

A second species of *Symbiezidium* from Africa

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Abstract – *Symbiezidium barbiflorum* (Lindenb. & Gottsche) A.Evans, a species widespread in the Neotropics, is discovered at the east coast of Madagascar. The identification is based on its winged and randomly lacinate perianth and its U shaped underleaf insertion, which well distinguishes it from the already known endemic *S. madagascariense* Steph. Otherwise *S. barbiflorum* is a new example of Afro-American disjuncts, which do not occur in continental Africa.

Symbiezidium / *Eosymbiezidium* / Lejeuneaceae / Hepaticae / Madagascar

Résumé – *Symbiezidium barbiflorum* (Lindenb. & Gottsche) A.Evans, espèce répandue dans les Néotropiques, est découverte sur la côte orientale de Madagascar. Le périanthe ailé et peu lacinié ainsi que l'insertion en forme de U de l'amphigastre la distinguent de l'espèce malgache endémique *S. madagascariense* Steph. *Symbiezidium barbiflorum* est un nouvel exemple d'espèces afro-américaine disjointe, absente du continent africain.

Symbiezidium / *Eosymbiezidium* / Lejeuneaceae / Hepaticae / Madagascar

INTRODUCTION

The genus *Symbiezidium* Trevis. was known, as mainly Neotropical, with 3 species: *S. dentatum* Herzog, *S. barbiflorum* (Lindenb. & Gottsche) A. Evans and *S. transversale* (Sw.) Trevis., the latter with two varieties, var. *transversale* and var. *hookerianum* (Gottsche) Gradstein & van Beek in the Americas and with only one species in Africa, distinguished even at the subgeneric level: *S. madagascariense* Steph. from Nosy Boraha (St. Marie Island) at the east coast of Madagascar and from the Seychelles: Mahé Island (Grolle, 1978; Gradstein & van Beek, 1985; Gradstein, 1994).

In their revision of the genus Gradstein & van Beek (1985) distinguished two subgenera, *Eosymbiezidium* with the only known African species, by its small, not decurrent, round underleaves with shallowly curved insertion (< 100 µm) and

with bistratose base at the rhizoid disc and by its smooth perianth, then subgenus *Symbiezidium* with the rest of the (Neotropical) species, having underleaves with deeply arched ($> 200 \mu\text{m}$), decurrent insertion, tristratose base at the rhizoid disc and winged, laciniate perianth.

