Life, death and fossilisation on volcanic oceanic islands, with special reference to Gran Canaria.

Cajsa Lisa Anderson[1], Alan Channing[2]

[1]Department of Biodiversity and Conservation, Real Jardín Botanico, CSIC, Madrid, Spain
[2]School of Earth and Ocean Sciences, Cardiff University, UK

(E-mail: cajsa.lisa.anderson@gmail.com)

Volcanic ocean islands seem unlikely settings for plant preservation. Their stratigraphy is generally dominated by thick successions of lavas, ignimbrites and tuffs, the products of volcanic eruptions. Indeed recent papers relating to plant molecular phylogeny and historical biogeography have suggested that the chances of discovering fossil floras are negligible and that violent periods of explosive volcanic activity sterilise islands. However, tectonic and magma chamber processes dictate that on such islands volcanism is punctuated by hiatuses where “normal” conditions allow colonisation by plants and periods of weathering, erosion and sedimentation.

Recent investigations of Gran Canaria have identified numerous volcanic and sedimentological settings where taphonomic conditions are conducive to preservation. These include:
A. Ash and tuff fall-deposits of the Miocene (*c*.13Ma) Fataga Fm subjected to later epithermal alteration containing isolated leaves of *c*. 10 leaf morphotypes preserved as moulds and by carbonate permineralisation. The overall assemblage is dominated by leaves of coriaceous/microphyllous shrubs characteristic of present day sclerophyllous *macchia* vegetation. **B**. Ignimbrites of the Pliocene (*c*. 3.5) Roque Nublo (RN) sequence contain numerous associated fossiliferous sub-environments. **i**. In proximal, welded ignimbrites basal horizons contain abundant external moulds of trunks and branches. Occasionally these have preserved moulds of bark and permineralised wood fragments. **ii**. Further form the eruptive centre where the basal ignimbrites overlie palaeo-valley fill sediments or early basic RN lava flows of the sequence articulated specimens of palms (?*Phoenix*), and *Euphorbia*, plus a diverse assemblage of isolated eudicot, lauraceous and monocot leaves are preserved as compressions and external moulds. **iii**. Distally, nearer the present day NE coast the ignimbrites which result from fluid rich phreatomagmatic eruptions transform into lahar like flows which contain disarticulated and fragmentary leaves preserved as moulds, compressions and by permineralisation. **iv**. Epiclastic deposits (alluvial, fluvial conglomerates, sands and silts) within the RN sequence filling deep palaeo-valleys contain compressions, moulds and permineralised/ leaves and fruits/flowers. Many samples are members of the Lauraceae or eudicots typical of the *laurisilva* vegetation including probable *Heberdenia*, *Ocotea*, *Arbutus*, *Hedera* and *Ilex*. Less common elements of the flora include *Asplenium*-like fern fronds. Charcoalified/permineralised wood fragments include the conifers *Tetraclinis* and *Pinus*.

The results of our study will provide essential information for systematic biologists who study the evolution of island endemics, historical distribution of plant groups and the timing of dispersals and extinctions. Already from the overall diversity of these fossil floras we can conclude that the typical ecosystems of the Canary Islands, such as the *laurisilva*, the Pinus forest and the thermophilous *macchia* vegetation were present during Miocene-Pliocene; this has been much debated, without any consensus reached. Macaronesian fossils will furthermore provide better age constraints for molecular dating of phylogenies, which are used in the latest model-based methods in biogeography. An example of a biogeographical and evolutionary enigma that could be solved is the floristic ”Rand Flora” pattern – the existence of disjunct distributions across many plant groups between northwest Africa-Macaronesia, Southern Arabia, and East-South Africa.