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Asplenium ×*rouyi* Viane (*A. onopteris* L. × *A. scolopendrium* L.) in the Azores *(Aspleniaceae, Pteridophyta)*

Abstract

Schäfer, H. & Rasbach, H.: *Asplenium* ×*rouyi* Viane (*A. onopteris* L. × *A. scolopendrium* L.) in the Azores *(Aspleniaceae, Pteridophyta).* – Willdenowia 30: 219-227. 2000. – ISSN 0511-9618.

Asplenium ×*rouyi*, the hybrid of *A. onopteris* and *A. scolopendrium*, previously found only once, more than 100 years ago in continental Portugal, was rediscovered on Faial Island, Azores, in 1999. Its morphology, cytology and ecology are described for the first time.

Introduction

Hybrids between *Asplenium scolopendrium* and other species of this genus, formerly known as ×*Asplenophyllitis* Alston, are extremely rare. In Europe, the triploid combination *Asplenium obovatum* subsp. *lanceolatum* (Fiori) P. Silva × *A. scolopendrium,* described as *A.* ×*microdon* (T. Moore) Lovis & Vida, was collected at Guernsey in 1885, 1965 and 1967 (Girard & Lovis 1968, Meyer 1969, Lovis 1975). Single specimens of *A.* ×*jacksonii* (Alston) Lawalrée, the triploid hybrid between *A. adiantum-nigrum* L. and *A. scolopendrium,* were found during the last 100 years at Guernsey and Jersey, in Cornwall, Devon (Meyer 1969, Lovis in Stace 1975) and W France (Prelli 1996). Furthermore, the hybrid *A.* ×*confluens* (T. Moore ex Lowe) Lawalrée, resulting from a cross between *A. scolopendrium* and *A. trichomanes* L., was reported from Cumberland (England) and Slovenia (Meyer 1969). Finally, a triploid hybrid between *A. lepidum* C. Presl and *A. scolopendrium* was found in Hungary in 1959 and subsequently described as ×*Asplenophyllitis kuemmerlei* Vida (1960); this plant was first considered as a hybrid of *Asplenium scolopendrium* with *A. ruta-muraria* L.

During fieldwork for a study of the neophytes of Faial Island (central group of the Azores, Portugal), the first author found in June 1999 a peculiar *Asplenium* that appeared to be a "×*Asplenophyllitis*". As *Asplenium scolopendrium* and *A. marinum* L. grew in the same place, it was noted as a hybrid between these species. Two fronds were collected and later sent to the second author for confirmation. Morphological and cytological examinations soon revealed that the second parent of the hybrid was not *A. marinum* but *A. onopteris* L. The plant was later identified as *Asplenium* ×*rouyi* Viane. This hybrid was previously found only once in the 19th century at "Aviutes près Porto (E. Schmitz)" in continental Portugal (Rouy 1895) and described as

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Fig. 1. *Asplenium* ×*rouyi* Viane in situ near Ribeira do Cabo, Faial Island, Azores. – Photograph: H. Schäfer, 8.1999.

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Scolopendrium lobatum Rouy, which was considered with some doubt as the hybrid *Scolopendrium vulgare* × *Asplenium marinum*. Meyer (1969) was probably the first to recognize after careful morphological studies that not *Asplenium marinum* but most likely *A. onopteris* is the second parent of this hybrid. He corrected the location to "Avinles" and the collector to "F. Schmitz" and gave the new name ×*Asplenophyllitis lobata* (Rouy) D. E. Mey. Unfortunately, no specimen could be traced in the herbaria in Lyon (LY) and Paris (P). Rouy (1895: 32) writes: "J'ai reproduit, planche C, en l'agrandissant, le seul exemplaire que je possède de cette intéressante fougère, et le seul exemplaire qui en existe dans les herbiers, je crois." According to the revision of the genera of the family *Aspleniaceae* (Derrick & al. 1987, Kramer & Viane 1990, Tutin & al. 1993), the name of this hybrid was changed to *Asplenium* ×*rouyi* Viane (Viane & Reichstein 1991).