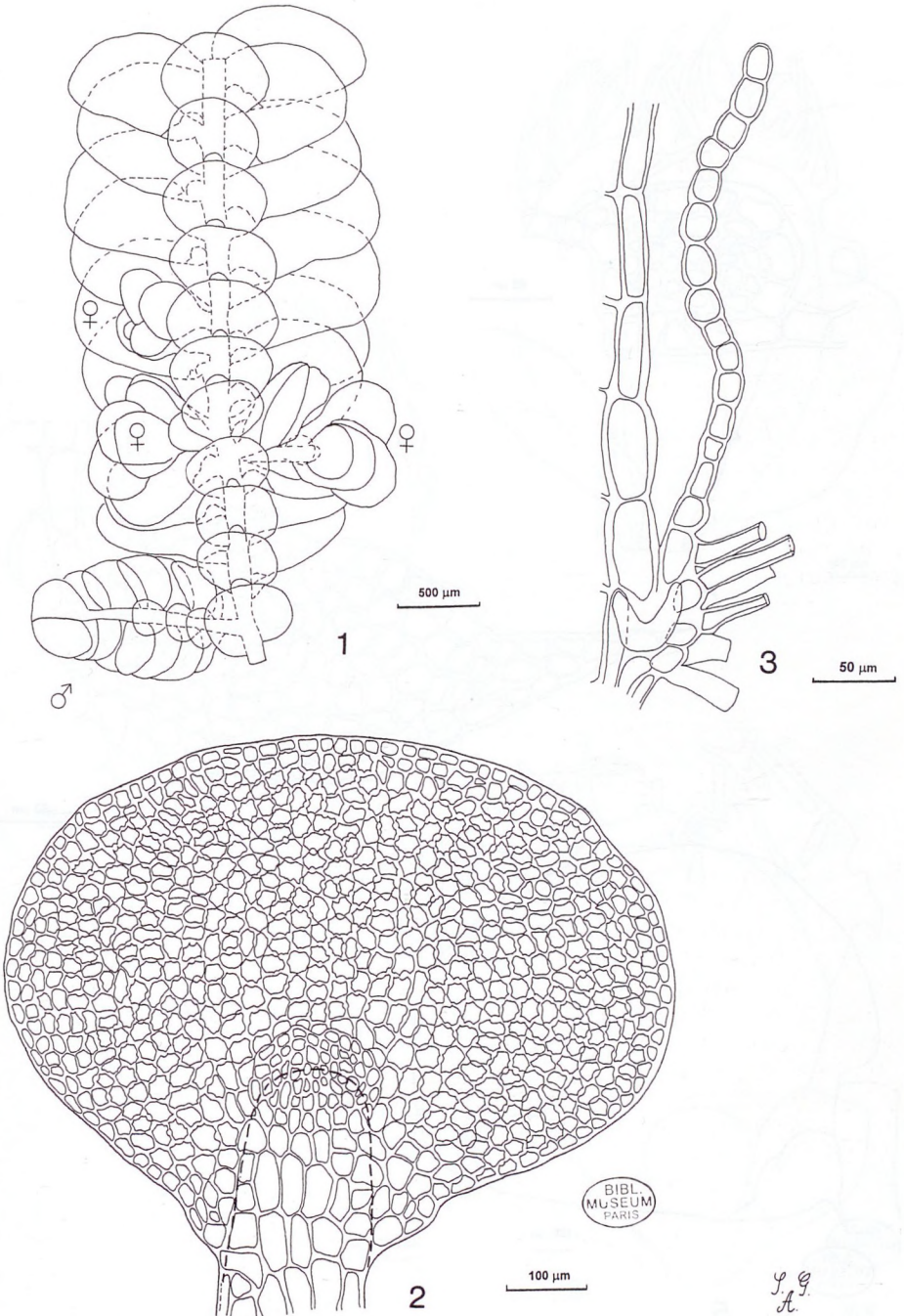
The second author, with his colleagues, collected two samples of *Symbiezidium* in the eastern coastal forests of Madagascar near to sea level: one from the Antongil Bay in the north in 1994 and an other from the central part of the coast near Ambila Lemaitso, in 1998. The sterile Antongil Bay specimen was first identified, as *S. madagascariense* (Pócs, 1995). But when the present authors studied the second specimen, rich in gametocidia, discovered that it can not belong to the known Madagascar species, having strongly winged and randomly laciniate perianths. Both specimens agreed also with one of the vegetative characters of subgenus *Symbiezidium*: the underleaf being decurrent with more than $200 \mu\text{m}$ deeply arched, inverted U shaped insertion. But on the other hand, the Madagascar plants are possessing a character given by Gradstein and van Beek of *Eosymbiezidium* subgenus (1985), having constantly only two cell layers of amphigastrium at the rhizoid disc. The size of the Madagascar plant is intermediate between the range of the two subgenera, being at the lowest size limit of Neotropical species. Apart from these characters, the Madagascar plants seemed to be very close to the Neotropical *Symbiezidium barbiflorum* (Lindenb. & Gottsche) A.Evans.

