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Palm (Arecaceae) pollen from the Lower Eocene of Austria and England

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Palm pollen are good proxies for the reconstruction of ancient "subtropical/tropical" biomes. Originating in Laurasia, palms dispersed several times during the Cenozoic (cf Baker & Couvreur, 2013): The subfamily Calamoideae presumably originated in Eurasia and stem lineages of Calamoideae dispersed into Africa and South America around the Late Cretaceous. Thus the presence of ring-like aperturate, disulcate, and diporate Calamoideae pollen in lower Eocene European localities (PETM floras: St Pankraz Austria; Brixton England; EECO floras: Krappfeld Austria) shows that the Calamae tribe was already split into the subtribe Salaccinae (ring-like aperturate pollen) and a stem lineage that hosts the Plectocomiineae and Calaminae subtribes (five disulcate and diporate pollen taxa). Although pollen characteristics can be conservative, these results are consistent with the reconstructed spatial and temporal evolution of palms by Baker and Couvreur. A second dispersal occurred during Paleocene to mid Eocene times, when the Cocoseae (Arecoideae) in South America moved southward via Antarctica to SE Laurasia. However, the presence of Lower Eocene pollen taxa affiliated to the Cocoseae subtribes Bactridineae (*Bactris*- type at the PETM & ?*Desmoncus* pollen) and Elaeidinae (*Elaeis* type at the PETM, two *Elaeis* types at the EECO) in Europe neither fits with the proposed divergence time of the two subtribes, nor with the dispersal pathway via Antarctica at the Eocene Oligocene boundary. Our data suggests that Bactridinae and Elaeidinae diverged earlier (Upper Cretaceous/Lower Paleocene times) and subsequently migrated from South America to Eurasia via West or South Africa. A reticulate pollen type with incomplete ring-like and disulcate apertures occurs at Krappfeld; an affiliation to *Areca chaiana* is challenged, because palm pollen with complete and incomplete ring-like apertures occur only in two extant echinate or gemmate taxa of Calamoideae, in *Areca (e.g., Areca chaiana*) and echinate *Nypa* (Krappfeld), whereas only disulcate types are only known from Calamoideae.