No hybrids of the "×*Asplenophyllitis*" group have ever been reported either from the Azores or from any other Macaronesian island (cf. Vasconcellos 1968, Fernandes & Fernandes 1980, Hansen & Sunding 1994).

Morphology

The hybrid of Faial is a rather strong plant. In June 1999, it was bearing 18 fronds with some more young fronds still developing (Fig. 1). The length of the lamina ranges between 15.2 and 18.1 cm, with an average of 16.4 cm. The petioles were found to range between 11.2 and 15.9 cm in length, with an average of almost 14 cm, and are dark brown to black in colour. The fronds are lanceolate and show the triangular outline of *Asplenium onopteris* with 16-20 pinnae (Fig. 2a). The length of the lowest pinnae ranges between 3.8 and 6.3 cm with an average of 5.3 cm. The margins of the pinnae are slightly toothed, partly undulate. Usually, the lowest 2-4 pinnae are entirely separated from the rhachis. In the uppermost fifth, the lamina is entire, comparable to the lamina of *A. scolopendrium*. The sori are mainly scolopendrioid and measure 5-11 mm. The spores are aborted.

The Azorean plant differs somehow from the single frond of Rouy's *Scolopendrium lobatum* (Fig. 2b), the latter being considerably smaller: Rouy (1895: 32, t. 100) gives a lamina length of 9 cm, the petiole measures only 4.5 cm, the number of pinnae is also considerably smaller (about 13) and the upper half of the lamina is almost entire. The maximum length of the sori does not exceed 7 mm. Lastly, the colour of the petiole seems to be much paler than in our plant.

There is, nevertheless, no doubt that *Schäfer Az-F-876* corresponds to *Scolopendrium lobatum* Rouy and can therefore be determined as the hybrid *Asplenium onopteris* × *A. scolopendrium* (= *A.* ×*rouyi* Viane). In Fig. 3, the intermediate morphology of the hybrid is shown.

Ecology

The hybrid was found in the western part of Faial Island, at Cabeço Verde north of Ribeira do Cabo at almost 500 m altitude (Fig. 4c). The average annual precipitation in this region amounts to more than 2000 mm, the medium annual temperature ranges between 15 and 13.5 °C. The soil is classified as andosole, a fertile product of airborne volcanic deposits. The pH of the A horizon is about 5 in the area (Schäfer 2000, unpubl. diploma thesis Univ. Regensburg, "Die Verbreitung der Farn- und Blütenpflanzen von Faial (Azoren) mit besonderer Berücksichtigung der Neophyten-Problematik").

The plant was found growing below an old hedge of *Hydrangea macrophylla (Hydrangeaceae),* a successful invasive exotic in the Azorean vegetation. As it is a common feature of other places in the Azores, the vegetation in this location is mainly anthropogenic, consisting above all of exotic plant species: among the phanerophytes the Asian species *Hedychium gardneranum (Zingiberaceae), Cryptomeria japonica (Taxodiaceae), Polygonum capitatum (Polygonaceae), Duchesnea indica (Rosaceae)* and the Australian tree *Pittosporum undulatum (Pittosporaceae)* are most important. However, the location is rich in pteridophytes, including *Osmunda*

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Fig. 2. *Asplenium* ×*rouy*i Viane – a: frond (total length 30 cm) of the plant from Faial Island, Azores *(Schäfer Az-F-876);* b: reproduction of Rouy 1895: t. 100. – Photographs by H. Rasbach (a) and M. Chalopin (b).

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Fig. 3. *Asplenium* ×*rouyi* Viane and the parental species *A. onopteris* L. (right) and *A. scolopendrium* L. (left). – Photograph: H. Rasbach.