RESULTS

First we inclined to describe the Madagascar representative of *Symbiezidium barbiflorum*, as a species new to science and prepared its detailed description and illustrations, as follows (see also the Figs. 1-9). We think that this description will be useful to recognise other possible African specimens:

Olive-green or brownish plants, shoot 1-2 cm long and 1.55-2.05 mm wide. Stem $150 \mu\text{m}$ diameter, with 10-12 cortical and 28-35 medullary cell rows, ventral merophyte 4 cells wide. Branching *Lejeunea* type (the rare subgynoecial innovations *Radula* type). Leaves imbricate, appressed, $1.1-1.3 \times 0.9-1.1$ mm, often slightly different sizes on the two sides of the stem, with auriculate dorsal base and broad, obtusely rounded apex. Median leaf cells isodiametric, 25-40 μm diameter, with triradial corner and 1 (seldom 2) intermediate thickenings. Lobulus of 0.2-0.3 lobus length, triangular ovate, at base inflated, the distal half flat, with an incision with obsolete teeth between the two parts. Underleaves imbricate or contiguous, flat, kidney shaped, about 5 times wider than the stem, 330-360 μm long (measured from the top of insertion) and 650-800 μm wide with decurrent base and inverted U shaped insertion line.

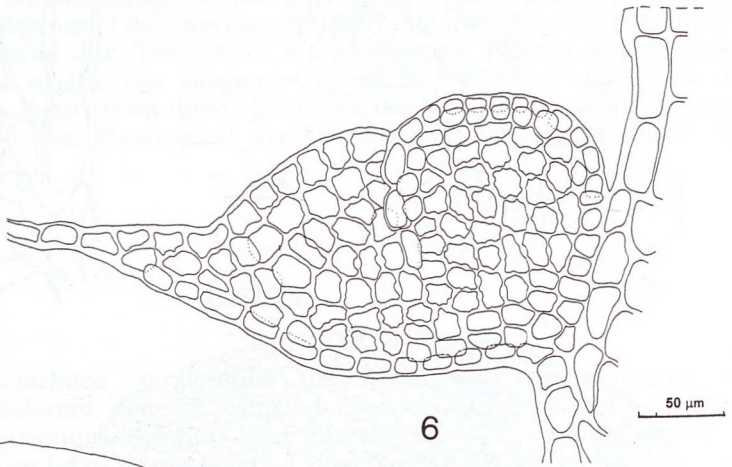
Autoicous, gynoecia at the top of short lateral branches, with emarginate or very shortly bilobed bracts and entire bracteole with obtuse apex. Perianth obovate, $1150 \times 825 \mu\text{m}$ in average, compressed on both sides or ventrally inflated. Two narrow or broad, laciniate lateral wings develop only in the upper half of perianth. Irregularly scattered laciniae may occur in the upper half of ventral side, but often very few or missing. Male branches occur laterally, irregularly alternating with female branches, each with 4-6 pairs of bracts and 2-3 round bracteoles only in the proximal part. Sporophyte not seen.



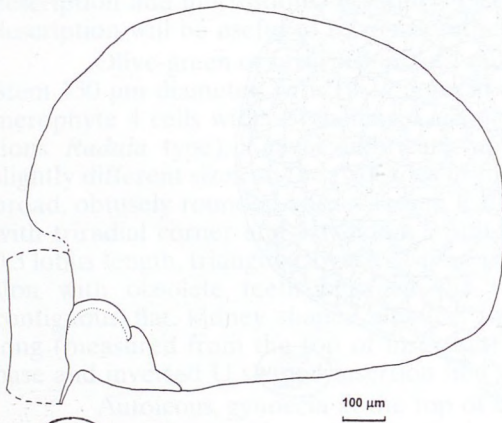
Figs 1-3. African *Symbiezidium barbiflorum* (Lindenb. & Gottsche) A. Evans specimen. 1: Habit, ventral view, with female and male branches. 2: Underleaf, with indication of insertion line. 3: Longitudinal section through the centre of underleaf base and rhizoid disc. (Drawn from Pócs & Szabó, 9881/BF, Madagascar, Ambila-Lemaitso.)



