Seed dispersal is a key feature in the life history of plants, with implications on the demography, spatial dispersion and gene flow within plant populations, and thus plays an important role in promoting diversity, particularly in tropical ecosystems. Given the ecological and evolutionary consequences of seed dispersal, many tropical angiosperms rely on a variety of vertebrate frugivores for seed dispersal. However, understanding how animal-dispersed plants are shaped by interactions with frugivores is challenging, as many ecosystems have undergone significant anthropogenic defaunation over thousands of years. The extinction of large megafauna in the Pleistocene such as giant sloths and elephant-like gomphotheres probably caused negative cascading effects on plant populations, whereas it remains unclear how animal-dispersed plants may respond to the ongoing biodiversity crisis, where many ecosystems now suffer from the lack of large vertebrates. Here, I ask whether the extinction of the Pleistocene megafauna has left a persistent signature in plant assemblages, and the ecological and evolutionary pressures that fleshy fruited plants may face under future scenarios of defaunation.