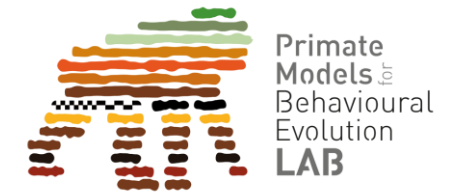


Using fossil evidence to improve our understanding of divergence estimates for the Panini and Hominini lineages

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Introduction

When did the hominin lineage split from our last common ancestor with *Pan*? The first molecular biology studies estimated the split occurred from around 5 Ma, to as early as 1.3 Ma. Our objective is to evaluate how the trend of estimates has changed for this split event, and how it fits the current fossil evidence.

Methods

A total of **189 split estimates** were sampled from the literature. For analysis, we built three different thresholds based on the fossil evidence at **4.4 Ma (*Australopithecus anamensis* and *Ardipithecus ramidus*)**, **6.2 Ma (*Orrorin tugenensis* and *Ar. kadabba*)**, and **7.3 Ma (*Sahelanthropus tchadensis*)** to filter out estimates that do not match the hypotheses of these species being hominins.

Results

The split event occurred during the Late Miocene (11.6—5.3 Ma), but each threshold pushes it further back, to **8.58—6.37 Ma**, **10.21—7.84 Ma**, and **10.90—8.77 Ma** (Fig. 1). Regression analysis shows that the estimates have generally been gravitating slowly from 5.5 Ma to 8.5 Ma over the past 50 years (Fig. 2).

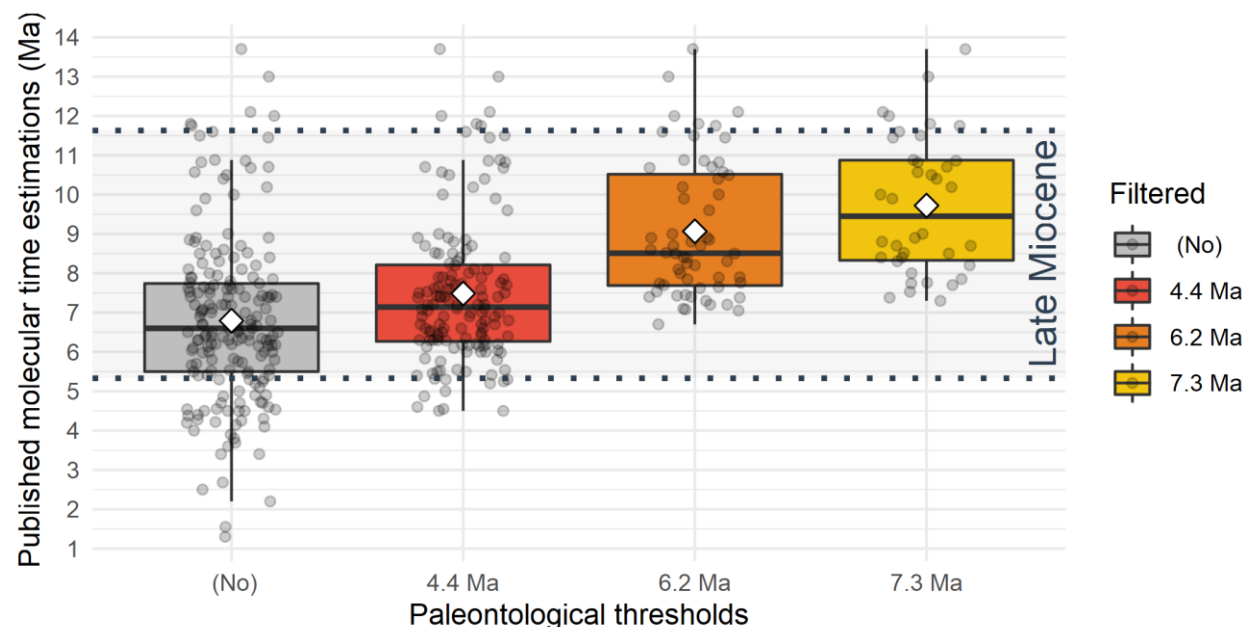


Fig. 1 – Interquartile range boxplots for divergence estimates filtered by different fossil thresholds. The arithmetic means and the medians are represented by white diamonds and black bars, respectively. All boxplots fit within the Late Miocene interval (11.6—5.3 Ma).

