

Mosses from the Mascarenes - 7. A small collection from Rodrigues

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Abstract: Fifteen taxa of mosses are reported from the island of Rodrigues. The second African report of *Luisierella barbula* (Schwaegr.) Steere bridges the Asian and New World disjunctions of this taxon. Three other species are reported new to the Mascarenes, i.e., *Calymperes tenerum* C.Müller var. *tenerum*, *Fissidens ramulosus* Mitten and *Weissia edentula* Mitten. Three are new to Rodrigues, i.e., *Bryum truncorum* Bridel, *Fissidens sciophyllus* Mitten and *Vesicularia ayresii* (Schimper ex Besch.) Broth.

Introduction

The island of Rodrigues is the smallest and most remote of the three main Mascarene Islands. It is of quite recent volcanic origin (1.5 million years, McDougall & al. 1965). As on most other tropical islands the plant cover of Rodrigues has undergone vast changes since its discovery some 350 years ago. Of an endemic flora of vascular plants, comprising about 40-45 taxa, all but one species are threatened with extinction. All plant communities have been seriously damaged by stray livestock grazing, woodcutting, squatters in the forests and lastly - but to the remnants of

indigenous forest maybe the most serious threat of all today - invasive alien plants. The following plants are among the most aggressive that have taken over most of the island: *Lantana camara* L., *Furcraea foetida* (L.) Haw., *Litsea glutinosa* (Lour.) C.B.Robinson and *Leucaena leucocephala* (Lam.) De Wit.

The junior author (KT) was based on the island from September 1985 to March 1988 as part of a WWF/IUCN plant conservation project aimed at conservation of the highly endangered endemic trees and remnants of indigenous forests. Very few areas on the island harbour bryophyte communities of notable size, but this small collection represents some, but not all, of the best

areas left on the island. The present collection does not claim to be an inventory, but is merely the result of an attempt to observe which bryophytes were able to grow on introduced trees and whether there were any species confined to the endemic trees, but as few epiphytes, apart from lichens and hepatics, were found, the collecting was extended to other substrates as well.

The most comprehensive list of mosses from Rodrigues is the early record of Mitten (1879), who examined mosses collected by Balfour in August to December 1874 during "The Transit of Venus Expedition". By the time Balfour collected plants on Rodrigues, little was left of native vegetation, but nevertheless he found 33 different taxa of mosses.

The senior author (GE) has determined most of the specimens, using the literature, notes and electronic databases assembled during work with the previous six parts of this series of papers (Een 1976, 1978, 1989, 1993 and 1997 and Sollman & Een 1996). In certain cases, however, we have received help from specialists. Thus we are very grateful to M.A.Bruggeman-Nannenga for determining two samples of *Fissidens*, to Sándor Orbán for five samples of *Calymperes*, to Philip Sollman for four samples of *Weissia* and one sample of *Luisierella*, to William Buck for one sample of *Trachyphyllum* and to Robert Magill for one sample of *Hildebrandtiella*.

List of species

An asterisk (*) before the scientific name indicates that the species is new to Rodrigues or new to a larger geographical area. RD000 is the collection number referring to the Thingsgaard collection from Rodrigues. Where nothing else is mentioned, the specimen is deposited in herbarium S.

Anomodon pseudotristsis (C.Müller) Kindb.

Rodrigues: N slope of Grande Montagne, on boulders, 1987-07-30 (RD048).

This species was recorded from Rodrigues by

Mitten (1879: 393) under the name *Anomodon exilis* sp. nov. This name was reduced to a synonym by Sim (1926: 378). Brotherus (1907: 986) placed this species in the genus *Haplohymenium* but Granzow (1997: 243), in his monograph of *Anomodon*, brought it back to the present genus.

Bescherelle (1880: 147) described *Haplohymenium Pseudoleskea tenuissima* sp. nov. on the basis of one specimen from Mauritius. Granzow (1997: 267) listed this species under "Taxa not available for study" with the comment "most likely a synonym of *Haplohymenium pseudotristsis* (see also Noguchi, 1957)."

The known distribution of this species, outside the Mascarenes, includes the South and East African mainland.

Bryum erythrocaulon (Schwaegr.) Bridel

Rodrigues: S. slope of Mt. Piton, growing on boulders, 1986-05-06 (RD006).

The leaves have a rather indistinct border and a flat margin. One very pale tuber was observed. The flat margin is one of the characteristics of *Bryum appressum* Ren. & Cardot, a species which has been recorded from Madagascar, but diagnostic characters of this taxon are cherry red tubers, and stems and leaves which darken when drying (Mohamed 1979: 439). The present sample has bright green leaves when dry and no red tubers.