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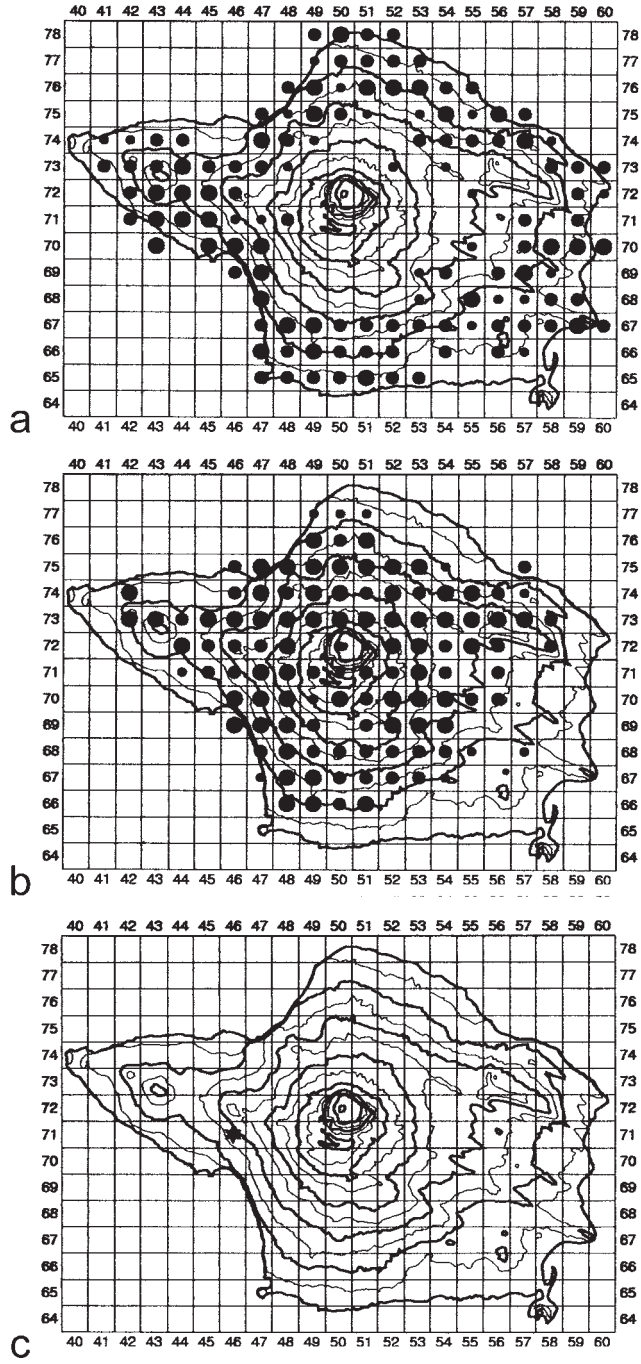


Fig. 4. Distribution of *Asplenium* ×*rouyi* (c) and its parent*s A. onopteris* L. (a) and *A. scolopendrium* L. (b) on Faial Island, Azores, in UTM-grid.

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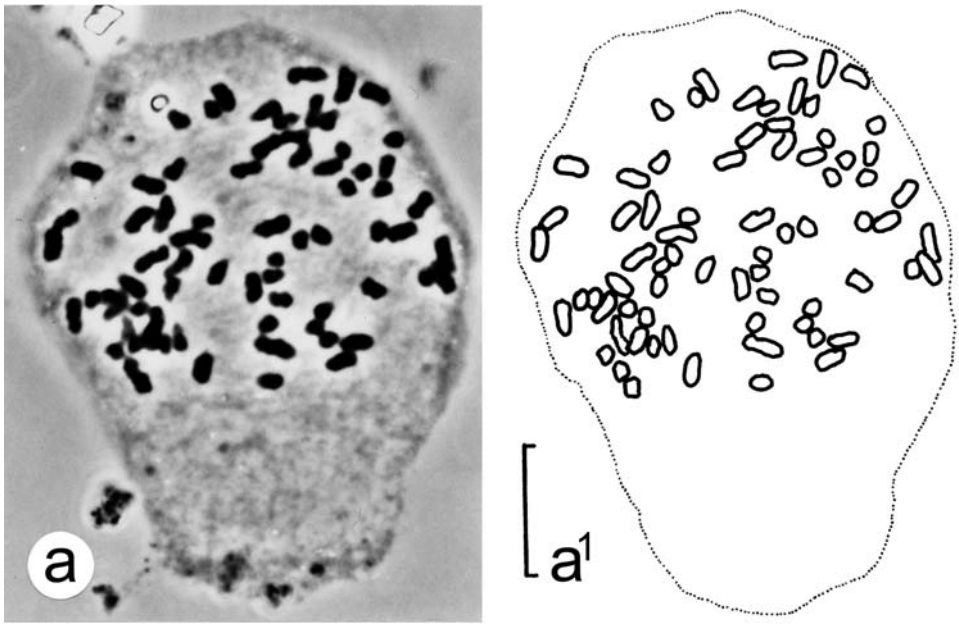


