Diet diversity might explain the differencial survival of Notosuchia (Crocodyliformes) at the Cretaceous-Palaeogene crisis

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Introduction

This poster is a partial presentation of [1]. Notosuchia is a group of mainly terrestrial crocodyliformes, a clade that is today represented by a few species all belonging to Crocodylia (which includes crocodiles, alligators & caimans and the gharial). Notosuchians contrast with thise low extant diversity. Indeed, unlike crocodylians (which all share the same overall ecology and morphology [2]), notosuchians show a very high degree of morphological and ecological diversity associated with multiple diets. In this study we used Phylogenetic Comparative Methods (PCMs) to investigate the role of intrinsic variables (body size & diet) in the differential survival of Notosuchia at the K/Pg crisis. The use of PCMs make it possible to perform statistical analysis on organisms by using their phylogenetic relationships to correct the non-independance of observations between them [3]. For the first time, we used PLR to test directly the effect of body size on survival at the K/Pg crisis. We also investigated the evolution of this trait and its interaction with diet.

SUPER-TREE PRODUCTION: assessing temporal and phylogenetic uncertainty

Choosing the topologies

- Reference topology = [4]
- Species added according to the literature
- Alternative topology (see arrow Fig.1)

Dating the species

- Species age = randomly picked within stratigraphic interval
- 100 repetitions for each topologies

Dating the nodes

- "mbl" = node age according to the oldest species included
- "equal" = equal distribution of time among zero-length branches

