

DAVIS EXPEDITION FUND

REPORT ON EXPEDITION / PROJECT

Expedition/Project Title: A Taxonomic Study of the Leaf cuticle Micromorphology of the Genus *Dioon* (Zamiaceae), University of Miami, Florida, USA

Travel Dates: 1 Oct – 15 Dec 2013

Location: Miami & Mexico

Group Members: James Clugston

Aims: Observing the leaf cuticle characters of the genus *Dioon*

Outcome (not less than 300 words):-

A Taxonomic Study of the Leaf Cuticle Micromorphology of the Genus *Dioon* (Zamiaceae)

Report to the Davis Expedition Fund committee- James Clugston 2014

The Davis Expedition Fund awarded me with a sum of £660 towards my project observing the leaf cuticle characters of the genus *Dioon*. This project was in partnership with Montgomery Botanical Center, Miami, FL, USA (MBC) and Andrew P. Vovides of Jardín Botánico Fco. Javier Clavijero, Xalapa, Mexico (XAL). Two samples were collected from all species 14 species within the genus *Dioon* (Zamiaceae) from known wild origin specimens of the MBC and a further 14 from each species in the living collection of XAL. Voucher specimens will be deposited in the Herbariums of The Royal Botanic Garden Edinburgh and Fairchild Tropical Garden.

SEM was performed using a Phillips XL-30 FEL Scanning electron microscope instrument at the University of Miami for all species. A maximum of four stomatal characters were measured from the abaxial surface in all species. The scale for each image was calibrated at 10 micrometres (μm) using the 'Set Scale' tool in ImageJ. Three stomatal characters; length of guard cell, width of guard cell and length of polar extension were selected based upon informality of the individual characters. Based on the findings of this current study; five morpho-geographic species groups were selected: Edule group; *D. edule* and *D. angustifolium*, Spinulosum group; *D. mejiae*, *D. rzedowskii* and *D. spinulosum*, Tomasellii

group; *D. sonorensis*, *D. stevensonii* and *D. tomasellii*, Purpusii group; *D. purpusii*, *D. califanoi*, *D. argenteum* and *D. caputoi* and Holmgrenii group; *D. holmgrenii* and *D. merolae*.

Statistical analysis and visualisations were carried in R software environment for statistical computing version 3.0.1. Each of the character was tested individually using a Welch two sample t-test conducted in R to test for statistically significant differences for each character between species of *Dioon*. The relationship between characters in each species group was analysed using the 'vegan' community ecology package for R version 2.0-7. In order to visually explore noticeable differences in the stomatal characters between species the datasets for each species group were merged together and a principal component analysis was conducted of all characters for each species group. Subsequently the function 'ordihull' was used to draw a convex hull on the PCA plot for each of the species to see whether there was overlap within the two-dimensional PCA 'character' space between the species.

Item	Cost
Flight from Heathrow to Miami	\$950
Flight to Veracruz, Mexico	\$560
Bus Veracruz to Xalapa, Mexico	\$70
Sustenance in Miami	\$2000
Chromium trioxide	\$170
Other lab equipment	\$170
SEM costs at University of Miami	\$962
Stay in Mexico	\$500
Total	\$5,382 (£3233.40 approximate)

Outcomes and predicted outcomes: 1st paper to be published in American Journal of Botany as a co-author with Andrew P. Vovides (XAL), which will be a descriptive paper on the leaf cuticle micromorphology of the genus and a second paper that will compare the differences in leaf cuticle micromorphology in each species between XAL and MBC