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Understanding the dynamics of ex-situ living collections: a globally sampled meta-collection approach

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The ex-situ living collections of botanic gardens are distinct from other horticultural landscapes in being "documented", in other words, they are defined by the data that describe the collections. Consequently, ex-situ living collections individually and globally amass vast quantities of data, as they seek to track and document the transient flow of biodiversity within and through networked ex-situ collections. But these data are rarely if ever comprehensively analysed to understand the strengths and weaknesses of ex-situ collections. At the Cambridge University Botanic Garden, we have developed a bioinformatic pipeline called BGSmartR which can thoroughly analyse the data of a living collection in order to reveal the quality (or otherwise) of collection management—itself crucial for the sustainable maintenance and conservation of ex-situ diversity. Furthermore, by combining these analyses across the multiple globally distributed living collections, we can reveal the global dynamics that enable or limit living collections and their management. Here, we report on the findings of these global meta-analyses, describing the rise and fall of the ex-situ living meta-collection over time, and the sometimes surprising and counterintuitive patterns that emerge from these longitudinal approaches. On the basis of these analyses, we identify intrinsic and extrinsic forces (including biodiversity legislation) that constrain our collective ability to manage high performance living collections and limit our potential to deliver ex-situ conservation.