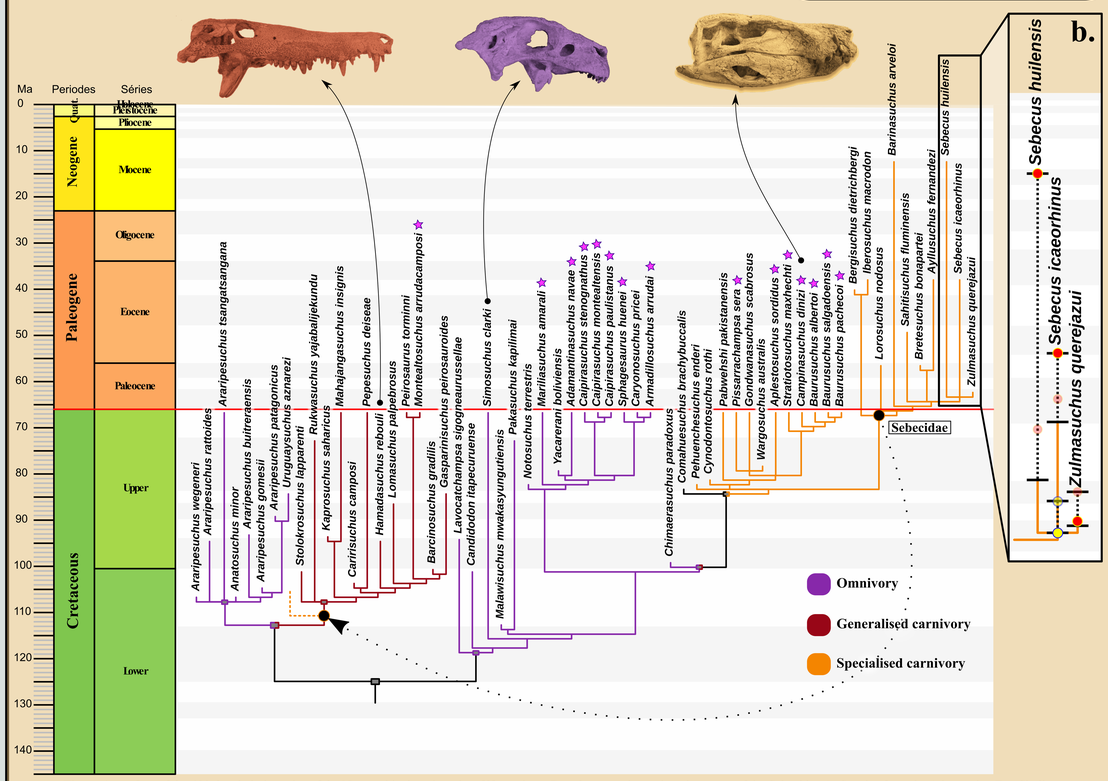

Figure 1: a. One of the 400 dated phylogenies of the Nosotuchia, here based on [3] topology. Doted arrow: alternative placement of the Sebecidae. ★: Species from the Adamantina Fm. Skull illustrations (from left to right): *Hamadasuchus rebouli* (Larsson & Sues, 2007), *Simosuchus clarki* (Kley *et al.*, 2010) and *Aphaurosuchus escharafacies* (Darlim *et al.*, 2021). **b.** Example of an alternative dating and its impact on internal node dating (shaded dots), black doted lines represent stratigraphic intervals. Modified from [5].

STATISTICAL ANALYSES: testing the effect of body size and survival and its relationship with diet

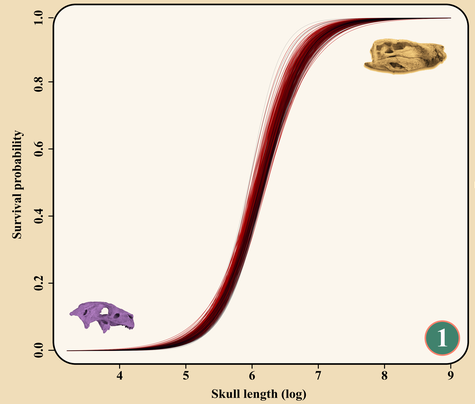

Figure 2: Curves of the significant models under PLR. Colors indicates the topology considered: red for [3], black for the alternative (see Fig. 1).

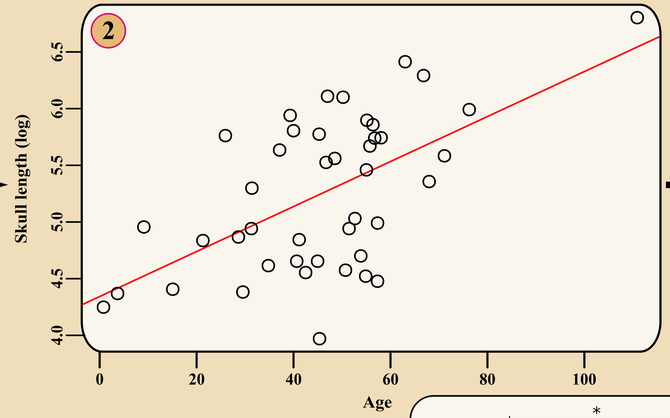

Figure 3: Regression of log-transformed skull lengths against the age of the species.

1 *Body size (skull length as proxy) effect on survival using Phylogenetic Logistic Regression (PLR)*

Larger body sizes = higher survival rates regardless of the topology (if all ★ incl.)

2 *Body size ~ age relationship (Cope's Rule) using Phylogenetic Generelized Least Squares (PGLS)*

Evolutionary trend towards larger body size when all notosuchians are included

Lost when carnivores are excluded → body size evolution is linked with diet

3 *Body size ~ diet using PGLS*

Carnivore are significantly larger than omnivores

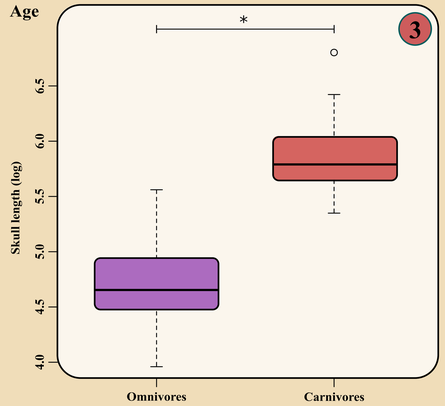

Figure 4: Boxplots of log-transformed skull lengths depending on the diet.

CONCLUSION

Diet might explain survival at the K/Pg crisis

Adamantina Fm → Lagerstätten effect

REFERENCES

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