



# FOSSIL FLORAS ON OCEANIC VOLCANIC ISLANDS [PART 1]: LATE MIOCENE - EARLY PLIOCENE RECORDS OF GYMNOSPERMS AND LAURISILVA ON GRAN CANARIA

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## IMPORTANCE!

Volcanic island archipelagos such as the Hawaiian and Galapagos chains and Canary Islands have been the focus of numerous studies concerning the evolution and biogeography of island endemic plants. The occurrence of a fossil record on these island groups would be an important tool for testing phylogenetical and biogeographical hypotheses, as well as providing minimum and maximum ages for molecular dating of phylogenies, and data for palaeoecological and climatological studies.

Unfortunately, fossil plant records from these island groups are generally rare.

## THE FOSSILS: BRANCHES, TWIGS, LEAVES, FRUITS, ...

Typically plants occur as casts of in situ tree stumps with associated prostrate logs within breccias. Or, as transported trunks, branches, twigs, leaves, and fruits in fluvial sediments. Cellular preservation of tissues by carbonate permineralisation is common.

Wood fragments include several kinds of angiosperms (as yet not securely identified) plus the gymnosperms *Pinus* and *Tetraclinis*.

The leaf assemblage appears to be dominated by members of the broad-leaved sclerophyllous genera of today's Macaronesian laurisilva. The leaves often have well preserved morphology, leaf venation and cuticular characters

Less common fossils include fruits/capsules [of Laurales and/or eudicots] and monocot stems and leaves.

At some localities, charcoalified plant fragments occur.

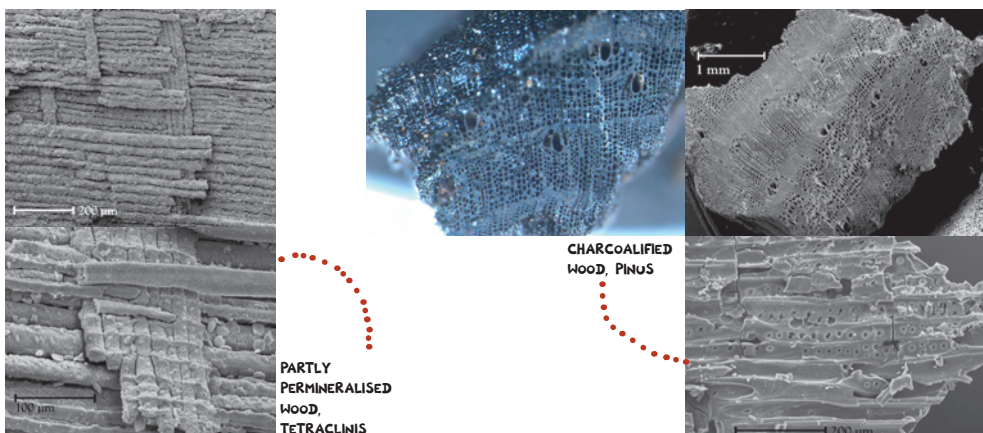


EXAMPLES OF TYPICAL FOSSILS: LEAVES WITH CUTICULAR FEATURES; TWIGS, WOOD AND BARK WITH CELLULAR PRESERVATION FROM ANGIOSPERMS AND TETRACLINIS; CASTS/MOLDS OF TRUNKS (THE BIG TRUNK ABOVE IS BRANCHED IN A WAY THAT SUGGESTS THAT IT BELONGS TO A CUPRESSACEAE, POSSIBLY TETRACLINIS)

## GYMNOSPERMS

In several localities, we find wood and bark of *Tetraclinis* (Cupressaceae), a genera that went extinct across most of Europe during the Neogene, and today only remain as relict populations in Malta, SE Spain and NW Africa. This is the first evidence that the genera had a distribution that included Macaronesia.

Charcoalified *Pinus* wood occurs at altitudes of 1300-1400m within Roque Nublo volcanoclastics. To date we have insufficient anatomical characters for species level identification, however the presence of abundant epithelial cells surrounding resin ducts may suggest affinity with the only indigenous species of the genera present in the western islands of Macaronesia, the endemic *P. canariensis*.

