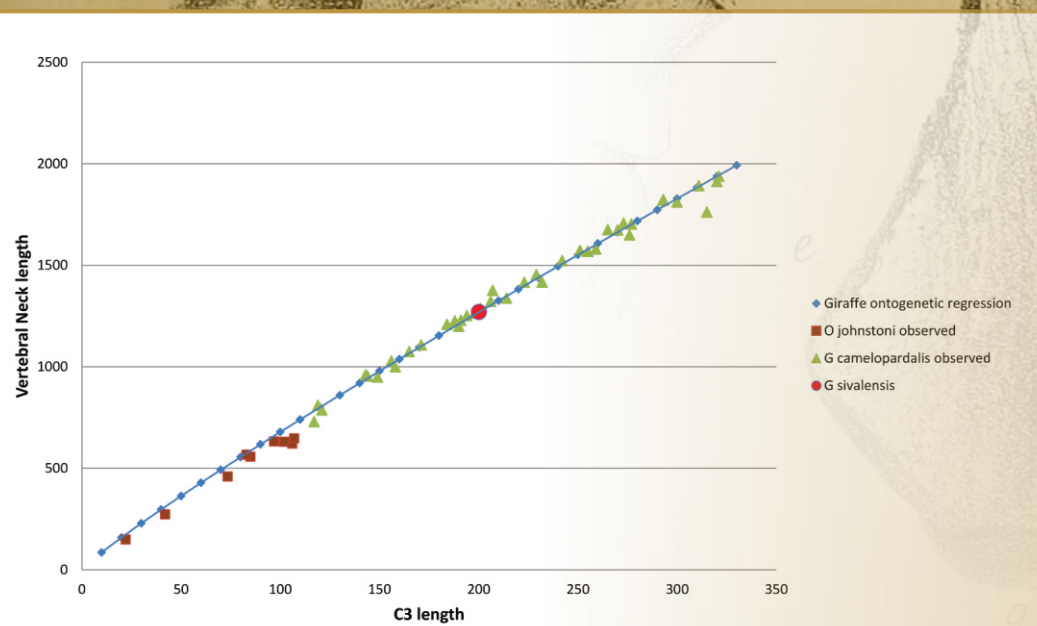


Fig 3 The relationship between neck length and C3 vertebral length throughout ontogeny in giraffes and okapis.



Fig 4 *Giraffa sivalensis* humeral specimen