This species was first recorded from Rodrigues by Mitten (1879: 391) with the comment "Widely spread on the island". Previously found also on Mauritius and Madagascar.

* *Bryum truncorum* (Bridel) Bridel

Rodrigues: S. slope of Grande Montagne, on the ground, 1986-07-23 (RD043).

This specimen has been determined in accordance with Mohamed (1979: 426-428) and Ochi (1971: 503-505) but no tubers were observed. The leaf border is much wider than in the previous species.

This species was previously recorded from Réunion and Madagascar but is new to Rodrigues.

Bryum sp.

S. slope of Mt. Piton, growing on boulders, 1986-05-06 (RD004); S. slope of Grande Montagne, on the ground, 1986-07-23 (RD041).

This material differs from the previous two species of *Bryum*, but the samples are too small and undeveloped for proper determination.

* *Calymperes tenerum* C.Müller var. *tenerum*

Rodrigues: Grande Montagne, epiphyte on *Litsea glutinosa*, 1987-05-11 (RD021B, dupl. EGR), det. Orbán; Cascade St. Louis, growing on rocks near the stream, 1987-08-07 (RD060); Cascade St. Louis, common on rocks near head of valley, 1987-08-07 (RD064 dupl. EGR), det. Orbán; Small valley east of Cascade St. Louis, epiphyte on *Elaeodendron orientale* Jacq. 1987-08-06 (RD066 dupl. EGR), det. Orbán.

This is the first record of this taxon from the Mascarenes. According to Sándor Orbán (pers. comm.) a later specimen from Mauritius, collected in 1996, exists in EGR (T. Pócs No. 9674/A, det. Orbán). This species is widely distributed in Africa, including Madagascar, the Comores and the Seychelles.

Calymperes palisotii Schwaegr. ssp. *palisotii*

Rodrigues: S. slope of Grande Montagne, on the ground, 1986-07-23, conf. Orbán (RD042D dupl. EGR); S.-E. slope of Grande Montagne, epiphyte on *Mathurina penduliflora* Balf.f., 1987-07-30, conf. Orbán (RD047C dupl. EGR).

This species was first recorded from Rodrigues by Mitten as *Calymperes laevifolium* sp. nov. (Mitten 1879: 388), later reduced to a synonym of *C. palisotii* by Ellis (1987: 683). Mitten (loc. cit.) reported a new *Calymperes* species from Rodrigues, viz. *Calymperes pallidum* Mitten and

noted that it was "frequent". In contrast to *C. palisotii* and *C. tenerum*, this species has no stereid cells in cross section of leaves and the teniola of lamina is well developed. Although *C. pallidum* is a more robust and paler plant, it has either been overlooked by the junior author or is no longer "frequent".

This taxon is widely distributed throughout Africa, Indian Ocean and Asia east to Thailand.

Fissidens

Mitten (1879) described two new species of *Fissidens* from Rodrigues, i.e., *F. procumbens* (pp. 395-396) and *F. brevifrons* (p. 396). Furthermore he recorded two species previously known from western Africa, i.e., *F. flaccidus* Mitten and *F. vogelianus* Mitten (p. 396).

Fissidens procumbens is now considered a synonym of *F. crispulus* Bridel (Bruggeman 1997: 158) and *F. vogelianus* a synonym of *F. zollingeri* Mont. (Bruggeman loc. cit: 169), while *F. brevifrons* and *F. flaccidus* are still considered valid specific names.

* *Fissidens sciophyllus* Mitten

Rodrigues: Cascade St. Louis, growing on rocks near the stream, 1987-08-07, det. Bruggeman (RD060B, dupl. in U).

This species is reported from the African mainland, Madagascar and Reunion (Bruggeman 1993: 145-146 as *F. purpureocaulis* C.Müller; Bruggeman 1997: 166-167). It is new to Rodrigues.

* *Fissidens ramulosus* Mitten

Rodrigues: Mt. Malartic, on rocks, windward slope in secondary exotic forest, 1987-08-06, det. Bruggeman (RD067D, dupl. in U).

In the Afr.3 area, sensu Index Muscorum (Wijk, Margadant & Florschütz 1959), this species has previously been reported from Madagascar

(Nossi-Comba) as *Fissidens comorensis* var. *acuminatus* Besch. (Bescherelle 1880: 42). It has also been recorded from the Comores (Bescherelle 1885: 85) under the same name, which was later reduced to a synonym of *F. ramulosus* (Bruggeman 1997: 165). It is otherwise known from large parts of mainland Africa but is new to the Mascarenes.