Fig. 5. Cytology of *Asplenium* ×*rouyi* Viane – photograph (a) and explanatory diagram (a[1]) of sporemothercell in meiosis showing n=72[I] (univalents). The large chromosomes are those of *A. scolopendrium* L., the smaller ones of *A. onopteris* L. – Scale bar = 10 µm; photograph and diagram by H. Rasbach.

regalis L., *Pteris incompleta* Cav., *Asplenium scolopendrium, A. onopteris, A. marinum, Stegnogramma pozoi* (Lag.) K. Iwats. subsp. *pozoi, Christella dentata* (Forssk.) Brownsey & Jermy var. *dentata, Athyrium filix-femina* (L.) Roth, *Diplazium caudatum* (Cav.) Jermy, *Deparia petersenii* (Kunze) M. Kato, *Polystichum setiferum* (Forssk.) Woynar, *Cyrtomium falcatum* (L. fil.) C. Presl, *Blechnum spicant* (L.) Roth and *Selaginella kraussiana* (Kunze) A. Br.

Asplenium onopteris is most common below 400 m altitude (Fig. 4a), whereas *A. scolopendrium* is found usually above 200 m altitude (Fig. 4b). Therefore, the altitudinal range they share is quite small. Furthermore, *A. scolopendrium* prefers shady places in ravines where *A. onopteris* is usually missing. The location at Cabeço Verde (Fig. 4c) is one of the very few places on the island, where both species could be found growing in close vicinity.

Cytology

Cytological examinations of the hybrid were done in 1999 by the second author with sori of young fronds which had been fixed in a 3:1 mixture of 100 % ethanol and glacial acetic acid. The fixed sporangia were stained in acetocarmine; the preparations were made according to Manton (1950). 15 sporemothercells were analysed, all showed n = 72[I] (= only univalent chromosomes) in meiosis; the plant is diploid without homologous chromosomes (Fig. 5). A hybrid of *Asplenium marinum* and *A. scolopendrium,* as *A.* ×*rouyi* was supposed to be by Rouy, would show the same number of chromosomes in meiosis, because *A. marinum* is diploid too. However, the hybrid with *A. marinum* would have a different morphology: the lamina would be narrow at the base with the longest pinnae in the middle of the frond. The cytological result excludes *A. adiantum-nigrum* as possible parental species, as this fern is tetraploid and the hybrid with *A. scolopendrium* triploid so (= *A.* ×*jacksonii*). The chromosomes of *A.* ×*rouyi* differ

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considerable in size, proving their different origins (Fig. 5). *A. scolopendrium* and *A. onopteris* of Faial Island were examined cytologically and by measurement of the spores and found to be diploid. The presented analysis is the first cytological proof for Meyer's suggestion about the parents of this hybrid.

Conclusions

In the last 30 years, a large number of new ferns and fern hybrids have been reported from the Azores. The discovery of *Asplenium* ×*rouyi* at Faial Island adds one more taxon to the long list of fascinating pteridophytes of these islands. However, there is a great need for further field studies in the Azores because most likely some more interesting plants are to discover. As the last remains of indigenous vegetation are seriously threatened by invasive exotics, road construction and dairy farming, not much time is left for botanical investigations.

Fronds of *A.* ×*rouyi* from Faial are kept in the private herbaria of both authors and will be deposited in one of the best collections of Azorean plants, the herbarium of the Universidade dos Açores (AZU) at Angra do Heroísmo, Terceira, and in the herbarium at Berlin-Dahlem (B).

Postscript: Although situated in a reserve protected by both Portuguese and European law, Cabeço Verde was almost completely destroyed in spring 2000 in order to get material for the construction of a new water reserve at Faial island. The Azorean environmental department did not interfer, a complaint at the European Parliament was not successful. Last remains of the dead hybrid were seen in May 2000.

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