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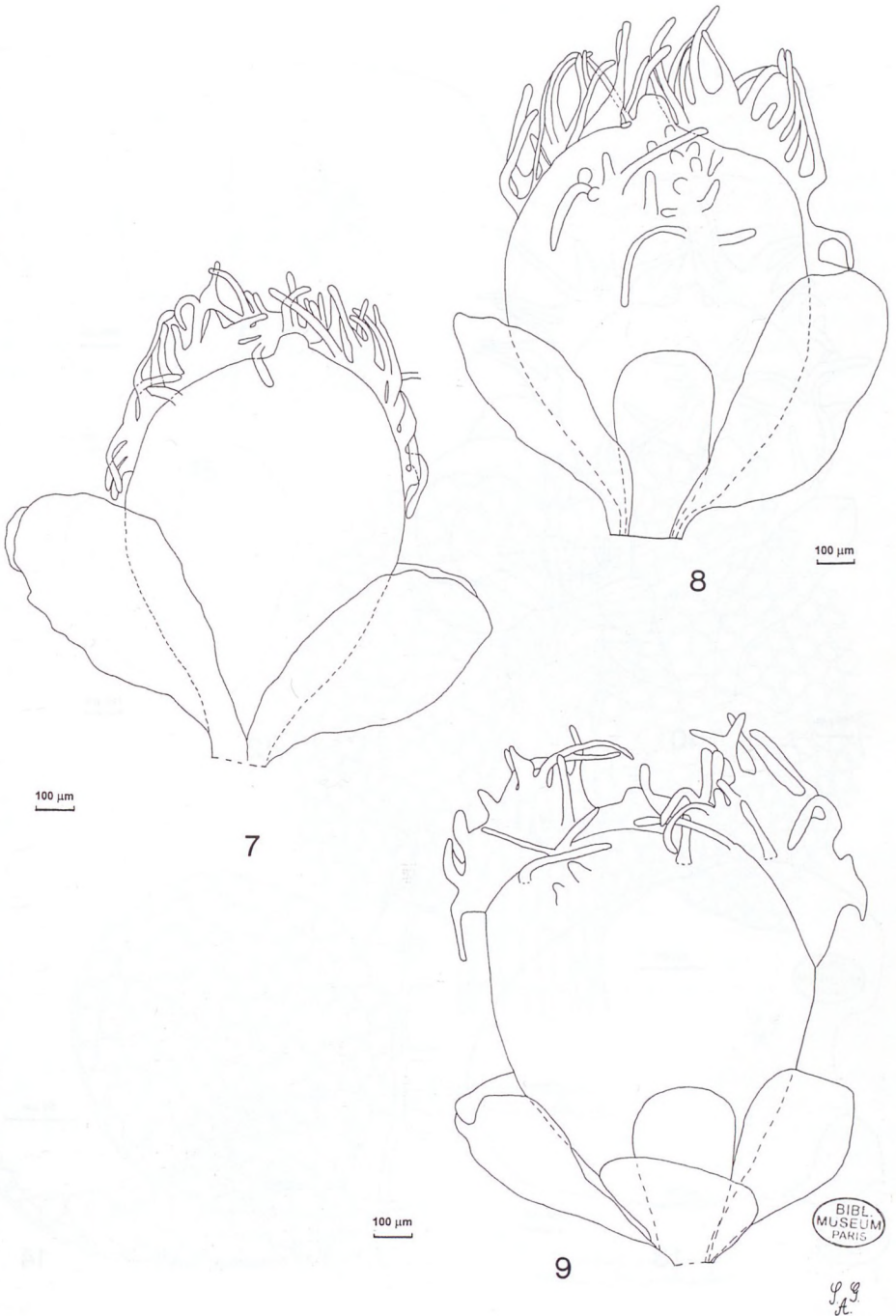