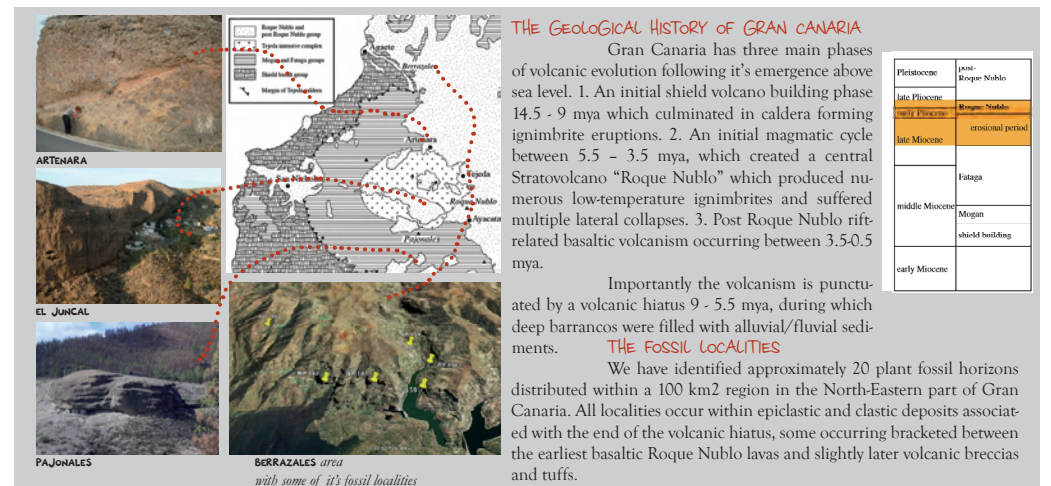


CHARCOALIFIED WOOD, PINUS

PARTLY PERMINERALISED WOOD, TETRACLINIS

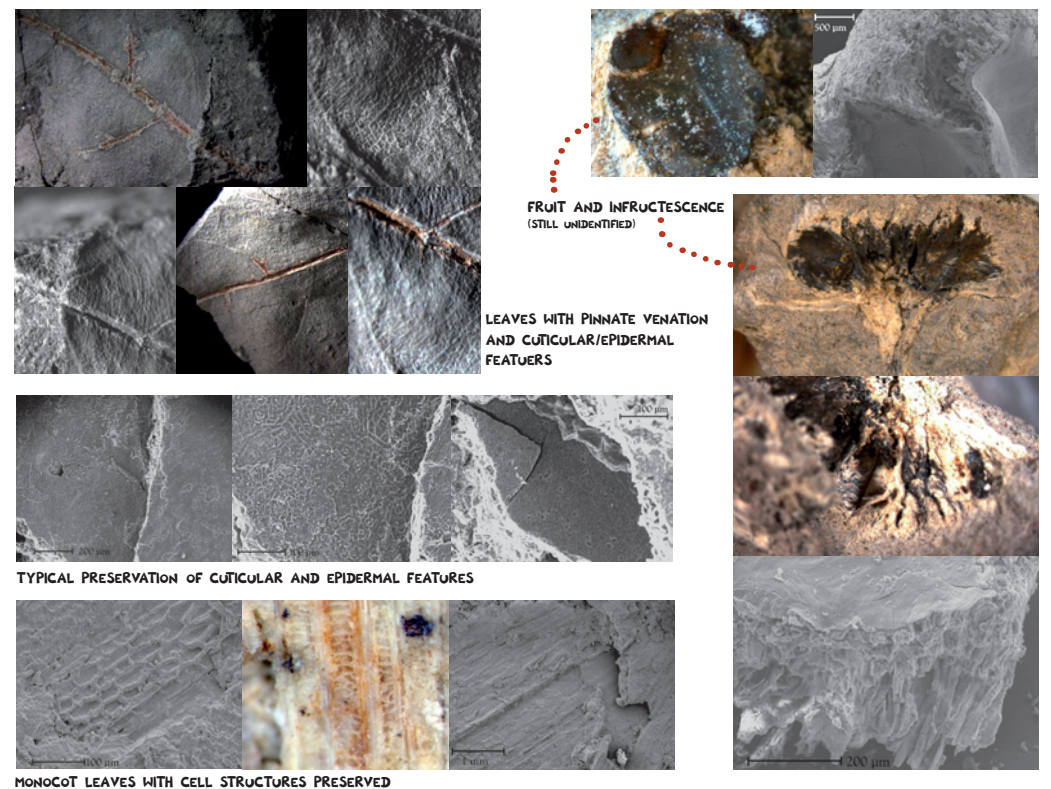
## FOSSILS ON VOLCANIC ISLANDS? HOW? WHERE?

The volcanic history of most of the islands of Macaronesia is marked by hiatuses in volcanism where chemical and physical weathering prevails. From these erosional hiatuses potentially fossiliferous fine grained volcanoclastic, epiclastic and sedimentary sequences are preserved but as yet unexplored by palaeontologists.



## LAURISILVA ANGIOSPERMS

Most of the fossil leaves are ovate/elliptical or possibly rhomboidal, pointed and with entire margins. Venation is pinnate. Stomata appear to be confined to abaxial surfaces. Lobed leaf "morphotypes" also occur. Preliminary work suggest the presence of genera of Lauraceae, as well as eudicot genera including possible *Ilex*, *Arbutus* and *Hedera*. The fruits and the fragmentary monocot plants we have collected are as yet unidentified. The flora indicate the presence of a Miocene laurel forest habitat, containing elements of today's laurisilva



FRUIT AND INFRACTESCENCE (STILL UNIDENTIFIED)

LEAVES WITH PINNATE VENATION AND CUTICULAR/EPIDERMAL FEATURES

TYPICAL PRESERVATION OF CUTICULAR AND EPIDERMAL FEATURES

MONOCOT LEAVES WITH CELL STRUCTURES PRESERVED

## IMPLICATIONS

This preliminary work suggests that both laurisilva and *Pinus*-dominated ecosystems were established on Gran Canaria between major late Miocene/early Pliocene volcanic events, supporting the concept of these elements of the Macaronesian flora as Miocene relicts.

## TO BE CONTINUED...

Despite the fragmentary nature of many fossils collected in this initial study we have identified a number of biogeographically interesting taxa. More detailed investigations of Gran Canaria and the other Macaronesian volcanic islands will undoubtedly result in further plant fossil discoveries, that will help in unraveling the evolutionary history of the Macaronesian flora.

In this initial exploratory visit, we concentrated primarily on the rapid assessment of easily accessible road sections which tended to provide vertical sections within road cuts. Bed by bed exploration of these deposits will yield further plant horizons. Additionally, extensive bedding plane exposures of basal Roque Nublo breccias are available across much of the northern half of Gran Canaria. Numerous older, Middle Miocene soil horizons, epiclastic and volcanoclastic deposits within the felsic lava sequence of the Fataga formation and less frequent soils within the Mogan formation remain unexplored.

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