Hildebrandtiella pachyclada Besch.

Rodrigues: Cascade St. d'Or, growing in spray from the "cascade", 1988-01-27, det. Magill (RD083, dupl. in MO)

This species was not recorded by Mitten, but one collection without locality from Rodrigues (Staub #10957) is cited by Argent (1973: 589). The known distribution of this species includes all three major Mascarene islands and Tanzania.

* *Luisierella barbula* (Schwaegr.) Steere

Rodrigues: Anse Quito. Growing on coralline (calcareous) rocks. 1987-08-05, det. Ph. Sollman (RD084, dupl. in L).

This record is the second from Africa. It has recently been reported from the Aldabra Atoll in the Seychelles (Seaward et al. 1996: 31 and O'Shea et al. 1996: 183). These two records seem to bridge the very large gap between the Asian and the New World disjunction.

The distribution of this small calciphyte may be wider than is known today, and it is likely that it will be found in other calcareous areas in the western Indian Ocean, e.g. the Mauritian islet Île aux Aigrettes. The blackish, in dry condition, crust-like patches, are not particularly conspicuous and it is probably overlooked. It has been recorded from Brazil, Central America, SE USA, Mexico, the West Indies, Java and Japan (Zander 1993), but is new to the Mascarenes.

Meiothecium madagascariense (Bridel) Broth.

Rodrigues: S. slope of Mt. Piton, on boulders,

1986-05-06, (RD002); S. slope of Grande Montagne, on the ground, 1986-07-23, (RD042A).

This species was recently reported as new to Rodrigues by Townsend (1978), but it was previously known from Mauritius, Réunion and Madagascar.

Meiothecium crassirete (Ren. & Card.) Card. from Madagascar, is very similar to *M. madagascariense* (Renault & Cardot 1915: 489) - the authors remarked "Espèce très voisine de la précédente". It is still uncertain whether they are conspecific.

Philonotis pungens (Mitten) Mitten

Rodrigues: S. slope of Mt. Piton, growing on boulders, 1986-05-06 (RD001, RD004, RD005); Mt. Malarctic. On rocks, windward slope in secondary exotic forest, 1987-08-06 (RD067C); Cascade St. Louis, growing on rocks near stream, 1987-08-07 (RD061); Cascade St. Louis, common on rocks near head of valley, 1987-08-07 (RD062).

Two species of *Bartramia* (*Philonotis*) were described by Mitten (1879: 390-391) from Rodrigues: *P. pungens* (Mitten) Mitten and *P. flaccidifolia* (Mitten) Paris. The latter species is described as being larger than *P. pungens* with wider leaves and a smooth costa. Mitten (loc. cit.), however, expressed his uncertainty that his two samples represented two taxa: "It is possible that this may only be an altered state of *P. pungens* by some peculiarity of locality, but its appearance is different".

The present six specimens from four localities fall in two morphologically different groups:

Morphotype A is a less than 4 mm tall unbranched plant growing in dense tufts on exposed rocks in the upland area at c. 220 m altitude (RD001, RD004, RD005). These plants have leaves almost straight with the ratio of greatest width over length (W/L) = 0.25 (0.21-0.28) and the length of leaves altogether ranging from 0.515 to 0.887 mm. Within sample (= patch) the range is less than 0.090 mm. Morphotype A

has no mamillae on cells of dorsal lamina. The costa is dorsally dentate, with the margin dentate and somewhat recurved.

Morphotype B is 10 - 35 mm tall irregularly branched plants in loose tufts growing either at somewhat exposed rocks in the upland at c. 360 m altitude (RD067), or on rocks at the humid head of one of the steep SE facing valleys at c. 15 m altitude (RD061, RD062). The plants have somewhat falcate-secund leaves on most stems. W/L of stem leaves is 0.22 (0.21- 0.23) the length of leaves ranging from 0.887 to 1.430 mm. Within sample the variation is up to 0.315 mm. Conspicuous mamillae occur on the apical end of laminal cells, and a dentate margin and a dentate costa are characteristic features.

RD067 is smaller - 6 to 10 mm tall - than the other two samples (RD061, RD062), and differs in having leaves with faint cuticular papillae.

Herb. S has an isotype of *Philonotis pungens*, which has been consulted. This specimen has capsules. It is close to morphotype B in habit and in the fact that it has mamillae also in the apical ends of the upper laminal cells.

