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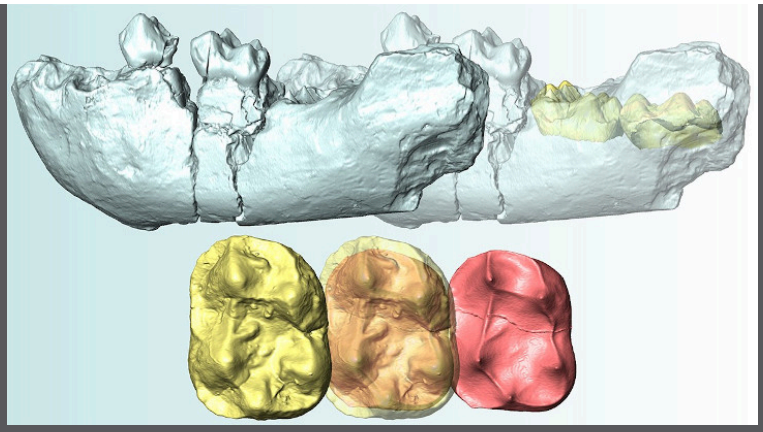
Teeth don't lie: pliopithecoid ancestry of the extinct primate "Pliobates" revealed



A research article published in *Nature Communications* by an international team led by researchers from the Institut Català de Paleontologia Miquel Crusafont (ICP-CERCA) describes new dental remains of the Miocene small-bodied primate *Pliobates* and, on its basis, reconstructs its closest kinship relationships. The results conclusively indicate that *Pliobates* is a derived crouzeliid pliopithecoid (i.e., a primitive Old World simian) convergent with modern apes in some aspects of its locomotor apparatus.

F. Bouchet, © ICP

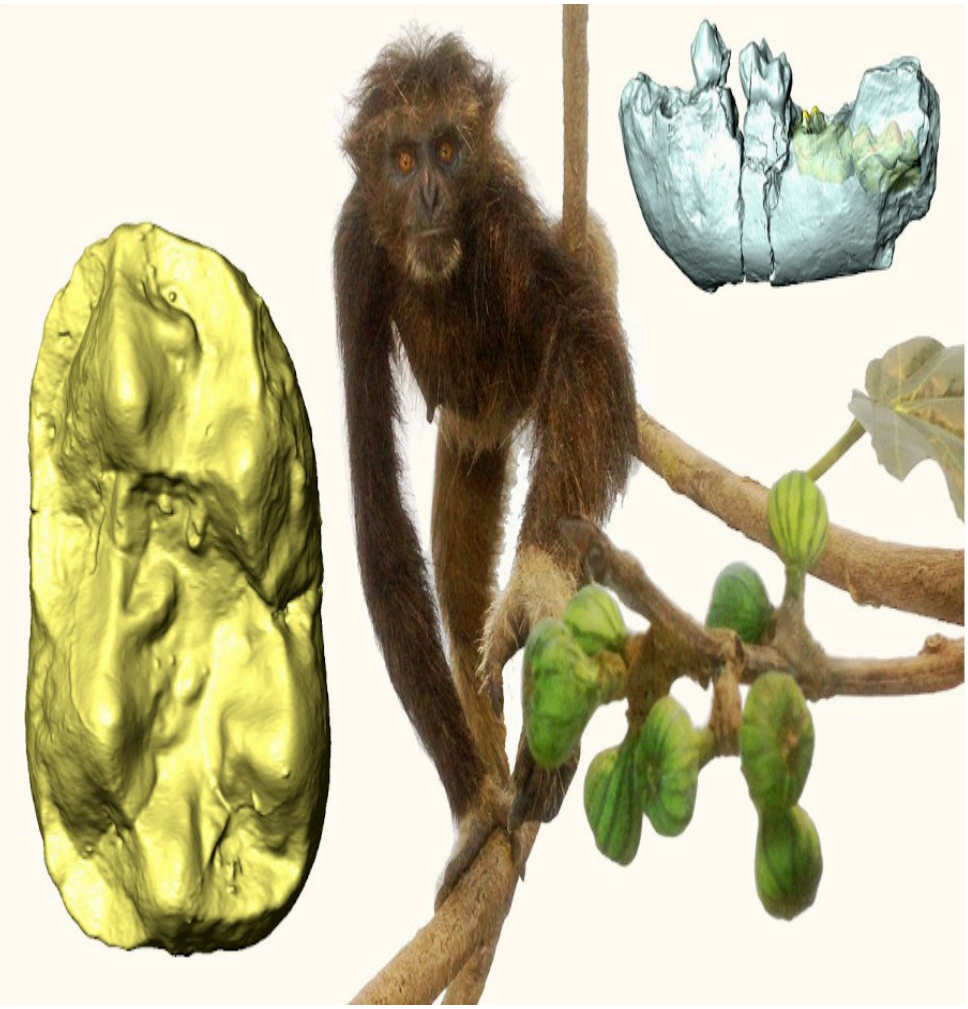
In 2015, a partial skeleton with the associated cranium of a small-bodied primate from the Abocador de Can Mata (els Hostalets de Pierola, Barcelona) was described as a new genus and species: *Pliobates cataloniae*. Nicknamed “Laia” by the researchers, this partial skeleton corresponds to an adult female of about 5 kg that inhabited the subtropical forests of the Vallès-Penedès Basin about 11.6 million years ago.