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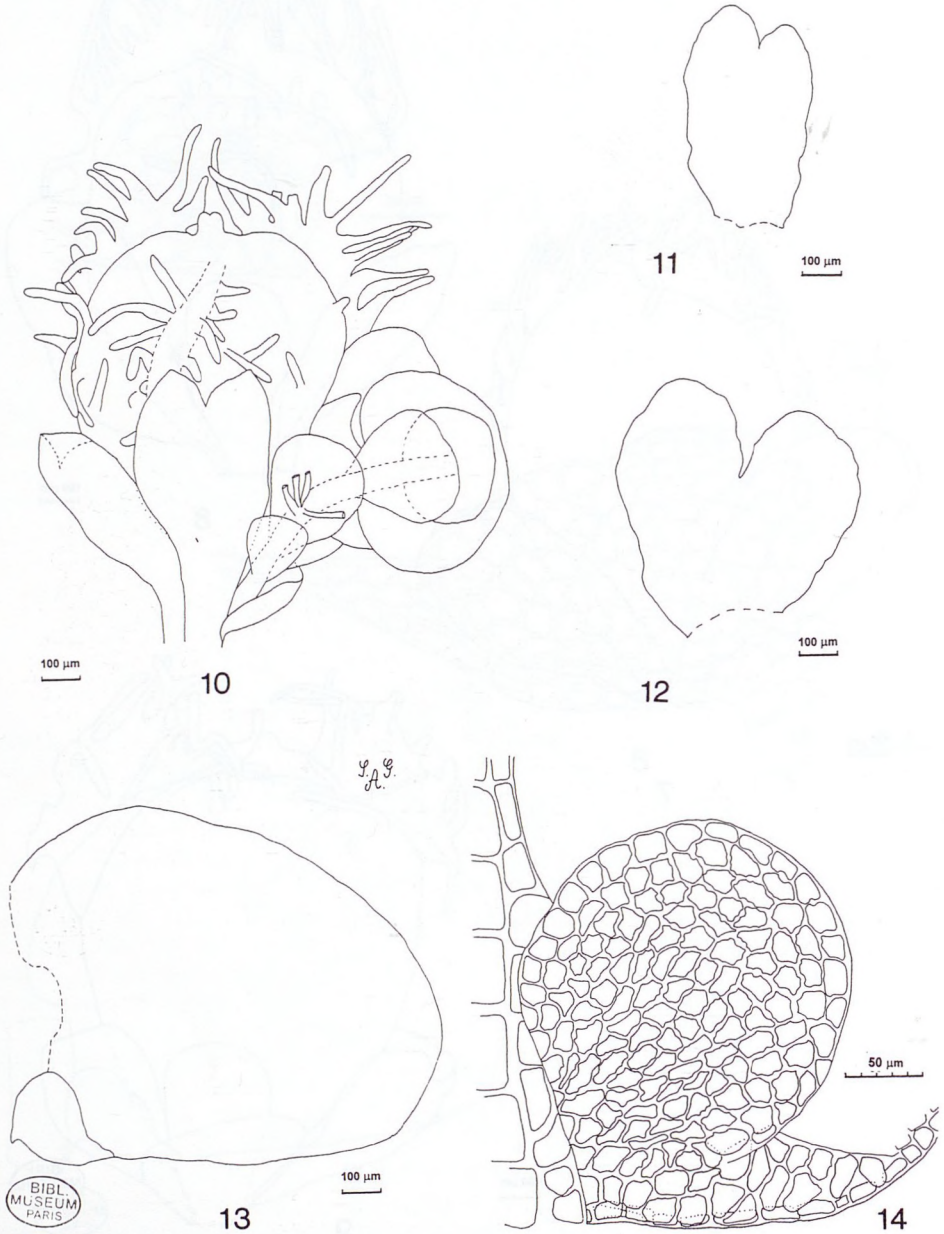
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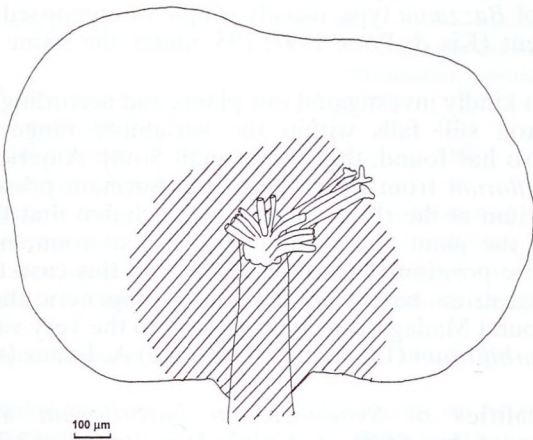
Figs 4-6. African *Symbiezidium barbiflorum* (Lindenb. & Gottsche) A. Evans specimen. 4: Transversal section of the stem. 5: Leaf, ventral view. 6: Lobule. (Drawn from Pócs & Szabó, 9881/BF.)