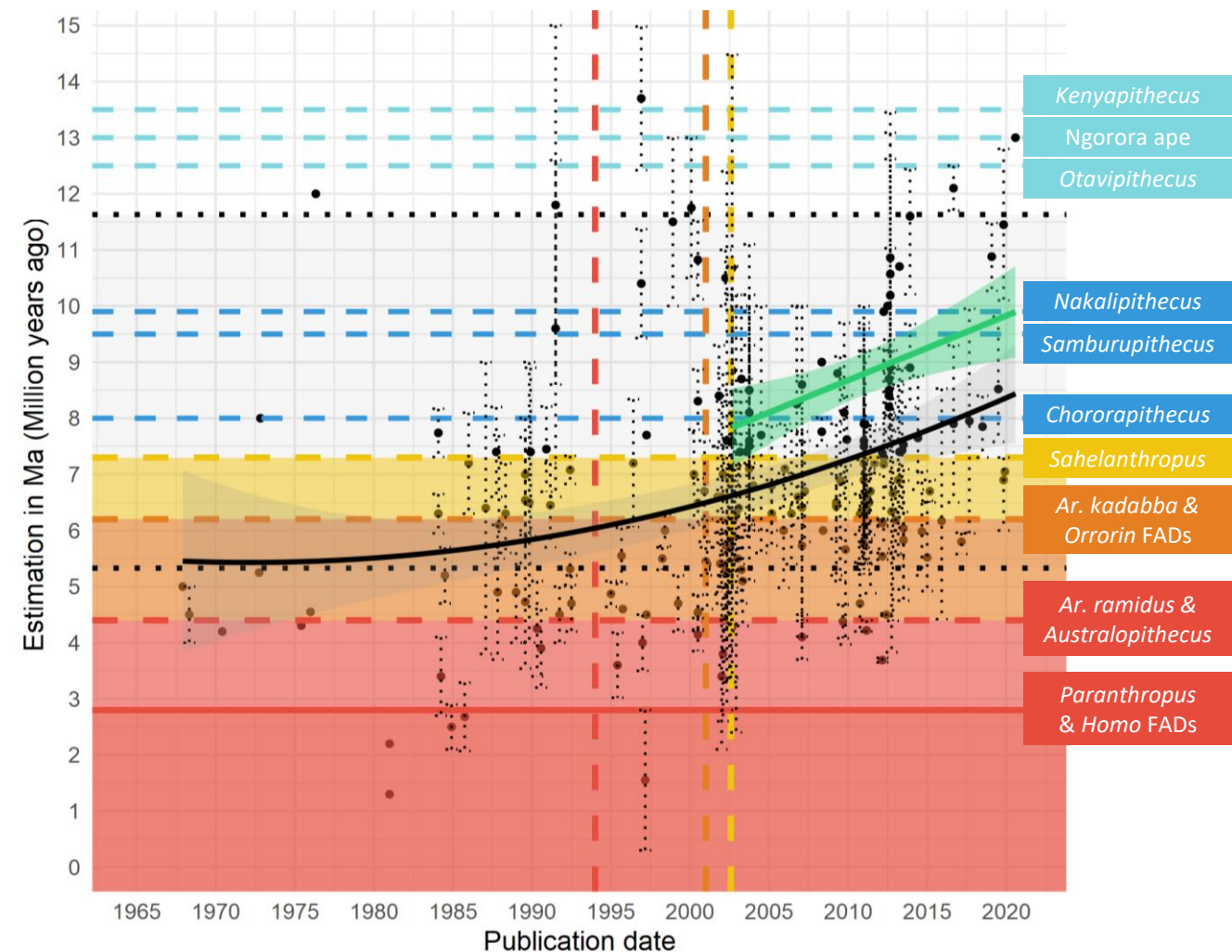


Fig. 2 – Polynomial regression fitting the sample of Homini-Panini split estimates by date of publication. Vertical dashed bars represent dates of publications of possible early hominins. The green regression fits all data above the *Sahelanthropus* filter and since its publication.

Discussion

That last threshold, based on the 7.34—7.20 dating of *Sahelanthropus* by Lebatard et al (2010), would reject 85.03% of all sampled molecular clock estimates. Overall, the analyses indicate that there was a strong bias in the first decades of molecular biology towards underestimating the Panini/Hominini divergence. However, estimates have slowly been approaching time intervals in agreement with the fossil evidence.