The description of *Philonotis gracilescens* Schimper in Wright (1892: 263) is based on a specimen from Mauritius collected by Ayres. An isotype is available in S. Our Rodrigues plants are fairly close to this, but differ slightly in leaf shape - narrowly triangular in *P. pungens* and somewhat lanceolate in *P. gracilescens*.

Several other similar *Philonotis* species are reported to occur in the Afr.3 area e.g., *P. hastata* (Duby in Moritzi) Wijk & Marg., *P. mauritiana* Ångstr., *P. sparsifolia* (Hampe) Jaeger (Renault & Cardot 1915: 307-315). *P. dregeana* (C.Müller) Jaeger from South Africa may also be very close.

Based on the taxonomic uncertainties and the very variable plants, we have chosen the conservative decision to label our samples *Philonotis pungens*, although it may well turn out, when a proper revision of the *Bartramiaceae* of the African region is carried out, that this taxon is conspecific with one or more of the above mentioned.

The apparent variation in leaf characters is considered to be of phenoplastic origin due to rather variable habitats. Variation in degree of

branching, size of plants and presence/absence of mamillae in at least younger parts of shoots is encountered in other *Philonotis* species, e.g., *Philonotis fontana* (Hedwig) Bridel.

The two samples collected at the head of the Cascade St. Louis valley near the stream in a very humid microclimate have longer leaves than the four upland collections. Although both Mt. Malarctic and Mt. Piton are situated in an area of the island with fairly high precipitation, still the sites occasionally become very dry. A response to these different conditions may well be the underlying explanation of the observed morphological variation, and thus it may be merely adaptive traits with no genetic background. On the other hand it can't be totally ruled out that two taxa are at hand. A two taxon decision would have to be based on careful study of the morphological variation in relation to ecological gradients, and/or an appropriate molecular method could help solve the problem.

Sematophyllum incurvum Mitten

Rodrigues: S.-E. slope of Grande Montagne, epiphyte on *Mathurina penduliflora* Balf.f., 1987-07-30 (RD047B); Mt. Malarctic, on rocks, windward slope secondary exotic forest, 1987-08-06 (RD067A, RD067B, RD068).

The original description by Mitten (1879: 394 + Plate 38A) was based on a plant from Rodrigues. Our plants agree well with the description although the leaves are slightly narrower than described by Mitten (loc. cit.).

Mitten (1879) compared his new species with *Sematophyllum brachycarpum* (Hampe) Broth., "from which it may be distinguished by the form of its leaves, which are all directed upward on the incurved branches". Specimens of *S. brachycarpum* from South Africa (RSA) have been studied and they were found to differ as described, as well as being somewhat larger than our plants.

According to Mitten (1879: 394) this species was common on Rodrigues. So far it has been reported only from this island.

Trachyphyllum inflexum (Harvey in Hooker) Gepp in Hiern

Rodrigues: S slope of Mt. Piton, growing on boulders, 1986-05-06, det. Buck (RD003); Top of Grande Montagne, on rocks, 1987-05-11 (RD020); S.-E. slope of Grande Montagne, epiphyte on *Mathurina penduliflora*, 1987-07-30 (RD047A); Grande Montagne, epiphyte on *Litsea glutinosa*, 1987-05-11 (RD021); Cascade St. Louis, growing on rocks near the stream, 1987-08-07 (RD060A).

This species was first reported from Rodrigues by Mitten (1879: 392) as *Pterogonium curvifolium* sp. nov., a name which was reduced to a synonym of *Trachyphyllum inflexum* by Buck (1979: 382).

It is known from all the three major Mascarene islands. It has a wide distribution in Africa, including Madagascar, the Comores and the Seychelles.

* *Vesicularia ayresii* (Schimper ex Besch.) Broth.

Rodrigues: Cascade Victoire, on cliffs, 1986-05-05 (RD007); SE-slope of Grande Mt., on boulders, 1987-07-30 (RD046).

RD007 has been compared with a specimen in herb. S from Mauritius, collected by Robillard, determined by Renaud and included in his Musci Mascareno-Madagascarienses as #142 (RM448). The match is good. The ratio of stem leaf greatest width over length (W/L) is 0.68 (0.63) and the ratio between median cell width over length (CW/L) is 0.38 (0.36) in both specimens. Figures within brackets refer to the Robillard specimen. RD046 has a slightly different habit. Branches and leaves are flat and not somewhat falcate as in RD007. W/L is 0.63, but CW/L is as low as 0.23. Both specimens have one single triangular inflated alar cell.

