
A global review of insular woodiness and its impact on diversification

Frederic Lens*^{†1} and Alex Zizka²

¹Naturalis Biodiversity Center [Leiden] (Naturalis) – Darwinweg 2, 2333 CR Leiden, Netherlands

²German Center for Integrative Biodiversity Research (iDiv) (iDIV) – Deutscher Platz 5e, 04103 Leipzig, Germany

Abstract

Woody species not only dominate most continental ecosystems, but also (sub)tropical islands are known to be proportionally more woody than the flora of adjacent continents. It is unclear, however, why some plants are woody and others herbaceous, probably because wood formation is a complex process that can be triggered in different and largely understudied ways.

As a first essential step to solve this evolutionary puzzle, we need to know what are the woody species that have evolved from herbaceous relatives on continents (derived woody species) and islands (insular woody species), and what are the hotspot regions of derived woodiness. Therefore, the presenting author has recently compiled a global derived woodiness database in angiosperms based on published phylogenies, taxonomic revisions and flora treatments.

The database comprises nearly 7000 derived woody species of which 1789 are island endemics. Most of these island endemics are insular woody in the strict sense, meaning that the wood development has occurred after arrival of the original (herbaceous) colonisers. The families that have contributed most to insular woodiness across archipelagos are Asteraceae, Gesneriaceae and Plantaginaceae. Interestingly, many spectacular examples of island radiations consist of insular woody lineages, such as *Cyrtandra* (245 sp), *Veronica* (125 sp) and *Sonchus* (64 sp). However, another species rich island lineage, the Hawaiian lobeliads (131 sp), has evolved its woodiness outside the archipelago (and is therefore not insular woody in the strict sense), and there are several examples of monotypic insular woody genera with narrow endemics. Likewise, we see much variation across islands-archipelagos in terms of number of insular species: Canary Islands are ranked number one (258 sp), followed by Hawaii (210 sp) and New Zealand (165 sp), while New Caledonia surprisingly harbours only a handful of insular woody species.

In conclusion, insular woodiness can be linked with diversification for many of the spectacular island radiations, but it may well be that insular woodiness could lead to an evolutionary dead-end scenario for other island lineages. Future diversification analyses based on in-depth molecular phylogenies of island lineages will shed more light into the relationship between insular woodiness and diversification.

Keywords: angiosperms, insular woodiness, diversification

*Speaker

[†]Corresponding author: frederic.lens@naturalis.nl