TWO NOVEL ASPLENIUM HYBRIDS (ASPLENIACEAE: PTERIDOPHYTA) FROM TENERIFE, CANARY ISLANDS

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ABSTRACT

A plant closely resembling Asplenium hemionitis L. but with more dissected, lobed fronds was discovered during a trip to the Anaga mountains, Tenerife, Canary Islands in 2009. This was found to show almost complete spore abortion, indicating a hybrid origin. From the associated species and frond form we suggest the other parent to be A. onopteris L. This represents the first documented hybrid of the rather taxonomically isolated A. hemionitis. The hybrid, A. × tagananaense, is described and its distinguishing features given. A further novel Asplenium hybrid, photographed in 1995 but not subsequently refound, is identified as that between A. onopteris and A. aureum Cav. In the absence of a specimen it is not formally described but its distinctive features are illustrated and its occurrence reported.

INTRODUCTION

In February 2009 a small group of pteridologists led by the second author and comprising Alison Evans, Michael Hayward, Tim Pyner and Martin Rickard went to Tenerife. During the excursion, an odd looking fern, which several in the group considered to be an aberrant form of Asplenium hemionitis was found. The plant had the palmate frond form unique in the region to this species but closer examination showed the lobes themselves to be more highly dissected, the lobules not apparent as they were largely in the same plane as the frond and closely imbricate. The possibility that this might constitute a hybrid was considered and accordingly photographs were taken (Fig. 1) along with a few voucher fronds (see drawing, Fig. 4a). On the groups’ return to the British Isles these were examined by FR and found to be producing highly abortive sporangia, strongly suggesting a hybrid origin. Comparison with recently collected Azorean material of the very rare hybrid A. × rouyi Viane (A. scolopendrium × A. onopteris), showed some similarities, suggesting that the other parent might also be diploid A. onopteris. The group returned to the site in November 2009, this time accompanied by Patrick Acock. They found the plant still to be present although no new foliage had developed. It gave the opportunity to make additional observations about the plant, its surroundings, etc. Apart from A. hemionitis the only other Asplenium species closely associated (and with juvenile plants in the immediate vicinity) was found to be A. onopteris (Fig. 2).

The possibility that A. × tagananaense is a hybrid with some other Canarian
Asplenium taxon may largely be ruled out on gross morphological grounds; the only other taxa with an appropriate frond shape are tetraploid and would be expected to show a greater influence on the hybrid frond form because of gene dosage effects (Bennert et al., 1991). Asplenium × rouyi (= A. onopteris × A. scolopendrium), another extremely rare hybrid, only ever found twice (Schäfer & Rasbach, 2000), shares similarities and the A. onopteris parent. This hybrid with the entire-fronded A. scolopendrium, a very rare plant in the Canaries, differs in its narrower more distinctly triangular frond form, the deeper divisions of the central lobe, the pinnules thus created more nearly at right angles to the rachis. It also appears to have a somewhat fleshier texture common to many A. scolopendrium hybrids (Rumsey et al., 2004).

Many years earlier AL had found another curious Asplenium on Tenerife which from its morphology (Figs. 3; 4b) could not be matched with any known species, although

Figure 1. Asplenium × tagananaense – head of Barranco de la Iglesia, Taganana, Tenerife. Feb. 2009. Photo: Alison Evans.
from its texture strongly suggested it may be a hybrid of *A. aureum* Cav., seen growing nearby. A voucher frond was collected and sent to the Department of Botany at the Natural History Museum; most unfortunately its present whereabouts have not been traced. Subsequent visits to the area, by a woodland trail in the hills c. 1km to the west of Erjos, Los Silos (c. 28° 19' 49.35''N 16° 49' 06.77''W) at an altitude of just over 720m, revealed the locality to have changed somewhat in character and the plant could no longer be refound. Photographs taken of the fern when first found, which unfortunately only reveal the upper surface of the fronds, show the plant to be very distinctive, clearly differing from *A. aureum* in its more dissected frond form and in its somewhat triangular shape, the lowest pinnules just the larger. While other taxa within the subgenus Ceterach are now known to occur on Tenerife, both morphological (frond width) and ecological factors indicate that *A. aureum* is involved. Again, on the basis of its morphology, only the 2-3 pinnate, deltate fronded *A. onopteris*, the only other *Asplenium* species seen in the vicinity, could be the other parent. Confirmation will however not be possible until the original specimen or similar wild plants are found. Few hybrids are known involving members of the morphologically distinctive subgenus Ceterach, although others are inferred in the origin of allopolyploids within this group (Trewick *et al.*, 2002; Van den Heede *et al.*, 2004); most examples of F1 hybrids found in the wild are backcrosses between allopolyploid derivatives and parental taxa (Van den Heede & Viane, 2002). The Canarian endemic *A. aureum* has been demonstrated to

**Figure 2.** *Asplenium × tagananaense in situ* with juvenile plants of both putative parents, Nov. 2009. Photo: P. Acock.
Figure 3. *Asplenium aureum × A. onopteris* – by forest trail c. 1km West of Erjos, Tenerife, Oct. 1995. Photo: A. Leonard.
be an allotetraploid (Pintér & Vida, 1993). Although its parentage is still uncertain, it is now known to be one parent of the Macaronesian endemic (Madeira, Canaries) hexaploid *A. lolegnamense* Gibby & Lovis (Pintér et al. 2002) and also involved in the origin of the Canarian endemic octoploid *A. octoploideum* Viane & Van den Heede (Van den Heede et al., 2004). The derived polyploid taxa may be more locally abundant than the more mesic *A. aureum*, particularly at altitude but they are more restricted in distribution across the Canarian archipelago.

