

**On the development of a drill-borer for sampling tropical supra-hardwoods:
An example using the Borneo Ironwood *Eusideroxylon zwageri***

Abstract

One of the greatest challenges to developing time series from non-annual ring forming tropical trees arises before a sampling campaign can begin. Tropical trees can be exceptionally hard, often containing chemicals and minerals which make the wood near non-biodegradable. Such trees have considerable palaeoclimatic potential due to their longevity and landscape survival times, but are challenging to sample non-destructively. The hardest of these trees, the Ironwoods, are often the target of sampling campaigns as their properties are associated with longevity. Our objective was to develop a low-technology drill-borer capable of extracting cores from the Borneo Ironwood (*Eusideroxylon zwageri* Teijsm and Binn) of a suitable diameter for carrying out stable isotopic analysis and radiocarbon analysis (necessary for chronology development in non-annual ring forming trees). Due to the inaccessibility of tropical sampling field sites our criteria for development included: construction to be from readily available and replaceable parts; power to be derived from batteries; the main body [drill] to be of a weight and size appropriate to sampling in remote locations; a system operable with minimal training by a non-expert. The cores produced by our drill system were of high quality, and samples could successfully be taken from extremely hard trees without charring. The biggest limitation to the operation of our system was that core segments snapped and had to be sequentially removed from the tree and stored separately. This trial is the first successful non-destructive sampling of living *E. zwageri*, a species which has considerable palaeoclimatic potential.