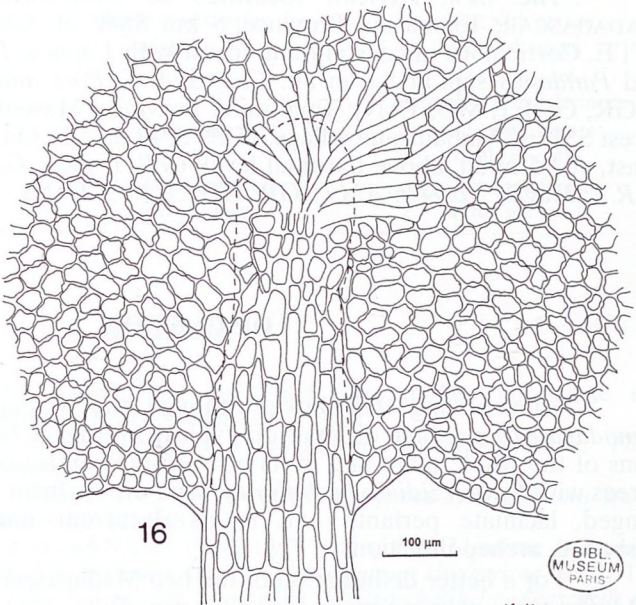
Figs 7-9. African *Symbiezidium barbiflorum* (Lindenb. & Gottsche) A. Evans specimen. 7: Gynoecium, dorsal view. 8-9: Gynoecium, perianths with different amount of laciniae, ventral view. (Drawn from Pócs & Szabó, 9881/BF.)



Figs 10-14. A typical American *Symbiezidium barbiflorum* (Lindenb. & Gottsche) A. Evans specimen. 10: Gynoecium, ventral view. 11-12: Bracteoles, different types. 13: Leaf, ventral view. 14: Lobule. (Drawn from Pócs & Caluff, 9180/T, Cuba, Oriente, Monte Verde N of Guantánamo, det. S.R. Gradstein.)



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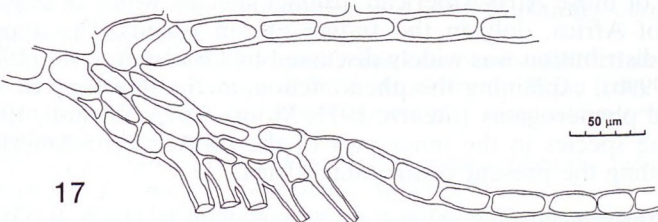


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100 µm

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g. g. st.



17

50 µm

Figs 15-17. A typical American *Symbiezidium barbiflorum* (Lindenb. & Gottsche) A. Evans specimen. 15-16: Underleaf, with the indication of insertion line. (Fig. 16 is at the same magnification, as Fig. 2.) 17: Longitudinal section through the centre of underleaf base and rhizoid disc. (Drawn from Pócs & Caluff, 9180/T, Cuba.)