Some earlier proposed hybrids involving crosses with taxa of other subgenera have subsequently been shown to be in error, eg. *Asplenoceterach badense*; only the hybrid of tetraploid *A. ceterach* L. with the allotetraploid *A. majoricum* (*A. × barrancense* (W. Bennert & D.E. Mey.) Pericás & Rosselló) has been cytologically confirmed (Rasbach et al., 1989). However, another very rare example in which *A. aureum* has been suggested to be parental is known (Hansen & Sunding, 1993). *Asplenium × newmani* Bolle was described from material collected by C. Bolle in the Barranco del Rio on La Palma in September 1852. It is a simply pinnate fern with fronds only c. 2cm broad, the rachis above green. Known only from the type gathering now in Herbarium Berolinense (B20 0026447), one parent is clearly either the Macaronesian endemic *A. anceps* or, and on ecological grounds less likely, its more cosmopolitan relative *Asplenium trichomanes* subsp. *quadrivalens*. Similar plants have never been refound.

**DESCRIPTION**

*Asplenium × tagananaense* F.J. Rumsey hybr. nov. (*A. hemionitis* L. × *A. onopteris* L.)

Habitu et textura *A. hemionitis* similis, praecepue frondis plus divisus, lobatus, plus minusve pinnatifidus, basi pinnatilobus, lobo terminali multo magis, sporae abortivus differt.

Holotypus: Canary Islands, Tenerife, Anaga mountains, by track to Taganana near Casa Forestal, at head of Barranco de la Iglesia, amongst rocks by path on steep slope in Laurel woodland, with both putative parents, c. 900m, 28° 32’ 43.50” N, 16° 13’ 34.50” W, Leonard et al., s.n. 2 February 2009. BM

Perennial from erect-ascending rhizome, leaves flushing annually, wintergreen, coriaceous, glabrous, to 35 cm; petiole 1.5-2.2 x lamina length, somewhat swollen at base, dark reddish brown for most of its length; lamina to c. 15 cm long, 12 cm broad, palmately (3-)5 lobed, the mid lobe distinctly longer, the lobes inconspicuously divided from ¼ to ⅔ of their width, the basal more profoundly, lobes with small erect teeth at their apices, the apices sub-acute to obtuse. Sori linear, +/- curved, sporangia failing to mature, spores highly abortive.

*Asplenium × tagananaense* is most likely to be confused with its *A. hemionitis* parent, various frond forms of which have been described from the Canary Islands (Kunkel, 1966; 1967 and see Benl, 1967). While very distinctive amongst European *Asplenium* because of its entire, initially deltate, later palmate frond form, variability exists in *A. hemionitis* and the more markedly lobed and deeply divided forms appear to be more prevalent and perhaps exclusive to the Canary Islands. Rare monstrose forms such as described by Kunkel, 1966; 1967 may be similar in appearance to the newly described hybrid, although they would not show the spore abortion it clearly demonstrates. From the illustration in its original publication f. *cristatum* Kunkel (Kunkel, 1966) is clearly not synonymous; we have seen no material of f. *pinnatipartidum* Kunkel with which to compare our plants.
Figure 4.
A. (right) *Asplenium × tagananaense* – underside of frond drawn from Holotype – Leonard et. al., sn. (BM). Scale bar represents 1cm.
B. (left) *Asplenium aureum × A. onopteris* – upper surface of frond. Scale bar represents 1cm.
All herbarium material of *A. hemionitis* at BM has been checked and no further examples of *A. × tagananaense* have been found. Given its superficial similarity to *A. hemionitis* it may be overlooked but we believe it highly likely that it is genuinely, extremely rare.

Molecular studies based on the sequencing of small portions of the plastid genome, by which the maternal parent can be identified (Vogel et al., 1998), have been initiated but not yet concluded.

**DISCUSSION**

No hybrids of *Asplenium hemionitis* have previously been reported (Reichstein, 1981; Prelli, 2001). *A. hemionitis* is somewhat isolated within the broad genus *Asplenium*, the only European example of the section Hemionitidastrum Fée (Schneider et al., 2004). Similarly no hybrids of *A. aureum* have been conclusively found (the likely origin of *A. × newmani*, found only once in the mid 19th century, still open to debate). Hybridization events involving *A. aureum* are however known to have occurred as inferred from molecular studies of its allopolyploid progeny (Pintér et al. 2002) (Van den Heede et al., 2004). Observations in other pteridophyte groups such as *Equisetum* (Page, 1972) suggest greater levels of hybridization between phylogenetically closer taxa, where speciation has proceeded through ecological, hence physical separation and breeding barriers may not have been so well established. The occurrence of hybrids may thus give some indication of relationships and where apparent inter-generic hybrids are found give cause for taxonomic reconsideration (see recent studies in the Orchidaceae, eg. Bateman, 2006). Generic delimitation within Aspleniaceae has long been contentious with some apparently morphologically distinctive entities, eg. *Phyllitis, Ceterach, Pleurosorus* traditionally recognised by many authors. Molecular phylogenetic studies (eg. Schneider et al., 2004), are now contributing much to our understanding of the relationships within this highly speciose and taxonomically contentious genus. These studies show that these entities are firmly nested within *Asplenium* and would by their recognition render it paraphyletic. Essentially, if we recognise *Phyllitis* or *Ceterach* then an equally valid case is made for the recognition of other segregates; even the limited British flora would see its 13 species split between 8 genera. As evidenced by the finds reported here, even where phylogenetically distant, rare inter-specific reproductive events may occur, the offspring often instantly threatened by the very combination of factors which have enabled their production. It is potentially these unique combinations of more disparate genomes which are the more likely to promote polyploidy through disrupted cell division and thus fuel the abrupt speciation of very distinctive entities. As such these plants afford us unique insights into evolutionary mechanisms and processes but currently have no conservation standing.

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**REFERENCES**

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