Two earlier records of *Vesicularia* from Rodrigues exist, i.e., *V. scaturigina* (Bridel) Broth. and *V. subenervis* (Mitten) Broth., both according to Mitten (1879: 394). A specimen of *V. scaturigina* from Madagascar, determined by Thériot, has been consulted and its W/L is 0.42

and CW/L is 0.17. No specimens of *V. subenervis* have been studied, and the original description by Mitten (1879: 394) is very short.

If future studies show that these three names have been given to one and the same variable taxon, *Vesicularia scaturigina* is the oldest name.

Vesicularia ayresii is new to Rodrigues, at least under this name.

* *Weissia edentula* Mitten

Rodrigues: S. slope of Grande Montagne, on the ground, 1986-07-23, det. Sollman (RD041, dupl. in L); Cascade St. Louis, common on rocks near head of valley, 1987-08-07, det. Sollman (RD063, RD065, dupl. in L); Mt. Piton, growing on boulders, 1987-08-26, det. Sollman (RD081, dupl. in L).

All four specimens have been determined by Philip Sollman with slight reservations due to the fact that no perfect peristome was found in the samples.

Mitten (1879: 388+389) reported the cosmopolitan species *Weissia controversa* Hedwig from Rodrigues and noted that it was "Everywhere on the banks of streams". *Weissia edentula* was described thirty years earlier by Mitten (1859: 27) based on a specimen from India. *Weissia controversa* has short, irregular, obtuse peristome teeth as opposed to the complete lack of peristome teeth in *W. edentula*.

Bizot (1968: 480) reported one specimen of *Weissia controversa* from Réunion and Een (1976: 217) reported five from two localities on the same island, but none from Mauritius. None of those six specimens have any peristome.

It is hard to believe that different species of *Weissia* were collected in 1874 and 1986/87, but until somebody cares to re-study the Balfour and other Mascarene collections, this will have to be the conclusion.

Weissia edentula is known to occur in tropical Asia, Polynesia, Australia and Central Africa (Sollman, in litt.). It is new to the Mascarenes, at least under this name.

Discussion

The present collection brings the number of moss taxa recorded from Rodrigues to forty-four. Only one species or 2.3 % appear to be endemic, viz. *Sematophyllum incurvum*. Compared to the 14% endemism reported for the bryophyte flora of the Seychelles (O'Shea et al., 1996) this figure might seem low, but is probably reasonable enough taking the geological history of these islands into account. The only endemic moss from Rodrigues has been collected on two occasions, once from the stem of an endangered endemic tree, and secondly epilithic in remnants of a native forest. It is difficult to assess the status of the species today, but it is probably not able to establish itself and grow on the exotic trees comprising the majority of forested areas today. If its major substrate is the bark of endangered trees, the moss is equally endangered, but hopefully it may be found in a few more places.

Mitten (1879) listed 33 species. Of these he annotated 10 species as rare or not common. Two of these rare species are represented in the present collection, viz. *Anomodon pseudotriste* in one collection, and *Trachyphyllum inflexum* at four localities - three from basaltic rocks and one from the trunk of the threatened endemic *Mathurina penduliflora* Balf.f. Fortunately this species also seems to be able to grow as epiphyte on the cortex of the very common exotic *Litsea glutinosa*. Four of the ten rare species listed by Mitten were found by Balfour only at Baie aux Huitres - today a major settlement and thus very degraded. Of greater interest is that of the sixteen species considered common by Mitten (loc. cit.), only four were collected by Thingsgaard. It is likely that most of these species have become rare due to the continuing deforestation and habitat destruction. Only two species were found growing on introduced trees, viz. *Calymperes tenerum* ssp. *tenerum* and *Trachyphyllum inflexum*. These two taxa obviously have a very broad ecological amplitude, as they are found growing as epiphytes on exotic as well as on native trees, and also epilithic. *Calymperes palisotii* ssp. *palisotii* and *Sematophyllum incurvum* are both recorded growing on endemic trees and other substrates, but seem to avoid the introduced trees.

There is no doubt, that even though Balfour found the island rather degraded in 1874 (Balfour 1879), the extent of remnants of natural plant communities has been continually reduced during the little more than a century which has passed between the Transit of Venus Expedition and the present collection of mosses. The fact that only half of the taxa collected by Thingsgaard were also collected by Balfour gives an indication, that neither of the two collections are particularly complete, but no doubt, the relative decrease in number of sampled taxa by some 55 percent is indicative of the loss of habitat during the past century.

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