In the original description, phylogenetic analyses were performed based on morphological features from the teeth, the cranium, and the rest of the body, with the aim of deciphering the closest kinship relationships of *Pliobates*. The results supported the view that *Pliobates* is a basal ape, a simian that predates the divergence between lesser and great apes. However, subsequent phylogenetic analyses conducted by other researchers suggested instead that

Pliobates is a pliopithecoid, i.e., a more primitive simian preceding the divergence between Old World monkeys and apes.

Admittedly, the skeleton of *Pliobates* displays a surprising mosaic combining very primitive characteristics—like those of basal simians—with others most closely resembling the derived condition of modern apes, hindering the interpretation of its kinship relationships. Now, our international team led by the Institut Català de Paleontologia Miquel Crusafont (ICP-CERCA) has published in *Nature Communications* the description of new dental remains and new phylogenetic analyses of *Pliobates*. The newly described teeth come from a different but roughly coeval locality to the one that yielded the skeleton of “Laia”. We used microcomputed tomography scans not only to inspect tooth internal morphology (in particular, the shape of the enamel-dentine junction, which is not affected by dental wear) but also to digitally extract from infantile individuals some permanent teeth that had yet to emerge.

Particularly relevant is an infantile mandible from which the first and second lower molars could be extracted, as the lower molar shape is very diagnostic for pliopithecoid primates due to the frequent presence of a structure known as the ‘pliopithecine triangle’—a small triangular basin limited by two crests (the ‘arms’ of the triangle) that are absent from the molars of other primates.



Reconstruction of the life appearance of Pliobates cataloniae elaborated by Quagga (currently on display at the ICP Museum in Sabadell), surrounded by the new infantile mandible with the permanent molars in semitransparency (right) and

occlusal view of the digitally extracted lower first molar showing the distal arm of the pliopithecine triangle (left), not to scale. Photograph by D.M. Alba and digital renders by Florian Bouchet, © ICP.

The results of our study conclusively indicate that *Pliobates* is a derived crouzeliid pliopithecoid, most closely related to the poorly-known and similarly small-bodied genera (*Plesiopliopithecus* and *Crouzelia*) recorded elsewhere in Europe. Interestingly, the phylogenetic analyses incorporating the new dental data unambiguously support the crouzeliid status of *Pliobates*, but yield strikingly diverging results for pliopithecoids as a whole depending on the anatomical region considered.

Thus, craniodental features recover pliopithecoids as a clade of stem catarrhines (i.e., as a monophyletic assemblage of taxa sharing a single last common ancestor that diverged before the split between Old World monkeys and apes). In contrast, the addition of postcranial characters (i.e., from the rest of the body) supports the incorrect view that pliopithecoids are stem hominoids (i.e., more closely related to apes and humans than to monkeys). This is attributable to the possession by *Pliobates* of multiple postcranial characteristics convergent with those displayed by modern apes, thus strengthening the contention that such features might also have independently evolved among various ape lineages due to adaptation for climbing and/or suspensory behaviors.

In summary, our results show that *Pliobates* is a derived pliopithecoid (stem catarrhine) convergent with extant hominoids. Despite this fact, *Pliobates* is still very relevant for better understanding hominoid evolution. On the one hand, it nicely illustrates the plausibility of comparable postcranial features independently evolving owing to similar selection pressures. On the other, *Pliobates* has been reconstructed as an arboreal cautious climber with important quadrupedal and suspensory components in its locomotor repertoire. Thus, it is arguably a suitable analog for understanding the intermediate stages in the transition from quadrupedal to climbing/suspensory apes during hominoid evolution.

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