

frequent, together with *A. dolomiticum* Love, in at least one hundred localities across the karst plateaus of Lika and Kordum, mostly in *Cymbalaria pallida* communities. Both *A. dolomiticum* and *A. javorkeanum* are also present on Adriatic coastal mounts and on the insular peaks of Cres, Krk, Brač and Pelešac. True *A. ceterach* L. is limited to the very coast and isles. It is excessively rare inland and restricted to a few cliffs and gorges in the ophiolite mounts of northern Bosnia and central Croatia (Mt Zrinska Gora). Here it grows in *Cheilanthes marantae*–*Polygonum moesiaticum* communities, together with *A. cuneifolium* Viv., *A. adulterinum* Milde and *Cheilanthes marantae* (L.) Domin. Former records of all these species (e.g. Schlosser and Vukotinovic 1869) elsewhere on calcareous mountains of Croatia are unsubstantiated and remain problematic. *Pteridium tauricum* Grossg. has been confirmed recently for the northeast Adriatic coast, and for the intermontane valleys of the west Dinaric Alps, growing in xeric oakwoods and pinewoods on both limestone and serpentine.

The interesting affinities and co-existence of *A. scolopendrium*, *A. sagittatum*, *A. hybridum*, *A. javorkeanum* and *A. ceterach* growing sympatrically in the Kvarner isles is a centre for the *Phyllitis*–*Ceterach* complex in the northeast Adriatic. Their origin here may be related to the Adriatic microplate drifting across the Tethys ocean during Cretaceous–Paleogene. Thus Lovric (1975) proposed a revised genus *Phyllitis* Hill with the section *Phyllitis* (incl. *P. scolopendrium*, *P. sagittata*, and *P. hybrida*), and section *Ceterach* (DC.) Lovr., to include *Phyllitis javorkeana* (Vida) Lovr., *p. ceterach* (L.) Lovr. and *P. aurea* (Link) Lovr.

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Hybridisation and speciation in the genus *Dryopteris* in Pico, Azores

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The species and hybrids of *Dryopteris* in Pico have recently been described in detail by Fraser-Jenkins (1983). Five species are present (two of which are endemic) and they have given rise to five endemic hybrids. Cytological analysis of the species and hybrids has elucidated the inter-relationships of the species, and provided evidence that one of the species has evolved in the Azores, by hybridisation and chromosome duplication. This is described in Figure 1.

Of the hybrids, only one clump has been found of *D. × picoensis*, but two or more individuals of each of the other hybrids are known from Pico. Considering these finds were made in two days of field work, there appears to be quite a high frequency of hybridisation in the island.

Both the tetraploid species, *D. dilatata* and *D. crispifolia*, have been shown to be allotetraploid (Gibby *et al.* 1978; Gibby, in prep.), and chromosome pairing in all the

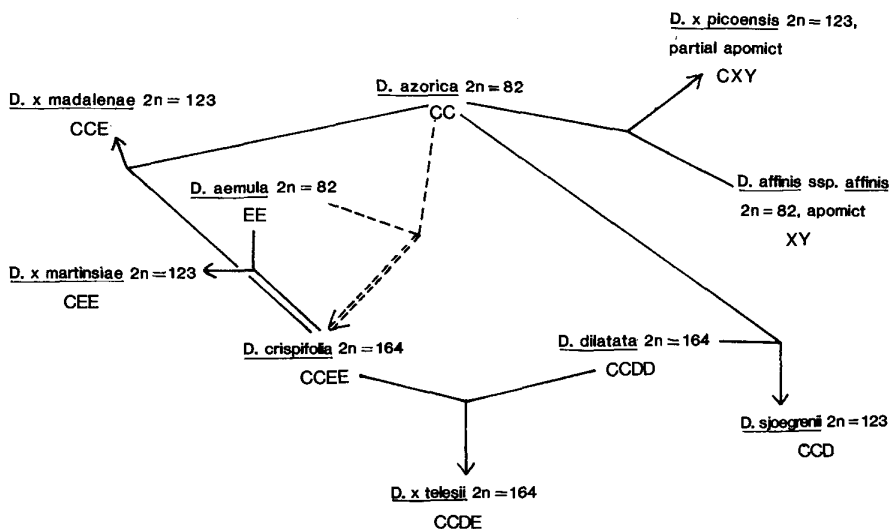


Figure 1. Hybridisation in Azores *Dryopteris*. The dotted line shows the proposed origin of *D. crispifolia*. Letters represent the genomic formulae determined by analysis of chromosome pairing.

hybrids is allosyndetic. *D. crispifolia* appears to have evolved *in situ* from a cross between *D. aemula* and *D. azorica*, with subsequent chromosome duplication. A diploid hybrid of *D. aemula* × *D. azorica* has not been found in the Azores, but such a cross could have been overlooked, as it must be close to *D. crispifolia* in morphology.

The hybrid *D. x picoensis* is assumed to be *D. affinis ssp. affinis* × *D. azorica* on morphological evidence, and this is supported by the cytological analysis. It is triploid and a partial apomict; 8-celled sporangia show 123 bivalents at metaphase 1, and 16-celled sporangia show *c.* 123 univalents. The low frequency of good-looking spores produced reflects the low frequency of the 8-celled sporangia in this plant.

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