Oil bodies 5-8 per cell of *Bazzania* type, each composed of 2-3 segments in the holotype and 6-12 per cell of *Bazzania* type, usually simple or composed of one large and one smaller segment (Kis & Pócs, 1997: 195, under the name of *S. madagascariense*).

Professor S.R. Gradstein kindly investigated our plants and according to his opinion the Madagascar taxon still falls within the variability range of *Symbiezidium barbiflorum*. He also has found, that some small South American specimens of *Symbiezidium barbiflorum* from Brazil and from Surinam possess only two cell layers of amphigastrium at the rhizoid disc and concluded that this character depends on the size of the plant and is influenced by environmental factors more than on its subgeneric position (Gradstein *in litt.*). In this case the number of cell layers at the amphigastrium base is not tenable, as subgeneric character any more and the recently found Madagascar plants belong to the very variable Neotropical *Symbiezidium barbiflorum* (Lindenb. & Gottsche) A. Evans (see Figs 10-17).

The new, African localities of *Symbiezidium barbiflorum* are: MADAGASCAR: Toamasina Province, 5 km SSW of Ambila-Lemaitso. 18°52.7'S, 49°1'E. Corticolous in coastal dune forest with *Uapaca*, *Trachylobium verrucosum* and *Pandanus* spp. at 5-8 m alt. *Coll. S. & T. Pócs and A. Szabó, No. 9881/BF* (EGR, GOET, MO, TAN); Toamasina Province: Masoala Peninsula, litoral rain-forest SSE of Ambanizana village. 15°39'S, 49°58.5'E. On bark of trees right at the coast, at 1.5 m alt. above the tidal level. *Coll. T. Pócs, G. Kis, C. Lafarge-England & R.E. Magill, No.9446/AM* (EGR, GOET, MO, TAN).

DISCUSSION

Summarizing the above, although the Madagascar plant approaches *S. madagascariense* (and differs from typical, average *S. barbiflorum*) in the dimensions of the whole plant and in its bistratose composition of underleaf base, well agrees with *Symbiezidium barbiflorum* (and differs from *S. madagascariense*) in its winged, lacinate perianth and in its decurrent underleaves with inverted U shaped, arched insertion.

For a better delimitation of the two Madagascar species, we prepared the following table of comparison (see next page 9).

The occurrence of *Symbiezidium barbiflorum* in Madagascar represents a new example of those Afro-American disjunct species, which does not occur in the continent of Africa, only in the Indian Ocean islands. This type of 'peri-Afroamerican' distribution was widely discussed by Gradstein *et al.* (1984) and by Pócs (1999a, 1999b), explaining the phenomenon, at the analogue of some similarly distributed phanerogams (Stearn, 1971; Moore, 1973; Borhidi, 1982) by the extinction of the species in the inner part of the former Afro-American supercontinent, including the present continental Africa.

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Tab. 1. Comparison of the African taxa of *Symbiezidium* Trevis.

	<i>S. madagascariense</i> (Madagascar, Seychelles)	<i>S. barbiflorum</i> (in Madagascar)
Shoot width mm	– 2.5	1.55-2.05
Stem diameter μm	180	140-160
Stem diameter in number of cells	9	7-8
Leaf size in mm	1-1.3 \times 0.8-1.1	1.1-1.3 \times 0.9-1.1
Lobule size	0.3 lobus length	0.2-0.3 lobus length
Underleaf size in μm	460-500 \times 500-600	330-360 \times 650-800
Underleaf insertion shape	Shallowly curved	More or less deeply arched, inverted U
Underleaf insertion size in μm	10-100 \times 180	200-240 \times 150-160 (211 \times 153 average)
Underleaf base	bistratose, not decurrent	bistratose, decurrent
Female bracteole	rounded, with entire or emarginate apex	entire, with obtuse, rounded apices
Perianth wing	none	always present, narrow or broad, laciniate
Perianth surface	smooth	randomly laciniate (rarely smooth)
Habitat ecology	lowland rainforest near sea level	coastal rainforest at the sea level

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